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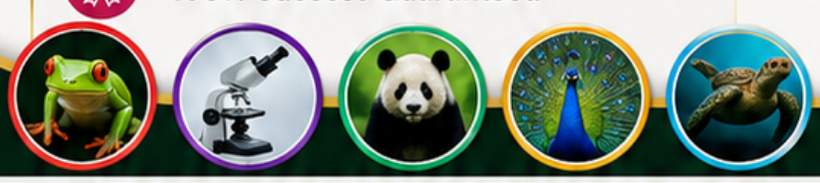

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Introduction to Zoology

1. What is the scientific study of animals called?
A) Botany
B) Ecology
C) Zoology
D) Anatomy
Answer: C -- Zoology

2. Which Greek word meaning "animal" forms the root of the term "Zoology"?
A) Logos
B) Zoon
C) Bios
D) Anthropos
Answer: B -- Zoon

3. The study of fishes is formally known as which branch of zoology?
A) Herpetology
B) Ornithology
C) Ichthyology
D) Mammalogy
Answer: C -- Ichthyology

4. Which group of fishes exhibits an enormous variety of color patterns, body forms, and feeding habits, including algae scrapers and scale eaters?
A) Salmonids
B) Cyprinids
C) Cichlids
D) Catfishes
Answer: C -- Cichlids

5. How many pairs of jaws do cichlid fishes typically possess?
A) One pair
B) Two pairs
C) Three pairs
D) Four pairs
Answer: B -- Two pairs

6. In mouth-brooding cichlids, where does fertilization and early development take place?
A) In a nest built on rocks
B) In the female's mouth
C) In open water column
D) In the male's mouth
Answer: B -- Female's mouth

7. The subdiscipline that studies the structure of entire organisms and their parts is known as?
A) Histology
B) Anatomy
C) Cytology
D) Embryology
Answer: B -- Anatomy

8. Which field of zoology focuses on the study of tissues?
A) Histology
B) Physiology
C) Genetics
D) Parasitology
Answer: A -- Histology

9. The study of subcellular details of animal structure and function belongs to which subdiscipline?
A) Molecular biology
B) Systematics
C) Comparative anatomy
D) Bioinformatics
Answer: A -- Molecular biology

10. Which branch of zoology deals with the interaction of organisms with their environment?
A) Genetics
B) Embryology
C) Ecology
D) Cytology
Answer: C -- Ecology

11. The study of the classification of, and evolutionary interrelationships among, animal groups is termed?
A) Systematics
B) Parasitology
C) Physiology
D) Anatomy
Answer: A -- Systematics

12. Herpetology is the study of which group of animals?
A) Fishes
B) Insects
C) Birds
D) Amphibians and reptiles
Answer: D -- Amphibians and reptiles

13. The study of insects is called?
A) Ornithology
B) Entomology
C) Mammalogy

D) Protozoology
Answer: B -- Entomology
14. Mammalogy is the branch of zoology dedicated to the study of?
A) Reptiles
B) Birds
C) Mammals
D) Protozoa
Answer: C -- Mammals
15. Which subdiscipline is concerned with the study of protozoa?
A) Herpetology
B) Ichthyology
C) Protozoology
D) Helminthology
Answer: C -- Protozoology
16. Organic evolution is defined as change in populations of organisms over?
A) Space
B) Time
C) Habitat
D) Behavior
Answer: B -- Time
17. Who published convincing evidence of evolution and proposed a mechanism for evolutionary change in 1859?
A) Gregor Mendel
B) Charles Darwin
C) Carolus Linnaeus
D) Alfred Wallace
Answer: B -- Charles Darwin
18. According to modern understanding, why is an evolutionary perspective crucial in zoology?
A) It describes only fossil animals
B) It explains family relationships and the origin of animal diversity
C) It focuses exclusively on animal behavior
D) It ignores genetic relationships
Answer: B -- Explains family relationships
19. The system of naming organisms using a two-part name is called?
A) Trinomial nomenclature
B) Polynomial nomenclature
C) Binomial nomenclature
D) Uninomial nomenclature
Answer: C -- Binomial nomenclature
20. Who is primarily credited with developing and popularizing binomial nomenclature for animals?
A) Charles Darwin
B) Gregor Mendel
C) Carolus von Linne (Linnaeus)
D) Ernst Haeckel
Answer: C -- Carolus von Linne
21. Which of the following represents the correct hierarchical order of taxonomic ranks from most inclusive to least inclusive?
A) Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species
B) Kingdom, Domain, Class, Phylum, Order, Family, Genus, Species
C) Species, Genus, Family, Order, Class, Phylum, Kingdom, Domain
D) Domain, Phylum, Kingdom, Class, Order, Family, Genus, Species
Answer: A -- Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species
22. Organisms placed in the same _____ are more closely related than organisms placed in the same family.
A) Phylum
B) Order
C) Class
D) Genus
Answer: D -- Genus
23. In modern zoology, birds are now considered to be part of which class?
A) Aves
B) Reptilia
C) Mammalia
D) Amphibia
Answer: B -- Reptilia
24. The realization that birds are reptiles that became adapted for flight is based on studies of DNA and shared characteristics between birds and?
A) Mammals
B) Amphibians
C) Reptiles
D) Fishes
Answer: C -- Reptiles
25. The only dinosaurs that survived the mass extinction event approximately 66 million years ago are?

Animal Systematics, Taxonomy, Phylogeny & Organization

1. **The protoplasmic grade of organization is characteristic of which group of organisms?**
A) Sponges
B) Cnidarians
C) Unicellular organisms
D) Flatworms
Answer: C – Unicellular organisms

2. **Which grade of organization is defined by an aggregation of similar cells into definite patterns or layers to perform a common function?**
A) Cellular grade
B) Cell-tissue grade
C) Tissue-organ grade
D) Organ-system grade
Answer: B – Cell-tissue grade

3. **In the tissue-organ grade of organization, the chief functional cells of an organ are called?**
A) Stroma
B) Mesoglea
C) Parenchyma
D) Peritoneum
Answer: C – Parenchyma

4. **Which of the following phyla demonstrates the organ-system grade of organization?**
A) Porifera
B) Cnidaria
C) Platyhelminthes
D) Nemertea
Answer: D – Nemertea

5. **Spherical symmetry in animals is best suited for which type of lifestyle?**
A) Sessile attachment
B) Burrowing
C) Floating and rolling
D) Directional swimming
Answer: C – Floating and rolling

6. **Which type of symmetry allows an animal to be divided into similar halves by more than two planes passing through the longitudinal axis?**
A) Spherical symmetry
B) Radial symmetry
C) Bilateral symmetry
D) Asymmetry
Answer: B – Radial symmetry

7. **Biradial symmetry is exemplified by which of the following animal groups?**
A) Sea anemones
B) Comb jellies (Ctenophora)
C) Sponges
D) Flatworms
Answer: B – Comb jetties (Ctenophora)

8. **The term "cephalization" refers to which evolutionary phenomenon?**
A) Development of a complete gut
B) Differentiation of a head with concentrated nervous tissue
C) Formation of a coelomic cavity
D) Segmentation of body parts
Answer: B – Differentiation of a head with concentrated nervous tissue

9. **In a bilaterally symmetrical animal, the plane that divides the body into dorsal and ventral halves is called?**
A) Sagittal plane
B) Midsagittal plane
C) Frontal plane
D) Transverse plane
Answer: C – Frontal plane

10. **Which body cavity in animals is derived from the blastocoel and is only partially lined by mesoderm?**
A) Coelom
B) Pseudocoelom
C) Gastocoel
D) Spongocoel
Answer: B – Pseudocoelom

11. **In acoelomate body plan, the space between ectodermal epidermis and endodermal digestive tract is filled with?**
A) Peritoneum
B) Mesenteries
C) Parenchyma

D) Coelomic fluid
Answer: C – Parenchyma

12. **The process of coelom formation by the splitting of mesodermal bands is called?**
A) Enterocoely
B) Schizocoely
C) Invagination
D) Delamination
Answer: B – Schizocoely

13. **In deuterostomes, mesoderm forms from the gut lining by which method?**
A) Schizocoely
B) Parenchymula formation
C) Enterocoely
D) Involution
Answer: C – Enterocoely

14. **The thin cellular membrane derived from mesoderm that lines the coelom is called?**
A) Mesoglea
B) Stroma
C) Peritoneum
D) Basement membrane
Answer: C – Peritoneum

15. **Which of the following is a characteristic feature of protostomes?**
A) Radial cleavage
B) Blastopore becomes anus
C) Mosaic cleavage
D) Enterocoely
Answer: C – Mosaic cleavage

16. **The blastopore becomes the mouth in which group of animals?**
A) Deuterostomes
B) Ecdysozoans only
C) Lophotrochozoan protostomes
D) Chordates
Answer: C – Lophotrochozoan protostomes

17. **A complete gut (tube-within-a-tube design) provides which major advantage?**
A) Increased body symmetry
B) One-way flow of food from mouth to anus
C) Formation of a hydrostatic skeleton
D) Enhanced cephalization
Answer: B – One-way flow of food from mouth to anus

18. **Serial repetition of similar body segments along the longitudinal axis is termed?**
A) Metamerism
B) Cephalization
C) Symmetry
D) Gastrulation
Answer: A – Metamerism

19. **Which three phyla clearly exhibit segmentation (metamerism) as a prominent feature?**
A) Porifera, Cnidaria, Platyhelminthes
B) Annelida, Arthropoda, Chordata
C) Mollusca, Nemertea, Echinodermata
D) Nematoda, Rotifera, Brachiopoda
Answer: B – Annelida, Arthropoda, Chordata

20. **Which tissue type is characterized by cells arranged in sheets that cover external and internal surfaces?**
A) Connective tissue
B) Muscular tissue
C) Nervous tissue
D) Epithelial tissue
Answer: D – Epithelial tissue

21. **Simple squamous epithelium is specialized primarily for which function?**
A) Absorption of nutrients
B) Secretion of mucus
C) Diffusion of gases and transport of molecules
D) Mechanical abrasion resistance
Answer: C – Diffusion of gases and transport of molecules

22. **The type of epithelium that lines the urinary tract and bladder of vertebrates and allows great stretching is?**
A) Stratified squamous epithelium
B) Simple cuboidal epithelium
C) Transitional epithelium
D) Simple columnar epithelium
Answer: C – Transitional epithelium

23. **Which protein is the most abundant in the animal kingdom and provides tensile strength in connective tissues?**
A) Elastin
B) Keratin
C) Collagen
D) Actin
Answer: C – Collagen

24. **The cells of cartilage located in pockets called lacunae are known as?**

A) Osteocytes
B) Fibroblasts
C) Chondrocytes
D) Macrophages
Answer: C – Chondrocytes

25. **Which type of muscle tissue is multinucleate, cylindrical, and under voluntary control in vertebrates?**
A) Cardiac muscle
B) Smooth muscle
C) Skeletal muscle
D) Obliquely striated muscle
Answer: C – Skeletal muscle

26. **Intercalated discs are specialized junctional complexes found in which muscle type?**
A) Skeletal muscle
B) Smooth muscle
C) Cardiac muscle
D) Obliquely striated muscle
Answer: C – Cardiac muscle

27. **The basic functional unit of the nervous system that receives and conducts impulses is called?**
A) Neuroglia
B) Dendrite
C) Neuron
D) Axon
Answer: C – Neuron

28. **Which part of a neuron carries signals away from the cell body to other neurons or effector organs?**
A) Dendrite
B) Soma
C) Axon
D) Myelin sheath
Answer: C – Axon

29. **As body size increases in animals, the surface area to volume ratio generally?**
A) Increases
B) Decreases
C) Remains constant
D) Fluctuates randomly
Answer: B – Decreases

30. **The binomial nomenclature system for naming species was developed by?**
A) Aristotle
B) Charles Darwin
C) Carolus Linnaeus
D) Ernst Mayr
Answer: C – Carolus Linnaeus

31. **In the scientific name *Homo sapiens*, the term *sapiens* represents the?**
A) Genus name
B) Family name
C) Species epithet
D) Order name
Answer: C – Species epithet

32. **According to the biological species concept proposed by Mayr, a species is defined as?**
A) A group of morphologically similar individuals
B) A reproductive community of populations reproductively isolated from others
C) A single lineage of ancestor-descendant populations
D) The smallest grouping of organisms diagnosably distinct
Answer: B – A reproductive community of populations reproductively isolated from others

33. **The evolutionary species concept, which adds a time dimension to species definition, was formulated by?**
A) Ernst Mayr
B) Theodosius Dobzhansky
C) George Gaylord Simpson
D) Joel Cracraft
Answer: C – George Gaylord Simpson

34. **Which species concept defines a species as the most inclusive population of individuals having the potential for phenotypic cohesion through intrinsic cohesion mechanisms?**
A) Biological species concept
B) Phylogenetic species concept
C) Cohesion species concept
D) Typological species concept
Answer: C – Cohesion species concept

35. **DNA barcoding for animals typically uses sequence information from which gene?**
A) 16S rRNA
B) Cytochrome c oxidase subunit 1 (COI)
C) ATP synthase gene
D) Hemoglobin beta gene

Animal-Like Protists: The Protozoans

1. **The kingdom Protista is considered polyphyletic because it originated from which ancestral group?**
A) Eubacteria
B) Archaea
C) Cyanobacteria
D) Eukarya
Answer: B – Archaea

2. **According to the endosymbiont hypothesis, the first eukaryotic cells arose approximately how many billion years ago?**
A) 3.5 billion years
B) 2.5 billion years
C) 1.5 billion years
D) 0.5 billion years
Answer: C – 1.5 billion years

3. **Which structure underlies the plasma membrane of many protozoa and consists of a regular arrangement of microtubules?**
A) Pellicle
B) Cortex
C) Ectoplasm
D) Glycocalyx
Answer: A – Pellicle

4. **The clear and firm portion of protozoan cytoplasm just beneath the pellicle is called?**
A) Endoplasm
B) Cytosol
C) Ectoplasm
D) Nucleoplasm
Answer: C – Ectoplasm

5. **Which organelle in freshwater protozoa removes excess water that enters by osmosis?**
A) Food vacuole
B) Contractile vacuole
C) Mitochondrion
D) Golgi apparatus
Answer: B – Contractile vacuole

6. **The specialized region analogous to a mouth in some protozoa for ingesting food is called?**
A) Cytopyge
B) Cytostome
C) Cytopharynx
D) Cytoproct
Answer: B – Cytostome

7. **In protozoa, the elimination of nitrogenous waste products occurs primarily by which process?**
A) Active transport
B) Phagocytosis
C) Diffusion across plasma membrane
D) Exocytosis through cytopyge
Answer: C – Diffusion across plasma membrane

8. **Multiple fission in which a large number of daughter cells form from a single parent is specifically termed?**
A) Binary fission
B) Budding
C) Schizogony
D) Sporogony
Answer: C – Schizogony

9. **The host that harbors the sexual stages of a parasitic protozoan is called the?**
A) Intermediate host
B) Reservoir host
C) Definitive host
D) Paratenic host
Answer: C – Definitive host

10. **Which phylum of protozoa is the largest, with over 18,000 described species possessing flagella, pseudopodia, or both?**
A) Apicomplexa
B) Ciliophora
C) Sarcomastigophora
D) Microspora
Answer: C – Sarcomastigophora

11. **Dinoflagellates that cause "red tides" and produce toxins belong to which class?**
A) Zoomastigophora
B) Phytomastigophora
C) Lobosea
D) Sporozoea
Answer: B – Phytomastigophora

12. **The pigment shield that covers a photoreceptor at the base of the flagellum in Euglena is called?**
A) Eyespot
B) Stigma
C) Ocellus
D) Chromatophore
Answer: B – Stigma

13. **Trypanosoma brucei gambiense and T. b. rhodesiense cause which disease in humans?**
A) Chagas disease
B) Leishmaniasis
C) African sleeping sickness
D) Amoebic dysentery
Answer: C – African sleeping sickness

14. **The tsetse fly (Glossina spp.) serves as which type of host for Trypanosoma brucei?**
A) Definitive host only
B) Intermediate host and vector
C) Reservoir host
D) Paratenic host
Answer: B – Intermediate host and vector

15. **Broad cell processes containing both ectoplasm and endoplasm used for locomotion and engulfing food are called?**
A) Filopodia
B) Axopodia
C) Lobopodia
D) Reticulopodia
Answer: C – Lobopodia

16. **Which type of pseudopodia contains only ectoplasm and provides two-way streaming like a conveyor belt?**
A) Lobopodia
B) Filopodia
C) Axopodia
D) Reticulopodia
Answer: B – Filopodia

17. **The test of the foraminiferan Polystomella is primarily composed of which material?**
A) Silica
B) Chitin
C) Calcium carbonate
D) Protein
Answer: C – Calcium carbonate

18. **The white cliffs of Dover in England are primarily composed of deposits from which protozoan group?**
A) Radiolarians
B) Foraminiferans
C) Heliozoans
D) Dinoflagellates
Answer: B – Foraminiferans

19. **Which protozoan phylum is characterized by an apical complex used for penetrating host cells?**
A) Ciliophora
B) Microspora
C) Apicomplexa
D) Sarcomastigophora
Answer: C – Apicomplexa

20. **The asexual multiple fission phase in the life cycle of Plasmodium that occurs in liver and red blood cells is called?**
A) Sporogony
B) Gametogony
C) Schizogony
D) Merogony
Answer: C – Schizogony

21. **The process in Plasmodium where the zygote undergoes meiosis and produces many sporozoites within the oocyst is termed?**
A) Schizogony
B) Gametogony
C) Sporogony
D) Merogony
Answer: C – Sporogony

22. **Which species of Plasmodium causes the most virulent form of malaria in humans, mainly in tropical and subtropical regions?**
A) P. vivax
B) P. malariae
C) P. ovale
D) P. falciparum
Answer: D – P. falciparum

23. **The paroxysms (chills and fever) in Plasmodium vivax malaria recur every?**
A) 24 hours
B) 48 hours
C) 72 hours
D) 96 hours
Answer: B – 48 hours

24. **Which coccidian parasite is known to resist chlorination and causes chronic diarrhea in AIDS patients?**
A) Eimeria tenella
B) Isospora belli
C) Cryptosporidium parvum
D) Toxoplasma gondii
Answer: C – Cryptosporidium parvum

25. **The definitive host for Toxoplasma gondii, where sexual reproduction occurs, is which animal?**
A) Human

B) Pig
C) Cat
D) Bird
Answer: C – Cat

26. **Nosema bombicus, which causes pebrine disease in silkworms, belongs to which phylum?**
A) Apicomplexa
B) Microspora
C) Acetospora
D) Myxozoa
Answer: B – Microspora

27. **Myxosoma cerebralis, which causes whirling disease in trout and salmon, belongs to which phylum?**
A) Microspora
B) Acetospora
C) Myxozoa
D) Apicomplexa
Answer: C – Myxozoa

28. **Ciliates possess two types of nuclei: a larger macronucleus and one or more smaller?**
A) Micronuclei
B) Par nuclei
C) Endonuclei
D) Accessory nuclei
Answer: A – Micronuclei

29. **Rod-like or oval pellicular structures in Paramecium that discharge sticky threads for protection are called?**
A) Trichocysts
B) Toxicysts
C) Nematocysts
D) Cystoblasts
Answer: A – Trichocysts

30. **The temporary union of two ciliates to exchange genetic material is known as?**
A) Autogamy
B) Syngamy
C) Conjugation
D) Binary fission
Answer: C – Conjugation

31. **In Paramecium, the large polyploid nucleus that regulates daily metabolic activities is the?**
A) Micronucleus
B) Macronucleus
C) Endonucleus
D) Kinetonucleus
Answer: B – Macronucleus

32. **Balantidium coli, a parasitic ciliate that causes dysentery in humans, lives in which organ?**
A) Small intestine
B) Stomach
C) Large intestine
D) Liver
Answer: C – Large intestine

33. **The suctorian ciliate Tokophrya feeds by using which specialized structures to suck prey cytoplasm?**
A) Cilia
B) Flagella
C) Tentacles
D) Pseudopodia
Answer: C – Tentacles

34. **According to cladograms based on 18S ribosomal RNA, which protozoan group represents modern relatives of the earliest major eukaryotic cell lines?**
A) Apicomplexa and Ciliophora
B) Mastigophora and Microspora
C) Sarcomastigophora and Myxozoa
D) Acetospora and Labyrinthomorpha
Answer: B – Mastigophora and Microspora

35. **The phylum Labyrinthomorpha consists of protozoa with spindle-shaped cells that move within a network of?**
A) Flagellar tracks
B) Ciliary tracts
C) Mucous tracks
D) Pseudopodial nets
Answer: C – Mucous tracks

36. **Which of the following foraminiferans is known to have a test that looks like a tiny snail with multiple chambers?**
A) Amoeba proteus
B) Arcella vulgaris
C) Polystomella
D) Diffugia oblongata
Answer: C – Polystomella

37. **The radial symmetry and siliceous tests of radiolarians make them important fossils in which type of geological deposits?**
A) Limestone
B) Chert

Spiralian & Acoelomate Phyla

1. **Which of the following characteristics first appeared in the Triploblastic Acoelomate body plan?**
A) Radial symmetry and diploblastic organization
B) Complete digestive system and closed circulation
C) Bilateral symmetry, true mesoderm, and a primitive brain
D) Exoskeleton and jointed appendages
Answer: C – Bilateral symmetry, true mesoderm, and a primitive brain

2. **The evolutionary phenomenon where sexual maturity is achieved in a larval body form is termed?**
A) Metamorphosis
B) Paedomorphosis
C) Ecdysis
D) Strobilation
Answer: B – Paedomorphosis

3. **The loose mesodermal tissue that fills spaces between organs in flatworms is called?**
A) Mesoglea
B) Parenchyma
C) Coelom
D) Stroma
Answer: B – Parenchyma

4. **In flatworms, the structures that swell and form a protective mucous sheath around the body are known as?**
A) Nematocysts
B) Rhabdites
C) Cnidocytes
D) Spicules
Answer: B – Rhabdites

5. **The excretory/osmoregulatory structures in flatworms that consist of networks of fine tubules with flame cells are called?**
A) Metanephridia
B) Protonephridia
C) Malpighian tubules
D) Green glands
Answer: B – Protonephridia

6. **The free-swimming, ciliated larval stage of a digenetic trematode that emerges from the egg and seeks a snail host is the?**
A) Cercaria
B) Redia
C) Miracidium
D) Oncomiracidium
Answer: C – Miracidium

7. **Which class of Platyhelminthes is characterized by a body divided into proglottids and the complete absence of a digestive system?**
A) Turbellaria
B) Trematoda
C) Monogenea
D) Cestoidea
Answer: D – Cestoidea

8. **The holdfast structure at the anterior end of a tapeworm, often equipped with suckers and hooks, is called the?**
A) Proglottid
B) Scolex
C) Strobila
D) Opisthaptor
Answer: B – Scolex

9. **The series of reproductive units that make up the main body of a tapeworm is known as the?**
A) Scolex
B) Neck
C) Strobila
D) Cercus
Answer: C – Strobila

10. **The large, posterior attachment organ characteristic of monogenean flukes is termed?**
A) Acetabulum
B) Oral sucker
C) Opisthaptor
D) Bothrium
Answer: C – Opisthaptor

11. **Which subclass of trematodes is characterized by a life cycle involving at least two different hosts, including a mollusk as the first intermediate host?**
A) Aspidogastrea
B) Digenea
C) Monogenea
D) Cestodaria
Answer: B – Digenea

12. **The larval stage of a digenetic trematode that develops within the snail and possesses a tail for swimming is the?**
A) Sporocyst
B) Redia
C) Metacercaria
D) Cercaria
Answer: D – Cercaria

13. **The encysted, juvenile stage of a fluke, which is infective to the definitive host, is known as?**
A) Miracidium
B) Cercaria
C) Metacercaria
D) Onchosphere
Answer: C – Metacercaria

14. **Blood flukes of the genus Schistosoma differ from most other trematodes because they are?**
A) Monoecious
B) Dioecious
C) Acoelomate
D) Free-living
Answer: B – Dioecious

15. **The unique body covering of parasitic flatworms (Monogenea, Trematoda, Cestoda) that is a syncytium and provides protection from the host's immune system is called the?**
A) Epidermis
B) Cuticle
C) Tegument
D) Glycocalyx
Answer: C – Tegument

16. **In a tapeworm, a proglottid that contains a complete set of male and female reproductive organs and is located in the mid-region is termed?**
A) Immature
B) Mature
C) Gravid
D) Terminal
Answer: B – Mature

17. **The disease caused by the larval cysts of Taenia solium in human tissues, which can be fatal if they encyst in the brain, is called?**
A) Schistosomiasis
B) Cysticercosis
C) Hydatid disease
D) Taeniasis
Answer: B – Cysticercosis

18. **The larval form of a beef or pork tapeworm that develops in the muscle of the intermediate host and consists of a fluid-filled bladder with an invaginated scolex is a?**
A) Cysticercus
B) Hydatid cyst
C) Coracidium
D) Procercoid
Answer: A – Cysticercus

19. **The phylum Nemertea is distinguished from Platyhelminthes by the presence of which two major evolutionary innovations?**
A) Flame cells and a nervous system
B) Complete digestive tract and closed circulatory system
C) Tegument and a scolex
D) Parenchyma and bilateral symmetry
Answer: B – Complete digestive tract and closed circulatory system

20. **The distinctive long, eversible structure used for prey capture in nemerteans is called the?**
A) Pharynx
B) Proboscis
C) Stylet
D) Tentacle
Answer: B – Proboscis

21. **The cavity that houses the proboscis in a nemertean worm is known as the?**
A) Pseudocoelom
B) Rhynchocoel
C) Hemocoel
D) Gastrovascular cavity
Answer: B – Rhynchocoel

22. **Gastrotrichs primarily use which structures for locomotion over the substrate?**
A) Parapodia
B) Cilia on the ventral surface
C) Muscular hydrostatic waves only
D) Setae
Answer: B – Cilia on the ventral surface

23. **The unique jaw structure found in members of the clade Gnathifera is composed of which material?**
A) Calcium carbonate
B) Cellulose
C) Chitin

D) Silica
Answer: C – Chitin

24. **The ciliated larval stage of the broad fish tapeworm, Diphyllobothrium latum, that is released from the egg and ingested by a copepod is called?**
A) Onchosphere
B) Cysticercus
C) Coracidium
D) Plerocercoid
Answer: C – Coracidium

25. **The second larval stage of the broad fish tapeworm that develops in the copepod and is later ingested by a fish is the?**
A) Procercoid
B) Plerocercoid
C) Cysticercus
D) Oncomiracidium
Answer: A – Procercoid

26. **The larval stage of the broad fish tapeworm that is infective to the definitive host (fish-eating mammal) is the?**
A) Procercoid
B) Plerocercoid
C) Coracidium
D) Onchosphere
Answer: B – Plerocercoid

27. **Which class of rotifers is characterized by the complete absence of males and reproduces exclusively by parthenogenesis?**
A) Seisonidea
B) Monogononta
C) Bdelloidea
D) Eurotatoria
Answer: C – Bdelloidea

28. **The characteristic ciliated organ on the head of a rotifer that functions in both locomotion and feeding is the?**
A) Mastax
B) Corona
C) Lorica
D) Trophi
Answer: B – Corona

29. **The unique, muscular, jaw-bearing pharynx found in rotifers that is used for grinding food is called the?**
A) Esophagus
B) Gizzard
C) Mastax
D) Crop
Answer: C – Mastax

30. **The phenomenon of cell constancy, where an adult of a species has a fixed number of cells, is known as?**
A) Eutely
B) Paedomorphosis
C) Polyembryony
D) Strobilation
Answer: A – Eutely

31. **The hard, resistant capsule containing germinative cells produced by freshwater ectoprocts (bryozoans) for surviving unfavorable conditions is a?**
A) Gemmule
B) Statoblast
C) Cyst
D) Spore
Answer: B – Statoblast

32. **The individual member of a colonial bryozoan, which lives in its own chamber called a zoecium, is known as a?**
A) Polypide
B) Zooid
C) Cystid
D) Lophophore
Answer: B – Zooid

33. **The feeding apparatus of a bryozoan, consisting of a crown of ciliated tentacles surrounding the mouth but not the anus, is called a?**
A) Corona
B) Mastax
C) Lophophore
D) Trochophore
Answer: C – Lophophore

34. **In brachiopods, the fleshy stalk that attaches the animal to the substrate is called the?**
A) Foot
B) Pedicel
C) Mantle
D) Cirrus
Answer: B – Pedicel

35. **Unlike bivalve molluscs, the two shells of a brachiopod are oriented?**
A) Laterally (right and left)

Nematodes & Other Ecdysozoans Phyla

1. The clade Ecdysozoa was established primarily through which type of evidence?
A) Fossil record analysis
B) Morphological characters only
C) Molecular studies of ribosomal RNA genes
D) Embryological development patterns
Answer: C – Molecular studies of ribosomal RNA genes

2. Which morphological character is the namesake of the clade Ecdysozoa?
A) Pseudocoelomate body plan
B) Unique layered cuticle that is molted periodically
C) Complete digestive tract
D) Longitudinal muscles only
Answer: B – Unique layered cuticle that is molted periodically

3. The process of molting in ecdysozoans is controlled through which system?
A) Nervous system
B) Endocrine system
C) Excretory system
D) Reproductive system
Answer: B – Endocrine system

4. Which of the following is an ancestral feature of Ecdysozoa?
A) Ventral mouth opening
B) Terminal mouth opening
C) Spiral cleavage
D) Locomotory cilia
Answer: B – Terminal mouth opening

5. Ecdysozoans typically lack which embryonic characteristic found in other protostomes?
A) Determinate cleavage
B) Spiral cleavage
C) Radial cleavage
D) Holoblastic cleavage
Answer: B – Spiral cleavage

6. The cuticle of ecdysozoans described in Chapter 13 is primarily composed of either collagen or which other substance?
A) Cellulose
B) Chitin
C) Keratin
D) Elastin
Answer: B – Chitin

7. The pseudocoelom in nematodes functions primarily as which type of skeleton?
A) Endoskeleton
B) Exoskeleton
C) Hydrostatic skeleton
D) Appendicular skeleton
Answer: C – Hydrostatic skeleton

8. In nematodes, body movements result from contractions of body wall musculature acting on what?
A) Cuticular plates
B) Fluid or gel within the pseudocoelom
C) Circular muscles
D) Segmental appendages
Answer: B – Fluid or gel within the pseudocoelom

9. The tough cuticle in nematodes prevents tearing of the body wall during changes in what?
A) Temperature
B) Pseudocoelomic pressure
C) Muscle tension
D) Neural activity
Answer: B – Pseudocoelomic pressure

10. How many billion nematodes may be present in every acre of fertile garden soil?
A) 1 billion
B) 3 billion
C) 5 billion
D) 10 billion
Answer: C – 5 billion

11. The estimated number of roundworm species according to zoologists may be as high as?
A) 50,000
B) 100,000
C) 250,000
D) 500,000
Answer: D – 500,000

12. Protorhabditis hortulana, a soil-inhabiting nematode from Japan, measures what length?
A) 0.1 mm
B) 0.2 mm
C) 0.5 mm

D) 1.0 mm
Answer: B – 0.2 mm

13. Placentonema gigantissima, a placental parasite of sperm whales, can reach lengths up to?
A) 2 meters
B) 5 meters
C) 8 meters
D) 12 meters
Answer: C – 8 meters

14. Which characteristic do nematodes share with arthropods regarding cellular structures?
A) Presence of cilia throughout the body
B) Lack of cilia except in sensory structures
C) Presence of flagellated sperm
D) Absence of all sensory structures
Answer: B – Lack of cilia except in sensory structures

15. The sperm of nematodes are morphologically described as?
A) Flagellated
B) Ciliated
C) Amoeboid
D) Non-motile
Answer: C – Amoeboid

16. The two recognized classes of phylum Nematoda based on morphological and ribosomal RNA gene studies are?
A) Monogononta and Bdelloidea
B) Enoplea and Chromadoria
C) Secernentea and Adenophora
D) Seisonidea and Monogononta
Answer: B – Enoplea and Chromadoria

17. The class Enoplea is divided into which two subclasses?
A) Chromadoria and Dorylaimia
B) Dorylaimia and Enoplia
C) Enoplia and Chromadoria
D) Dorylaimia and Secernentea
Answer: B – Dorylaimia and Enoplia

18. Subclass Dorylaimia contains nematodes from which habitats?
A) Marine only
B) Freshwater and terrestrial only
C) Marine and freshwater
D) Terrestrial and marine
Answer: B – Freshwater and terrestrial only

19. Subclass Enoplia primarily consists of nematodes from which habitat?
A) Freshwater
B) Terrestrial
C) Marine
D) Parasitic only
Answer: C – Marine

20. The body shape of a typical nematode is best described as?
A) Flattened and ribbon-like
B) Slender, elongate, cylindrical, tapered at both ends
C) Spherical and untapered
D) Segmented and dorsoventrally flattened
Answer: B – Slender, elongate, cylindrical, tapered at both ends

21. The noncellular outer covering of nematodes is called?
A) Epidermis
B) Hypodermis
C) Cuticle
D) Tegument
Answer: C – Cuticle

22. The nematode cuticle is secreted by which underlying layer?
A) Circular muscles
B) Pseudocoelomic membrane
C) Hypodermis (epidermis)
D) Basement membrane
Answer: C – Hypodermis (epidermis)

23. The outermost layer of the nematode cuticle is called?
A) Cortical zone
B) Medial zone
C) Basal zone
D) Epicuticle
Answer: D – Epicuticle

24. The epicuticle of nematodes is comprised of which substances?
A) Collagen only
B) Chitin and cellulose
C) Lipid and glycolipid
D) Keratin and elastin
Answer: C – Lipid and glycolipid

25. Cuticulins are proteins that contribute to what property of the nematode cuticle?
A) Flexibility
B) Strong, insoluble nature

A) Proteome
B) Transcriptome
C) Entire genome
D) Metabolome
Answer: C – Entire genome

39. How many Nobel prizes have resulted from research using Caenorhabditis elegans?
A) One
B) Two
C) Three
D) Four
Answer: C – Three

40. Ascaris lumbricoides adults live in which part of the human body?
A) Large intestine
B) Small intestine
C) Stomach
D) Liver
Answer: B – Small intestine

41. How many people worldwide may be infected with Ascaris lumbricoides?
A) 200 million
B) 500 million
C) 800 million
D) 1.5 billion
Answer: C – 800 million

42. The infective stage of Ascaris lumbricoides is which larval stage?
A) First-stage larva
B) Second-stage larva
C) Third-stage larva
D) Fourth-stage larva
Answer: B – Second-stage larva

43. After hatching, Ascaris larvae penetrate the intestinal wall and are carried to which organ via circulation?
A) Liver
B) Heart
C) Lungs
D) Brain
Answer: C – Lungs

44. Enterobius vermicularis adults become established in which part of the human digestive tract?
A) Small intestine
B) Stomach
C) Lower region of the large intestine
D) Duodenum
Answer: C – Lower region of the large intestine

45. Gravid female pinworms migrate to which area to deposit eggs?
A) Rectum
B) Perianal area
C) Small intestine
D) Vagina
Answer: B – Perianal area

46. Necator americanus is commonly known as?
A) Pinworm
B) Hookworm
C) Porkworm
D) Filarial worm
Answer: B – Hookworm

47. The infective stage of Necator americanus that penetrates human skin is called?
A) Rhabditiform larva
B) Microfilaria
C) Filariiform larva
D) Cystacanth
Answer: C – Filariiform larva

48. Trichinella spiralis adults live in which part of the host's body?
A) Skeletal muscles
B) Mucosa of the small intestine
C) Lymphatic system
D) Bloodstream
Answer: B – Mucosa of the small intestine

49. The disease caused by Trichinella spiralis is called?
A) Trichinosis
B) Elephantiasis
C) Ascariasis
D) Enterobiasis
Answer: A – Trichinosis

50. In Trichinella spiralis, where do the young larvae encyst?
A) Cardiac muscle
B) Smooth muscle
C) Skeletal (striated) muscles
D) Liver tissue
Answer: C – Skeletal (striated) muscles

51. Wuchereria bancrofti and Wuchereria malayi live in which human system?
A) Circulatory system
B) Nervous system

Phylum Mollusca

1. **Ocean acidification affects molluscs primarily by which mechanism?**
A) Increasing metabolic rates
B) Reducing biologically available calcium
C) Causing direct neurological damage
D) Increasing shell thickness
Answer: B – Reducing biologically available calcium

2. **Which molluscan class appears to be least affected by ocean acidification?**
A) Gastropoda
B) Bivalvia
C) Cephalopoda
D) Polyplacophora
Answer: C – Cephalopoda

3. **The radula is absent in which of the following molluscan classes?**
A) Gastropoda and Polyplacophora
B) Bivalvia and most Solenogasters
C) Cephalopoda and Scaphopoda
D) Monoplacophora and Caudofoveata
Answer: B – Bivalvia and most Solenogasters

4. **The molluscan mantle cavity primarily functions in all except which?**
A) Housing gills or lungs
B) Secretion of the shell
C) Receiving digestive and reproductive products
D) Jet propulsion in cephalopods
Answer: B – Secretion of the shell

5. **Which structure in molluscs is unique to the phylum and serves as a rasping organ?**
A) Odontophore
B) Radula
C) Ctenidium
D) Operculum
Answer: B – Radula

6. **The outer organic layer of the molluscan shell is called?**
A) Prismatic layer
B) Nacreous layer
C) Periostracum
D) Conchiolin layer
Answer: C – Periostracum

7. **Which layer of the molluscan shell is secreted continuously throughout the animal's life?**
A) Periostracum
B) Prismatic layer
C) Nacreous layer
D) Conchiolin layer
Answer: C – Nacreous layer

8. **The larval stage that is characteristic of many lophotrochozoans and found in molluscs is called?**
A) Veliger
B) Glochidium
C) Trochophore
D) Spat
Answer: C – Trochophore

9. **In molluscs, the coelom is typically reduced to cavities surrounding which structures?**
A) Digestive gland and radula
B) Heart, nephridia, and gonads
C) Mantle cavity and foot
D) Gills and tentacles
Answer: B – Heart, nephridia, and gonads

10. **Which molluscan class exhibits a closed circulatory system?**
A) Gastropoda
B) Bivalvia
C) Polyplacophora
D) Cephalopoda
Answer: D – Cephalopoda

11. **The unique molluscan larval stage that possesses foot, shell, and mantle is called?**
A) Trochophore
B) Glochidium
C) Veliger
D) Amphiblastula
Answer: C – Veliger

12. **Which class of molluscs is characterized by wormlike body, no shell, and calcareous sclerites?**
A) Polyplacophora and Monoplacophora
B) Caudofoveata and Solenogastres
C) Gastropoda and Bivalvia

D) Scaphopoda and Cephalopoda
Answer: B – Caudofoveata and Solenogastres

13. **The class Caudofoveata is sometimes referred to as?**
A) Neomeniomorpha
B) Chaetodermomorpha
C) Amphineura
D) Loricata
Answer: B – Chaetodermomorpha

14. **Solenogasters typically feed on which group of organisms?**
A) Algae
B) Cnidarians
C) Bivalves
D) Detritus
Answer: B – Cnidarians

15. **The number of dorsal shell plates in chitons (class Polyplacophora) is typically?**
A) Five or six
B) Seven or eight
C) Nine or ten
D) One or two
Answer: B – Seven or eight

16. **Which chiton genus is known to be predatory rather than grazing?**
A) Tonicella
B) Cryptochiton
C) Placidiorella velata
D) Mopalia
Answer: C – Placidiorella velata

17. **The iron-containing mineral that reinforces radular teeth in chitons is called?**
A) Hematite
B) Magnetite
C) Pyrite
D) Limonite
Answer: B – Magnetite

18. **Living specimens of Neopilina (class Monoplacophora) were first discovered in which year?**
A) 1932
B) 1945
C) 1952
D) 1960
Answer: C – 1952

19. **The Serialia hypothesis proposes that which two molluscan classes are sister taxa?**
A) Gastropoda and Bivalvia
B) Monoplacophora and Polyplacophora
C) Cephalopoda and Scaphopoda
D) Caudofoveata and Solenogastres
Answer: B – Monoplacophora and Polyplacophora

20. **The largest and most diverse class of molluscs is?**
A) Bivalvia
B) Cephalopoda
C) Gastropoda
D) Polyplacophora
Answer: C – Gastropoda

21. **The shell coiling direction that is genetically dominant and more common in gastropods is?**
A) Sinistral
B) Dextral
C) Planospiral
D) Conispiral
Answer: B – Dextral

22. **The plate that covers the shell aperture when a gastropod withdraws into its shell is called?**
A) Operculum
B) Periostracum
C) Odontophore
D) Columella
Answer: A – Operculum

23. **The 180° counterclockwise twisting of the visceral mass, mantle, and mantle cavity in gastropods is called?**
A) Coiling
B) Detorsion
C) Torsion
D) Involution
Answer: C – Torsion

24. **After torsion in gastropods, the anus and mantle cavity open where relative to the head?**
A) Below the head
B) Behind the head
C) Above the head
D) On the left side
Answer: C – Above the head

25. **Which gastropod subclass shows partial or complete detorsion?**

A) Prosobranchia
B) Opisthobranchia
C) Pulmonata
D) Archaeogastropoda
Answer: B – Opisthobranchia

26. **The specialized chemosensory tentacles found in opisthobranchs are called?**
A) Cerata
B) Rhinophores
C) Captacula
D) Palps
Answer: B – Rhinophores

27. **Which gastropod group has lost the ancestral ctenidia and uses a vascularized mantle wall as a lung?**
A) Prosobranchia
B) Opisthobranchia
C) Pulmonata
D) Heteropoda
Answer: C – Pulmonata

28. **The opening of the lung in pulmonate gastropods is called?**
A) Pneumostome
B) Nephridiopore
C) Osculum
D) Spiracle
Answer: A – Pneumostome

29. **In most modern prosobranch gastropods, how many gills are present?**
A) Two
B) One
C) Three
D) None
Answer: B – One

30. **The condition where the right gill, atrium, and kidney are lost in gastropods is called?**
A) Torsion
B) Detorsion
C) Bilateral asymmetry
D) Symplesiomorphy
Answer: C – Bilateral asymmetry

31. **Cone snails (genus Conus) use their radula for which specialized function?**
A) Scraping algae
B) Drilling holes
C) Harpooning prey with venom
D) Filtering plankton
Answer: C – Harpooning prey with venom

32. **The toxic peptides found in Conus venom are called?**
A) Conotoxins
B) Conulariins
C) Molluscotoxins
D) Gastropotoxins
Answer: A – Conotoxins

33. **In ciliary feeding gastropods, most digestion occurs where?**
A) In the stomach lumen
B) Intracellularly in digestive glands
C) In the mouth
D) In the intestine
Answer: B – Intracellularly in digestive glands

34. **The sensory organ located at the base of the siphon in most gastropods that is chemosensory is called?**
A) Statocyst
B) Osphradium
C) Rhinophore
D) Esthete
Answer: B – Osphradium

35. **In terrestrial pulmonates, nitrogenous waste is excreted primarily as?**
A) Ammonia
B) Urea
C) Uric acid
D) Guanine
Answer: C – Uric acid

36. **The dart sac found in some terrestrial pulmonates functions to?**
A) Inject venom into prey
B) Heighten excitement before copulation
C) Digest plant material
D) Defend against predators
Answer: B – Heighten excitement before copulation

37. **Which gastropod is known as the "flamingo tongue" and feeds on gorgonians?**
A) Cyphoma gibbosum
B) Haliotis rufescens
C) Busycon carica
D) Pleuroploca gigantea
Answer: A – Cyphoma gibbosum

Phylum Annelida

1. What is metamerism in annelids?
A) Formation of a head
B) Segmental body arrangement
C) Loss of body divisions
D) A type of larva
Answer: **B – Segmental body arrangement**

2. Tagmatization refers to?
A) Segment fusion for specialization
B) Body cavity formation
C) Setae production
D) Larval development
Answer: **A – Segment fusion for specialization**

3. Which coelom formation type occurs in annelids?
A) Enterocoely
B) Schizocoely
C) Blastocoely
D) Epicoely
Answer: **B – Schizocoely**

4. Setae in annelids are made of?
A) Calcium carbonate
B) Silica
C) Chitin
D) Keratin
Answer: **C – Chitin**

5. The dorsal blood vessel in annelids pumps blood?
A) Posteriorly
B) Anteriorly
C) Laterally
D) Ventrally
Answer: **B – Anteriorly**

6. Clitellata is characterized by?
A) Parapodia and many setae
B) A clitellum for cocoon formation
C) Trochophore larva
D) Separate sexes
Answer: **B – A clitellum for cocoon formation**

7. Parapodia are primarily used for?
A) Excretion
B) Locomotion and gas exchange
C) Digestion
D) Sensory reception
Answer: **B – Locomotion and gas exchange**

8. Prostomium in polychaetes is a?
A) Tail segment
B) Head lobe with sensory organs
C) Egg sac
D) Excretory pore
Answer: **B – Head lobe with sensory organs**

9. Peristomium is the segment that?
A) Contains the anus
B) Surrounds the mouth
C) Bears the clitellum
D) Houses the heart
Answer: **B – Surrounds the mouth**

10. Which annelid group lacks a mouth and digestive tract?
A) Errantia
B) Oligochaeta
C) Siboglinidae
D) Hirudinea
Answer: **C – Siboglinidae**

11. The eversible proboscis in errant polychaetes functions in?
A) Reproduction
B) Prey capture
C) Osmoregulation
D) Respiration
Answer: **B – Prey capture**

12. Metanephridia have a ciliated funnel called?
A) Nephrostome
B) Nephridiopore
C) Flame cell
D) Solenocyte
Answer: **A – Nephrostome**

13. Epitoky is a reproductive strategy involving?
A) Asexual budding
B) Transformation into a reproductive individual
C) Direct development
D) Internal fertilization
Answer: **B – Transformation into a reproductive individual**

14. Trochophore larva is found in?
A) Earthworms only
B) Leeches only
C) Marine polychaetes
D) All annelids
Answer: **C – Marine polychaetes**

15. Nereis belongs to which clade?
A) Sedentaria
B) Errantia
C) Clitellata
D) Siboglinidae
Answer: **B – Errantia**

16. Fireworms (Eurythoe) have setae that are?
A) Solid and sensory
B) Hollow and venomous
C) Absent
D) Calcified
Answer: **B – Hollow and venomous**

17. The bloodworm Glycera has hemoglobin in?
A) Red blood cells
B) Coelomocytes
C) Plasma only
D) Nephridia
Answer: **B – Coelomocytes**

18. Christmas-tree worms (Spirobranchus) are?
A) Errant polychaetes
B) Sedentary tubeworms
C) Leeches
D) Earthworms
Answer: **B – Sedentary tubeworms**

19. Riftia pachyptila is a giant?
A) Earthworm
B) Leech
C) Siboglinid tubeworm
D) Fireworm
Answer: **C – Siboglinid tubeworm**

20. Echiurans (spoon worms) lack?
A) A proboscis
B) Segmentation
C) A coelom
D) Setae
Answer: **B – Segmentation**

21. The clitellum in earthworms is involved in?
A) Locomotion
B) Cocoon formation
C) Respiration
D) Excretion
Answer: **B – Cocoon formation**

22. Lumbricus terrestris is a common?
A) Marine polychaete
B) Freshwater oligochaete
C) Terrestrial earthworm
D) Parasitic leech
Answer: **C – Terrestrial earthworm**

23. Calciferous glands in earthworms help in?
A) Calcium excretion and pH regulation
B) Digestion of proteins
C) Absorption of water
D) Setae formation
Answer: **A – Calcium excretion and pH regulation**

24. The typhlosole in earthworm intestine increases?
A) Body length
B) Surface area for absorption
C) Setae number
D) Nephridia count
Answer: **B – Surface area for absorption**

25. Chloragogen tissue in annelids functions like?
A) Vertebrate liver
B) Vertebrate kidney
C) Vertebrate heart
D) Vertebrate lung
Answer: **A – Vertebrate liver**

26. Leeches (Hirudinea) lack?
A) Anterior and posterior suckers
B) Setae (except in some)
C) A coelom
D) Hermaphroditism
Answer: **B – Setae (except in some)**

27. Hirudin is an anticoagulant secreted by?
A) Earthworms
B) Polychaetes
C) Leeches
D) Siboglinids
Answer: **C – Leeches**

28. The number of segments in true leeches (Hirudinea) is fixed at?
A) 34
B) 100
C) 15
D) 50
Answer: **A – 34**

29. Chaetopterus is known as?
A) Parchment worm
B) Peanut worm
C) Bloodworm
D) Clam worm
Answer: **A – Parchment worm**

30. Sipunculans (peanut worms) lack?
A) A coelom
B) Segmentation and setae
C) A complete digestive tract
D) Trochophore larva
Answer: **B – Segmentation and setae**

31. Which annelid group exhibits bioluminescence?
A) Earthworms only
B) Some polychaetes like fireworms
C) All leeches
D) Freshwater oligochaetes
Answer: **B – Some polychaetes like fireworms**

32. Nuchal organs in polychaetes are primarily?
A) Photoreceptors
B) Chemoreceptors
C) Mechanoreceptors
D) Statocysts
Answer: **B – Chemoreceptors**

33. Giant axons in annelid nerve cord mediate?
A) Slow crawling
B) Escape reactions
C) Feeding behavior
D) Reproduction
Answer: **B – Escape reactions**

34. In earthworms, sperm exchange occurs via?
A) Direct copulation with penis
B) External fertilization in water
C) Mucous sheath and seminal grooves
D) Hypodermic impregnation
Answer: **C – Mucous sheath and seminal grooves**

35. The pygidium in annelids bears the?
A) Mouth
B) Anus
C) Clitellum
D) Brain
Answer: **B – Anus**

36. Osedax worms are siboglinids that feed on?
A) Coral polyps
B) Whale bones
C) Algae
D) Blood
Answer: **B – Whale bones**

37. Bonellia exhibits extreme sexual dimorphism where males are?
A) Larger than females
B) Dwarf and live on females
C) Free-swimming only
D) Hermaphroditic
Answer: **B – Dwarf and live on females**

38. Which annelid has a U-shaped tube and mucous net feeding?
A) Nereis
B) Chaetopterus
C) Hirudo
D) Lumbricus
Answer: **B – Chaetopterus**

39. The main nitrogenous waste in terrestrial annelids is?
A) Ammonia
B) Urea
C) Uric acid
D) Creatinine
Answer: **B – Urea**

40. Protonephridia in annelids are found in?
A) Most earthworms
B) Some primitive polychaetes
C) All leeches
D) Only siboglinids
Answer: **B – Some primitive polychaetes**

41. Aortic arches in earthworms function to?
A) Pump blood to the body
B) Maintain steady blood pressure
C) Filter blood
D) Produce setae
Answer: **B – Maintain steady blood pressure**

42. The peristomium in Nereis bears?
A) Eyes
B) Tentacles and jaws
C) Clitellum
D) Anus
Answer: **B – Tentacles and jaws**

43. Which polychaete family has image-resolving eyes?
A) Nereididae
B) Alicopidae
C) Siboglinidae
D) Chaetopteridae
Answer: **B – Alicopidae**

44. The trophosome in siboglinids contains?
A) Digestive enzymes
B) Chemoautotrophic bacteria
C) Gametes

Hexapoda and Myriapoda

1. According to modern phylogenetics, hexapods are most closely related to which crustacean group?
A) Copepods
B) Barnacles
C) Remipedes
D) Isopods
Answer: C – Remipedes

2. The study of insects is formally called:
A) Herpetology
B) Entomology
C) Ornithology
D) Mammalogy
Answer: B – Entomology

3. Which structure in insects is derived from modified maxillae and forms a coiled sucking tube?
A) Labrum
B) Hypopharynx
C) Proboscis of butterflies
D) Mandibles
Answer: C – Proboscis of butterflies

4. In grasshoppers, the sensory lower lip that helps in food handling is called:
A) Labrum
B) Labium
C) Hypopharynx
D) Maxilla
Answer: B – Labium

5. The waxy layer of insect exoskeleton that prevents desiccation is part of:
A) Procuticle
B) Epicuticle
C) Endocuticle
D) Basement membrane
Answer: B – Epicuticle

6. Which insect order includes termites according to modern classification?
A) Isoptera
B) Blattodea
C) Orthoptera
D) Dermaptera
Answer: B – Blattodea

7. The fusion of two embryonic segments in millipedes results in a structure called:
A) Diplosegment
B) Metamere
C) Somite
D) Tagma
Answer: A – Diplosegment

8. Poison claws in centipedes are modified appendages known as:
A) Maxillipeds
B) Chelicerae
C) Gonopods
D) Forcipules
Answer: A – Maxillipeds

9. The nauplius larva is characteristic of which arthropod group?
A) Insects
B) Arachnids
C) Crustaceans
D) Myriapods
Answer: C – Crustaceans

10. Which hormone directly initiates molting in insects by acting on epidermal cells?
A) Juvenile hormone
B) Prothoracicotropic hormone
C) Ecdysone
D) Bursticon
Answer: C – Ecdysone

11. In honey bees, the pollen basket is located on which pair of legs?
A) Prothoracic legs
B) Mesothoracic legs
C) Metathoracic legs
D) All legs equally
Answer: C – Metathoracic legs

12. The respiratory pigment found in some insects that carries oxygen is:
A) Hemocyanin
B) Hemoglobin
C) Hemerythrin
D) Chlorocruorin
Answer: B – Hemoglobin

13. Johnston's organ in insects is a specialized mechanoreceptor located in the:
A) Legs
B) Abdomen
C) Base of antennae

D) Mouthparts
Answer: C – Base of antennae

14. Which type of metamorphosis is exhibited by silverfish (order Thysanura)?
A) Holometabolous
B) Hemimetabolous
C) Ametabolous
D) Hypermetamorphosis
Answer: C – Ametabolous

15. The terminal abdominal appendages in insects that are sensory are called:
A) Cerci
B) Styli
C) Gonopods
D) Uropods
Answer: A – Cerci

16. In asynchronous flight muscles, a single nerve impulse can produce approximately how many wingbeats?
A) 1-2
B) 10-20
C) 50
D) 200
Answer: C – 50

17. The protein resilin is found in insect cuticle and functions in:
A) Pigmentation
B) Elastic energy storage
C) Waterproofing
D) Pathogen defense
Answer: B – Elastic energy storage

18. Which order of insects has the highest number of described species?
A) Diptera
B) Lepidoptera
C) Hymenoptera
D) Coleoptera
Answer: D – Coleoptera

19. The green glands (antennal glands) are excretory organs found in:
A) Insects
B) Crustaceans
C) Arachnids
D) Myriapods
Answer: B – Crustaceans

20. In crayfish, the scaphognathite (gill bailer) is part of which appendage?
A) First maxilla
B) Second maxilla
C) First maxilliped
D) Mandible
Answer: B – Second maxilla

21. The X-organ and Y-organ in crustaceans control which physiological process?
A) Digestion
B) Molting
C) Circulation
D) Excretion
Answer: B – Molting

22. Which compound do repugnatorial glands of millipedes produce as a defense?
A) Formic acid
B) Hydrogen cyanide
C) Acetic acid
D) Sulfuric acid
Answer: B – Hydrogen cyanide

23. The anterior pair of wings in beetles that are hardened and protective are called:
A) Tegmina
B) Halteres
C) Elytra
D) Hemelytra
Answer: C – Elytra

24. In Diptera, the hindwings are reduced into balancing organs known as:
A) Halteres
B) Cerci
C) Stylets
D) Spiracles
Answer: A – Halteres

25. The process of emerging from the pupal case as an adult insect is called:
A) Ecdysis
B) Eclosion
C) Metamorphosis
D) Diapause
Answer: B – Eclosion

26. Which of the following is a primitively wingless insect order?
A) Orthoptera
B) Coleoptera
C) Thysanura
D) Lepidoptera
Answer: C – Thysanura

27. The filter chamber in some insects is a modification of the digestive system for:
A) Rapid water removal
B) Increased enzyme secretion
C) Storage of food
D) Grinding plant material
Answer: A – Rapid water removal

28. In termites, the exchange of food and pheromones among colony members is called:
A) Trophallaxis
B) Parthenogenesis
C) Altruism
D) Kin selection
Answer: A – Trophallaxis

29. Which insect is the classic example of a parasitoid that lays eggs inside caterpillars?
A) Honey bee
B) Braconid wasp
C) Monarch butterfly
D) Dung beetle
Answer: B – Braconid wasp

30. The blood of insects (hemolymph) is not primarily involved in:
A) Nutrient transport
B) Hormone distribution
C) Oxygen transport
D) Waste transport
Answer: C – Oxygen transport

31. The number of described insect species is approximately:
A) 500,000
B) 750,000
C) 1,000,000
D) 1,500,000
Answer: C – 1,000,000

32. Which structure in insects prevents tracheal collapse and allows lengthwise expansion?
A) Taenidia
B) Spiracles
C) Atria
D) Tracheoles
Answer: A – Taenidia

33. The term "paurometabolous" metamorphosis is now more commonly called:
A) Ametabolous
B) Hemimetabolous
C) Holometabolous
D) Hypermetabolous
Answer: B – Hemimetabolous

34. In holometabolous insects, the non-feeding, transformative stage is the:
A) Larva
B) Nymph
C) Pupa
D) Adult
Answer: C – Pupa

35. Which sensory structure in moths detects ultrasonic echolocation calls of bats?
A) Johnston's organ
B) Tympanal organ
C) Compound eye
D) Ocellus
Answer: B – Tympanal organ

36. The production of light by fireflies is an example of:
A) Fluorescence
B) Bioluminescence
C) Phosphorescence
D) Chemiluminescence
Answer: B – Bioluminescence

37. The exoskeleton of crustaceans is stiffened primarily by:
A) Chitin
B) Calcium carbonate
C) Scleroproteins
D) Resilin
Answer: B – Calcium carbonate

38. In male honey bees (drones), which type of sex determination system is present?
A) Diploid
B) Haploid
C) Triploid
D) Tetraploid
Answer: B – Haploid

39. The term "kin selection" explains altruistic behavior in social insects because:
A) Workers are unrelated to the queen
B) Workers share 75% of genes with sisters
C) Drones are sterile
D) Queens produce only male offspring
Answer: B – Workers share 75% of genes with sisters

40. The cottony-cushion scale insect was controlled in California by introducing:
A) Vedalia beetle

Phylum Echinodermata

1. **Which of the following is a synapomorphy of clade Ambulacraria?**
A) Pharyngeal gill slits
B) Dorsal hollow nerve cord
C) Notochord
D) Postanal tail
Answer: **A – Pharyngeal gill slits**

2. **The water-vascular system in echinoderms is derived from which embryonic coelomic compartment?**
A) Protocoel
B) Mesocoel
C) Metacoel
D) Hydrocoel
Answer: **D – Hydrocoel**

3. **Which of the following echinoderm classes retains open ambulacral grooves in adults?**
A) Ophiuroidea and Echinoidea
B) Asteroidea and Crinoidea
C) Holothuroidea and Concentricycloidea
D) Echinoidea and Holothuroidea
Answer: **B – Asteroidea and Crinoidea**

4. **The madreporite in asteroids is located on which surface?**
A) Oral surface
B) Aboral surface
C) Lateral surface
D) Internal cavity
Answer: **B – Aboral surface**

5. **Which structure in echinoderms is primarily responsible for locomotion and food gathering?**
A) Hemal system
B) Papulae
C) Tube feet
D) Pedicellariae
Answer: **C – Tube feet**

6. **The unique connective tissue in echinoderms that can change from liquid to solid state under neural control is called?**
A) Areolar tissue
B) Catch collagen
C) Elastic cartilage
D) Reticular fiber
Answer: **B – Catch collagen**

7. **Which class of echinoderms lacks an anus and has a sac-like stomach confined to the central disc?**
A) Asteroidea
B) Ophiuroidea
C) Echinoidea
D) Holothuroidea
Answer: **B – Ophiuroidea**

8. **Aristotle's lantern is a specialized chewing structure found in which class?**
A) Asteroidea
B) Ophiuroidea
C) Echinoidea
D) Crinoidea
Answer: **C – Echinoidea**

9. **The respiratory tree, used for gas exchange and excretion, is a unique feature of which class?**
A) Asteroidea
B) Ophiuroidea
C) Echinoidea
D) Holothuroidea
Answer: **D – Holothuroidea**

10. **Which of the following is the free-swimming larval stage of asteroids?**
A) Ophiopluteus
B) Echinopluteus
C) Bipinnaria
D) Auricularia
Answer: **C – Bipinnaria**

11. **The calcareous endoskeleton of echinoderms is characterized by a meshwork structure known as?**
A) Stroma
B) Stereom
C) Spongin
D) Sclereid
Answer: **B – Stereom**

12. **Which echinoderm class is characterized by arms sharply marked off from the central disc and tube feet without suckers?**
A) Asteroidea
B) Ophiuroidea
C) Echinoidea

D) Crinoidea
Answer: **B – Ophiuroidea**

13. **The madreporite in ophiuroids is located on which surface?**
A) Aboral surface
B) Oral surface
C) Lateral surface
D) Internal coelom
Answer: **B – Oral surface**

14. **Cuvierian tubules, used for defense, are modified parts of which structure in sea cucumbers?**
A) Digestive tract
B) Respiratory tree
C) Hemal system
D) Water-vascular system
Answer: **B – Respiratory tree**

15. **Which of the following statements about crinoids is correct?**
A) They have a madreporite on the oral surface
B) They lack pedicellariae and spines
C) They have closed ambulacral grooves
D) They reproduce only asexually
Answer: **B – They lack pedicellariae and spines**

16. **The dorsal nerve cord in some hemichordates is considered to have evolved independently from that in chordates. This is an example of?**
A) Homology
B) Convergent evolution
C) Divergent evolution
D) Coevolution
Answer: **B – Convergent evolution**

17. **Which fossil echinoderm was bilaterally symmetrical with two feeding appendages and a muscular non-plated stalk?**
A) Ctenoimbricata
B) Helicoplacus
C) Yanjiahella biscarpa
D) Dendrocystites
Answer: **C – Yanjiahella biscarpa**

18. **In sea stars, the cardiac stomach can be everted through the mouth during feeding. This is primarily used for?**
A) Defense against predators
B) Extracellular digestion outside the body
C) Gas exchange
D) Excretion of nitrogenous waste
Answer: **B – Extracellular digestion outside the body**

19. **The hemal system in echinoderms is surrounded by extensions of the coelom called?**
A) Perihemal sinuses
B) Ampullae
C) Polian vesicles
D) Tiedemann's bodies
Answer: **A – Perihemal sinuses**

20. **Which cells in echinoderm coelomic fluid are involved in engulfing waste products?**
A) Lymphocytes
B) Coelomocytes
C) Osteocytes
D) Choanocytes
Answer: **B – Coelomocytes**

21. **The condition in which an echinoderm casts off an injured arm near its base is known as?**
A) Evisceration
B) Autotomy
C) Fission
D) Paedomorphosis
Answer: **B – Autotomy**

22. **Which of the following is the correct sequence of development in sea stars?**
A) Zygote → Brachiolaria → Bipinnaria → Adult
B) Zygote → Bipinnaria → Brachiolaria → Adult
C) Zygote → Ophiopluteus → Brachiolaria → Adult
D) Zygote → Auricularia → Doliolaria → Adult
Answer: **B – Zygote → Bipinnaria → Brachiolaria → Adult**

23. **In sea urchins, the periproct is the region that contains?**
A) Mouth and teeth
B) Anus and genital pores
C) Madreporite only
D) Tube feet only
Answer: **B – Anus and genital pores**

24. **Which echinoderm class exhibits the greatest elongation along the oral-aboral axis?**

A) Asteroidea
B) Ophiuroidea
C) Echinoidea
D) Holothuroidea
Answer: **D – Holothuroidea**

25. **The stone canal in asteroids connects the madreporite to which structure?**
A) Polian vesicles
B) Ring canal
C) Radial canal
D) Tiedemann's bodies
Answer: **B – Ring canal**

26. **Which of the following functions is NOT associated with pedicellariae in echinoderms?**
A) Keeping the body surface free of debris
B) Capturing small prey
C) Locomotion on soft substrates
D) Protection with venom glands
Answer: **C – Locomotion on soft substrates**

27. **The auricularia larva is characteristic of which echinoderm class?**
A) Asteroidea
B) Ophiuroidea
C) Echinoidea
D) Holothuroidea
Answer: **D – Holothuroidea**

28. **In crinoids, the calyx and arms together form the?**
A) Stalk
B) Crown
C) Test
D) Disc
Answer: **B – Crown**

29. **Which extinct echinoderm group was triradial with three spirally arranged ambulacra?**
A) Homalozoa
B) Cystoidea
C) Helicoplacoidea
D) Blastoidea
Answer: **C – Helicoplacoidea**

30. **The water-vascular system in crinoids functions without a madreporite. How is fluid exchanged?**
A) Through the anus
B) Using existing coelomic fluid
C) Through tube feet only
D) Via the respiratory tree
Answer: **B – Using existing coelomic fluid**

31. **Which of the following is a key characteristic of class Concentricycloidea (sea daisies)?**
A) Five long arms with open grooves
B) Two concentric ring canals and no arms
C) Presence of Aristotle's lantern
D) Respiratory tree for gas exchange
Answer: **B – Two concentric ring canals and no arms**

32. **The process of evisceration in sea cucumbers involves expulsion of?**
A) Tube feet only
B) Respiratory tree and digestive tract
C) Madreporite and stone canal
D) Pedicellariae and spines
Answer: **B – Respiratory tree and digestive tract**

33. **In regular sea urchins, the primary mode of locomotion is by?**
A) Arm movements
B) Tube feet with assistance from spines
C) Contractions of body wall muscles
D) Ciliary gliding
Answer: **B – Tube feet with assistance from spines**

34. **The pyloric ceca in sea stars are primarily involved in?**
A) Gas exchange
B) Digestion and absorption
C) Excretion of ammonia
D) Production of gametes
Answer: **B – Digestion and absorption**

35. **Which of the following is true about the nervous system of echinoderms?**
A) It possesses a distinct brain and ganglia
B) It consists of three neural units with a nerve ring and radial nerves
C) It is absent in holothuroids
D) It is entirely centralized in the aboral surface
Answer: **B – It consists of three neural units with a nerve ring and radial nerves**

36. **The adhesive papillae in brachiolaria larvae of asteroids are used for?**
A) Swimming
B) Attachment to substratum

Phylum Hemichordata & Chordata

1. **Which of the following is a characteristic feature of the phylum Hemichordata?**
A) Notochord throughout life
B) Pharyngeal slits
C) Postanal tail
D) Dorsal hollow nerve cord
Answer: B – **Pharyngeal slits**

2. **The proboscis in acorn worms is primarily used for?**
A) Respiration
B) Locomotion and feeding
C) Reproduction
D) Defense only
Answer: B – **Locomotion and feeding**

3. **In hemichordates, the buccal diverticulum was once mistaken for?**
A) Endostyle
B) Notochord
C) Dorsal nerve cord
D) Postanal tail
Answer: B – **Notochord**

4. **The class Pterobranchia is characterized by?**
A) Free-swimming lifestyle
B) Presence of a stalk and tentacles
C) Large body size
D) Absence of pharyngeal slits in all species
Answer: B – **Presence of a stalk and tentacles**

5. **Cephalodiscus and Rhabdopleura belong to which hemichordate class?**
A) Enteropneusta
B) Pterobranchia
C) Ascidiacea
D) Thaliacea
Answer: B – **Pterobranchia**

6. **The tornaria larva of hemichordates closely resembles the larva of?**
A) Annelids
B) Arthropods
C) Echinoderms
D) Molluscs
Answer: C – **Echinoderms**

7. **In enteropneusts, the glomerulus is associated with which function?**
A) Digestion
B) Excretion
C) Circulation
D) Reproduction
Answer: B – **Excretion**

8. **The dorsal nerve cord in some hemichordates is described as?**
A) Solid and ventral
B) Hollow and dorsal
C) Double and lateral
D) Absent in all species
Answer: B – **Hollow and dorsal**

9. **Which of the following is NOT a characteristic of phylum Chordata?**
A) Notochord
B) Pharyngeal slits
C) Jointed appendages
D) Postanal tail
Answer: C – **Jointed appendages**

10. **The subphylum Urochordata is also known as?**
A) Lancelets
B) Tunicates
C) Acorn worms
D) Vertebrates
Answer: B – **Tunicates**

11. **In ascidians, the incurrent siphon is also called?**
A) Atrial siphon
B) Oral siphon
C) Excurrent siphon
D) Branchial siphon
Answer: B – **Oral siphon**

12. **The only animals that produce cellulose are members of?**
A) Cephalochordata
B) Vertebrata
C) Urochordata
D) Hemichordata
Answer: C – **Urochordata**

13. **The heart of tunicates exhibits which unusual feature?**
A) Four-chambered structure
B) Absence of blood vessels
C) Reversal of blood flow direction
D) Hemoglobin as respiratory pigment
Answer: C – **Reversal of blood flow direction**

14. **The appendicularians (Larvacea) are unique among tunicates because?**
A) They are sessile as adults
B) They retain the tadpole form and notochord as adults
C) They lack pharyngeal slits
D) They have a cellulose tunic
Answer: B – **They retain the tadpole form and notochord as adults**

15. **Thaliaceans (salps) use which method for locomotion?**
A) Ciliary action
B) Muscular contractions and jet propulsion
C) Undulation of notochord
D) Walking on tube feet
Answer: B – **Muscular contractions and jet propulsion**

16. **The larval tunicate attaches to substrate using?**
A) Suckers on the tail
B) Adhesive papillae
C) Oral tentacles
D) Atrial siphon
Answer: B – **Adhesive papillae**

17. **During metamorphosis of a tunicate, the internal structures rotate by?**
A) 90 degrees
B) 180 degrees
C) 270 degrees
D) 360 degrees
Answer: B – **180 degrees**

18. **Cephalochordates are commonly called?**
A) Sea squirts
B) Lancelets or amphioxus
C) Acorn worms
D) Salps
Answer: B – **Lancelets or amphioxus**

19. **The notochord in amphioxus is unique because?**
A) It is replaced by bone
B) It contains muscle cells and is contractile
C) It is absent in adults
D) It is located ventrally
Answer: B – **It contains muscle cells and is contractile**

20. **In amphioxus, the oral hood bears ciliated fingerlike projections called?**
A) Cirri
B) Tentacles
C) Palps
D) Setae
Answer: A – **Cirri**

21. **The chamber surrounding the pharynx in cephalochordates is called?**
A) Atrium
B) Coelom
C) Pericardium
D) Hemocoel
Answer: A – **Atrium**

22. **Amphioxus lacks a true heart; blood is propelled by?**
A) Somatic muscles
B) Contractile waves in vessel walls
C) Ciliary action
D) External pressure
Answer: B – **Contractile waves in vessel walls**

23. **The midgut cecum in amphioxus functions similarly to which vertebrate organs?**
A) Liver and pancreas
B) Kidney and spleen
C) Heart and lungs
D) Brain and spinal cord
Answer: A – **Liver and pancreas**

24. **Which fossil chordate from the Burgess Shale shows myomeres and a notochord?**
A) Haikouella
B) Pikaia
C) Myllokunmingia
D) Conodont
Answer: B – **Pikaia**

25. **Haikouella lanceolata is considered significant because it possesses?**
A) A complete cranium
B) Paired eyes and an enlarged brain
C) Jaws and paired fins
D) Amniotic egg
Answer: B – **Paired eyes and an enlarged brain**

26. **The ammocoete larva belongs to which vertebrate group?**
A) Hagfishes
B) Lampreys
C) Bony fishes
D) Amphibians
Answer: B – **Lampreys**

27. **The ammocoete larva resembles amphioxus in body form but also has?**
A) A chambered heart and tripartite brain
B) Jaws and paired fins
C) A cellulose tunic
D) A notochord only
Answer: A – **A chambered heart and tripartite brain**

28. **According to Garstang's hypothesis, vertebrates evolved from?**
A) Sessile adult tunicates
B) Paedomorphic tunicate larvae
C) Free-swimming cephalochordates
D) Hemichordate worms
Answer: B – **Paedomorphic tunicate larvae**

29. **Paedomorphosis refers to?**
A) Loss of larval stage
B) Retention of juvenile traits in adult body
C) Premature death of larvae
D) Transformation of larva into adult
Answer: B – **Retention of juvenile traits in adult body**

30. **Current molecular evidence suggests that the sister group of vertebrates is?**
A) Cephalochordata
B) Hemichordata
C) Urochordata (Tunicates)
D) Echinodermata
Answer: C – **Urochordata (Tunicates)**

31. **The earliest known vertebrate fossils from the early Cambrian include?**
A) Ostracoderms
B) Myllokunmingia and Haikouichthys
C) Placoderms
D) Acanthodians
Answer: B – **Myllokunmingia and Haikouichthys**

32. **Conodonts are extinct vertebrates known primarily from?**
A) Bony armor
B) Phosphatized toothlike elements
C) Complete soft body preservation
D) Shell impressions
Answer: B – **Phosphatized toothlike elements**

33. **Ostracoderms were jawless fishes characterized by?**
A) Cartilaginous skeleton only
B) Bony dermal armor
C) Absence of any skeleton
D) Paired fins in all species
Answer: B – **Bony dermal armor**

34. **Heterostracans, a group of ostracoderms, lacked?**
A) A caudal fin
B) Paired fins
C) A bony head shield
D) Pharyngeal slits
Answer: B – **Paired fins**

35. **The evolution of jaws in gnathostomes is believed to have arisen from?**
A) The first pharyngeal (mandibular) arch
B) The notochord
C) Paired fins
D) The neural crest
Answer: A – **The first pharyngeal (mandibular) arch**

36. **Placoderms and acanthodians are significant because they were?**
A) The first jawless fishes
B) The first jawed vertebrates
C) The first terrestrial vertebrates
D) The first filter feeders
Answer: B – **The first jawed vertebrates**

37. **The fin-fold hypothesis explains the origin of?**
A) Jaws
B) Paired pectoral and pelvic fins
C) The notochord
D) Pharyngeal slits
Answer: B – **Paired pectoral and pelvic fins**

38. **The hyponeural and ectoneural systems are part of the nervous system in?**
A) Hemichordates
B) Cephalochordates
C) Echinoderms (but we skip, so not included)
Answer: (skip – I will avoid echinoderms. Let me correct: I will not include any echinoderm-specific MCQs. I will focus on chordates and hemichordates only.)
I will continue with pure hemichordate and chordate MCQs.

39. **Which of the following is a synapomorphy of the clade Ambulacraria?**
A) Notochord
B) Postanal tail
C) Tripartite coelom

Fishes: Vertebrate Success in Water

1. **The oldest known craniate fossils, dating back 530-520 million years, are collectively referred to as which of the following?**
A) Conodonts
B) Ostracoderms
C) Myllokunmingiids
D) Placoderms
Answer: C – Myllokunmingiids

2. **The toothlike structures found in conodonts, made of hydroxyapatite, are called what?**
A) Placoid scales
B) Denticles
C) Ampullae
D) Lamellae
Answer: B – Denticles

3. **Which extinct group of fishes was jawless, covered by protective bony plates, and lacked paired fins?**
A) Placoderms
B) Acanthodians
C) Ostracoderms
D) Cyclostomes
Answer: C – Ostracoderms

4. **The evolution of which two structures enabled the subsequent adaptive radiation and diversification of fishes?**
A) Lungs and swim bladder
B) Jaws and paired appendages
C) Scales and operculum
D) Notochord and gill slits
Answer: B – Jaws and paired appendages

5. **According to cladistic analysis, which extant group is considered the most primitive craniate?**
A) Lampreys
B) Hagfishes
C) Lancelets
D) Tunicates
Answer: B – Hagfishes

6. **Hagfishes defend themselves by producing copious amounts of slime from which structures?**
A) Oral tentacles
B) Epidermal teeth
C) Ventrolateral slime glands
D) Pharyngeal pouches
Answer: C – Ventrolateral slime glands

7. **The rasping tongue of hagfishes, used to remove flesh from carcasses, is aided by specialized body contortions called what?**
A) Ammocoete twists
B) Spiral valves
C) Knots
D) Ram ventilations
Answer: C – Knots

8. **The adhesive mouth of a sea lamprey is lined with numerous epidermal teeth and surrounds which movable structure?**
A) Radula
B) Rasping tongue
C) Tentacle
D) Gill raker
Answer: B – Rasping tongue

9. **The filter-feeding larval stage of a lamprey is known as which of the following?**
A) Trochophore
B) Ammocoete
C) Leptocephalus
D) Nauplius
Answer: B – Ammocoete

10. **Which of the following best describes the reproductive habit of sea lampreys (Petromyzon marinus)?**
A) Iteroparous with multiple spawning events
B) Semelparous, dying after a single spawning event
C) Viviparous with internal gestation
D) Parthenogenetic without fertilization
Answer: B – Semelparous, dying after a single spawning event

11. **Jaws of vertebrates evolved from which embryonic structure?**
A) The most anterior pair of pharyngeal arches
B) The neural crest cells
C) The notochordal sheath
D) The ectodermal placodes
Answer: A – The most anterior pair of pharyngeal arches

12. **Which extinct group of fishes is considered to be the last common ancestor of modern**

gnathostomes?
A) Ostracoderms
B) Placoderms
C) Acanthodians
D) Conodonts
Answer: C – Acanthodians

13. **The skin of sharks is covered by dermal denticles known as which type of scales?**
A) Cycloid scales
B) Ctenoid scales
C) Ganoid scales
D) Placoid scales
Answer: D – Placoid scales

14. **The largest living sharks, such as the whale shark, are primarily which type of feeders?**
A) Predatory carnivores
B) Filter feeders
C) Detritivores
D) Parasitic feeders
Answer: B – Filter feeders

15. **The lateral expansion of pectoral fins into winglike appendages is a characteristic modification seen in which group?**
A) Sharks
B) Ratfishes
C) Skates and rays
D) Chimaeras
Answer: C – Skates and rays

16. **The gill cover, called an operculum, and teeth modified into large crushing plates are specializations of which chondrichthyan subclass?**
A) Elasmobranchii
B) Holocephali
C) Myxini
D) Petromyzontida
Answer: B – Holocephali

17. **Which group of sarcopterygians can survive seasonal droughts by burrowing into mud and aestivating?**
A) Coelacanths
B) Tetrapodomorphs
C) Lungfishes (Protopterus and Lepidosiren)
D) Ray-finned fishes
Answer: C – Lungfishes (Protopterus and Lepidosiren)

18. **The discovery of a live coelacanth (Latimeria chalumnae) in 1938 was a milestone because it was found where?**
A) Off the coast of Indonesia
B) In the Mississippi River basin
C) Off the coast of South Africa
D) In the Amazon River
Answer: C – Off the coast of South Africa

19. **The large, paddlelike rostrum of paddlefishes is densely innervated with sensory organs for detecting what?**
A) Chemical odors
B) Weak electrical fields
C) Water pressure changes
D) Low-frequency sounds
Answer: B – Weak electrical fields

20. **The Chinese paddlefish (Psephurus gladius) was declared extinct in which year?**
A) 2010
B) 2015
C) 2019
D) 2022
Answer: C – 2019

21. **The specialized muscle bundles in most fishes, arranged in a zigzag pattern, are called what?**
A) Myofibrils
B) Myomeres
C) Sarcomeres
D) Myotomes (as functional units)
Answer: B – Myomeres

22. **The condition where teeth are uniform along the length of the jaw and seated in shallow depressions is known as?**
A) Heterodont and thecodont
B) Homodont and acrodont
C) Homodont and pleurodont
D) Heterodont and acrodont
Answer: B – Homodont and acrodont

23. **The outpocketings of the intestine that increase absorptive surface in bony fishes are called what?**
A) Spiral valves
B) Typhlosoles
C) Pyloric ceca
D) Villi
Answer: C – Pyloric ceca

24. **In teleosts, the conus arteriosus is replaced by an expansion of the ventral aorta called the?**
A) Sinus venosus
B) Bulbus arteriosus
C) Atrioventricular node
D) Spiral valve
Answer: B – Bulbus arteriosus

25. **The vessel that carries blood to the lungs in lungfishes, developed as a branch off aortic arch VI, is called the?**
A) Pulmonary vein
B) Dorsal aorta
C) Pulmonary artery
D) Branchial artery
Answer: C – Pulmonary artery

26. **The highly efficient gas exchange mechanism in fish gills, where blood and water flow in opposite directions, is called?**
A) Concurrent exchange
B) Countercurrent exchange
C) Crosscurrent exchange
D) Parallel exchange
Answer: B – Countercurrent exchange

27. **The modified first pharyngeal slits of elasmobranchs, used as an alternate route for water entering the pharynx, are called?**
A) Opercula
B) Spiracles
C) Nares
D) Cloacae
Answer: B – Spiracles

28. **The vascular network that secretes gases into the swim bladder of physoclistous fishes is known as the?**
A) Ovale
B) Gas gland
C) Rete mirabile
D) Choroid plexus
Answer: C – Rete mirabile

29. **Fishes that gulp air at the surface to force air into their swim bladders, which are connected to the digestive tract, are termed?**
A) Physoclistous
B) Physostomous
C) Homocercal
D) Heterocercal
Answer: B – Physostomous

30. **The lateral-line system of fishes consists of sensory pits called neuromasts that are primarily stimulated by?**
A) Light intensity
B) Chemical gradients
C) Water movements
D) Electrical fields
Answer: C – Water movements

31. **Electroreceptors located on the heads of sharks, used to detect bioelectric fields of prey, are called?**
A) Neuromasts
B) Ampullae of Lorenzini
C) Rods and cones
D) Olfactory rosettes
Answer: B – Ampullae of Lorenzini

32. **The electric eel (Electrophorus electricus) uses electrical currents called "doublets" to cause what effect in prey?**
A) Immediate death
B) Involuntary muscle contractions
C) Loss of orientation
D) Cardiac arrest
Answer: B – Involuntary muscle contractions

33. **Freshwater fishes combat excess water buildup by producing large quantities of which type of urine?**
A) Concentrated urine
B) Isotonic urine
C) Dilute urine
D) Uric acid paste
Answer: C – Dilute urine

34. **Elasmobranchs maintain osmotic balance by retaining high concentrations of urea and which other compound in their blood?**
A) Ammonia
B) Trimethylamine oxide (TMAO)
C) Uric acid
D) Creatinine
Answer: B – Trimethylamine oxide (TMAO)

35. **The functional unit of the fish kidney, which filters bloodborne wastes, is called the?**
A) Nephron
B) Alveolus
C) Glomerulus
D) Tubule
Answer: A – Nephron

Amphibians

1. **The transition from water to land in both ontogeny and phylogeny is uniquely exhibited by which vertebrate group?**
A) Reptiles
B) Mammals
C) Amphibians
D) Birds
Answer: **C – Amphibians**

2. **The superclass that includes amphibians and amniotes as the two major extant branches is called?**
A) Gnathostomata
B) Tetrapoda
C) Osteichthyes
D) Chordata
Answer: **B – Tetrapoda**

3. **Which Devonian lobe-finned fish possessed an upper arm bone (humerus) and two forearm bones (radius and ulna) homologous to tetrapod limbs?**
A) Tiktaalik
B) Acanthostega
C) Eusthenopteron
D) Ichthyostega
Answer: **C – Eusthenopteron**

4. **The fossil genus considered morphologically intermediate between lobe-finned fishes and tetrapods, living approximately 375 million years ago, is?**
A) Eusthenopteron
B) Panderichthys
C) Tiktaalik
D) Acanthostega
Answer: **C – Tiktaalik**

5. **Which early Devonian tetrapod had well-formed limbs with digits but limbs were too weak for walking on land?**
A) Ichthyostega
B) Acanthostega
C) Tiktaalik
D) Pederpes
Answer: **B – Acanthostega**

6. **The earliest tetrapods like Acanthostega and Ichthyostega had how many digits per limb?**
A) Five
B) Four
C) More than five
D) Three
Answer: **C – More than five**

7. **Which early tetrapod possessed stronger vertebrae, elevated head muscles, strengthened girdles, protective rib cage, and ears modified for airborne sounds?**
A) Acanthostega
B) Tiktaalik
C) Ichthyostega
D) Eusthenopteron
Answer: **C – Ichthyostega**

8. **The air-filled cavity that evolved originally as a swim bladder but later coopted for air breathing illustrates which evolutionary principle?**
A) Adaptation
B) Exaptation
C) Convergent evolution
D) Parallel evolution
Answer: **B – Exaptation**

9. **The group that contains modern amphibians plus many extinct lineages first appearing in the early Carboniferous is called?**
A) Lepospondyls
B) Anthracosaurs
C) Temnospondyls
D) Reptiliomorphs
Answer: **C – Temnospondyls**

10. **Which group generally has only four digits on the forelimb rather than the five typical of most tetrapods?**
A) Amniotes
B) Lepospondyls
C) Anthracosaurs
D) Temnospondyls
Answer: **D – Temnospondyls**

11. **The subclass that contains modern amphibians is known as?**
A) Labyrinthodontia
B) Lepospondyli
C) Lissamphibia
D) Temnospondyli
Answer: **C – Lissamphibia**

12. **The earliest fossils attributable to modern amphibians appear in which geological period?**
A) Carboniferous
B) Devonian
C) Permian
D) Triassic
Answer: **C – Permian**

13. **Which two groups of Carboniferous and Permian tetrapods are judged from skull structure to be closer to amniotes than to temnospondyls?**
A) Temnospondyls and Lissamphibians
B) Lepospondyls and Anthracosaurs
C) Microsaurs and Nectrideans
D) Ichthyostegids and Acanthostegids
Answer: **B – Lepospondyls and Anthracosaurs**

14. **Approximately how many species of living amphibians are currently recognized?**
A) 5,000
B) 6,500
C) 8,456
D) 10,000
Answer: **C – 8,456**

15. **In the ancestral amphibian life history, the larval form uses which structure for respiration?**
A) Lungs
B) Skin
C) Gills
D) Buccal cavity
Answer: **C – Gills**

16. **Many lungless salamanders respire primarily by gas exchange across which surfaces?**
A) Lungs only
B) Gills only
C) Skin and mucous membranes of mouth and throat
D) Buccal cavity and lungs
Answer: **C – Skin and mucous membranes of mouth and throat**

17. **The condition in which salamanders retain a permanently aquatic, larval morphology throughout life is called?**
A) Neoteny
B) Paedomorphosis
C) Metamorphosis
D) Direct development
Answer: **B – Paedomorphosis**

18. **The order Gymnophiona contains approximately how many species of caecilians?**
A) 150
B) 214
C) 350
D) 771
Answer: **B – 214**

19. **Caecilians are characterized by the presence of which sensory structure on the snout?**
A) Lateral line
B) Nictitating membrane
C) Sensory tentacles
D) Tympanic membrane
Answer: **C – Sensory tentacles**

20. **In caecilians, fertilization is internal and males have a protrusible copulatory organ called?**
A) Cloaca
B) Phallodeum
C) Spermatophore
D) Hemipenis
Answer: **B – Phallodeum**

21. **The order Urodela comprises approximately how many species of salamanders?**
A) 214
B) 350
C) 771
D) 7,471
Answer: **C – 771**

22. **In most salamanders, fertilization occurs via transfer of a packet of sperm called?**
A) Spermatheca
B) Spermatophore
C) Sperm plug
D) Amplexus
Answer: **B – Spermatophore**

23. **The female salamander stores sperm in a special pouch called?**
A) Cloaca
B) Spermatheca
C) Oviduct
D) Nuptial pad
Answer: **B – Spermatheca**

24. **The largest family of salamanders, containing more than 490 species, many of which are lungless, is?**
A) Salamandridae

B) Ambystomatidae
C) Plethodontidae
D) Proteidae
Answer: **C – Plethodontidae**

25. **Which salamander family is entirely lungless and represents the only vertebrates with neither lungs nor gills at any life stage?**
A) Cryptobranchidae
B) Plethodontidae
C) Amphiumidae
D) Sirenidae
Answer: **B – Plethodontidae**

26. **The mud puppy (Necturus) is an example of which type of paedomorphosis?**
A) Facultative
B) Obligate perennibranchiate
C) Direct development
D) Terrestrial paedomorphosis
Answer: **B – Obligate perennibranchiate**

27. **The axolotl (Ambystoma mexicanum) fails to metamorphose due to deficiency of which hormone?**
A) Prolactin
B) Thyroxine (T4)
C) Growth hormone
D) Cortisol
Answer: **B – Thyroxine (T4)**

28. **The order Anura contains approximately how many species of frogs and toads?**
A) 771
B) 2,000
C) 7,471
D) 10,000
Answer: **C – 7,471**

29. **The name "Anura" literally means?**
A) Tailed one
B) Without tail
C) Naked snake
D) Double life
Answer: **B – Without tail**

30. **The rodlike structure in frogs that represents fused caudal vertebrae is called?**
A) Urostyle
B) Coccyx
C) Sacrum
D) Ilium
Answer: **A – Urostyle**

31. **The largest anuran in the world, Conraua goliath, is found in?**
A) South America
B) Southeast Asia
C) West Africa
D) Australia
Answer: **C – West Africa**

32. **The smallest known tetrapods are frogs of the genus Eleutherodactylus and Psyllophryne measuring less than?**
A) 5 mm
B) 1 cm
C) 2 cm
D) 5 cm
Answer: **B – 1 cm**

33. **The largest American frog is the bullfrog, Lithobates catesbeianus, which reaches a head and body length of?**
A) 10 cm
B) 15 cm
C) 20 cm
D) 30 cm
Answer: **C – 20 cm**

34. **The family Ranidae is commonly known as?**
A) True frogs
B) True toads
C) Tree frogs
D) Poison dart frogs
Answer: **A – True frogs**

35. **The family Bufonidae is commonly known as?**
A) True frogs
B) True toads
C) Tree frogs
D) Burrowing frogs
Answer: **B – True toads**

36. **The family Hylidae is commonly known as?**
A) True frogs
B) True toads
C) Tree frogs
D) Spadefoot toads
Answer: **C – Tree frogs**

37. **The skin of amphibians is attached loosely to the body and contains which two layers?**
A) Epidermis and hypodermis
B) Stratum corneum and stratum basale
C) Epidermis and dermis

Reptiles

1. The semipermeable skin and developmental stages of most amphibians keep them tied to which type of habitats?
A) Arid deserts
B) Aquatic systems and moist terrestrial habitats
C) High-altitude alpine zones
D) Deep oceanic trenches
Answer: B – Aquatic systems and moist terrestrial habitats

2. The monophyletic lineage Amniota includes which of the following groups?
A) Only nonavian reptiles
B) Only mammals and birds
C) Nonavian reptiles, avian reptiles (birds), and mammals
D) Only amphibians and reptiles
Answer: C – Nonavian reptiles, avian reptiles (birds), and mammals

3. The major synapomorphy that distinguishes reptiles and mammals from other vertebrates is which of the following?
A) Four-chambered heart
B) Amniotic egg
C) Keratinized skin
D) Metanephric kidneys
Answer: B – Amniotic egg

4. In nonavian reptiles, the lateral line system found in fishes and amphibians is which of the following?
A) Highly developed
B) Present but modified
C) Lost
D) Replaced by electroreception
Answer: C – Lost

5. The extraembryonic membrane that encloses the embryo in a fluid-filled sac and protects against shock and desiccation is called which of the following?
A) Chorion
B) Allantois
C) Amnion
D) Yolk sac
Answer: C – Amnion

6. Which extraembryonic membrane becomes highly vascular and aids in gas exchange, lying near the shell?
A) Amnion
B) Allantois
C) Chorion
D) Yolk sac
Answer: C – Chorion

7. The allantois in the amniotic egg serves which primary function?
A) Cushioning the embryo
B) Gas exchange only
C) Storing nitrogenous wastes
D) Producing yolk
Answer: C – Storing nitrogenous wastes

8. According to the traditional classification presented, which order contains turtles?
A) Crocodylia
B) Squamata
C) Sphenodontia
D) Testudines
Answer: D – Testudines

9. The order Crocodylia is characterized by which of the following features?
A) Complete absence of a ventricular septum
B) Elongate, muscular, laterally compressed body and complete ventricular septum
C) Teeth absent in adults
D) Movable quadrate bones only
Answer: B – Elongate, muscular, laterally compressed body and complete ventricular septum

10. The tuataras belong to which order of nonavian reptiles?
A) Squamata
B) Testudines
C) Crocodylia
D) Sphenodontia
Answer: D – Sphenodontia

11. The order Squamata includes which of the following groups?
A) Turtles only
B) Crocodiles and alligators
C) Snakes, lizards, and worm lizards
D) Tuataras only
Answer: C – Snakes, lizards, and worm lizards

12. The class Reptilia as shown in the traditional classification is considered which type of grouping?
A) Monophyletic
B) Paraphyletic
C) Polyphyletic
D) Holophyletic
Answer: B – Paraphyletic
13. The term "synapsid" refers to an amniote skull condition characterized by which feature?
A) No temporal fenestrae
B) Two pairs of temporal fenestrae
C) A single opening (fenestra) in the temporal region
D) Multiple openings in the nasal region
Answer: C – A single opening (fenestra) in the temporal region
14. The term "diapsid" refers to an amniote skull condition characterized by which feature?
A) No temporal fenestrae
B) Upper and lower temporal fenestrae
C) A single temporal fenestra
D) Fenestrae only in the nasal region
Answer: B – Upper and lower temporal fenestrae
15. The term "anapsid" refers to a skull that has which characteristic?
A) Two pairs of temporal fenestrae
B) A single temporal fenestra
C) Lacks temporal fenestrae
D) Fenestrae fused into one opening
Answer: C – Lacks temporal fenestrae
16. Although turtles possess an anapsid skull, they are currently grouped within which larger clade?
A) Synapsida
B) Anapsida
C) Diapsida
D) Parareptilia
Answer: C – Diapsida
17. The anapsid skull in Testudines is thought to have resulted from which evolutionary process?
A) Retention of primitive condition
B) Evolutionary loss of temporal fenestrae
C) Fusion of synapsid openings
D) Independent origin of fenestrae
Answer: B – Evolutionary loss of temporal fenestrae
18. Nonavian reptiles have dry skin with epidermal scales composed primarily of which protein?
A) Collagen
B) Elastin
C) Keratin
D) Melanin
Answer: C – Keratin
19. Keratin, when chemically bonded to phospholipids, provides which function in nonavian reptiles?
A) Increases metabolic rate
B) Prevents water loss across body surfaces
C) Enhances color vision
D) Aids in calcium absorption
Answer: B – Prevents water loss across body surfaces
20. The dorsal portion of a turtle's shell is called which of the following?
A) Plastron
B) Carapace
C) Scute
D) Bridge
Answer: B – Carapace
21. The carapace of a turtle forms from a fusion of which structures?
A) Only dermal bones
B) Vertebrae, expanded ribs, and dermal bone
C) Only expanded ribs
D) Pectoral girdle and sternum
Answer: B – Vertebrae, expanded ribs, and dermal bone
22. The ventral portion of a turtle's shell is called which of the following?
A) Carapace
B) Bridge
C) Plastron
D) Neural plate
Answer: C – Plastron
23. The plastron of a turtle forms from bones of the pectoral girdle and which other structure?
A) Skull bones
B) Dermal bone
C) Vertebral spines
D) Limb bones
Answer: B – Dermal bone
24. Turtles that bend their long necks in a horizontal plane to withdraw their head belong to which clade?

A) Cryptodira
B) Pleurodira
C) Anapsida
D) Synapsida
Answer: B – Pleurodira
25. Turtles that fully withdraw the head and neck in a vertical plane between the forelimbs belong to which clade?
A) Pleurodira
B) Cryptodira
C) Parareptilia
D) Eureptilia
Answer: B – Cryptodira
26. All turtles are which of the following reproductive types?
A) Viviparous
B) Ovoviviparous
C) Oviparous
D) Parthenogenetic
Answer: C – Oviparous
27. Archosaurs are characterized by which of the following dental conditions?
A) Acrodont teeth
B) Pleurodont teeth
C) Thecodont teeth
D) Absence of teeth
Answer: C – Thecodont teeth
28. The first archosaurs appeared during which geological period?
A) Carboniferous
B) Devonian
C) Permian
D) Jurassic
Answer: C – Permian
29. Archosaurs became dominant terrestrial vertebrates during which period?
A) Permian
B) Carboniferous
C) Triassic
D) Cretaceous
Answer: C – Triassic
30. Crocodilians can be distinguished from other reptiles by which of the following features?
A) Circular eye orbits
B) Triangular eye orbits
C) Absence of teeth
D) Protrusible tongue
Answer: B – Triangular eye orbits
31. The largest extant crocodilian is which species?
A) Nile crocodile
B) American alligator
C) Saltwater crocodile
D) Gharial
Answer: C – Saltwater crocodile
32. The secondary palate in archosaurs separates which two passageways?
A) Oral and esophageal
B) Nasal and mouth passageways
C) Tracheal and esophageal
D) Pharyngeal and laryngeal
Answer: B – Nasal and mouth passageways
33. Lepidosauria is a monophyletic diapsid lineage that first appeared in which period?
A) Jurassic
B) Cretaceous
C) Early Triassic
D) Permian
Answer: C – Early Triassic
34. Lepidosaurs are characterized by which of the following features?
A) Absence of scales
B) Overlapping keratinized epidermal scales and regular shedding cycles
C) Single male reproductive organ
D) Longitudinal cloacal slit
Answer: B – Overlapping keratinized epidermal scales and regular shedding cycles
35. The two surviving species of tuataras are found in which country?
A) Australia
B) South Africa
C) New Zealand
D) Madagascar
Answer: C – New Zealand
36. Tuataras have which type of skull structure?
A) Kinetic skull
B) Akinetic skull
C) Synapsid skull
D) Anapsid skull only
Answer: B – Akinetic skull
37. In tuataras, the unique chewing mechanism involves which tooth arrangement?

Birds: Class Aves

1. According to T.H. Huxley, birds are described as which of the following?
A) Modern reptiles
B) Glorified reptiles
C) Flying mammals
D) Advanced amphibians
Answer: B – Glorified reptiles

2. The single point of articulation between the skull and the first cervical vertebra in birds is called?
A) Double condyle
B) Occipital condyle
C) Atlantal condyle
D) Cervical condyle
Answer: B – Occipital condyle

3. Which ancient theropod had a feather-covered body and membranous wings similar to bats?
A) Microraptor
B) Caudipteryx
C) Yi qi
D) Sinosauropteryx
Answer: C – Yi qi

4. Asymmetrical feathers are required for which type of flight?
A) Gliding
B) Powered flight
C) Soaring
D) Hovering
Answer: B – Powered flight

5. The furcula in birds is commonly known as?
A) Wishbone
B) Keel
C) Pygostyle
D) Synsacrum
Answer: A – Wishbone

6. Which theropod possessed asymmetrical feathers on both fore and hind appendages?
A) Yi qi
B) Sinosauropteryx
C) Caudipteryx
D) Microraptor
Answer: D – Microraptor

7. The fossil Archaeopteryx was discovered in which country?
A) China
B) Germany
C) France
D) Spain
Answer: B – Germany

8. Sinornis is approximately how many million years younger than Archaeopteryx?
A) 5 million years
B) 10 million years
C) 15 million years
D) 20 million years
Answer: C – 15 million years

9. The presence of alula in Eoalulavis indicates evolution of which flight mechanism?
A) Gliding
B) Highly maneuverable flight
C) Soaring
D) Hovering
Answer: B – Highly maneuverable flight

10. The superorder composed of large, flightless birds is called?
A) Neognathae
B) Palaeognathae
C) Archosauria
D) Theropoda
Answer: B – Palaeognathae

11. Which order includes ostriches and rheas?
A) Anseriformes
B) Struthioniformes
C) Galliformes
D) Columbiformes
Answer: B – Struthioniformes

12. The neognathous lineage includes which type of birds?
A) Only flightless birds
B) Modern flying bird species
C) Only ancient birds
D) Only aquatic birds
Answer: B – Modern flying bird species

13. The asteroid impact that led to dinosaur extinctions occurred approximately?
A) 150 mya
B) 135 mya
C) 125 mya
D) 66 mya
Answer: D – 66 mya

14. Pennaceous feathers are characterized by which feature?
A) Rudimentary shaft only
B) Prominent shaft with interlocking barbules
C) No barbules
D) Only downy structure
Answer: B – Prominent shaft with interlocking barbules

15. The tiny hooks that interlock barbules in pennaceous feathers are called?
A) Barbicels
B) Hamuli
C) Rachis
D) Calamus
Answer: B – Hamuli

16. Plumulaceous feathers include which type of feathers?
A) Flight feathers
B) Contour feathers
C) Down feathers
D) Primary feathers
Answer: C – Down feathers

17. The oil gland at the base of the tail in birds is called?
A) Preen gland
B) Uropygial gland
C) Scent gland
D) Sebaceous gland
Answer: B – Uropygial gland

18. Anting behavior in birds involves rubbing ants over feathers to obtain which acid?
A) Acetic acid
B) Citric acid
C) Formic acid
D) Lactic acid
Answer: C – Formic acid

19. Blue feathers appear blue due to which phenomenon?
A) Blue pigment
B) Structural color
C) Melanin deposition
D) Carotenoid pigments
Answer: B – Structural color

20. The process of shedding and replacing feathers is called?
A) Ecdysis
B) Molting
C) Desquamation
D) Sloughing
Answer: B – Molting

21. The cervical vertebrae in birds have which type of articular surface?
A) Flat
B) Ball-and-socket
C) Saddle-shaped
D) Hinge-like
Answer: C – Saddle-shaped

22. The synsacrum in birds is formed by fusion of which vertebrae?
A) Only cervical vertebrae
B) Only caudal vertebrae
C) Posterior thoracic, lumbar, sacral, and anterior caudal
D) Only thoracic vertebrae
Answer: C – Posterior thoracic, lumbar, sacral, and anterior caudal

23. The posterior caudal vertebrae in birds are fused into a structure called?
A) Synsacrum
B) Pygostyle
C) Furcula
D) Carina
Answer: B – Pygostyle

24. The keel on the sternum of birds is also known as?
A) Furcula
B) Pygostyle
C) Carina
D) Synsacrum
Answer: C – Carina

25. The perching tendon mechanism in birds causes the foot to grip when which joint is flexed?
A) Knee joint
B) Hip joint
C) Ankle joint
D) Shoulder joint
Answer: C – Ankle joint

26. The largest and strongest muscles in most birds are the?
A) Leg muscles
B) Neck muscles
C) Flight muscles
D) Tail muscles
Answer: C – Flight muscles

27. The alula in birds is supported by bones of which digit?
A) First digit
B) Medial digit
C) Lateral digit
D) Fourth digit
Answer: B – Medial digit

28. During hovering flight, hummingbirds beat their wings at which rate?
A) 10-20 beats per second
B) 30-40 beats per second
C) 50-80 beats per second
D) 100-120 beats per second
Answer: C – 50-80 beats per second

29. The crop in birds is a diverticulum of which organ?
A) Stomach
B) Esophagus
C) Intestine
D) Cloaca
Answer: B – Esophagus

30. Pigeon's milk is produced by which structure?
A) Proventriculus
B) Gizzard
C) Crop
D) Liver
Answer: C – Crop

31. The glandular part of the bird's stomach that secretes gastric juices is called?
A) Gizzard
B) Proventriculus
C) Crop
D) Ceca
Answer: B – Proventriculus

32. The muscular part of the bird's stomach that grinds food is called?
A) Proventriculus
B) Gizzard
C) Crop
D) Cloaca
Answer: B – Gizzard

33. Birds that swallow sand and abrasives to aid digestion are similar to which reptile group?
A) Snakes
B) Lizards
C) Crocodylians
D) Turtles
Answer: C – Crocodylians

34. The heart rate of a hummingbird under stress can exceed?
A) 500 beats per minute
B) 800 beats per minute
C) 1000 beats per minute
D) 1200 beats per minute
Answer: C – 1000 beats per minute

35. The bird heart is relatively large, up to what percentage of total body weight?
A) 1.2%
B) 1.8%
C) 2.4%
D) 3.0%
Answer: C – 2.4%

36. The voice box in birds is called?
A) Larynx
B) Syrinx
C) Pharynx
D) Trachea
Answer: B – Syrinx

37. The fine air tubes in bird lungs about 400 µm in diameter are called?
A) Alveoli
B) Bronchioles
C) Parabronchi
D) Air capillaries
Answer: C – Parabronchi

38. How many ventilatory cycles are required to move a given volume of air through the avian respiratory system?
A) One
B) Two
C) Three
D) Four
Answer: B – Two

39. The enlargement of cerebral hemispheres in birds is due to which structure?
A) Corpus callosum
B) Corpus striatum
C) Hippocampus
D) Amygdala
Answer: B – Corpus striatum

40. The pineal body in birds is located on the roof of which brain region?
A) Hindbrain

Ecology & Ecosystems

1. What term describes a group of populations of different species living close enough to interact?
A) Ecosystem
B) Community
C) Population
D) Biosphere
Answer: Community

2. Which of the following is a +/- interaction?
A) Mutualism
B) Commensalism
C) Predation
D) Competition
Answer: Predation

3. The principle that two species competing for the same limiting resources cannot coexist is called?
A) Resource partitioning
B) Character displacement
C) Competitive exclusion
D) Niche differentiation
Answer: Competitive exclusion

4. The specific set of biotic and abiotic resources used by an organism is its?
A) Habitat
B) Niche
C) Territory
D) Range
Answer: Niche

5. Differentiation of niches to enable similar species to coexist is called?
A) Competitive exclusion
B) Character displacement
C) Resource partitioning
D) Exploitation
Answer: Resource partitioning

6. The tendency for characteristics to diverge more in sympatric populations than in allopatric populations is?
A) Competitive exclusion
B) Resource partitioning
C) Character displacement
D) Niche differentiation
Answer: Character displacement

7. Bright coloration that warns predators of prey toxicity is called?
A) Cryptic coloration
B) Batesian mimicry
C) Aposematic coloration
D) Müllerian mimicry
Answer: Aposematic coloration

8. When a harmless species mimics a harmful one, it is called?
A) Cryptic coloration
B) Aposematic coloration
C) Batesian mimicry
D) Müllerian mimicry
Answer: Batesian mimicry

9. An interaction where one organism eats part of a plant or alga is?
A) Predation
B) Parasitism
C) Herbivory
D) Commensalism
Answer: Herbivory

10. A +/- interaction where one organism derives nourishment from a host is?
A) Herbivory
B) Predation
C) Parasitism
D) Mutualism
Answer: Parasitism

11. A +/+ interaction benefiting both species is?
A) Commensalism
B) Mutualism
C) Predation
D) Competition
Answer: Mutualism

12. A +/0 interaction where one species benefits and the other is unaffected is?
A) Mutualism
B) Commensalism
C) Amensalism
D) Parasitism
Answer: Commensalism

13. The variety of different kinds of organisms in a community is its?
A) Relative abundance
B) Species richness
C) Species diversity
D) Trophic structure
Answer: Species diversity

14. The number of different species in a community is its?
A) Species evenness
B) Species diversity
C) Species richness
D) Relative abundance
Answer: Species richness

15. A widely used index that incorporates both richness and relative abundance is the?
A) Simpson index
B) Shannon diversity index
C) Species-area index
D) Trophic index
Answer: Shannon diversity index

16. The transfer of chemical energy from producers through consumers is a?
A) Food web
B) Trophic level
C) Food chain
D) Energy pyramid
Answer: Food chain

17. Linked food chains form a?
A) Trophic structure
B) Energy pyramid
C) Food web
D) Biomass pyramid
Answer: Food web

18. The hypothesis that food chain length is limited by inefficient energy transfer is the?
A) Top-down hypothesis
B) Energetic hypothesis
C) Productivity hypothesis
D) Bottom-up hypothesis
Answer: Energetic hypothesis

19. Species that have strong effects due to their large size or high abundance are?
A) Keystone species
B) Foundation species
C) Ecosystem engineers
D) Dominant species
Answer: Foundation species

20. A species that exerts a disproportionate influence on community structure relative to its abundance is a?
A) Foundation species
B) Keystone species
C) Ecosystem engineer
D) Dominant competitor
Answer: Keystone species

21. A beaver that dramatically alters its environment is an example of a(n)?
A) Keystone species
B) Foundation species
C) Ecosystem engineer
D) Invasive species
Answer: Ecosystem engineer

22. Control of community structure by nutrient supply is called?
A) Top-down control
B) Trophic cascade
C) Bottom-up control
D) Intermediate control
Answer: Bottom-up control

23. Control of community structure by predators is called?
A) Bottom-up control
B) Resource control
C) Top-down control
D) Energetic control
Answer: Top-down control

24. An event that changes a community by removing organisms is a?
A) Succession
B) Disturbance
C) Equilibrium
D) Climax
Answer: Disturbance

25. The model that describes communities as constantly changing after disturbances is the?
A) Equilibrium model
B) Climax model
C) Nonequilibrium model
D) Disturbance model
Answer: Nonequilibrium model

26. The hypothesis that moderate disturbance fosters greatest diversity is the?
A) Disturbance frequency hypothesis
B) Intermediate disturbance hypothesis
C) Successional hypothesis
D) Diversity-stability hypothesis
Answer: Intermediate disturbance hypothesis

27. The process of change in species composition after a disturbance is?
A) Disturbance
B) Succession
C) Equilibrium
D) Stabilization
Answer: Succession
28. Succession on a newly formed volcanic island is?
A) Secondary succession
B) Primary succession
C) Tertiary succession
D) Climax succession
Answer: Primary succession
29. The species that colonize first during succession are?
A) Keystone species
B) Pioneer species
C) Foundation species
D) Climax species
Answer: Pioneer species
30. Which factor is most correlated with high species richness in terrestrial communities?
A) Low evapotranspiration
B) High latitude
C) High evapotranspiration
D) Low precipitation
Answer: High evapotranspiration
31. The relationship between species richness and area is described by the?
A) Species-area curve
B) Diversity-index curve
C) Latitudinal gradient
D) Equilibrium model
Answer: Species-area curve
32. The island equilibrium model was developed by?
A) Darwin and Wallace
B) MacArthur and Wilson
C) Connell and Slatyer
D) Gause and Lotka
Answer: MacArthur and Wilson
33. In the island equilibrium model, the number of species is determined by the balance between?
A) Birth and death rates
B) Immigration and extinction
C) Speciation and migration
D) Competition and predation
Answer: Immigration and extinction
34. Disease-causing agents such as viruses and bacteria are called?
A) Vectors
B) Parasites
C) Pathogens
D) Hosts
Answer: Pathogens
35. Diseases transferred from animals to humans are called?
A) Vector diseases
B) Parasitic diseases
C) Zoonotic diseases
D) Infectious diseases
Answer: Zoonotic diseases
36. The sum of all organisms and abiotic factors in an area is a(n)?
A) Community
B) Ecosystem
C) Population
D) Biosphere
Answer: Ecosystem
37. The first law of thermodynamics states that energy cannot be?
A) Created or destroyed
B) Transformed
C) Lost as heat
D) Used inefficiently
Answer: Created or destroyed
38. Organisms that produce organic compounds from inorganic sources are?
A) Heterotrophs
B) Decomposers
C) Autotrophs
D) Consumers
Answer: Autotrophs
39. The trophic level consisting of autotrophs is?
A) Primary consumers
B) Secondary consumers
C) Primary producers
D) Decomposers
Answer: Primary producers
40. Organisms that obtain energy from detritus are?

Nutrition & Digestion

1. Which of the following is the correct sequence of the digestive tract from proximal to distal?
A) Esophagus, Stomach, Duodenum, Jejunum, Ileum
B) Stomach, Esophagus, Ileum, Jejunum, Duodenum
C) Duodenum, Jejunum, Ileum, Stomach, Esophagus
D) Jejunum, Ileum, Duodenum, Stomach, Esophagus
Answer: Esophagus, Stomach, Duodenum, Jejunum, Ileum

2. Which hormone is responsible for stimulating the release of bicarbonate-rich pancreatic juice?
A) Gastrin
B) Secretin
C) Cholecystokinin
D) Gastric Inhibitory Peptide
Answer: Secretin

3. Which of the following cells secrete pepsinogen in the stomach?
A) Parietal Cells
B) G Cells
C) Chief Cells
D) Mucous Neck Cells
Answer: Chief Cells

4. The majority of nutrient absorption occurs in which part of the small intestine?
A) Duodenum
B) Jejunum
C) Ileum
D) All parts equally
Answer: Jejunum

5. Which vitamin requires intrinsic factor for its absorption in the ileum?
A) Vitamin C
B) Vitamin B12
C) Vitamin D
D) Vitamin K
Answer: Vitamin B12

6. The process of breaking down large fat globules into smaller droplets is primarily the function of:
A) Pancreatic Lipase
B) Bile Salts
C) Gastric Lipase
D) Colipase
Answer: Bile Salts

7. Which of the following is NOT a primary function of the liver?
A) Gluconeogenesis
B) Production of Insulin
C) Synthesis of Plasma Proteins
D) Detoxification of Ammonia
Answer: Production of Insulin

8. The muscular contractions that mix food with digestive juices in the small intestine are called:
A) Peristalsis
B) Segmentation
C) Haustration
D) Mass Movements
Answer: Segmentation

9. Which enzyme is responsible for the digestion of starch in the mouth and small intestine?
A) Maltase
B) Sucrase
C) Amylase
D) Lactase
Answer: Amylase

10. The hormone that inhibits gastric emptying and secretion when fats are present in the duodenum is:
A) Gastrin
B) Secretin
C) Cholecystokinin
D) Motilin
Answer: Cholecystokinin

11. The main function of the large intestine is:
A) Digestion of Proteins
B) Absorption of Amino Acids
C) Absorption of Water and Electrolytes
D) Production of Bile
Answer: Absorption of Water and Electrolytes

12. Which of the following is a zymogen (inactive enzyme precursor)?
A) Pepsin
B) Trypsin
C) Trypsinogen
D) Amylase
Answer: Trypsinogen

13. The final product of protein digestion that is absorbed is:
A) Dipeptides
B) Tripeptides
C) Amino Acids
D) Polypeptides
Answer: Amino Acids

14. Which sphincter regulates the passage of chyme from the stomach to the duodenum?
A) Cardiac Sphincter
B) Pyloric Sphincter
C) Ileocecal Sphincter
D) Anal Sphincter
Answer: Pyloric Sphincter

15. The hormone that stimulates gastric acid secretion is:
A) Secretin
B) Gastrin
C) Somatostatin
D) Gastric Inhibitory Peptide
Answer: Gastrin

16. Where does the chemical digestion of carbohydrates begin?
A) Stomach
B) Small Intestine
C) Mouth
D) Esophagus
Answer: Mouth

17. The process of moving food from the pharynx to the stomach is called:
A) Mastication
B) Deglutition
C) Peristalsis
D) Segmentation
Answer: Deglutition

18. Pancreatic juice contains all of the following enzymes EXCEPT:
A) Trypsin
B) Pepsin
C) Amylase
D) Lipase
Answer: Pepsin

19. Which structure prevents food from entering the larynx during swallowing?
A) Uvula
B) Epiglottis
C) Tongue
D) Pharynx
Answer: Epiglottis

20. The primary energy source absorbed directly into the bloodstream as monosaccharides is:
A) Fructose
B) Galactose
C) Glucose
D) Maltose
Answer: Glucose

21. The "brush border" of the small intestine refers to:
A) Villi
B) Microvilli
C) Plicae Circulares
D) Lacteals
Answer: Microvilli

22. Which mineral is essential for the formation of hemoglobin?
A) Calcium
B) Iron
C) Iodine

D) Sodium
Answer: Iron
23. The hormone that signals satiety and is released by adipose tissue is:
A) Ghrelin
B) Leptin
C) Peptide YY
D) Insulin
Answer: Leptin
24. What is the primary function of the gallbladder?
A) Produce Bile
B) Digest Fats
C) Store and Concentrate Bile
D) Produce Cholesterol
Answer: Store and Concentrate Bile
25. A deficiency of which vitamin causes scurvy?
A) Vitamin A
B) Vitamin C
C) Vitamin D
D) Vitamin K
Answer: Vitamin C
26. The enzyme that converts trypsinogen to trypsin is:
A) Enterokinase
B) Pepsin
C) HCl
D) Carboxypeptidase
Answer: Enterokinase
27. Which part of the tooth contains blood vessels and nerves?
A) Enamel
B) Dentin
C) Pulp
D) Cementum
Answer: Pulp
28. Which of the following is a characteristic of carnivore dentition?
A) Broad, flat molars
B) Well-developed canines
C) Diastema
D) Horny plates
Answer: Well-developed canines
29. The hormone that increases blood glucose levels by stimulating glycogen breakdown is:
A) Insulin
B) Glucagon
C) Cortisol
D) Epinephrine
Answer: Glucagon
30. The medical term for inflammation of the liver is:
A) Hepatitis
B) Cirrhosis
C) Cholecystitis
D) Pancreatitis
Answer: Hepatitis
31. The process of taking food into the mouth is known as:
A) Digestion
B) Ingestion
C) Absorption
D) Elimination
Answer: Ingestion
32. Which of the following is a fat-soluble vitamin?
A) Vitamin B1
B) Vitamin C
C) Vitamin D
D) Vitamin B12
Answer: Vitamin D
33. The main site for cellulose digestion in rabbits and horses is the:
A) Rumen
B) Cecum
C) Abomasum
D) Small Intestine
Answer: Cecum
34. Which hormone is released by the duodenum in response to acidic chyme?
A) Gastrin
B) Secretin
C) Cholecystokinin

Respiratory System & Gas Exchange

1. Which of the following structures is primarily responsible for preventing food aspiration into the airway?
A) Uvula
B) Glottis
C) Epiglottis
D) Tongue
Answer: Epiglottis

2. What is the primary muscle of inspiration during quiet breathing?
A) External intercostals
B) Internal intercostals
C) Diaphragm
D) Abdominals
Answer: Diaphragm

3. The majority of carbon dioxide in blood is transported as:
A) Dissolved CO2
B) Carbaminohemoglobin
C) Bicarbonate ions
D) Carbonic acid
Answer: Bicarbonate ions

4. The oxygen-hemoglobin dissociation curve shifts to the right in response to:
A) Increased pH
B) Decreased temperature
C) Increased 2,3-DPG
D) Decreased PCO2
Answer: Increased 2,3-DPG

5. Which respiratory disorder is characterized by destruction of alveolar walls and loss of elastic recoil?
A) Chronic bronchitis
B) Asthma
C) Emphysema
D) Pulmonary fibrosis
Answer: Emphysema

6. The enzyme carbonic anhydrase catalyzes the reaction between:
A) O2 and hemoglobin
B) CO2 and water
C) CO and plasma
D) H+ and bicarbonate
Answer: CO2 and water

7. The partial pressure of oxygen in alveolar air is approximately:
A) 40 mmHg
B) 100 mmHg
C) 46 mmHg
D) 160 mmHg
Answer: 100 mmHg

8. Which lung volume cannot be measured directly by spirometry?
A) Tidal volume
B) Expiratory reserve volume
C) Inspiratory reserve volume
D) Residual volume
Answer: Residual volume

9. The chemoreceptors most sensitive to changes in arterial PCO2 are located in the:
A) Carotid bodies
B) Aortic bodies
C) Medulla oblongata
D) Lungs
Answer: Medulla oblongata

10. Surfactant is produced by which type of alveolar cells?
A) Type I pneumocytes
B) Type II pneumocytes
C) Alveolar macrophages
D) Goblet cells
Answer: Type II pneumocytes

11. The condition of low oxygen levels in tissues is termed:
A) Hypoxemia
B) Hypercapnia
C) Hypoxia
D) Anemia
Answer: Hypoxia

12. Which law states that the total pressure of a gas mixture is the sum of partial pressures?
A) Boyle's Law
B) Dalton's Law
C) Henry's Law
D) Fick's Law
Answer: Dalton's Law

13. The primary stimulus for increasing ventilation during moderate exercise is:
A) Decreased PO2

B) Increased PCO2 and H+
C) Increased lactic acid
D) Conscious control
Answer: Increased PCO2 and H+

14. Which structure marks the beginning of the respiratory zone?
A) Terminal bronchiole
B) Respiratory bronchiole
C) Alveolar duct
D) Alveolar sac
Answer: Respiratory bronchiole

15. Myoglobin is found in which type of tissue and has what affinity for oxygen compared to hemoglobin?
A) Liver; lower affinity
B) Muscle; higher affinity
C) Blood; similar affinity
D) Lung; no affinity
Answer: Muscle; higher affinity

16. Chronic Obstructive Pulmonary Disease (COPD) typically includes which two conditions?
A) Asthma and pneumonia
B) Emphysema and chronic bronchitis
C) Tuberculosis and fibrosis
D) Bronchiectasis and atelectasis
Answer: Emphysema and chronic bronchitis

17. The chloride shift occurs in red blood cells to:
A) Transport oxygen
B) Maintain electrical neutrality during CO2 transport
C) Increase hemoglobin's oxygen affinity
D) Produce carbonic acid
Answer: Maintain electrical neutrality during CO2 transport

18. The volume of air remaining in the lungs after a maximal expiration is called:
A) Expiratory reserve volume
B) Residual volume
C) Functional residual capacity
D) Total lung capacity
Answer: Residual volume

19. Which of the following is an upper respiratory tract infection?
A) Pneumonia
B) Tuberculosis
C) Sinusitis
D) Bronchiolitis
Answer: Sinusitis

20. The Hering-Breuer reflex helps to:
A) Increase heart rate
B) Prevent over-inflation of the lungs
C) Stimulate cough
D) Control sneezing
Answer: Prevent over-inflation of the lungs

21. The Adam's apple is formed by which laryngeal cartilage?
A) Cricoid
B) Thyroid
C) Arytenoid
D) Epiglottic
Answer: Thyroid

22. A person with a barrel chest appearance most likely has:
A) Asthma
B) Emphysema
C) Pneumonia
D) Lung cancer
Answer: Emphysema

23. The maximum volume of air that can be exhaled after a maximal inhalation is:
A) Tidal volume
B) Inspiratory capacity
C) Vital capacity
D) Total lung capacity
Answer: Vital capacity

24. Which gas law explains the inverse relationship between pressure and volume of a gas?
A) Henry's Law
B) Dalton's Law
C) Boyle's Law
D) Charles' Law
Answer: Boyle's Law

25. The primary cause of lung cancer is most closely associated with:
A) Air pollution
B) Genetic factors
C) Smoking
D) Occupational dust
Answer: Smoking

26. In the systemic capillaries, oxygen unloading is enhanced by the Bohr effect, which is triggered by:

A) Low PCO2 and high pH
B) High PCO2 and low pH
C) Low temperature
D) High oxygen concentration
Answer: High PCO2 and low pH

27. The vocal cords are located within the:
A) Pharynx
B) Larynx
C) Trachea
D) Bronchus
Answer: Larynx

28. The term eupnea refers to:
A) Labored breathing
B) Normal quiet breathing
C) Absence of breathing
D) Rapid deep breathing
Answer: Normal quiet breathing

29. The majority of oxygen in blood is transported bound to:
A) Plasma proteins
B) Hemoglobin in RBCs
C) Dissolved in plasma
D) Myoglobin
Answer: Hemoglobin in RBCs

30. Which of the following is NOT a property of an efficient respiratory surface?
A) Moist
B) Thick and muscular
C) Large surface area
D) Rich blood supply
Answer: Thick and muscular

31. Carbon monoxide poisoning is dangerous because CO:
A) Dissolves readily in plasma
B) Forms stable carboxyhemoglobin
C) Converts to bicarbonate
D) Stimulates respiratory center
Answer: Forms stable carboxyhemoglobin

32. The number of lobes in the right human lung is:
A) Two
B) Three
C) Four
D) One
Answer: Three

33. The space between the lungs containing the heart is the:
A) Hilum
B) Pleural cavity
C) Mediastinum
D) Pericardium
Answer: Mediastinum

34. The normal arterial blood pH range is:
A) 7.20-7.30
B) 7.30-7.40
C) 7.35-7.45
D) 7.45-7.55
Answer: 7.35-7.45

35. The primary buffer system in blood is the:
A) Phosphate system
B) Protein system
C) Bicarbonate system
D) Hemoglobin system
Answer: Bicarbonate system

36. Which of the following is a restrictive lung disease?
A) Chronic bronchitis
B) Emphysema
C) Pulmonary fibrosis
D) Asthma
Answer: Pulmonary fibrosis

37. The term for coughing up blood is:
A) Epistaxis
B) Hemoptysis
C) Hematemesis
D) Hemothorax
Answer: Hemoptysis

38. The term for bleeding from the nose is:
A) Epistaxis
B) Hemoptysis
C) Hematemesis
D) Hematuria
Answer: Epistaxis

39. The volume of air that can be forcibly inhaled after a normal tidal inspiration is the:
A) Expiratory reserve volume
B) Inspiratory reserve volume
C) Tidal volume
D) Residual volume
Answer: Inspiratory reserve volume

40. The condition of air in the pleural cavity is called:
A) Pleural effusion
B) Pneumothorax

Circulation & Transport

1. The thickest walled chamber of the human heart is the:
A) Right Atrium
B) Left Atrium
C) Right Ventricle
D) Left Ventricle
Answer: Left Ventricle

2. The membrane that encloses the heart in a double-layered sac is the:
A) Myocardium
B) Endocardium
C) Pericardium
D) Epicardium
Answer: Pericardium

3. The pacemaker of the heart, which initiates each heartbeat, is the:
A) Atrioventricular Node
B) Bundle of His
C) Purkinje Fibers
D) Sinoatrial Node
Answer: Sinoatrial Node

4. Blood vessels that carry blood away from the heart are called:
A) Veins
B) Venules
C) Capillaries
D) Arteries
Answer: Arteries

5. The valve present between the left atrium and left ventricle is the:
A) Tricuspid Valve
B) Pulmonary Semilunar Valve
C) Aortic Semilunar Valve
D) Bicuspid (Mitral) Valve
Answer: Bicuspid (Mitral) Valve

6. Deoxygenated blood from the body enters the heart through the:
A) Pulmonary Veins
B) Aorta
C) Superior and Inferior Vena Cavae
D) Pulmonary Arteries
Answer: Superior and Inferior Vena Cavae

7. The phase of the cardiac cycle when the ventricles contract is called:
A) Atrial Systole
B) Ventricular Diastole
C) Ventricular Systole
D) Atrial Diastole
Answer: Ventricular Systole

8. The 'lub' heart sound is primarily caused by the closure of the:
A) Semilunar Valves
B) Atrioventricular Valves
C) Pulmonary Valve Only
D) Aortic Valve Only
Answer: Atrioventricular Valves

9. The inner lining of the heart chambers is called the:
A) Epicardium
B) Myocardium
C) Pericardium
D) Endocardium
Answer: Endocardium

10. Which blood vessels have the thinnest walls to allow for material exchange?
A) Arteries
B) Arterioles
C) Capillaries
D) Veins
Answer: Capillaries

11. The QRS complex in an Electrocardiogram (ECG) represents:
A) Atrial Depolarization
B) Atrial Repolarization
C) Ventricular Depolarization
D) Ventricular Repolarization
Answer: Ventricular Depolarization

12. The hormone Epinephrine (Adrenaline) causes:
A) Vasoconstriction Only
B) Vasodilation Only
C) Both Vasoconstriction and Vasodilation
D) No Effect on Blood Vessels
Answer: Both Vasoconstriction and Vasodilation

13. The medical term for a heart attack is:
A) Angina Pectoris
B) Atherosclerosis
C) Myocardial Infarction
D) Congestive Heart Failure
Answer: Myocardial Infarction

14. The liquid part of the blood is called:
A) Serum
B) Lymph
C) Plasma
D) Interstitial Fluid
Answer: Plasma

15. Which component of blood is primarily responsible for carrying oxygen?
A) Platelets
B) Plasma
C) White Blood Cells
D) Red Blood Cells (Erythrocytes)
Answer: Red Blood Cells (Erythrocytes)

16. The lifespan of a typical human red blood cell is approximately:
A) 120 days
B) 30 days
C) 1 year
D) 7 days
Answer: 120 days

17. The process of white blood cells squeezing through capillary walls is called:
A) Hemolysis
B) Diapedesis
C) Phagocytosis
D) Agglutination
Answer: Diapedesis

18. Heparin, an anticoagulant, is produced by which type of blood cell?
A) Neutrophils
B) Lymphocytes
C) Basophils
D) Eosinophils
Answer: Basophils

19. The largest lymphatic vessel, which drains most of the body, is the:
A) Right Lymphatic Duct
B) Thoracic Duct
C) Hepatic Portal Vein
D) Subclavian Vein
Answer: Thoracic Duct

20. Lymph ultimately drains back into the venous circulation at the:
A) Jugular Veins
B) Subclavian Veins
C) Renal Veins
D) Femoral Veins
Answer: Subclavian Veins

21. The term for high blood pressure is:
A) Hypotension
B) Bradycardia
C) Hypertension
D) Tachycardia
Answer: Hypertension

22. Baroreceptors that help regulate blood pressure are located in the:
A) Heart Ventricles
B) Carotid Sinus and Aortic Arch
C) Pulmonary Veins
D) Renal Arteries
Answer: Carotid Sinus and Aortic Arch

23. The narrowing of arteries due to plaque buildup is called:
A) Aneurysm
B) Varicose Veins
C) Atherosclerosis
D) Phlebitis
Answer: Atherosclerosis

24. A stationary blood clot within a vessel is called a(n):
A) Embolus
B) Thrombus
C) Aneurysm
D) Plaque
Answer: Thrombus

25. A moving blood clot that can cause blockage elsewhere is called a(n):
A) Thrombus
B) Embolus
C) Atheroma
D) Hematoma
Answer: Embolus

26. Which procedure uses a balloon to open a blocked coronary artery?
A) Coronary Bypass
B) Angioplasty
C) Valve Replacement
D) Pacemaker Implantation
Answer: Angioplasty

27. The pre-capillary sphincters regulate blood flow into:
A) Arteries
B) Veins

C) Capillaries
D) Venules
Answer: Capillaries

28. The main function of the lymphatic system is:
A) Oxygen Transport
B) Hormone Production
C) Return of Interstitial Fluid to Blood
D) Blood Clotting
Answer: Return of Interstitial Fluid to Blood

29. Which organ filters blood, removes old RBCs, and stores iron?
A) Liver
B) Pancreas
C) Spleen
D) Kidney
Answer: Spleen

30. The P-wave in an ECG corresponds to:
A) Ventricular Depolarization
B) Ventricular Repolarization
C) Atrial Depolarization
D) Atrial Repolarization
Answer: Atrial Depolarization

31. The volume of blood pumped by each ventricle per minute is called:
A) Stroke Volume
B) Heart Rate
C) Cardiac Output
D) Blood Pressure
Answer: Cardiac Output

32. The chordae tendineae are attached to the:
A) Semilunar Valves
B) Walls of the Atria
C) Cusps of the Atrioventricular Valves
D) Interventricular Septum
Answer: Cusps of the Atrioventricular Valves

33. The coronary arteries supply blood to the:
A) Lungs
B) Liver
C) Heart Muscle
D) Brain
Answer: Heart Muscle

34. The hepatic portal vein carries blood from the digestive organs to the:
A) Heart
B) Lungs
C) Liver
D) Kidneys
Answer: Liver

35. The normal pH range of human blood is approximately:
A) 6.8 - 7.0
B) 7.0 - 7.2
C) 7.35 - 7.45
D) 7.8 - 8.0
Answer: 7.35 - 7.45

36. Which plasma protein is most important for maintaining osmotic pressure?
A) Fibrinogen
B) Globulin
C) Albumin
D) Prothrombin
Answer: Albumin

37. The formation of blood cells is called:
A) Hemostasis
B) Hemopoiesis (Hematopoiesis)
C) Hemolysis
D) Agglutination
Answer: Hemopoiesis (Hematopoiesis)

38. The clumping of red blood cells due to an antibody reaction is called:
A) Coagulation
B) Embolism
C) Agglutination
D) Sedimentation
Answer: Agglutination

39. The fluid that leaks out of capillaries into tissue spaces is called:
A) Plasma
B) Serum
C) Lymph
D) Interstitial Fluid
Answer: Interstitial Fluid

40. Which blood type is considered the universal donor?
A) A
B) B
C) AB
D) O
Answer: O

41. The amount of blood in an average adult human is approximately:
A) 2-3 liters
B) 4-6 liters

Homeostasis

1. Which term describes the maintenance of a stable internal environment despite external changes?
A) Metabolism
B) Homeostasis
C) Adaptation
D) Acclimatization
Answer: Homeostasis

2. Who first proposed the concept of the constancy of the internal environment?
A) Walter Cannon
B) Claude Bernard
C) Louis Pasteur
D) Anton van Leeuwenhoek
Answer: Claude Bernard

3. The primary nitrogenous waste excreted by most aquatic animals is:
A) Urea
B) Uric acid
C) Ammonia
D) Creatinine
Answer: Ammonia

4. Which structure in flatworms functions in osmoregulation and excretion?
A) Metanephridia
B) Malpighian tubules
C) Protonephridia
D) Nephridiopores
Answer: Protonephridia

5. Birds primarily excrete nitrogenous waste in the form of:
A) Ammonia
B) Urea
C) Uric acid
D) Allantoin
Answer: Uric acid

6. Freshwater fish are _____ to their environment and tend to _____ water.
A) hypertonic, gain
B) hypotonic, lose
C) isotonic, neither gain nor lose
D) hypertonic, lose
Answer: hypertonic, gain

7. Marine bony fishes compensate for water loss by:
A) Producing large volumes of dilute urine
B) Drinking seawater and excreting excess salts through gills
C) Retaining urea in their blood
D) Absorbing water through skin
Answer: Drinking seawater and excreting excess salts through gills

8. The functional unit of the vertebrate kidney is the:
A) Glomerulus
B) Bowman's capsule
C) Nephron
D) Collecting duct
Answer: Nephron

9. Which hormone increases water reabsorption in the collecting ducts?
A) Aldosterone
B) Renin
C) Antidiuretic hormone (ADH)
D) Atrial natriuretic peptide
Answer: Antidiuretic hormone (ADH)

10. The process forcing fluid from glomerular capillaries into Bowman's capsule is:
A) Tubular secretion
B) Tubular reabsorption
C) Glomerular filtration
D) Countercurrent multiplication
Answer: Glomerular filtration

11. Animals that maintain constant internal osmolarity regardless of environment are:
A) Osmoconformers
B) Osmoregulators
C) Stenohaline
D) Euryhaline
Answer: Osmoregulators

12. Uric acid excretion as a paste is especially advantageous for:
A) Aquatic animals
B) Terrestrial animals conserving water
C) Animals producing large urine volumes
D) Animals with high protein diets
Answer: Terrestrial animals conserving water

13. Malpighian tubules are excretory structures found in:
A) Earthworms

B) Insects
C) Flatworms
D) Crustaceans
Answer: Insects

14. Sharks maintain osmotic balance with seawater by retaining high levels of:
A) Ammonia
B) Uric acid
C) Urea
D) Sodium chloride
Answer: Urea

15. The filtration membrane in the glomerulus includes pores and slits of:
A) Mesangial cells
B) Podocytes
C) Juxtaglomerular cells
D) Macula densa cells
Answer: Podocytes

16. The maximum rate a substance can be reabsorbed from filtrate is its:
A) Filtration fraction
B) Renal threshold
C) Tubular transport maximum (Tm)
D) Clearance rate
Answer: Tubular transport maximum (Tm)

17. Secretion of H+ into the renal tubule is crucial for regulating:
A) Blood glucose
B) Blood pH
C) Blood pressure
D) Plasma osmolarity
Answer: Blood pH

18. Aldosterone promotes sodium reabsorption in which nephron segment?
A) Proximal tubule
B) Loop of Henle
C) Distal tubule
D) Collecting duct
Answer: Distal tubule

19. Renin is secreted by the juxtaglomerular apparatus in response to:
A) High blood pressure
B) Low blood pressure
C) High blood sodium
D) Low blood potassium
Answer: Low blood pressure

20. Atrial natriuretic peptide (ANP) acts to:
A) Increase sodium reabsorption
B) Decrease sodium reabsorption
C) Increase water reabsorption
D) Stimulate aldosterone secretion
Answer: Decrease sodium reabsorption

21. The nitrogenous waste requiring most energy to produce but conserving most water is:
A) Ammonia
B) Urea
C) Uric acid
D) Allantoin
Answer: Uric acid

22. Most glomerular filtrate reabsorption occurs in the:
A) Loop of Henle
B) Distal convoluted tubule
C) Proximal convoluted tubule
D) Collecting duct
Answer: Proximal convoluted tubule

23. The descending limb of the loop of Henle is permeable to _____, while the ascending limb is permeable to _____.
A) salt, water
B) water, salt
C) urea, water
D) glucose, salt
Answer: water, salt

24. Diabetes insipidus results from insufficient secretion or action of:
A) Insulin
B) Aldosterone
C) Antidiuretic hormone
D) Renin
Answer: Antidiuretic hormone

25. The fluid between cells that bathes all body tissues is:
A) Plasma
B) Lymph
C) Interstitial fluid
D) Hemolymph
Answer: Interstitial fluid

26. Which is NOT a function of the vertebrate kidney?
A) Regulation of blood pH
B) Production of red blood cells
C) Excretion of nitrogenous wastes

D) Regulation of blood volume
Answer: Production of red blood cells
27. Movement of substances from peritubular capillaries into the tubule is termed:
A) Filtration
B) Reabsorption
C) Secretion
D) Excretion
Answer: Secretion
28. Concentrated urine production relies heavily on:
A) Cortical nephrons
B) Juxtamedullary nephrons with long loops
C) Glomerular filtration rate
D) Afferent arteriole diameter
Answer: Juxtamedullary nephrons with long loops
29. Urine is carried from kidney to bladder by the:
A) Urethra
B) Ureter
C) Collecting duct
D) Renal pelvis
Answer: Ureter
30. The primary organ for osmoregulation and excretion in terrestrial vertebrates is the:
A) Liver
B) Skin
C) Lung
D) Kidney
Answer: Kidney
31. Removing amino groups from amino acids to produce ammonia is called:
A) Transamination
B) Deamination
C) Amination
D) Ureogenesis
Answer: Deamination
32. Which animal is an osmoconformer?
A) Freshwater fish
B) Human
C) Marine sponge
D) Desert kangaroo rat
Answer: Marine sponge
33. The primary driving force for glomerular filtration is:
A) Osmotic pressure of plasma proteins
B) High hydrostatic pressure in glomerular capillaries
C) Active transport by podocytes
D) Low pressure in Bowman's capsule
Answer: High hydrostatic pressure in glomerular capillaries
34. Glucose normally appears in filtrate but not in urine because it is:
A) Secreted into the tubule
B) Completely reabsorbed in the proximal tubule
C) Metabolized by tubule cells
D) Filtered only in small amounts
Answer: Completely reabsorbed in the proximal tubule
35. The inner region of the kidney containing loops of Henle is the:
A) Renal cortex
B) Renal medulla
C) Renal pelvis
D) Renal capsule
Answer: Renal medulla
36. Which substance is NOT typically found in significant amounts in normal urine?
A) Urea
B) Sodium ions
C) Glucose
D) Potassium ions
Answer: Glucose
37. The liver converts ammonia to urea via the:
A) Krebs cycle
B) Ornithine cycle
C) Uric acid cycle
D) Cori cycle
Answer: Ornithine cycle
38. Angiotensin II causes:
A) Vasodilation and decreased BP
B) Vasoconstriction and increased BP
C) Decreased aldosterone secretion
D) Inhibition of thirst
Answer: Vasoconstriction and increased BP
39. The excretory system of earthworms consists of:
A) Protonephridia
B) Metanephridia
C) Malpighian tubules
D) Flame cells
Answer: Metanephridia
40. Which hormone is produced by the heart in response to high blood volume?
A) Aldosterone

Support Protection & Movement

1. Which of the following is the primary function of the integumentary system?
A) Nutrient absorption
B) Gas exchange
C) Protection from mechanical injury and microbial invasion
D) Hormone production
Answer: Protection from mechanical injury and microbial invasion

2. The integument of many invertebrates consists of a single layer of epithelial cells called the:
A) Dermis
B) Hypodermis
C) Epidermis
D) Cuticle
Answer: Epidermis

3. In arthropods, the non-living outer covering secreted by the epidermis is called the:
A) Shell
B) Mantle
C) Cuticle
D) Scale
Answer: Cuticle

4. The process by which arthropods shed their old exoskeleton to accommodate growth is called:
A) Keratinization
B) Sclerotization
C) Ecdysis
D) Ossification
Answer: Ecdysis

5. The vertebrate integument is typically composed of two main layers: the epidermis and the:
A) Hypodermis
B) Subcutaneous layer
C) Dermis
D) Basement membrane
Answer: Dermis

6. Which group of fishes possesses tooth-like dermal scales known as denticles?
A) Bony fishes
B) Hagfishes
C) Lampreys
D) Cartilaginous fishes
Answer: Cartilaginous fishes

7. The scales of bony fishes are primarily derived from which layer?
A) Epidermis
B) Dermis
C) Hypodermis
D) Subcutaneous layer
Answer: Dermis

8. Amphibian skin is characterized by being thin and moist, and it contains glands that secrete mucus and noxious fluids. These glands are:
A) Dermal in origin
B) Epidermal in origin
C) Hypodermal in origin
D) Subcutaneous in origin
Answer: Epidermal in origin

9. The tough, impermeable protein that helps protect tetrapod skin from desiccation is:
A) Collagen
B) Chitin
C) Keratin
D) Resilin
Answer: Keratin

10. Reptilian scales, claws, and beaks are primarily composed of:
A) Dermal bone
B) Keratin
C) Dentine
D) Cartilage
Answer: Keratin

11. Feathers in birds are derived from which epidermal layer?
A) Stratum germinativum
B) Stratum corneum
C) Stratum granulosum
D) Basement membrane
Answer: Stratum corneum

12. A diagnostic derived character of mammals first seen in Mesozoic fossils is:
A) Scales
B) Feathers
C) Hair
D) Glands
Answer: Hair

13. Which of the following is NOT an epidermal derivative in mammals?

A) Hair
B) Sebaceous glands
C) Mammary glands
D) Dermal bone
Answer: Dermal bone

14. The muscle responsible for causing hair to stand erect is the:
A) Flexor muscle
B) Arrector pili muscle
C) Adductor muscle
D) Extensor muscle
Answer: Arrector pili muscle

15. Melanin, the primary pigment in mammalian skin and hair, is produced by cells called:
A) Chromatophores
B) Chondrocytes
C) Osteocytes
D) Melanocytes
Answer: Melanocytes

16. Which type of skeleton uses an incompressible fluid enclosed within a muscular wall for support and movement?
A) Exoskeleton
B) Endoskeleton
C) Hydrostatic skeleton
D) Axial skeleton
Answer: Hydrostatic skeleton

17. An earthworm moves using its hydrostatic skeleton, which relies on fluid pressure in the:
A) Gastrovascular cavity
B) Coelom
C) Hemocoel
D) Pseudocoelom
Answer: Coelom

18. The exoskeleton of arthropods is hardened by calcification in crustaceans and by a process called _____ in insects.
A) Keratinization
B) Ossification
C) Sclerotization
D) Mineralization
Answer: Sclerotization

19. The highly elastic protein found in insect cuticle that stores energy for jumping and flight is:
A) Keratin
B) Collagen
C) Resilin
D) Actin
Answer: Resilin

20. The supportive calcareous ossicles found in echinoderms are an example of an:
A) Exoskeleton
B) Hydrostatic skeleton
C) Endoskeleton
D) Axial skeleton
Answer: Endoskeleton

21. The two major divisions of the vertebrate endoskeleton are the axial skeleton and the:
A) Visceral skeleton
B) Cranial skeleton
C) Appendicular skeleton
D) Pectoral skeleton
Answer: Appendicular skeleton

22. Which of the following is a primary skeletal tissue in chondrichthyan fishes?
A) Bone
B) Cartilage
C) Dentine
D) Keratin
Answer: Cartilage

23. The bone that forms by replacing a cartilaginous model during development is called:
A) Dermal bone
B) Intramembranous bone
C) Endochondral bone
D) Compact bone
Answer: Endochondral bone

24. The basic histological unit of compact bone, consisting of concentric rings around a central canal, is the:
A) Lacuna
B) Osteocyte
C) Osteon
D) Trabecula
Answer: Osteon

25. Cells that build bone matrix are called:
A) Osteocytes
B) Osteoclasts
C) Osteoblasts
D) Chondrocytes
Answer: Osteoblasts

26. Cells responsible for bone resorption are called:

A) Osteocytes
B) Osteoclasts
C) Osteoblasts
D) Chondrocytes
Answer: Osteoclasts

27. The first vertebra that allows increased head mobility in tetrapods is the:
A) Atlas
B) Axis
C) Sacrum
D) Coccyx
Answer: Atlas

28. The type of movement exhibited by amoebas and some animal cells like macrophages is called:
A) Ciliary movement
B) Flagellar movement
C) Ameboid movement
D) Muscular movement
Answer: Ameboid movement

29. Eukaryotic cilia and flagella have an internal structure characterized by a:
A) 9+0 arrangement of microtubules
B) 9+2 arrangement of microtubules
C) 9+1 arrangement of microtubules
D) 12+2 arrangement of microtubules
Answer: 9+2 arrangement of microtubules

30. The motor protein responsible for generating the sliding force between microtubules in cilia and flagella is:
A) Myosin
B) Kinesin
C) Dynein
D) Actin
Answer: Dynein

31. Which of the following is NOT a type of vertebrate muscle tissue?
A) Skeletal
B) Cardiac
C) Smooth
D) Elastic
Answer: Elastic

32. Striated muscle is so named because of its:
A) Spindle-shaped cells
B) Single nucleus per cell
C) Alternating dark and light bands
D) Involuntary control
Answer: Alternating dark and light bands

33. The functional unit of contraction in a skeletal muscle myofibril is the:
A) Sarcolemma
B) Sarcoplasmic reticulum
C) Sarcomere
D) Myofiber
Answer: Sarcomere

34. Within a sarcomere, the thin filaments are primarily composed of the protein:
A) Myosin
B) Troponin
C) Tropomyosin
D) Actin
Answer: Actin

35. The thick filaments within a sarcomere are primarily composed of the protein:
A) Myosin
B) Troponin
C) Tropomyosin
D) Actin
Answer: Myosin

36. The region of a sarcomere where only actin filaments are present is the:
A) A band
B) I band
C) H zone
D) M line
Answer: I band

37. The regulatory protein that blocks the myosin-binding sites on actin in a relaxed muscle is:
A) Troponin
B) Tropomyosin
C) Titin
D) Nebulin
Answer: Tropomyosin

38. The release of which ion from the sarcoplasmic reticulum initiates muscle contraction?
A) Sodium (Na+)
B) Potassium (K+)
C) Calcium (Ca2+)
D) Chloride (Cl-)
Answer: Calcium (Ca2+)

39. At the neuromuscular junction, the neurotransmitter released by the motor neuron is:
A) Norepinephrine
B) Dopamine
C) Acetylcholine

Nervous & Sensory System

1. Which division of the peripheral nervous system is under conscious control?
A) Sympathetic nervous system
B) Parasympathetic nervous system
C) Somatic nervous system
D) Autonomic nervous system
Answer: Somatic nervous system

2. The resting membrane potential of a typical neuron is approximately:
A) +70 mV
B) -70 mV
C) 0 mV
D) -90 mV
Answer: -70 mV

3. What is the primary ion responsible for the depolarization phase of an action potential?
A) Potassium (K+)
B) Chloride (Cl-)
C) Sodium (Na+)
D) Calcium (Ca2+)
Answer: Sodium (Na+)

4. The gap between two neurons where neurotransmitters are released is called the:
A) Node of Ranvier
B) Synaptic cleft
C) Axon hillock
D) Myelin sheath
Answer: Synaptic cleft

5. Which glial cells produce myelin in the central nervous system?
A) Schwann cells
B) Astrocytes
C) Oligodendrocytes
D) Microglia
Answer: Oligodendrocytes

6. The part of the brain responsible for coordination and balance is the:
A) Cerebrum
B) Cerebellum
C) Medulla oblongata
D) Thalamus
Answer: Cerebellum

7. Which neurotransmitter is primarily involved in muscle contraction at neuromuscular junctions?
A) Dopamine
B) Serotonin
C) Acetylcholine
D) GABA
Answer: Acetylcholine

8. The sympathetic nervous system is most active during which response?
A) Rest and digest
B) Fight or flight
C) Sleep and arousal
D) Nutrient absorption
Answer: Fight or flight

9. Saltatory conduction occurs in:
A) Unmyelinated axons
B) Myelinated axons
C) Dendrites
D) Cell bodies
Answer: Myelinated axons

10. Which part of the brain is considered the major integrating center for sensory information?
A) Hypothalamus
B) Cerebellum
C) Thalamus
D) Hippocampus
Answer: Thalamus

11. An inhibitory postsynaptic potential (IPSP) is usually caused by the opening of channels for which ion?
A) Sodium
B) Potassium
C) Calcium
D) Chloride
Answer: Chloride

12. Broca's area is primarily involved in:
A) Language comprehension
B) Speech production
C) Visual processing
D) Emotional responses
Answer: Speech production

13. The refractory period of an action potential is primarily due to:
A) Inactivation of sodium channels
B) Opening of potassium channels
C) Hyperpolarization

D) Calcium influx
Answer: Inactivation of sodium channels
14. Which brain structure is crucial for the formation of new long-term memories?
A) Amygdala
B) Hypothalamus
C) Hippocampus
D) Basal ganglia
Answer: Hippocampus
15. Parkinson's disease is primarily associated with a deficiency of which neurotransmitter?
A) Serotonin
B) Acetylcholine
C) Dopamine
D) Norepinephrine
Answer: Dopamine
16. What type of potential is described as a local, graded change in membrane potential?
A) Action potential
B) Resting potential
C) Threshold potential
D) Generator potential
Answer: Generator potential
17. The blood-brain barrier is formed primarily by the foot processes of which cells?
A) Oligodendrocytes
B) Astrocytes
C) Microglia
D) Schwann cells
Answer: Astrocytes
18. Which cranial nerve is responsible for transmitting visual information?
A) Olfactory (I)
B) Optic (II)
C) Vagus (X)
D) Trigeminal (V)
Answer: Optic (II)
19. The equilibrium potential for potassium (EK) is approximately:
A) +62 mV
B) -90 mV
C) -70 mV
D) 0 mV
Answer: -90 mV
20. Multiple sclerosis is an autoimmune disease that affects which component of neurons?
A) Cell bodies
B) Dendrites
C) Myelin sheaths
D) Synaptic vesicles
Answer: Myelin sheaths
21. The "all-or-none" principle is characteristic of which neuronal event?
A) Resting potential
B) Graded potential
C) Action potential
D) Synaptic potential
Answer: Action potential
22. Which part of a neuron receives incoming signals from other neurons?
A) Axon
B) Axon hillock
C) Dendrites
D) Synaptic terminal
Answer: Dendrites
23. Long-term potentiation (LTP) is most closely associated with learning and memory and involves which neurotransmitter?
A) GABA
B) Glutamate
C) Glycine
D) Acetylcholine
Answer: Glutamate
24. The somatic nervous system innervates which type of tissue?
A) Cardiac muscle
B) Smooth muscle
C) Skeletal muscle
D) Glands
Answer: Skeletal muscle
25. Wernicke's area is primarily involved in:
A) Motor coordination
B) Language comprehension
C) Emotional regulation
D) Visual association
Answer: Language comprehension
26. What is the primary role of the sodium-potassium pump in neurons?
A) Generate action potentials
B) Maintain resting membrane potential
C) Release neurotransmitters
D) Propagate nerve impulses
Answer: Maintain resting membrane potential

27. Which brain wave pattern is characteristic of deep, dreamless sleep?
A) Alpha waves
B) Beta waves
C) Theta waves
D) Delta waves
Answer: Delta waves

28. The minimal stimulus strength required to generate an action potential is called the:
A) Resting potential
B) Threshold potential
C) Equilibrium potential
D) Reversal potential
Answer: Threshold potential

29. Which part of the brainstem controls vital functions like breathing and heart rate?
A) Pons
B) Midbrain
C) Medulla oblongata
D) Reticular formation
Answer: Medulla oblongata

30. Drugs classified as SSRIs primarily affect the levels of which neurotransmitter?
A) Dopamine
B) Norepinephrine
C) Serotonin
D) Acetylcholine
Answer: Serotonin

31. Which type of synapse provides the fastest possible signal transmission?
A) Chemical synapse
B) Electrical synapse
C) Neuromuscular junction
D) Axoaxonic synapse
Answer: Electrical synapse

32. The ventral root of a spinal nerve contains axons of which type of neuron?
A) Sensory neurons
B) Interneurons
C) Motor neurons
D) Autonomic neurons
Answer: Motor neurons

33. Alzheimer's disease is characterized by the accumulation of which protein?
A) Alpha-synuclein
B) Huntingtin
C) Beta-amyloid
D) Prion protein
Answer: Beta-amyloid

34. The process by which a neuron adds together graded potentials from multiple synapses is called:
A) Propagation
B) Summation
C) Facilitation
D) Inhibition
Answer: Summation

35. Which division of the autonomic nervous system originates from the craniosacral regions?
A) Sympathetic
B) Parasympathetic
C) Somatic
D) Enteric
Answer: Parasympathetic

36. The absolute refractory period ensures that action potentials:
A) Travel in one direction
B) Summate temporally
C) Are graded in strength
D) Propagate slowly
Answer: Travel in one direction

37. Which sense does NOT send its sensory information through the thalamus before reaching the cortex?
A) Vision
B) Hearing
C) Smell
D) Touch
Answer: Smell

38. The primary motor cortex is located in which lobe of the cerebrum?
A) Frontal
B) Parietal
C) Temporal
D) Occipital
Answer: Frontal

39. What is the main function of the hypothalamus?
A) Motor coordination
B) Sensory integration
C) Homeostasis and endocrine control
D) Language processing
Answer: Homeostasis and endocrine control

40. Which ion's influx into the presynaptic terminal triggers neurotransmitter release?

Endocrine System

1. Which gland is referred to as the "master gland" of the endocrine system?
A) Thyroid
B) Hypothalamus
C) Adrenal
D) Pituitary
Answer: Pituitary

2. Hormones that are secreted into the bloodstream and act on distant target cells are classified as:
A) Autocrine
B) Paracrine
C) Endocrine
D) Exocrine
Answer: Endocrine

3. Which hormone is secreted by the alpha cells of the pancreatic islets?
A) Insulin
B) Somatostatin
C) Glucagon
D) Pancreatic polypeptide
Answer: Glucagon

4. A patient presents with excessive thirst and urination; which hormone deficiency is most likely?
A) Aldosterone
B) Antidiuretic hormone
C) Cortisol
D) Thyroxine
Answer: Antidiuretic hormone

5. Graves' disease is caused by antibodies that mimic the action of which hormone?
A) Thyroxine
B) Thyroid-stimulating hormone
C) Calcitonin
D) Parathyroid hormone
Answer: Thyroid-stimulating hormone

6. Which hormone is secreted in response to low blood calcium levels?
A) Calcitonin
B) Thyroxine
C) Parathyroid hormone
D) Aldosterone
Answer: Parathyroid hormone

7. Oxytocin is synthesized in the hypothalamus and stored in which gland?
A) Anterior pituitary
B) Posterior pituitary
C) Pineal gland
D) Adrenal medulla
Answer: Posterior pituitary

8. Which of the following is a steroid hormone?
A) Insulin
B) Epinephrine
C) Thyroxine
D) Cortisol
Answer: Cortisol

9. Acromegaly in adults is caused by the overproduction of which hormone?
A) Thyroxine
B) Growth hormone
C) Prolactin
D) Adrenocorticotropic hormone
Answer: Growth hormone

10. Which gland produces melatonin?
A) Pituitary
B) Thyroid
C) Pineal
D) Thymus
Answer: Pineal

11. Cushing's syndrome is associated with excessive secretion of which hormone?
A) Insulin
B) Cortisol
C) Aldosterone
D) Glucagon
Answer: Cortisol

12. The "fight-or-flight" response is primarily mediated by which hormones?
A) Insulin and glucagon
B) Estrogen and progesterone
C) Epinephrine and norepinephrine
D) Thyroxine and calcitonin
Answer: Epinephrine and norepinephrine

13. Which hormone directly lowers blood glucose levels?
A) Glucagon
B) Cortisol
C) Growth hormone

D) Insulin
Answer: Insulin

14. Hyposecretion of thyroid hormones in infants leads to which condition?
A) Myxedema
B) Graves' disease
C) Cretinism
D) Acromegaly
Answer: Cretinism

15. Which hormone stimulates milk production in the mammary glands?
A) Oxytocin
B) Prolactin
C) Estrogen
D) Progesterone
Answer: Prolactin

16. The Islets of Langerhans are found in which organ?
A) Liver
B) Pancreas
C) Kidney
D) Spleen
Answer: Pancreas

17. Which of the following is a function of aldosterone?
A) Increases blood glucose
B) Promotes sodium reabsorption
C) Stimulates uterine contractions
D) Lowers blood calcium
Answer: Promotes sodium reabsorption

18. Which hormone is released by the adrenal medulla?
A) Cortisol
B) Aldosterone
C) Epinephrine
D) Testosterone
Answer: Epinephrine

19. A goiter can result from the deficiency of which dietary element?
A) Calcium
B) Iodine
C) Iron
D) Sodium
Answer: Iodine

20. Which hormone is antagonistic to insulin?
A) Glucagon
B) Somatostatin
C) Amylin
D) Gastrin
Answer: Glucagon

21. The hormone responsible for circadian rhythm regulation is:
A) Melatonin
B) Serotonin
C) Dopamine
D) Cortisol
Answer: Melatonin

22. Which gland atrophies after puberty?
A) Thyroid
B) Thymus
C) Adrenal
D) Pituitary
Answer: Thymus

23. Addison's disease results from the underproduction of hormones by which gland?
A) Thyroid
B) Adrenal cortex
C) Pancreas
D) Parathyroid
Answer: Adrenal cortex

24. Which hormone stimulates the synthesis and secretion of thyroid hormones?
A) TRH
B) TSH
C) ACTH
D) FSH
Answer: TSH

25. Diabetes insipidus is caused by a deficiency of which hormone?
A) Insulin
B) Glucagon
C) ADH
D) Aldosterone
Answer: ADH

26. The hormone calcitonin is produced by which cells?
A) Parafollicular cells (C cells)
B) Beta cells
C) Alpha cells
D) Follicular cells
Answer: Parafollicular cells (C cells)

27. Which hormone is primarily involved in the regulation of metabolism?
A) Thyroxine

B) Parathyroid hormone
C) Calcitonin
D) Erythropoietin
Answer: Thyroxine

28. Luteinizing Hormone (LH) in males stimulates the production of:
A) Sperm
B) Testosterone
C) Seminal fluid
D) Inhibin
Answer: Testosterone

29. Which hormone is secreted by the heart to regulate blood pressure?
A) Renin
B) Atrial natriuretic peptide
C) Erythropoietin
D) Angiotensin
Answer: Atrial natriuretic peptide

30. Prolactin inhibiting factor (PIF) is now known to be which neurotransmitter?
A) Dopamine
B) Serotonin
C) Acetylcholine
D) Norepinephrine
Answer: Dopamine

31. The hormone hCG (human chorionic gonadotropin) is produced by:
A) Pituitary
B) Ovary
C) Placenta
D) Hypothalamus
Answer: Placenta

32. The hormone responsible for the development of secondary sexual characteristics in females is:
A) Progesterone
B) Estrogen
C) Prolactin
D) Oxytocin
Answer: Estrogen

33. Which pancreatic cells secrete somatostatin?
A) Alpha cells
B) Beta cells
C) Delta cells
D) F cells
Answer: Delta cells

34. The hormone that promotes calcium deposition in bones is:
A) Parathyroid hormone
B) Calcitonin
C) Calcitriol
D) Thyroxine
Answer: Calcitonin

35. Gigantism is caused by hypersecretion of Growth Hormone during:
A) Adulthood
B) Childhood
C) Old age
D) Puberty
Answer: Childhood

36. The hormone that stimulates erythropoiesis is:
A) Thrombopoietin
B) Erythropoietin
C) Renin
D) Calcitriol
Answer: Erythropoietin

37. Which hormone is responsible for the let-down reflex during breastfeeding?
A) Prolactin
B) Oxytocin
C) Estrogen
D) Progesterone
Answer: Oxytocin

38. The primary mineralocorticoid produced by the adrenal cortex is:
A) Cortisol
B) Aldosterone
C) Androstenedione
D) Corticosterone
Answer: Aldosterone

39. Hypoglycemia can be triggered by an overdose of which hormone?
A) Glucagon
B) Insulin
C) Cortisol
D) Growth hormone
Answer: Insulin

40. The hormone that inhibits gastric acid secretion is:
A) Gastrin
B) Secretin
C) Cholecystokinin
D) Ghrelin
Answer: Secretin

Immune System

1. The study of immunity and the body's defense mechanisms is called:
A) Pathology
B) Immunology
C) Microbiology
D) Hematology
Answer: Immunology

2. The first line of defense against microbes includes:
A) Skin and mucous membranes
B) Phagocytes and NK cells
C) Antibodies and T cells
D) Fever and inflammation
Answer: Skin and mucous membranes

3. The third line of defense is also known as:
A) Innate immunity
B) Specific immunity
C) Nonspecific defense
D) Physical barrier
Answer: Specific immunity

4. Which of the following is NOT part of the first line of defense?
A) Stomach acid
B) Skin keratin
C) Mucous membrane
D) Macrophages
Answer: Macrophages

5. The protein that strengthens skin cells and provides resistance to abrasion is:
A) Collagen
B) Keratin
C) Elastin
D) Melanin
Answer: Keratin

6. Sweat contains an enzyme that breaks down bacterial cell walls called:
A) Pepsin
B) Lysozyme
C) Amylase
D) Lipase
Answer: Lysozyme

7. The acidic pH of the skin is maintained by secretions from:
A) Sweat glands
B) Sebaceous glands
C) Both A and B
D) Salivary glands
Answer: Both A and B

8. In the respiratory tract, mucus and trapped particles are moved by:
A) Peristalsis
B) Ciliary action
C) Diffusion
D) Active transport
Answer: Ciliary action

9. Which cell is NOT a phagocyte?
A) Macrophage
B) Neutrophil
C) Red blood cell
D) Dendritic cell
Answer: Red blood cell

10. Natural Killer (NK) cells destroy target cells by releasing:
A) Histamine
B) Interferons
C) Perforins and granzymes
D) Antibodies
Answer: Perforins and granzymes

11. The complement system kills bacteria by:
A) Phagocytosis
B) Forming membrane attack complexes
C) Neutralizing toxins
D) Producing antibodies
Answer: Forming membrane attack complexes

12. Interferons are primarily secreted by:
A) Virus-infected cells
B) Bacteria
C) Macrophages
D) B cells
Answer: Virus-infected cells

13. The inflammatory response is characterized by all EXCEPT:
A) Heat
B) Pain
C) Cyanosis
D) Swelling
Answer: Cyanosis

14. The chemical released by mast cells during inflammation is:
A) Interleukin

B) Histamine
C) Pyrogen
D) Interferon
Answer: Histamine

15. Pus is mainly composed of:
A) Dead bacteria and neutrophils
B) Live macrophages
C) Plasma proteins
D) Red blood cells
Answer: Dead bacteria and neutrophils

16. Fever is triggered by chemicals called:
A) Cytokines
B) Pyrogens
C) Antigens
D) Antibodies
Answer: Pyrogens

17. Which of the following is a benefit of fever?
A) Increases microbial reproduction
B) Reduces phagocyte activity
C) Lowers interferon production
D) Inhibits bacterial growth
Answer: Inhibits bacterial growth

18. The cells responsible for adaptive immunity are:
A) Phagocytes
B) Lymphocytes
C) Erythrocytes
D) Thrombocytes
Answer: Lymphocytes

19. An antigen is best defined as:
A) A protein that kills pathogens
B) A foreign molecule that stimulates an immune response
C) A type of white blood cell
D) An enzyme in sweat
Answer: A foreign molecule that stimulates an immune response

20. Antibodies are produced by:
A) T cells
B) Plasma cells
C) Macrophages
D) NK cells
Answer: Plasma cells

21. Which cells mature in the thymus gland?
A) B cells
B) T cells
C) Macrophages
D) Neutrophils
Answer: T cells

22. The "B" in B cells originally referred to:
A) Blood
B) Bone marrow
C) Bursa of Fabricius
D) Brain
Answer: Bursa of Fabricius

23. Which of the following is responsible for cell-mediated immunity?
A) B cells
B) T cells
C) NK cells
D) Macrophages
Answer: T cells

24. Helper T cells are also known as:
A) CD4+ cells
B) CD8+ cells
C) Plasma cells
D) Memory cells
Answer: CD4+ cells

25. Cytotoxic T cells directly kill:
A) Free viruses
B) Bacteria
C) Virus-infected and cancer cells
D) Toxins
Answer: Virus-infected and cancer cells

26. Which T cell type helps shut down the immune response?
A) Helper T cells
B) Cytotoxic T cells
C) Suppressor T cells
D) Memory T cells
Answer: Suppressor T cells

27. Memory cells provide:
A) Immediate immunity
B) Long-term immunity
C) Passive immunity
D) Non-specific immunity
Answer: Long-term immunity

28. The humoral immune response involves:
A) T cells
B) B cells and antibodies
C) Phagocytes only
D) NK cells
Answer: B cells and antibodies

Reproduction & Development

1. Each testis consists of a complex duct system called the:
A) Ejaculatory duct
B) Seminiferous tubules
C) Epididymis
D) Sperm duct
Answer: Seminiferous tubules

2. Spermatogonia increase in size and differentiate into:
A) Secondary spermatocyte
B) Spermatids
C) Spermatozoa
D) Primary spermatocyte
Answer: Primary spermatocyte

3. In pregnant infected women, a virus transmitted to the infant during birth can damage eyes and CNS. This is:
A) Gonorrhea
B) Syphilis
C) Genital Herpes
D) AIDS
Answer: Genital Herpes

4. Mature sperm are formed from spermatids by the process of:
A) Meiosis I
B) Meiosis II
C) Mitosis
D) Spermiogenesis (Differentiation)
Answer: Spermiogenesis (Differentiation)

5. During human meiosis and fertilization, which of the following cells is diploid?
A) Primary spermatocyte, primary oocyte, zygote
B) Oogonia, spermatids, egg
C) Secondary oocyte, secondary spermatocyte, second polar body
D) Secondary polar body, embryo, spermatogonia
Answer: Primary spermatocyte, primary oocyte, zygote

6. How many blood vessels are present in the umbilical cord of the placenta?
A) Two, one artery & one vein
B) Three, two arteries & one vein
C) Three, one artery & two veins
D) Four, two arteries & two veins
Answer: Three, two arteries & one vein

7. In humans, which meiotic phase has the longest duration?
A) Anaphase I in females
B) Prophase I in females
C) Prophase II in males
D) Metaphase II in females
Answer: Prophase I in females

8. Which one of the following is part of the male reproductive system only?
A) Urethra
B) Bulbourethral gland
C) Gonads
D) Urinary bladder
Answer: Bulbourethral gland

9. Between the seminiferous tubules are cells which secrete testosterone. These are:
A) Sertoli cells
B) Germ cells
C) Interstitial (Leydig) cells
D) Epithelial cells
Answer: Interstitial (Leydig) cells

10. What is the correct trajectory of sperm during ejaculation?
A) Ejaculatory duct → Epididymis → Vas deferens → Urethra
B) Epididymis → Ejaculatory duct → Vas deferens → Urethra
C) Epididymis → Vas deferens → Ejaculatory duct → Urethra
D) Vas deferens → Ejaculatory duct → Urethra → Epididymis
Answer: Epididymis → Vas deferens → Ejaculatory duct → Urethra

11. Germ cells in the ovary produce:
A) One oogonium
B) Many oogonia
C) Infinite oogonia
D) Few oogonia
Answer: Many oogonia

12. Oogonia divide mitotically to form:
A) Secondary oocyte
B) Primary oocyte
C) Ovum
D) Eggs
Answer: Primary oocyte

13. These are enclosed in a group of follicle cells:
A) Oogonia
B) Primary oocyte
C) Secondary oocyte
D) Ova
Answer: Primary oocyte
14. After ovulation, the ovum is transferred to the:
A) Uterus
B) Cervix
C) Sperm duct
D) Oviduct (Fallopian tube)
Answer: Oviduct (Fallopian tube)
15. Both the ovarian cycle and uterine cycle are regulated by pituitary hormones called:
A) Somatotrophins
B) Thyrotrophins
C) Gonadotrophins
D) Corticotrophins
Answer: Gonadotrophins
16. Spermiogenesis specifically refers to:
A) A process happening in the sperm duct
B) The shedding of unnecessary cytoplasm from spermatids
C) The process of meiosis in males
D) Selection of spermatogonia
Answer: The shedding of unnecessary cytoplasm from spermatids
17. The uterine tube (oviduct) opens into the:
A) Uterus
B) Cervix
C) Vagina
D) Ovary
Answer: Uterus
18. Fertilization of the ovum typically takes place in the:
A) Proximal part (ampulla) of the oviduct
B) Proximal part of the ovary
C) Distal part of the oviduct
D) Distal part of the ovary
Answer: Proximal part (ampulla) of the oviduct
19. It enters the uterus where it is implanted:
A) Zygote
B) Fertilizing ovum
C) Unfertilized ovum
D) Fertilized ovum (Blastocyst)
Answer: Fertilized ovum (Blastocyst)
20. Which hormonal change is directly linked with menstruation (onset of the menstrual period)?
A) Increase secretion of progesterone by Corpus luteum
B) Decrease in levels of progesterone and estrogen
C) Increased level of follicle stimulating hormone and LH
D) Increased secretion of estrogen
Answer: Decrease in levels of progesterone and estrogen
21. The urethra and vagina have what kind of openings to the exterior?
A) Independent
B) Common
C) Homologous
D) Multiple
Answer: Independent
22. How many chromatids and chromosomes are present in a human secondary spermatocyte?
A) 46 chromatids, 46 chromosomes
B) 23 chromatids, 23 chromosomes
C) 92 chromatids, 46 chromosomes
D) 46 chromatids, 23 chromosomes
Answer: 46 chromatids, 23 chromosomes
23. The events that involve both the ovarian cycle and uterine cycle are collectively called the:
A) Life cycle
B) Menstrual cycle
C) Estrous cycle
D) Uterine cycle
Answer: Menstrual cycle
24. This hormone stimulates the development of several primary follicles in the ovary:
A) LH
B) FSH
C) ICSH
D) GH
Answer: FSH
25. This hormone stimulates the endometrium and promotes its vascularization:
A) LH
B) FSH
C) Estrogen
D) Progesterone
Answer: Estrogen
26. This hormone inhibits FSH secretion but stimulates LH secretion:

A) Progesterone
B) Luteotropic Hormone (LTH)
C) Estrogen
D) Prolactin
Answer: Estrogen

27. Which hormone is most consistently and positively correlated with the thickening and secretory development of the endometrium?
A) FSH
B) LH
C) Estrogen
D) Progesterone
Answer: Progesterone

28. Which structures are responsible for maintaining levels of progesterone earlier and later in pregnancy?
A) Placenta earlier and ovaries later
B) Placenta earlier and umbilical cord later
C) Corpus luteum earlier and Placenta later
D) Uterus earlier and ovaries later
Answer: Corpus luteum earlier and Placenta later

29. If fertilization does not occur, this structure starts degenerating:
A) Corpus luteum
B) Follicle
C) Ovary
D) Uterus
Answer: Corpus luteum

30. Ovulation coincides with the period of:
A) Menstruation
B) Conception
C) Thickening of uterine walls (proliferative phase end)
D) Fertilization
Answer: Thickening of uterine walls (proliferative phase end)

31. In a human female, the periodic reproductive (menstrual) cycle is completed in approximately:
A) 30 days
B) 27 days
C) 28 days
D) 29 days
Answer: 28 days

32. A direct result of an enzymatic deficiency in the sperm's acrosome would be:
A) The egg would not complete metaphase II
B) The primary spermatocyte would not become secondary spermatocyte
C) Implantation may occur in the uterine tube
D) The sperm would be unable to penetrate the zona pellucida
Answer: The sperm would be unable to penetrate the zona pellucida

33. This sexually transmitted infection can harm the eyes of infants during birth:
A) Gonorrhea
B) Syphilis
C) Genital herpes
D) Gonorrhea and genital herpes
Answer: Gonorrhea and genital herpes

34. It is caused by the spirochete Treponema pallidum:
A) Syphilis
B) AIDS
C) Genital Herpes
D) Gonorrhea
Answer: Syphilis

35. Which one of the following is caused by a retrovirus?
A) AIDS
B) Gonorrhea
C) Syphilis
D) Genital herpes
Answer: AIDS

36. During pregnancy, hormones maintain the uterine lining. What event would likely lead to miscarriage?
A) Increasing level of estrogen
B) Stimulation of progesterone secretory tissues
C) Decreasing levels of Oxytocin
D) Early degeneration of the Corpus luteum
Answer: Early degeneration of the Corpus luteum

37. Maximum thickening of the uterine wall occurs during which phase?
A) Menstruation phase
B) Proliferative phase
C) Secretory (Luteal) phase
D) Ovulation phase
Answer: Secretory (Luteal) phase

38. The outermost cellular layer surrounding a newly ovulated ovum is the:
A) Zona pellucida
B) Corona radiata
C) Chorioallantois

Behaviour

1. Ethology is best defined as the scientific study of:
A) Human psychology in laborat ory settings.
B) Animal behavior, particularly under natural conditions.
C) The genetic basis of all behaviors.
D) Learned behaviors only.
Answer: Animal behavior, particularly under natural conditions.

2. The 1973 Nobel Prize in Physiology or Medicine was awarded to ethologists for pioneering work in animal behavior; who among the following was NOT a recipient?
A) Karl von Frisch
B) Konrad Lorenz
C) Niko Tinbergen
D) E.O. Wilson
Answer: E.O. Wilson

3. Questions about the immediate mechanistic causes of a behavior, such as hormonal triggers, address its:
A) Ultimate causation.
B) Phylogenetic history.
C) Proximate causation.
D) Adaptive significance.
Answer: Proximate causation.

4. The egg-retrieval behavior of a greylag goose, once initiated, continues to completion even if the egg is removed. This is an example of a:
A) Conditioned reflex.
B) Fixed action pattern.
C) Habituated response.
D) Cognitive map.
Answer: Fixed action pattern.

5. In classical ethology, a simple environmental stimulus that triggers a fixed action pattern is called a:
A) Conditioned stimulus.
B) Reinforcer.
C) Sign stimulus or releaser.
D) Cognitive signal.
Answer: Sign stimulus or releaser.

6. A male stickleback fish aggressively attacks any model with a red underside, even if it doesn't resemble a fish. This demonstrates the role of a:
A) Pheromone.
B) Sign stimulus.
C) Imprinting cue.
D) Dominance display.
Answer: Sign stimulus.

7. Behavioral ecology primarily focuses on the study of:
A) Neural circuits controlling behavior.
B) The adaptive value and evolutionary history of behavior.
C) Learning in controlled laboratory settings.
D) Genetic sequences coding for behavioral traits.
Answer: The adaptive value and evolutionary history of behavior.

8. A suite of correlated behaviors that show consistency across different situations in individuals is termed a:
A) Fixed action pattern.
B) Behavioral syndrome.
C) Cognitive bias.
D) Ritualized display.
Answer: Behavioral syndrome.

9. The rover and sitter foraging types in Drosophila melanogaster larvae are an example of behavioral variation caused by:
A) Environmental conditioning only.
B) Alternative alleles at a single gene locus.
C) Imprinting during a critical period.
D) Random mutation with no heritability.
Answer: Alternative alleles at a single gene locus.

10. Hygienic behavior in honeybees, involving uncapping cells and removing diseased larvae, is controlled by:
A) One dominant gene.
B) Two independently assorting recessive genes.
C) Queen pheromones only.
D) Environmental temperature.
Answer: Two independently assorting recessive genes.

11. When hybrid lovebirds show intermediate and poorly executed nest-building techniques compared to their parents, it suggests the behavior has a:
A) Strong learned component.
B) Simple Mendelian genetic basis.

C) Polygenic and partially genetic basis.
D) Solely environmental cause.
Answer: Polygenic and partially genetic basis.

12. A decrease in the gill-withdrawal reflex of Aplysia after repeated harmless touch of its siphon is an example of:
A) Sensitization.
B) Classical conditioning.
C) Habituation.
D) Imprinting.
Answer: Habituation.

13. If a noxious stimulus to the head of Aplysia causes an enhanced gill-withdrawal response to a subsequent siphon touch, this demonstrates:
A) Operant conditioning.
B) Sensitization.
C) Latent learning.
D) Insight learning.
Answer: Sensitization.

14. The formation of a persistent social attachment during a limited critical period early in life is known as:
A) Conditioning.
B) Imprinting.
C) Habituation.
D) Insight learning.
Answer: Imprinting.

15. In white-crowned sparrows, normal song development requires:
A) Only a genetic template.
B) Exposure to the species-specific song during a critical period.
C) Learning from any bird species' song.
D) Visual imprinting on the father.
Answer: Exposure to the species-specific song during a critical period.

16. A major advantage of social living for animals is:
A) Increased competition for all resources.
B) Reduced individual predation risk through group vigilance.
C) Guaranteed reproductive success for all members.
D) Elimination of the need for communication.
Answer: Reduced individual predation risk through group vigilance.

17. Ritualized aggressive encounters that establish dominance without serious injury are favored by selection because they:
A) Prolong conflict and waste energy.
B) Reduce the costs of fighting for both winner and loser.
C) Ensure only the strongest genes are passed on by killing the weak.
D) Are more unpredictable and challenging.
Answer: Reduce the costs of fighting for both winner and loser.

18. A stable, linear hierarchy within a social group that reduces constant fighting over resources is called a:
A) Territorial system.
B) Dominance hierarchy or peck order.
C) Lek.
D) Cooperative alliance.
Answer: Dominance hierarchy or peck order.

19. An area that is actively defended against intruders of the same species to secure exclusive access to resources is a:
A) Home range.
B) Territory.
C) Lek.
D) Colony.
Answer: Territory.

20. The total area an individual uses in its daily activities, which may overlap with others', is its:
A) Territory.
B) Home range.
C) Dominance zone.
D) Foraging circuit.
Answer: Home range.

21. A mating system where one male pairs with one female each breeding season is:
A) Polygyny.
B) Polyandry.
C) Monogamy.
D) Promiscuity.
Answer: Monogamy.

22. When one male mates with multiple females in a breeding season, the system is termed:
A) Polyandry.
B) Monogamy.
C) Polygyny.
D) Polygynandry.
Answer: Polygyny.

Biological Membranes

1. Which component of the plasma membrane is primarily responsible for its selective permeability barrier?
A) Cholesterol
B) Integral proteins
C) Phospholipid bilayer
D) Carbohydrate chains
Answer: Phospholipid bilayer

2. According to the fluid mosaic model, membrane proteins are:
A) Stationary within the bilayer
B) Embedded and able to move laterally
C) Only present on the cytoplasmic side
D) Covalently bound to phospholipids
Answer: Embedded and able to move laterally

3. What property of phospholipid tails increases membrane fluidity at lower temperatures?
A) Saturation
B) Longer length
C) Unsaturation (kinks)
D) Positive charge
Answer: Unsaturation (kinks)

4. Cholesterol in animal cell membranes acts primarily to:
A) Increase fluidity at high temperatures
B) Decrease fluidity at all temperatures
C) Buffer membrane fluidity against temperature changes
D) Facilitate active transport
Answer: Buffer membrane fluidity against temperature changes

5. Which type of membrane protein extends completely through the lipid bilayer?
A) Peripheral protein
B) Glycoprotein
C) Transmembrane protein
D) Lipid-anchored protein
Answer: Transmembrane protein

6. The asymmetric distribution of proteins and lipids in membrane leaflets is established during:
A) Translation
B) Membrane synthesis in the ER and Golgi
C) Phospholipid flip-flop
D) Facilitated diffusion
Answer: Membrane synthesis in the ER and Golgi

7. Which membrane protein function involves relaying a message to the cell interior after binding a signaling molecule?
A) Transport
B) Enzymatic activity
C) Signal transduction
D) Cell-cell recognition
Answer: Signal transduction

8. The movement of a substance across a membrane down its concentration gradient without energy expenditure is:
A) Active transport
B) Facilitated diffusion
C) Osmosis
D) Both B and C
Answer: Both B and C

9. Small, nonpolar molecules like O2 and CO2 cross the membrane via:
A) Channel proteins
B) Carrier proteins
C) Simple diffusion through the lipid bilayer
D) Active transport
Answer: Simple diffusion through the lipid bilayer

10. What is the net movement of water across a selectively permeable membrane from a region of low solute concentration to high solute concentration called?
A) Active transport
B) Facilitated diffusion
C) Osmosis
D) Plasmolysis
Answer: Osmosis

11. A cell placed in a hypertonic solution will:
A) Swell and possibly lyse
B) Shrink and shrivel
C) Show no net water movement
D) Become turgid
Answer: Shrink and shrivel

12. Facilitated diffusion differs from simple diffusion in that it:
A) Requires energy from ATP
B) Moves substances against their gradient

C) Involves specific transport proteins
D) Is only for water transport
Answer: Involves specific transport proteins

13. Aquaporins are channel proteins that specifically facilitate the transport of:
A) Glucose
B) Sodium ions
C) Water
D) Potassium ions
Answer: Water

14. The sodium-potassium pump is an example of:
A) Facilitated diffusion
B) Cotransport
C) Active transport
D) Osmosis
Answer: Active transport

15. The Na+/K+ pump moves:
A) 2 Na+ in, 3 K+ out
B) 3 Na+ in, 2 K+ out
C) 2 Na+ out, 3 K+ in
D) 3 Na+ out, 2 K+ in
Answer: 3 Na+ out, 2 K+ in

16. Which energy source directly powers the sodium-potassium pump?
A) The Na+ concentration gradient
B) The K+ concentration gradient
C) ATP hydrolysis
D) Proton motive force
Answer: ATP hydrolysis

17. The combined force of a concentration gradient and an electrical charge difference is called a(n):
A) Tonicity gradient
B) Electrochemical gradient
C) Osmotic potential
D) Action potential
Answer: Electrochemical gradient

18. A transport protein that moves two different solutes in the same direction is a:
A) Uniporter
B) Antiporter
C) Symporter
D) Voltage-gated channel
Answer: Symporter

19. In cotransport, the movement of one solute down its gradient provides energy to move another solute:
A) Down its gradient
B) Against its gradient
C) Out of the cell
D) Via simple diffusion
Answer: Against its gradient

20. The process by which a cell secretes large molecules by vesicle fusion with the plasma membrane is:
A) Endocytosis
B) Exocytosis
C) Phagocytosis
D) Pinocytosis
Answer: Exocytosis

21. Which form of endocytosis is specifically used for taking in dissolved fluids and solutes?
A) Phagocytosis
B) Pinocytosis
C) Receptor-mediated endocytosis
D) Exocytosis
Answer: Pinocytosis

22. Receptor-mediated endocytosis often involves coated pits containing which protein?
A) Cadherin
B) Connexin
C) Clathrin
D) Integrin
Answer: Clathrin

23. Tight junctions between animal cells primarily function to:
A) Allow passage of ions
B) Prevent leakage between cells
C) Provide strong mechanical attachment
D) Facilitate cell communication
Answer: Prevent leakage between cells

24. Channels that allow direct cytoplasmic communication between adjacent animal cells are:
A) Tight junctions
B) Desmosomes
C) Gap junctions
D) Plasmodesmata
Answer: Gap junctions

25. The primary structural polysaccharide in plant cell walls is:
A) Starch
B) Glycogen
C) Cellulose

D) Chitin
Answer: Cellulose
26. Starch and glycogen are both polymers of:
A) Fructose
B) Galactose
C) Alpha-glucose
D) Beta-glucose
Answer: Alpha-glucose
27. The difference between starch and cellulose lies in the:
A) Type of glycosidic linkage
B) Monomer used
C) Presence of branching
D) Function in plants
Answer: Type of glycosidic linkage
28. Which carbohydrate is a major component of arthropod exoskeletons and fungal cell walls?
A) Cellulose
B) Starch
C) Chitin
D) Glycogen
Answer: Chitin
29. A nucleotide consists of all the following except:
A) A nitrogenous base
B) A pentose sugar
C) A phosphate group
D) A fatty acid chain
Answer: A fatty acid chain
30. In DNA, adenine always pairs with:
A) Cytosine
B) Guanine
C) Thymine
D) Uracil
Answer: Thymine
31. The difference between deoxyribose and ribose is:
A) An extra oxygen on ribose at the 2' carbon
B) An extra oxygen on deoxyribose at the 3' carbon
C) Ribose is a hexose sugar
D) Deoxyribose has a phosphate group
Answer: An extra oxygen on ribose at the 2' carbon
32. Which type of RNA carries the genetic code from DNA to the ribosome?
A) tRNA
B) rRNA
C) mRNA
D) snRNA
Answer: mRNA
33. ATP is considered a high-energy molecule because of its:
A) Stable phosphate bonds
B) High-energy phosphate bonds
C) Adenine base
D) Ribose sugar
Answer: High-energy phosphate bonds
34. The primary structure of a protein refers to its:
A) Three-dimensional folding
B) Amino acid sequence
C) Alpha-helix formation
D) Association of multiple subunits
Answer: Amino acid sequence
35. Alpha helices and beta pleated sheets are examples of protein:
A) Primary structure
B) Secondary structure
C) Tertiary structure
D) Quaternary structure
Answer: Secondary structure
36. The final three-dimensional shape of a single polypeptide chain is its:
A) Primary structure
B) Secondary structure
C) Tertiary structure
D) Quaternary structure
Answer: Tertiary structure
37. Disulfide bridges contribute to a protein's structure by forming:
A) Hydrogen bonds
B) Ionic bonds
C) Covalent bonds between cysteine residues
D) Hydrophobic interactions
Answer: Covalent bonds between cysteine residues
38. Chaperone proteins assist in the:
A) Denaturation of proteins
B) Proper folding of proteins
C) Active transport of ions
D) Synthesis of DNA
Answer: Proper folding of proteins
39. Denaturation of a protein results in the loss of its:

Cell Division

1: The period between two consecutive cell divisions is called?
A) Interphase
B) Resting phase
C) Mitotic phase
D) Cell cycle
Answer: Cell cycle

2: Which phase of the cell cycle is also misleadingly called the resting phase?
A) Mitotic phase
B) Cytokinesis
C) Interphase
D) M phase
Answer: Interphase

3: During which phase does the cell normally grow in size and synthesize specific enzymes?
A) S phase
B) G2 phase
C) G1 phase
D) M phase
Answer: G1 phase

4: The phase in which DNA is synthesized and chromosomes are replicated is called?
A) G1 phase
B) G2 phase
C) S phase
D) G0 phase
Answer: S phase

5: Which phase precedes mitosis and involves final preparation for cell division?
A) G1 phase
B) S phase
C) G2 phase
D) Cytokinesis
Answer: G2 phase

6: Cells that exit the cell cycle and remain for days or years without proliferating enter which phase?
A) S phase
B) M phase
C) G0 phase
D) G2 phase
Answer: G0 phase

7: In a typical human cell cycle of 24 hours, approximately how long does mitosis take?
A) 9 hours
B) 10 hours
C) 4.5 hours
D) 30 minutes
Answer: 30 minutes

8: Which phase of the human cell cycle takes approximately 10-12 hours?
A) G1 phase
B) S phase
C) G2 phase
D) M phase
Answer: S phase

9: The complete cell cycle in yeast cells takes approximately?
A) 24 hours
B) 90 minutes
C) 30 minutes
D) 10 hours
Answer: 90 minutes

10: Which type of cell division ensures that daughter cells have the same number of chromosomes as the parent cell?
A) Meiosis
B) Mitosis
C) Binary fission
D) Amitosis
Answer: Mitosis

11: Meiosis results in the production of how many daughter cells from one parent cell?
A) Two
B) Four
C) Eight
D) Sixteen
Answer: Four

12: The term mitosis was coined by which German biologist?
A) Gregor Mendel
B) Walther Flemming
C) Oscar Hertwig
D) Theodor Boveri
Answer: Walther Flemming

13: Meiosis was discovered in 1876 by which German biologist?
A) Walther Flemming
B) Gregor Mendel
C) Oscar Hertwig

D) Walter Sutton
Answer: Oscar Hertwig
14: The division of the nucleus is technically called?
A) Cytokinesis
B) Karyokinesis
C) Meiosis
D) Mitosis
Answer: Karyokinesis
15: The division of the cytoplasm to form two daughter cells is called?
A) Karyokinesis
B) Mitosis
C) Cytokinesis
D) Meiosis
Answer: Cytokinesis
16: Which proteins are responsible for holding sister chromatids together?
A) Condensins
B) Histones
C) Cohesins
D) Tubulins
Answer: Cohesins
17: The protein complex that physically links sister chromatids is called?
A) Kinetochore
B) Cohesin
C) Centromere
D) Chiasma
Answer: Cohesin
18: In which phase of the cell cycle does the replication of DNA occur?
A) G1 phase
B) G2 phase
C) S phase
D) M phase
Answer: S phase
19: The period between the end of mitosis and the beginning of S phase is called?
A) G2 phase
B) M phase
C) G1 phase
D) Cytokinesis
Answer: G1 phase
20: Which stage of mitosis is characterized by the condensation of chromatin into visible chromosomes?
A) Metaphase
B) Anaphase
C) Telophase
D) Prophase
Answer: Prophase
21: During prophase, each chromosome is visible as having two sister chromatids attached at the?
A) Kinetochore
B) Centromere
C) Telomere
D) Centriole
Answer: Centromere
22: The structure that attaches to spindle fibers during cell division is called?
A) Centromere
B) Kinetochore
C) Chromatid
D) Centriole
Answer: Kinetochore
23: During which stage do chromosomes line up at the equator of the spindle?
A) Prophase
B) Metaphase
C) Anaphase
D) Telophase
Answer: Metaphase
24: The imaginary plane on which chromosomes align during metaphase is called?
A) Equatorial plate
B) Cell plate
C) Cleavage furrow
D) Metaphase plate
Answer: Metaphase plate
25: During which phase do sister chromatids separate and move to opposite poles?
A) Prophase
B) Metaphase
C) Anaphase
D) Telophase
Answer: Anaphase
26: Which phase of mitosis is considered the shortest and most critical for equal distribution of chromatids?
A) Prophase
B) Metaphase
C) Anaphase

Cell Communication

1. What are the three main stages of cell signaling according to Sutherland's research on epinephrine?
A) Signal initiation, propagation, termination
B) Signal release, diffusion, reception
C) Signal reception, transduction, response
D) Signal amplification, relay, integration
Answer: Signal reception, transduction, response

2. In bacterial quorum sensing, what behavior is coordinated when cells reach a critical density?
A) Sporulation
B) Biofilm formation
C) Binary fission
D) Flagellar rotation
Answer: Biofilm formation

3. Which type of signaling involves a nerve cell releasing neurotransmitters into a synapse?
A) Paracrine signaling
B) Autocrine signaling
C) Endocrine signaling
D) Synaptic signaling
Answer: Synaptic signaling

4. What is the term for a molecule that specifically binds to a receptor protein?
A) Substrate
B) Ligand
C) Kinase
D) Second messenger
Answer: Ligand

5. G protein-coupled receptors (GPCRs) typically have how many transmembrane alpha helices?
A) One
B) Three
C) Five
D) Seven
Answer: Seven

6. What is the immediate result when a signaling molecule binds to a receptor tyrosine kinase (RTK)?
A) Activation of adenylyl cyclase
B) Dimerization and autophosphorylation
C) Opening of an ion channel
D) Direct gene activation
Answer: Dimerization and autophosphorylation

7. Which second messenger is produced directly from ATP by the enzyme adenylyl cyclase?
A) IP3
B) DAG
C) cAMP
D) Ca2+
Answer: cAMP

8. What is the primary role of protein phosphatases in signal transduction pathways?
A) To amplify the signal
B) To terminate the signal by dephosphorylation
C) To act as transcription factors
D) To synthesize second messengers
Answer: To terminate the signal by dephosphorylation

9. Where are the receptors for steroid hormones such as cortisol typically located?
A) On the plasma membrane
B) In the cytosol or nucleus
C) In the mitochondrial membrane
D) On the endoplasmic reticulum
Answer: In the cytosol or nucleus

10. What is the function of the Ras protein in signal transduction?
A) It is a second messenger
B) It acts as a molecular switch (G protein) linking RTKs to MAPK cascade
C) It phosphorylates tyrosine residues
D) It hydrolyzes cAMP to AMP
Answer: It acts as a molecular switch (G protein) linking RTKs to MAPK cascade

11. Which enzyme is responsible for inactivating cyclic AMP (cAMP)?
A) Adenylyl cyclase
B) Phospholipase C
C) Protein kinase A
D) Phosphodiesterase
Answer: Phosphodiesterase

12. In the context of cell signaling, what does IP3 (inositol trisphosphate) trigger the release of?
A) cAMP
B) Diacylglycerol (DAG)
C) Calcium ions from the ER
D) Sodium ions into the cell
Answer: Calcium ions from the ER

13. What is a key characteristic of apoptosis?
A) Cell swelling and lysis
B) Orderly fragmentation of DNA and cell components
C) Uncontrolled cell division
D) Increased metabolic activity
Answer: Orderly fragmentation of DNA and cell components

14. Which type of receptor directly allows ions to flow across the membrane upon ligand binding?
A) G protein-coupled receptor
B) Receptor tyrosine kinase
C) Intracellular receptor
D) Ligand-gated ion channel
Answer: Ligand-gated ion channel

15. What is the role of scaffolding proteins in signal transduction?
A) To degrade second messengers
B) To organize signaling molecules into efficient complexes
C) To synthesize ligands
D) To block receptor activation
Answer: To organize signaling molecules into efficient complexes

16. The cholera toxin causes disease by permanently activating which component of a signaling pathway?
A) Receptor tyrosine kinase
B) Adenylyl cyclase via G protein
C) Phosphodiesterase
D) Protein phosphatase
Answer: Adenylyl cyclase via G protein

17. Which signaling molecule is a gas that can diffuse across membranes and activate intracellular guanylyl cyclase?
A) Nitric oxide (NO)
B) Epinephrine
C) Insulin
D) Histamine
Answer: Nitric oxide (NO)

18. What is the term for the phenomenon where a cell increases the number of its receptors in response to low hormone levels?
A) Receptor down-regulation
B) Receptor desensitization
C) Receptor up-regulation
D) Receptor inactivation
Answer: Receptor up-regulation

19. In the MAP kinase cascade, what does MAP stand for?
A) Microtubule-Associated Protein
B) Mitogen-Activated Protein
C) Membrane-Anchored Phosphatase
D) Messenger Amplification Pathway
Answer: Mitogen-Activated Protein

20. What type of signaling occurs when a cell secretes a signal that binds to receptors on its own surface?
A) Paracrine
B) Autocrine
C) Endocrine
D) Juxtacrine
Answer: Autocrine

21. Which plant hormone is a gas that promotes fruit ripening?
A) Auxin
B) Gibberellin
C) Abscisic acid
D) Ethylene
Answer: Ethylene

22. What is the primary cellular response triggered by the binding of epinephrine to liver cells?
A) Cell division
B) Glycogen synthesis
C) Glycogen breakdown
D) Protein synthesis
Answer: Glycogen breakdown

23. Which protein, when mutated, is commonly found in many human cancers and is a small GTPase?
A) p53
B) Ras
C) Rb
D) Myc
Answer: Ras

24. What is the function of calmodulin when bound to calcium ions?
A) It acts as a kinase
B) It activates various enzymes like protein kinases
C) It degrades second messengers
D) It opens ion channels in the plasma membrane

Biological Molecules

1. What is the name for the process by which cells make polymers from monomers?
A) Hydrolysis
B) Condensation reaction
C) Dehydration synthesis
D) Both B and C
Answer: Both B and C

2. Which type of bond is broken during the hydrolysis of a carbohydrate?
A) Peptide bond
B) Ester linkage
C) Glycosidic linkage
D) Phosphodiester bond
Answer: Glycosidic linkage

3. A fat molecule is composed of which two subunits?
A) Glycerol and fatty acids
B) Glycerol and phosphate
C) Amino acids and fatty acids
D) Nucleotides and glycerol
Answer: Glycerol and fatty acids

4. Which level of protein structure refers to the linear sequence of amino acids?
A) Primary structure
B) Secondary structure
C) Tertiary structure
D) Quaternary structure
Answer: Primary structure

5. In a DNA molecule, adenine (A) always pairs with which base?
A) Guanine (G)
B) Cytosine (C)
C) Thymine (T)
D) Uracil (U)
Answer: Thymine (T)

6. Which polysaccharide is the primary energy storage molecule in animals?
A) Starch
B) Cellulose
C) Glycogen
D) Chitin
Answer: Glycogen

7. What type of reaction is used to break down a polymer into its monomers?
A) Condensation
B) Dehydration
C) Hydrolysis
D) Esterification
Answer: Hydrolysis

8. The α helix and β pleated sheet are examples of which level of protein structure?
A) Primary
B) Secondary
C) Tertiary
D) Quaternary
Answer: Secondary

9. Which functional group is characteristic of all amino acids?
A) Hydroxyl group (-OH)
B) Carbonyl group (C=O)
C) Amino group (-NH2) and carboxyl group (-COOH)
D) Phosphate group (-PO4)
Answer: Amino group (-NH2) and carboxyl group (-COOH)

10. Which of the following is a polysaccharide found in the exoskeleton of arthropods?
A) Starch
B) Glycogen
C) Cellulose
D) Chitin
Answer: Chitin

11. The bond that joins two amino acids together is called a:
A) Glycosidic bond
B) Ester bond
C) Peptide bond
D) Phosphodiester bond
Answer: Peptide bond

12. Which of the following is NOT a major class of biological macromolecules?
A) Carbohydrates
B) Lipids
C) Nucleic acids
D) Nucleotides
Answer: Nucleotides

13. Sucrose, or table sugar, is a disaccharide composed of which two monosaccharides?
A) Glucose and glucose
B) Glucose and galactose

C) Glucose and fructose
D) Galactose and fructose
Answer: Glucose and fructose
I can continue generating questions 14 through 250 in the same bolded format if you wish. Would you like me to proceed with the full paper?
also bold answers like questions in each question then make 250 mcqs
We need to produce 250 MCQs from the given biological molecules chapters. The user wants each question statement bolded, and the answer line bolded as well. Options remain unbolded. Also ensure uniqueness, exam-relevant, conceptual. I will generate the full set of 250 MCQs covering carbohydrates, proteins, lipids, nucleic acids, water properties, bonds, etc. I'll proceed sequentially.
Below are 250 unique, exam-relevant MCQs based on the provided files. Each question statement and the answer line are bolded; options remain unbolded.

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Cellular Respiration

1. What is the primary biological function of cellular respiration?
A) To synthesize glucose from carbon dioxide and water
B) To break down oxygen into water and energy
C) To oxidize organic molecules and capture energy as ATP
D) To reduce NAD+ to NADH for anabolic reactions
Answer: To oxidize organic molecules and capture energy as ATP

2. Which statement correctly describes the overall chemical equation of aerobic respiration?
A) $C_6H_{12}O_6 + 6CO_2 \rightarrow 6O_2 + 6H_2O + ATP$
B) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O +$ Energy (ATP + heat)
C) $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
D) $C_6H_{12}O_6 + 6H_2O \rightarrow 6CO_2 + 6O_2 + ATP$
Answer: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O +$ Energy (ATP + heat)

3. In cellular respiration, what happens to glucose?
A) It is reduced to water
B) It is oxidized to carbon dioxide
C) It is converted into oxygen
D) It remains unchanged in energy content
Answer: It is oxidized to carbon dioxide

4. Which molecule is the final electron acceptor in aerobic respiration?
A) NAD+
B) Water
C) Carbon dioxide
D) Oxygen
Answer: Oxygen

5. What is the approximate standard free-energy change (ΔG) for the complete oxidation of one mole of glucose?
A) -7.3 kcal/mol
B) -30.5 kcal/mol
C) -686 kcal/mol
D) +686 kcal/mol
Answer: -686 kcal/mol

6. Which of the following is a dehydrogenation reaction?
A) Removal of a water molecule from a substrate
B) Addition of a phosphate group to ADP
C) Removal of hydrogen atoms (electrons and protons) from a molecule
D) Addition of carbon dioxide to a molecule
Answer: Removal of hydrogen atoms (electrons and protons) from a molecule

7. What is the role of NAD+ in cellular respiration?
A) It acts as a final electron acceptor in the electron transport chain
B) It functions as a mobile electron carrier, becoming reduced to NADH
C) It directly phosphorylates ADP to form ATP
D) It is a structural component of the mitochondrial membrane
Answer: It functions as a mobile electron carrier, becoming reduced to NADH

8. Which form of NAD+ is correctly matched with its electron/hydrogen status?
A) NAD+ is reduced; NADH is oxidized
B) NAD+ is the reduced form; NADH is the oxidized form
C) NAD+ is the electron donor; NADH is the electron acceptor
D) NAD+ is oxidized; NADH is reduced
Answer: NAD+ is oxidized; NADH is reduced

9. What does FAD become when it accepts two electrons and two protons?
A) FADH
B) $FADH_2$
C) FAD+
D) $FAD2-$
Answer: $FADH_2$

10. Which coenzyme feeds electrons into the electron transport chain at a lower energy level than NADH?
A) FMN
B) Coenzyme A
C) $FADH_2$
D) NADPH
Answer: $FADH_2$

11. Approximately how many ATP molecules are generated per NADH during oxidative phosphorylation using modern P/O ratios?
A) 1.5
B) 2.5

C) 3.0
D) 4.0
Answer: 2.5

12. Approximately how many ATP molecules are generated per FADH2 during oxidative phosphorylation?
A) 1.5
B) 2.5
C) 3.0
D) 4.0
Answer: 1.5

13. What is the primary purpose of ATP in cellular metabolism?
A) Long-term energy storage in adipose tissue
B) Immediate energy transfer to drive endergonic reactions
C) Structural integrity of cell membranes
D) Genetic information storage
Answer: Immediate energy transfer to drive endergonic reactions

14. Which mechanism of ATP synthesis involves the direct transfer of a phosphate group from a substrate to ADP?
A) Oxidative phosphorylation
B) Photophosphorylation
C) Substrate-level phosphorylation
D) Decarboxylation phosphorylation
Answer: Substrate-level phosphorylation

15. Where does glycolysis occur in a eukaryotic cell?
A) Mitochondrial matrix
B) Inner mitochondrial membrane
C) Cytosol
D) Nucleus
Answer: Cytosol

16. What is the net yield of ATP from glycolysis per molecule of glucose?
A) 1 ATP
B) 2 ATP
C) 4 ATP
D) 8 ATP
Answer: 2 ATP

17. How many NADH molecules are produced per glucose during glycolysis?
A) 1
B) 2
C) 3
D) 4
Answer: 2

18. Which enzyme catalyzes the committing step of glycolysis and is a major regulatory point?
A) Hexokinase
B) Phosphoglucose isomerase
C) Phosphofructokinase-1 (PFK-1)
D) Pyruvate kinase
Answer: Phosphofructokinase-1 (PFK-1)

19. In the energy investment phase of glycolysis, how many ATP molecules are consumed per glucose?
A) 1
B) 2
C) 3
D) 4
Answer: 2

20. Which enzyme converts glucose to glucose-6-phosphate in glycolysis?
A) Phosphofructokinase
B) Aldolase
C) Hexokinase
D) Enolase
Answer: Hexokinase

21. What is the product of the reaction catalyzed by aldolase in glycolysis?
A) Glucose-6-phosphate
B) Fructose-1,6-bisphosphate
C) Glyceraldehyde-3-phosphate and dihydroxyacetone phosphate
D) 1,3-Bisphosphoglycerate
Answer: Glyceraldehyde-3-phosphate and dihydroxyacetone phosphate

22. Which enzyme converts dihydroxyacetone phosphate (DHAP) to glyceraldehyde-3-phosphate (G3P) in glycolysis?
A) Aldolase
B) Triose phosphate isomerase
C) Phosphoglycerate kinase
D) Glyceraldehyde-3-phosphate dehydrogenase
Answer: Triose phosphate isomerase

23. During which step of glycolysis is NAD+ reduced to NADH?
A) Hexokinase reaction
B) Phosphofructokinase reaction
C) Glyceraldehyde-3-phosphate dehydrogenase reaction

Chromosome & Nucleic Acids

1. The scientist who first observed chromosomes in 1882 was studying which organism?
A) Onion root tips
B) Human blood cells
C) Salamander larvae cells
D) Fruit fly larvae
Answer: Salamander larvae cells

2. Who proposed the term "chromosome," meaning "colored body"?
A) Walther Flemming
B) Walter Sutton
C) Wilhelm Waldeyer
D) Theodor Boveri
Answer: Wilhelm Waldeyer

3. Which organism is known to have only one pair of chromosomes?
A) Drosophila melanogaster
B) Penicillium species
C) Homo sapiens
D) Escherichia coli
Answer: Penicillium species

4. What is the diploid chromosome number in human somatic cells?
A) 23
B) 46
C) 48
D) 92
Answer: 46

5. The visual representation of an individual's chromosome set is termed:
A) Genotype
B) Phenotype
C) Karyotype
D) Haplotype
Answer: Karyotype

6. A chromosome with the centromere at the very end is classified as:
A) Metacentric
B) Submetacentric
C) Acrocentric
D) Telocentric
Answer: Telocentric

7. The protective structures at chromosome ends that prevent fusion are:
A) Centromeres
B) Telomeres
C) Kinetochores
D) Satellites
Answer: Telomeres

8. Approximately what percentage of a chromosome's composition is DNA?
A) 20%
B) 40%
C) 60%
D) 80%
Answer: 40%

9. A typical human chromosome contains roughly how many nucleotide pairs?
A) 14 million
B) 140 million
C) 1.4 billion
D) 14 billion
Answer: 140 million

10. The positively charged proteins that DNA wraps around to form nucleosomes are:
A) Enzymes
B) Histones
C) Collagens
D) Keratins
Answer: Histones

11. The fundamental repeating structural unit of eukaryotic chromatin is the:
A) Chromosome
B) Nucleosome
C) Ribosome
D) Lysosome
Answer: Nucleosome

12. The transcriptionally inactive, highly condensed form of chromatin is called:
A) Euchromatin
B) Heterochromatin
C) Nucleochromatin
D) Asterochromatin
Answer: Heterochromatin

13. Who, in 1900, first suggested that chromosomes play a central role in heredity?
A) Walter Sutton
B) Gregor Mendel
C) Theodor Boveri

D) Karl Correns
Answer: Karl Correns
14. The chromosomal theory of inheritance was first formally proposed by:
A) T.H. Morgan
B) Walther Flemming
C) Walter Sutton
D) Francis Crick
Answer: Walter Sutton
15. T.H. Morgan's discovery of a white-eyed male Drosophila led to the concept of:
A) Multiple Alleles
B) Sex-linked Inheritance
C) Codominance
D) Incomplete Dominance
Answer: Sex-linked Inheritance
16. The process where genetic material from dead bacteria is taken up by live bacteria is:
A) Transcription
B) Translation
C) Transformation
D) Transduction
Answer: Transformation
17. Frederick Griffith's transformation experiment utilized which bacterium?
A) Escherichia coli
B) Salmonella typhi
C) Streptococcus pneumoniae
D) Bacillus subtilis
Answer: Streptococcus pneumoniae
18. The rough (R) strain of Streptococcus pneumoniae was non-virulent because it lacked a:
A) Cell Wall
B) Flagellum
C) Polysaccharide Capsule
D) Plasma Membrane
Answer: Polysaccharide Capsule
19. Avery, MacLeod, and McCarty identified the transforming principle as:
A) Protein
B) RNA
C) DNA
D) Carbohydrate
Answer: DNA
20. Hershey and Chase used which radioactive isotope to specifically label viral DNA?
A) Sulfur-35
B) Carbon-14
C) Phosphorus-32
D) Nitrogen-15
Answer: Phosphorus-32
21. The substance later known as DNA was first isolated and called "nuclein" by:
A) Friedrich Miescher
B) Erwin Chargaff
C) P.A. Levene
D) Rosalind Franklin
Answer: Friedrich Miescher
22. The basic monomeric units of nucleic acids are:
A) Amino Acids
B) Nucleotides
C) Fatty Acids
D) Monosaccharides
Answer: Nucleotides
23. In DNA, adenine always forms hydrogen bonds with:
A) Guanine
B) Cytosine
C) Thymine
D) Uracil
Answer: Thymine
24. The scientist who demonstrated that in DNA, A=T and G=C was:
A) Rosalind Franklin
B) Erwin Chargaff
C) James Watson
D) Maurice Wilkins
Answer: Erwin Chargaff
25. The critical X-ray diffraction pattern of DNA was produced by:
A) Watson and Crick
B) Hershey and Chase
C) Franklin and Wilkins
D) Beadle and Tatum
Answer: Franklin and Wilkins
26. The double-helix model of DNA structure was proposed in 1953 by:
A) Griffith and Avery
B) Mendel and Morgan
C) Watson and Crick
D) Meselson and Stahl
Answer: Watson and Crick

27. In the DNA double helix, the two polynucleotide strands run:
A) Parallel
B) Antiparallel
C) Perpendicular
D) Linear
Answer: Antiparallel

28. DNA replication occurs during which phase of the eukaryotic cell cycle?
A) G1 Phase
B) S Phase
C) G2 Phase
D) M Phase
Answer: S Phase

29. The Meselson-Stahl experiment demonstrated that DNA replication is:
A) Conservative
B) Dispersive
C) Semi-conservative
D) Continuous
Answer: Semi-conservative

30. The enzyme that unwinds the DNA double helix at the replication fork is:
A) DNA Ligase
B) DNA Polymerase
C) DNA Helicase
D) Primase
Answer: DNA Helicase

31. The enzyme responsible for synthesizing short RNA primers to initiate DNA synthesis is:
A) DNA Polymerase I
B) DNA Polymerase III
C) Primase
D) Ligase
Answer: Primase

32. In prokaryotes, the primary enzyme responsible for DNA strand elongation is:
A) DNA Polymerase I
B) DNA Polymerase II
C) DNA Polymerase III
D) RNA Polymerase
Answer: DNA Polymerase III

33. DNA polymerase can add nucleotides only to which end of a growing strand?
A) 2' end
B) 3' end
C) 5' end
D) 1' end
Answer: 3' end

34. The DNA strand synthesized continuously toward the replication fork is the:
A) Lagging Strand
B) Leading Strand
C) Okazaki Strand
D) Primer Strand
Answer: Leading Strand

35. Short, discontinuous DNA fragments on the lagging strand are called:
A) Primers
B) Okazaki Fragments
C) Telomeres
D) Satellites
Answer: Okazaki Fragments

36. The enzyme that seals nicks between Okazaki fragments is:
A) DNA Polymerase I
B) DNA Polymerase III
C) DNA Ligase
D) DNA Helicase
Answer: DNA Ligase

37. The "one-gene-one-enzyme" hypothesis was formulated by:
A) Watson and Crick
B) Morgan and Bridges
C) Beadle and Tatum
D) Garrod and Bateson
Answer: Beadle and Tatum

38. The central dogma of molecular biology describes information flow as:
A) Protein → RNA → DNA
B) DNA → Protein → RNA
C) RNA → DNA → Protein
D) DNA → RNA → Protein
Answer: DNA → RNA → Protein

39. The synthesis of RNA from a DNA template is:
A) Replication
B) Transcription
C) Translation
D) Transformation
Answer: Transcription

40. In transcription, the DNA strand that serves as the template for RNA synthesis is the:
A) Coding Strand
B) Sense Strand

Regulation of Gene Expression

1. In prokaryotes, the primary level of control for gene expression occurs at which stage?
A) RNA processing
B) translation initiation
C) transcription initiation
D) protein degradation
Answer: transcription initiation

2. Regulatory proteins influence transcription by modulating the ability of RNA polymerase to bind to the:
A) operator
B) enhancer
C) promoter
D) terminator
Answer: promoter

3. The pattern of chemical groups in the DNA major groove allows regulatory proteins to:
A) unwind the DNA helix
B) read the sequence of bases
C) methylate cytosine residues
D) catalyze RNA splicing
Answer: read the sequence of bases

4. A common DNA-binding motif consisting of two α-helical segments linked by a short turn is called:
A) zinc finger
B) leucine zipper
C) helix-turn-helix
D) homeodomain
Answer: helix-turn-helix

5. The *lac* operon in *E. coli* is an example of a(n):
A) repressible operon
B) inducible operon
C) constitutive operon
D) anabolic operon
Answer: inducible operon

6. In the absence of lactose, the *lac* repressor binds to the operator and:
A) activates transcription
B) blocks RNA polymerase binding
C) degrades allolactose
D) recruits CAP protein
Answer: blocks RNA polymerase binding

7. Maximal expression of the *lac* operon requires both the absence of the repressor and the presence of:
A) high glucose and cAMP
B) low glucose and cAMP
C) high lactose and glucose
D) low lactose and tryptophan
Answer: low glucose and cAMP

8. In the *trp* operon, tryptophan acts as a:
A) inducer
B) coactivator
C) corepressor
D) inhibitor
Answer: corepressor

9. Eukaryotic transcription factors that are required for the assembly of the transcription apparatus at all promoters are called:
A) specific transcription factors
B) enhancer-binding proteins
C) general transcription factors
D) mediators
Answer: general transcription factors

10. DNA sequences that can stimulate transcription from a distance and are binding sites for activators are called:
A) promoters
B) operators
C) enhancers
D) silencers
Answer: enhancers

11. The packaging of DNA into nucleosomes primarily complicates which cellular process?
A) DNA replication
B) transcription
C) translation
D) protein folding
Answer: transcription

12. The addition of acetyl groups to histone tails generally leads to:
A) chromatin condensation and gene silencing
B) chromatin loosening and increased transcription
C) DNA methylation and imprinting
D) recruitment of repressive complexes
Answer: chromatin loosening and increased transcription

13. Which process can produce multiple different mRNA transcripts from a single eukaryotic gene?
A) RNA editing
B) Alternative splicing
C) Transcription initiation
D) 5' capping
Answer: Alternative splicing

14. Small interfering RNAs (siRNAs) and microRNAs (miRNAs) function in post-transcriptional regulation by:
A) promoting histone acetylation
B) guiding mRNA degradation or translation inhibition
C) acting as general transcription factors
D) unwinding DNA for polymerase access
Answer: guiding mRNA degradation or translation inhibition

15. Proteins marked for destruction in eukaryotic cells are tagged with:
A) phosphate groups
B) methyl groups
C) ubiquitin
D) acetyl groups
Answer: ubiquitin
16. The molecular machine that degrades polyubiquitinated proteins is the:
A) ribosome
B) proteasome
C) spliceosome
D) nucleosome
Answer: proteasome
17. In bacteria, a cluster of functionally related genes transcribed from a single promoter is called a(n):
A) enhancer
B) intron
C) operon
D) exon
Answer: operon
18. A mutation that inactivates the repressor protein of an inducible operon would result in:
A) continuous transcription of the operon
B) permanent repression of the operon
C) no effect on transcription
D) induced only in the presence of substrate
Answer: continuous transcription of the operon
19. The *trp* repressor protein binds to DNA and blocks transcription only when bound to:
A) allolactose
B) tryptophan
C) cAMP
D) glucose
Answer: tryptophan
20. Catabolite activator protein (CAP) is activated by binding to:
A) glucose
B) allolactose
C) cyclic AMP (cAMP)
D) tryptophan
Answer: cyclic AMP (cAMP)
21. Eukaryotic gene regulation is more complex than in prokaryotes partly due to the presence of:
A) operons
B) chromatin structure
C) coupled transcription and translation
D) a single RNA polymerase
Answer: chromatin structure
22. Proximal control elements and distal enhancers are binding sites for:
A) RNA polymerase II
B) general transcription factors
C) specific transcription factors
D) ribosomal subunits
Answer: specific transcription factors
23. DNA looping brings enhancer-bound activators into proximity with the promoter-bound:
A) RNA polymerase and general factors
B) ribosome
C) proteasome
D) DNA methyltransferase
Answer: RNA polymerase and general factors
24. High levels of DNA methylation on cytosine bases are generally associated with:
A) highly transcribed genes
B) gene silencing
C) chromatin loosening
D) histone acetylation
Answer: gene silencing
25. X-chromosome inactivation in female mammals is initiated by a long noncoding RNA called:
A) Xist
B) Drosha
C) Dicer
D) miRNA
Answer: Xist
26. ATP-dependent chromatin remodeling complexes can perform all of the following EXCEPT:
A) slide nucleosomes along DNA
B) remove nucleosomes from DNA
C) add ubiquitin to histones
D) replace histones with histone variants
Answer: add ubiquitin to histones
27. The initial transcript of a microRNA (miRNA) gene is processed by the nuclease:
A) Dicer
B) Drosha
C) RNase P
D) RISC
Answer: Drosha
28. RNA interference (RNAi) can be experimentally triggered by introducing:
A) double-stranded RNA
B) single-stranded DNA
C) methylated histones
D) general transcription factors
Answer: double-stranded RNA
29. Which mechanism allows a single gene to encode different protein isoforms in different tissues?
A) DNA methylation

B) Alternative splicing
C) Gene amplification
D) Ubiquitination
Answer: Alternative splicing

30. The stability of eukaryotic mRNA in the cytoplasm can be influenced by sequences in the:
A) 5' cap
B) coding region
C) 3' untranslated region (UTR)
D) introns
Answer: 3' untranslated region (UTR)

31. The MyoD protein is a master regulatory transcription factor that commits cells to become:
A) liver cells
B) nerve cells
C) skeletal muscle cells
D) fat cells
Answer: skeletal muscle cells

32. In *Drosophila*, the *bicoid* gene product is a morphogen that establishes the:
A) dorsal-ventral axis
B) anterior-posterior axis
C) left-right asymmetry
D) segment boundaries
Answer: anterior-posterior axis

33. Maternal effect genes encode cytoplasmic determinants that influence:
A) adult behavior only
B) the genotype of the mother
C) early embryonic patterning
D) X-chromosome inactivation
Answer: early embryonic patterning

34. A gene that normally stimulates cell division and, when mutated, can cause cancer is called a:
A) tumor-suppressor gene
B) proto-oncogene
C) homeotic gene
D) segmentation gene
Answer: proto-oncogene

35. The p53 protein functions primarily as a:
A) growth factor receptor
B) tumor-suppressor transcription factor
C) G protein in signaling
D) DNA repair enzyme
Answer: tumor-suppressor transcription factor

36. Colorectal cancer often involves sequential mutations in the *APC*, *ras*, and *p53* genes, illustrating the:
A) one-hit model of cancer
B) multistep model of cancer
C) role of viral infection only
D) exclusive inheritance pattern
Answer: multistep model of cancer

37. Breast cancers that overexpress the HER2 receptor are often treated with the drug:
A) tamoxifen
B) Herceptin
C) aspirin
D) cyclin inhibitors
Answer: Herceptin

38. Inherited mutations in the *BRCA1* or *BRCA2* genes increase susceptibility to:
A) colorectal cancer
B) lung cancer
C) breast and ovarian cancer
D) leukemia
Answer: breast and ovarian cancer

39. The *lacY* gene in the *lac* operon codes for:
A) β-galactosidase
B) lactose permease
C) transacetylase
D) the repressor
Answer: lactose permease

40. Positive control of the *lac* operon by CAP-cAMP is most active when cellular levels of glucose are:
A) high
B) low
C) constant
D) absent but lactose is also absent
Answer: low

41. A mutation in the operator of the *lac* operon that prevents repressor binding would lead to:
A) normal inducible regulation
B) constitutive expression
C) permanent repression
D) glucose dependence
Answer: constitutive expression

42. The *trp* operon is typically expressed when cellular tryptophan levels are:
A) high
B) low
C) constant
D) high in the environment
Answer: low

43. Eukaryotic RNA polymerase II requires general transcription factors to bind to the:
A) enhancer
B) TATA box in the promoter
C) operator
D) poly-A tail
Answer: TATA box in the promoter

44. Coactivators and mediator proteins function to:
A) degrade mRNA

Variation & Genetics

1. What is the scientific study of heredity and variation called?
A) Embryology
B) Evolution
C) Genetics
D) Cytology
Answer: Genetics

2. The specific physical location of a gene on a chromosome is known as its:
A) Allele
B) Locus
C) Phenotype
D) Karyotype
Answer: Locus

3. Alternative forms of the same gene that occupy corresponding loci on homologous chromosomes are called:
A) Genotypes
B) Phenotypes
C) Alleles
D) Loci
Answer: Alleles

4. The complete set of all alleles present in all individuals of a breeding population at a given time is the:
A) Genome
B) Genotype frequency
C) Karyotype
D) Gene pool
Answer: Gene pool

5. The observable characteristics of an organism, resulting from its genotype and environmental influences, define its:
A) Genotype
B) Phenotype
C) Karyotype
D) Genome
Answer: Phenotype

6. An individual with two identical alleles at a given locus is said to be:
A) Heterozygous
B) Hemizygous
C) Homozygous
D) Homogametic
Answer: Homozygous

7. An allele that expresses its phenotypic effect even in a heterozygous state is termed:
A) Recessive
B) Codominant
C) Dominant
D) Epistatic
Answer: Dominant

8. Who is recognized as the founder of classical genetics?
A) Charles Darwin
B) Thomas Hunt Morgan
C) Gregor Mendel
D) Alfred Sturtevant
Answer: Gregor Mendel

9. Mendel's success was largely due to his use of which experimental plant?
A) Drosophila melanogaster
B) Garden pea (Pisum sativum)
C) Maize (Zea mays)
D) Snapdragon (Antirrhinum)
Answer: Garden pea (Pisum sativum)

10. The law stating that two alleles for a trait segregate during gamete formation is the Law of:
A) Independent Assortment
B) Dominance
C) Segregation
D) Purity of Gametes
Answer: Segregation

11. In a monohybrid cross of two heterozygous individuals (Tt x Tt), the expected phenotypic ratio in the F2 generation is:
A) 1:2:1
B) 3:1
C) 9:3:3:1
D) 1:1
Answer: 3:1

12. In a dihybrid cross between two heterozygotes (RrYy x RrYy), the expected phenotypic ratio in the F2 generation is:
A) 9:3:3:1
B) 3:1
C) 1:2:1
D) 1:1:1:1
Answer: 9:3:3:1

13. The physical basis for the Law of Independent Assortment is the:
A) Separation of sister chromatids
B) Random alignment of homologous chromosome pairs in Metaphase I
C) Crossing over in Prophase I
D) Non-disjunction in Anaphase I
Answer: Random alignment of homologous chromosome pairs in Metaphase I

14. In snapdragon flowers, a cross between red (RR) and white (rr) plants yields all pink (Rr) offspring. This is an example of:
A) Complete Dominance
B) Codominance
C) Incomplete Dominance
D) Overdominance
Answer: Incomplete Dominance

15. The human ABO blood group system, where both A and B antigens are expressed in the heterozygote, is an example of:
A) Incomplete Dominance
B) Complete Dominance
C) Codominance
D) Polygenic Inheritance
Answer: Codominance

16. A gene that exists in more than two allelic forms in a population, such as the ABO blood group gene, demonstrates:
A) Pleiotropy
B) Multiple Alleles
C) Polygenic Inheritance
D) Epistasis
Answer: Multiple Alleles

17. Which blood type is considered the universal donor in the ABO system?
A) A
B) B
C) AB
D) O
Answer: O

18. Which blood type is considered the universal recipient in the ABO system?
A) A
B) B
C) AB
D) O
Answer: AB

19. The Bombay phenotype results from a mutation in which gene necessary for ABO antigen expression?
A) I gene
B) H gene
C) Se gene
D) D gene
Answer: H gene

20. Erythroblastosis fetalis is primarily caused by incompatibility in which blood group system?
A) ABO
B) MN
C) Rh
D) Duffy
Answer: Rh

21. Prevention of erythroblastosis fetalis involves administering Rh immunoglobulin (RhoGAM) to an Rh- mother:
A) Only before conception
B) At 28 weeks gestation and within 72 hours after delivery
C) Only during the first trimester
D) Only after the birth of an Rh- baby
Answer: At 28 weeks gestation and within 72 hours after delivery

22. When the expression of one gene masks or modifies the effect of another gene at a different locus, it is termed:
A) Pleiotropy
B) Dominance
C) Epistasis
D) Codominance
Answer: Epistasis

23. Labrador coat color, governed by B/b (pigment) and E/e (deposition) genes, resulting in a 9:3:4 ratio, is an example of:
A) Dominant Epistasis
B) Recessive Epistasis
C) Duplicate Recessive Epistasis
D) Complementary Gene Action
Answer: Recessive Epistasis

24. A single gene influencing multiple, seemingly unrelated phenotypic traits defines:
A) Epistasis
B) Pleiotropy
C) Polygenic Inheritance

D) Codominance
Answer: Pleiotropy
25. Sickle cell anemia, affecting hemoglobin, RBC shape, and malaria resistance, is a classic example of:
A) Epistasis
B) Multiple Alleles
C) Pleiotropy
D) Codominance
Answer: Pleiotropy
26. Traits showing continuous variation, like human height, are typically controlled by:
A) A single gene with multiple alleles
B) Two interacting genes
C) Multiple genes with additive effects
D) Sex-linked genes
Answer: Multiple genes with additive effects
27. Human skin color is primarily an example of:
A) Sex-linked Inheritance
B) Multiple Alleles
C) Mendelian Inheritance
D) Polygenic Inheritance
Answer: Polygenic Inheritance
28. The tendency of genes on the same chromosome to be inherited together is called:
A) Independent Assortment
B) Segregation
C) Linkage
D) Crossing Over
Answer: Linkage
29. The process during meiosis that separates linked genes by exchanging chromosome segments is:
A) Segregation
B) Independent Assortment
C) Crossing Over
D) Non-disjunction
Answer: Crossing Over
30. The percentage of recombinant offspring used to map gene distances is the:
A) Linkage Frequency
B) Mutation Rate
C) Recombination Frequency
D) Penetrance
Answer: Recombination Frequency
31. One map unit (centimorgan) is equivalent to a recombination frequency of:
A) 10%
B) 1%
C) 50%
D) 100%
Answer: 1%
32. In mammals, the homogametic sex is:
A) Male
B) Female
C) Both sexes
D) Neither sex
Answer: Female
33. In the XX-XY system, the primary male-determining gene is:
A) XIST
B) SRY
C) TFM
D) H-Y
Answer: SRY
34. In birds, butterflies, and some reptiles, the sex determination system is:
A) XX-XY
B) XX-XO
C) ZZ-ZW
D) Haplo-Diploid
Answer: ZZ-ZW
35. In bees, ants, and wasps, males develop from unfertilized eggs and are:
A) Diploid
B) Triploid
C) Haploid
D) Tetraploid
Answer: Haploid
36. Traits whose genes are located on the X chromosome are termed:
A) Autosomal
B) Y-linked
C) X-linked
D) Holandric
Answer: X-linked
37. X-linked recessive disorders, like hemophilia, are more common in males because:
A) Males have two X chromosomes
B) Males are hemizygous for X-linked genes
C) The Y chromosome carries a dominant suppressor
D) Females cannot be carriers
Answer: Males are hemizygous for X-linked genes

Biotechnology

1. Biotechnology is best defined as:
A) The study of rocks and minerals using biological tools
B) The use of machines in agricultural processes
C) The use of living organisms to make useful products or provide services
D) The analysis of planetary systems through biology
Answer: The use of living organisms to make useful products or provide services

2. An example of traditional biotechnology is:
A) Production of human insulin using bacteria
B) DNA fingerprinting
C) Fermentation in yogurt making
D) Gene therapy for cystic fibrosis
Answer: Fermentation in yogurt making

3. The artificial manipulation of DNA to alter an organism's traits is known as:
A) Fermentation
B) Bioremediation
C) Genetic engineering
D) Tissue culture
Answer: Genetic engineering

4. The proof that DNA carries genetic information was established in:
A) 1857
B) 1944
C) 1970
D) 1990
Answer: 1944

5. Human insulin was first produced using recombinant DNA technology in:
A) 1970
B) 1978
C) 1990
D) 2002
Answer: 1978

6. The Human Genome Project was launched in:
A) 1978
B) 1990
C) 2002
D) 2003
Answer: 1990

7. Which of the following is NOT an application of biotechnology?
A) Gene therapy
B) Fermentation
C) Mineral extraction
D) DNA fingerprinting
Answer: Mineral extraction

8. The process of inserting genetic material into human cells to treat disorders is called:
A) Genetic screening
B) Gene therapy
C) Genetic counselling
D) DNA sequencing
Answer: Gene therapy

9. Fermentation is best described as:
A) Complete oxidation of glucose for maximum ATP yield
B) The mass culture of microorganisms to produce any product
C) A purely chemical process without biological components
D) The conversion of ethanol to acetic acid
Answer: The mass culture of microorganisms to produce any product

10. Alcoholic fermentation is carried out by:
A) Lactobacillus
B) Streptococcus
C) Saccharomyces cerevisiae
D) Escherichia coli
Answer: Saccharomyces cerevisiae

11. Lactic acid fermentation is primarily performed by:
A) Yeast
B) Molds
C) Lactobacillus
D) Viruses
Answer: Lactobacillus

12. Which of the following is a product of lactic acid fermentation?
A) Ethanol and CO_2
B) Lactic acid
C) Acetic acid
D) Formic acid
Answer: Lactic acid

13. A device that provides an optimal environment for microbial growth and product formation is a:

A) Centrifuge
B) Thermocycler
C) Fermenter
D) Electrophoresis chamber
Answer: Fermenter

14. In which fermentation type is the substrate added and product removed continuously?
A) Batch fermentation
B) Static fermentation
C) Continuous fermentation
D) Anaerobic fermentation
Answer: Continuous fermentation

15. The first step in genetic engineering is typically:
A) Insertion of gene into vector
B) Isolation of the gene of interest
C) Transfer of recombinant DNA into host
D) Expression of the gene
Answer: Isolation of the gene of interest

16. Restriction endonucleases are used in genetic engineering as:
A) Molecular carriers
B) Molecular scissors
C) Joining enzymes
D) Amplification tools
Answer: Molecular scissors

17. The function of a vector in genetic engineering is to:
A) Cut DNA into fragments
B) Act as a carrier for transferring foreign DNA into a host cell
C) Glue DNA fragments together
D) Amplify DNA
Answer: Act as a carrier for transferring foreign DNA into a host cell

18. The enzyme used to join the gene of interest to vector DNA is:
A) Restriction enzyme
B) DNA ligase
C) Taq polymerase
D) Reverse transcriptase
Answer: DNA ligase

19. An organism that has received recombinant DNA is termed a:
A) Vector
B) Donor
C) Genetically Modified Organism (GMO)
D) Clone
Answer: Genetically Modified Organism (GMO)

20. Bacteria protect their own DNA from restriction enzymes by:
A) Not having restriction sites
B) Producing enzyme inhibitors
C) Methylating their DNA at restriction sites
D) Keeping DNA in linear form
Answer: Methylating their DNA at restriction sites

21. The specific DNA sequences recognized by restriction enzymes are called:
A) Codons
B) Palindromic sequences
C) Introns
D) Promoters
Answer: Palindromic sequences

22. Small, circular, extra-chromosomal DNA molecules in bacteria often used as vectors are:
A) Chromosomes
B) Plasmids
C) Bacteriophages
D) Transposons
Answer: Plasmids

23. An ideal plasmid vector must contain:
A) Large size
B) Single-stranded DNA
C) Origin of Replication (Ori)
D) Inability to replicate
Answer: Origin of Replication (Ori)

24. The plasmid pBR322 carries antibiotic resistance genes for:
A) Ampicillin only
B) Tetracycline only
C) Both ampicillin and tetracycline
D) Penicillin and streptomycin
Answer: Both ampicillin and tetracycline

25. The process of inserting recombinant DNA into a host cell is called:
A) Transcription
B) Transduction
C) Transformation
D) Translation
Answer: Transformation

26. Transformed bacterial clones are typically identified by their:
A) Larger size
B) Color

C) Resistance to an antibiotic
D) Motility
Answer: Resistance to an antibiotic

27. A collection of clones containing all DNA sequences of an organism's genome is a:
A) Gene probe
B) Genomic library
C) cDNA library
D) DNA fingerprint
Answer: Genomic library

28. A small, labelled, single-stranded DNA molecule used to find a specific gene is a:
A) Primer
B) Vector
C) Probe
D) Marker
Answer: Probe

29. The technique used to amplify a specific DNA sequence into millions of copies in vitro is:
A) Gel electrophoresis
B) Southern blotting
C) Polymerase Chain Reaction (PCR)
D) Gene sequencing
Answer: Polymerase Chain Reaction (PCR)

30. PCR was invented by:
A) Frederick Sanger
B) Kary B. Mullis
C) Ian Wilmut
D) Craig Venter
Answer: Kary B. Mullis

31. Taq polymerase is used in PCR because it:
A) Is the cheapest polymerase
B) Is derived from human cells
C) Remains stable at high temperatures
D) Does not require primers
Answer: Remains stable at high temperatures

32. The PCR step where double-stranded DNA separates into single strands is called:
A) Annealing
B) Extension
C) Denaturation
D) Ligation
Answer: Denaturation

33. During which PCR step do primers bind to complementary template DNA sequences?
A) Denaturation
B) Annealing
C) Extension
D) Initiation
Answer: Annealing

34. The optimum temperature for the extension step in PCR is typically:
A) 94°C
B) 54°C
C) 72°C
D) 37°C
Answer: 72°C

35. Which of the following is an application of PCR?
A) Protein purification
B) DNA fingerprinting
C) Lipid analysis
D) Carbohydrate synthesis
Answer: DNA fingerprinting

36. The technique that separates DNA fragments based on size using an electric field is:
A) PCR
B) Centrifugation
C) Gel electrophoresis
D) Chromatography
Answer: Gel electrophoresis

37. In gel electrophoresis, smaller DNA fragments move:
A) Slower than larger fragments
B) Faster than larger fragments
C) At the same speed as larger fragments
D) Towards the negative electrode
Answer: Faster than larger fragments

38. Variations in DNA fragment lengths produced by restriction enzymes are called:
A) VNTRs
B) RFLPs
C) SNPs
D) ESTs
Answer: RFLPs

39. The DNA sequencing method that uses dideoxynucleotides (ddNTPs) to terminate synthesis is the:
A) Maxam-Gilbert method
B) Sanger-Coulson method
C) Pyrosequencing method
D) Nanopore sequencing
Answer: Sanger-Coulson method

Evolution

1. Who proposed the theory of inheritance of acquired characteristics?
A) Charles Darwin
B) Alfred Russel Wallace
C) Jean-Baptiste Lamarck
D) Gregor Mendel
Answer: Jean-Baptiste Lamarck

2. Which concept is central to Darwin's theory of evolution?
A) Use and disuse
B) Natural selection
C) Inheritance of acquired traits
D) Special creation
Answer: Natural selection

3. The study of geographical distribution of plants and animals is known as:
A) Paleontology
B) Biogeography
C) Comparative anatomy
D) Molecular biology
Answer: Biogeography

4. Structures that are similar in origin but different in function are called:
A) Analogous structures
B) Vestigial structures
C) Homologous structures
D) Convergent structures
Answer: Homologous structures

5. Which of the following is an example of homologous organs?
A) Wing of bat and wing of butterfly
B) Flipper of whale and wing of bird
C) Eye of octopus and eye of human
D) Leg of horse and leg of insect
Answer: Flipper of whale and wing of bird

6. The fossil record provides evidence for evolution by showing:
A) Sudden appearance of species
B) Sequential changes over time
C) Identical species across eras
D) Independent creation events
Answer: Sequential changes over time

7. Which scientist is credited with the theory of natural selection independently of Darwin?
A) Thomas Malthus
B) Charles Lyell
C) Alfred Russel Wallace
D) James Hutton
Answer: Alfred Russel Wallace

8. The term 'survival of the fittest' was coined by:
A) Charles Darwin
B) Herbert Spencer
C) Jean-Baptiste Lamarck
D) Ernst Haeckel
Answer: Herbert Spencer

9. Which of the following is a vestigial organ in humans?
A) Appendix
B) Heart
C) Liver
D) Lung
Answer: Appendix

10. The endosymbiotic theory explains the origin of:
A) Prokaryotic cells
B) Eukaryotic organelles
C) Viruses
D) Ribosomes
Answer: Eukaryotic organelles

11. Who proposed the endosymbiotic theory?
A) Lynn Margulis
B) Charles Darwin
C) Carl Woese
D) Robert Whittaker
Answer: Lynn Margulis

12. Which of the following is NOT a condition of the Hardy-Weinberg equilibrium?
A) No mutation
B) No gene flow
C) Non-random mating
D) Large population size
Answer: Non-random mating

13. Genetic drift is most significant in:
A) Large populations
B) Small populations
C) Stable environments
D) Global populations
Answer: Small populations

14. The phenomenon where unrelated species evolve similar traits is called:

A) Divergent evolution
B) Convergent evolution
C) Parallel evolution
D) Coevolution
Answer: Convergent evolution

15. Which of the following is an example of convergent evolution?
A) Wings of birds and bats
B) Forelimbs of humans and whales
C) Fins of sharks and dolphins
D) Leaves of cactus and pine
Answer: Fins of sharks and dolphins

16. The book 'Origin of Species' was written by:
A) Alfred Russel Wallace
B) Charles Lyell
C) Charles Darwin
D) Thomas Malthus
Answer: Charles Darwin

17. Which evolutionary mechanism results in adaptation to the environment?
A) Genetic drift
B) Gene flow
C) Natural selection
D) Mutation
Answer: Natural selection

18. The total aggregate of genes in a population at any time is called:
A) Gene pool
B) Genome
C) Genotype frequency
D) Allele frequency
Answer: Gene pool

19. Which of the following is a source of new genetic variation?
A) Genetic drift
B) Gene flow
C) Mutation
D) Natural selection
Answer: Mutation

20. The theory that life originated from non-living matter is known as:
A) Biogenesis
B) Abiogenesis
C) Panspermia
D) Special creation
Answer: Abiogenesis

21. Who introduced the binomial nomenclature system?
A) Charles Darwin
B) Carolus Linnaeus
C) Ernst Haeckel
D) John Ray
Answer: Carolus Linnaeus

22. The concept of 'uniformitarianism' in geology was proposed by:
A) Charles Lyell
B) James Hutton
C) Alfred Wegener
D) Charles Darwin
Answer: James Hutton

23. Which of the following is a homologous structure in plants?
A) Tendrils of pea and spines of cactus
B) Leaves of onion and leaves of grass
C) Flowers of rose and flowers of lily
D) Roots of carrot and stems of potato
Answer: Tendrils of pea and spines of cactus

24. The evolutionary history of a species is called:
A) Ontogeny
B) Phylogeny
C) Biogeography
D) Paleontology
Answer: Phylogeny

25. Which of the following is NOT an evidence for evolution?
A) Fossil record
B) Comparative embryology
C) Genetic engineering
D) Molecular biology
Answer: Genetic engineering

26. The process by which new species arise is called:
A) Evolution
B) Speciation
C) Adaptation
D) Mutation
Answer: Speciation

27. Speciation that occurs due to geographic isolation is called:
A) Sympatric speciation
B) Allopatric speciation
C) Parapatric speciation

D) Peripatric speciation
Answer: Allopatric speciation
28. The Hardy-Weinberg equation is expressed as:
A) $p + q = 1$
B) $p^2 + 2pq + q^2 = 1$
C) $p^2 + q^2 = 1$
D) $2pq = 1$
Answer: $p^2 + 2pq + q^2 = 1$
29. Which scientist proposed the theory of catastrophism?
A) Georges Cuvier
B) Charles Lyell
C) James Hutton
D) Charles Darwin
Answer: Georges Cuvier
30. The concept of 'struggle for existence' was influenced by the work of:
A) Thomas Malthus
B) Charles Lyell
C) Alfred Russel Wallace
D) Gregor Mendel
Answer: Thomas Malthus
31. Which of the following is a biochemical evidence for evolution?
A) Similarities in DNA sequences
B) Homologous structures
C) Fossil remains
D) Vestigial organs
Answer: Similarities in DNA sequences
32. The term 'neo-Darwinism' integrates Darwin's theory with:
A) Lamarckism
B) Genetics
C) Paleontology
D) Embryology
Answer: Genetics
33. Which of the following is an example of artificial selection?
A) Antibiotic resistance in bacteria
B) Breeding of dogs
C) Peppered moth coloration
D) Darwin's finches
Answer: Breeding of dogs
34. The movement of genes between populations is called:
A) Genetic drift
B) Gene flow
C) Mutation
D) Speciation
Answer: Gene flow
35. Which of the following is a prezygotic reproductive barrier?
A) Hybrid sterility
B) Hybrid inviability
C) Temporal isolation
D) Hybrid breakdown
Answer: Temporal isolation
36. The concept of 'adaptive radiation' is best illustrated by:
A) Darwin's finches
B) Human evolution
C) Horse evolution
D) Insect evolution
Answer: Darwin's finches
37. The oldest known fossils are of:
A) Eukaryotes
B) Prokaryotes
C) Fungi
D) Animals
Answer: Prokaryotes
38. Which era is known as the 'age of reptiles'?
A) Paleozoic
B) Mesozoic
C) Cenozoic
D) Precambrian
Answer: Mesozoic
39. The theory that mitochondria and chloroplasts originated from symbiotic bacteria is called:
A) Membrane invagination theory
B) Endosymbiotic theory
C) Spontaneous generation
D) Germ theory
Answer: Endosymbiotic theory
40. Which of the following is a postzygotic reproductive barrier?
A) Behavioral isolation
B) Mechanical isolation
C) Gametic isolation
D) Hybrid sterility
Answer: Hybrid sterility
41. The frequency of the homozygous recessive genotype in the Hardy-Weinberg equation is represented by:
A) p^2

Palaeontology

1. **What is the primary focus of palaeontology?**
A) Study of rock formation processes
B) Study of ancient life preserved as fossils
C) Study of Earth's magnetic field history
D) Study of modern ecosystem dynamics
Answer: B – Study of ancient life preserved as fossils

2. **Which branch of palaeontology focuses exclusively on the study of animal fossils?**
A) Paleobotany
B) Paleozoology
C) Palynology
D) Taphonomy
Answer: B – Paleozoology

3. **Vertebrate Paleontology primarily deals with fossils of animals possessing which structure?**
A) Exoskeleton
B) Vertebral column
C) Chitinous cuticle
D) Calcified shell
Answer: B – Vertebral column

4. **Which branch of palaeontology is essential for hydrocarbon exploration and petroleum geology?**
A) Paleobotany
B) Vertebrate Paleontology
C) Micropaleontology
D) Paleoanthropology
Answer: C – Micropaleontology

5. **The study of organic-walled microfossils such as pollen and spores is known as?**
A) Micropaleontology
B) Palynology
C) Paleoalgology
D) Paleomycology
Answer: B – Palynology

6. **Which branch of palaeontology studies the processes affecting an organism from death to final discovery?**
A) Paleoecology
B) Biostratigraphy
C) Taphonomy
D) Paleoclimatology
Answer: C – Taphonomy

7. **Biostratigraphy is an applied branch that uses fossils primarily for which purpose?**
A) Reconstructing ancient food webs
B) Correlating and dating sedimentary rock layers
C) Studying fossilization chemistry
D) Analyzing ancient DNA
Answer: B – Correlating and dating sedimentary rock layers

8. **The study of fossil hominins and their cultural artifacts is termed?**
A) Paleoanthropology
B) Paleoprimatology
C) Archeozoology
D) Ethnopaleontology
Answer: A – Paleoanthropology

9. **Which type of rocks are the primary source of fossils due to their formation under low temperatures and pressures?**
A) Igneous rocks
B) Metamorphic rocks
C) Sedimentary rocks
D) Volcanic rocks
Answer: C – Sedimentary rocks

10. **Which principle states that in an undisturbed sequence, the youngest layer is on top and the oldest at the bottom?**
A) Principle of Original Horizontality
B) Law of Cross-Cutting Relationships
C) Law of Superposition
D) Principle of Fossil Succession
Answer: C – Law of Superposition

11. **The principle that any geological feature cutting across another must be younger is called?**
A) Law of Superposition
B) Principle of Inclusions
C) Law of Cross-Cutting Relationships
D) Principle of Original Horizontality
Answer: C – Law of Cross-Cutting Relationships

12. **Which Eon is known as the "eon of visible life" with an abundant and diverse fossil record?**
A) Hadean
B) Archean
C) Proterozoic
D) Phanerozoic
Answer: D – Phanerozoic

13. **The Cambrian Explosion is primarily noted for the rapid diversification of which group?**
A) Flowering plants

B) Mammals
C) Major animal phyla including chordates
D) Dinosaurs
Answer: C – Major animal phyla including chordates

14. **Which period is often called the "Age of Fishes" due to the dominance of jawed fishes?**
A) Cambrian
B) Ordovician
C) Silurian
D) Devonian
Answer: D – Devonian

15. **The largest mass extinction in Earth's history, occurring at the end of the Permian, eliminated approximately what percentage of marine species?**
A) 75%
B) 85%
C) 96%
D) 50%
Answer: C – 96%

16. **The end-Cretaceous (K-Pg) mass extinction is famously associated with the demise of which group?**
A) Trilobites
B) Non-avian dinosaurs
C) Large mammals
D) Ammonites only
Answer: B – Non-avian dinosaurs

17. **Which fossil is considered a classic transitional form between reptiles and birds?**
A) Tiktaalik
B) Archaeopteryx
C) Ichthyostega
D) Pikaia
Answer: B – Archaeopteryx

18. **A fossil that exhibits a mosaic of features common to both an ancestral and a derived group is called?**
A) Index fossil
B) Living fossil
C) Transitional fossil
D) Trace fossil
Answer: C – Transitional fossil

19. **The term "living fossil" refers to a modern species that?**
A) Has recently gone extinct
B) Shows no evolutionary change since its origin
C) Resembles ancient fossil relatives closely
D) Is preserved in amber
Answer: C – Resembles ancient fossil relatives closely

20. **Which of the following is an example of an unaltered fossil?**
A) Petrified wood
B) Carbonized leaf
C) Woolly mammoth in permafrost
D) Internal mould of a shell
Answer: C – Woolly mammoth in permafrost

21. **The process where groundwater minerals fill microscopic pore spaces in bones or wood is called?**
A) Replacement
B) Carbonization
C) Permineralization
D) Recrystallization
Answer: C – Permineralization

22. **Fossilized feces that provide direct evidence of diet and digestive physiology are known as?**
A) Gastroliths
B) Coprolites
C) Steinkerns
D) Ichnofossils
Answer: B – Coprolites

23. **Which type of trace fossil indicates dwelling, feeding, or nesting behavior in sediment?**
A) Tracks
B) Trails
C) Burrows
D) Gastroliths
Answer: C – Burrows

24. **Rapid burial in sediment is a critical condition for fossilization because it?**
A) Enhances mineral replacement
B) Prevents scavenging and weathering
C) Increases body temperature
D) Promotes soft tissue decay
Answer: B – Prevents scavenging and weathering

25. **Lagerstätten are fossil sites characterized by?**
A) Abundant igneous rocks
B) Exceptional preservation of soft tissues
C) Complete absence of invertebrates
D) Only mammalian fossils
Answer: B – Exceptional preservation of soft tissues

26. **The Ediacaran Biota, found in the Proterozoic Eon, represents?**

A) First hard-shelled organisms
B) Complex, soft-bodied multicellular organisms
C) Early flowering plants
D) First vertebrate animals
Answer: B – Complex, soft-bodied multicellular organisms

27. **The first true mammals evolved from which group during the Triassic period?**
A) Therapsid reptiles
B) Cynodont synapsids
C) Theropod dinosaurs
D) Pelycosaurs
Answer: B – Cynodont synapsids

28. **Which group first evolved the amniotic egg, allowing reproduction away from water?**
A) Amphibians
B) Reptiles
C) Bony fishes
D) Synapsids
Answer: B – Reptiles

29. **The evolution of jaws in vertebrates was a major innovation that arose from?**
A) Fusion of skull bones
B) Modification of gill arches
C) Elongation of the notochord
D) Development of paired fins
Answer: B – Modification of gill arches

30. **According to the Tritubercular Theory, the tribosphenic molar is characterized by?**
A) A single linear row of cusps
B) A triangular arrangement of cusps with a crushing heel
C) Extremely high crown height
D) Fusion of cusps into transverse lophs
Answer: B – A triangular arrangement of cusps with a crushing heel

31. **In mammalian dental terminology, the suffix "-conid" refers to cusps on which jaw?**
A) Upper jaw
B) Lower jaw
C) Premaxilla
D) Maxilla
Answer: B – Lower jaw

32. **Selenodont molars, characterized by crescent-shaped ridges, are primarily adapted for?**
A) Shearing meat
B) Crushing insects
C) Grinding fibrous plant material
D) Tearing flesh
Answer: C – Grinding fibrous plant material

33. **Hypsodont teeth, which are high-crowned, are an adaptation for?**
A) Browsing on soft leaves
B) Grazing on abrasive grasses
C) Piercing and holding prey
D) Crushing hard-shelled prey
Answer: B – Grazing on abrasive grasses

34. **The evolution of elephants (Proboscidea) shows a clear trend of?**
A) Decrease in body size
B) Reduction in tusk size
C) Increase in body size and molar complexity
D) Loss of the proboscis
Answer: C – Increase in body size and molar complexity

35. **Moeritherium, an early proboscidean from the late Eocene, is characterized by?**
A) A long trunk and large tusks
B) Small size, no trunk, and bilophodont molars
C) Fully modern elephant dentition
D) Complete loss of incisors
Answer: B – Small size, no trunk, and bilophodont molars

36. **Gomphotherium is distinguished by which dental feature?**
A) Single transverse ridge on molars
B) Trilophodont molars and shovel-like lower tusks
C) Complete absence of enamel on tusks
D) Hypsodont molars with 30 lamellae
Answer: B – Trilophodont molars and shovel-like lower tusks

37. **Mammuthus (mammoths) were cold-adapted proboscideans with molars specialized for?**
A) Browsing soft fruits
B) Grinding tough, silica-rich tundra grasses
C) Filter-feeding aquatic plants
D) Crushing woody stems
Answer: B – Grinding tough, silica-rich tundra grasses

38. **The evolutionary history of camels (Camelidae) originated on which continent?**
A) Asia
B) Africa
C) South America

Zoogeography

1. The specialized branch of biogeography that focuses exclusively on the geographical distribution of animals is called?
A) Phytogeography
B) Ecology
C) Zoogeography
D) Paleontology
Answer: C – Zoogeography

2. Who is widely regarded as the "father of modern zoogeography" for his classical work on the distribution of mammals?
A) P.L. Sclater
B) Alfred Wegener
C) Charles Darwin
D) A.R. Wallace
Answer: D – A.R. Wallace

3. The total range of environmental conditions within which an organism can survive, grow, and reproduce is termed?
A) Ecological niche
B) Habitat specificity
C) Ecological valency
D) Tolerance range
Answer: C – Ecological valency

4. Animals possessing a broad ecological valency and capable of inhabiting a wide variety of habitats are called?
A) Stenotopic
B) Eurytopic
C) Endemic
D) Specialized
Answer: B – Eurytopic

5. The branch of zoogeography that deals with the application of animal distribution knowledge for public health, agriculture, and biological control is called?
A) Causal zoogeography
B) Descriptive zoogeography
C) Applied zoogeography
D) Historical zoogeography
Answer: C – Applied zoogeography

6. The branch of zoogeography that investigates how current environmental factors like climate, competition, and predation determine the realized distribution of species is?
A) Historical zoogeography
B) Ecological zoogeography
C) Experimental zoogeography
D) Systematic zoogeography
Answer: B – Ecological zoogeography

7. The branch of zoogeography that employs controlled experiments, translocations, and introductions to test hypotheses about species dispersal is known as?
A) Descriptive zoogeography
B) Ecological zoogeography
C) Experimental zoogeography
D) Faunistic zoogeography
Answer: C – Experimental zoogeography

8. Reconstructing the evolutionary history of animal distributions using fossils, phylogenetics, and paleogeography is the primary focus of?
A) Applied zoogeography
B) Ecological zoogeography
C) Historical zoogeography
D) Chorological zoogeography
Answer: C – Historical zoogeography

9. The sub-branch of descriptive zoogeography that deals with the discovery, inventory, and documentation of species within a defined region is called?
A) Biocoenotic zoogeography
B) Chorological zoogeography
C) Systematic zoogeography
D) Faunistic zoogeography
Answer: D – Faunistic zoogeography

10. The study of the geographical distribution and dynamics of entire animal communities (biocoenoses) across environmental gradients is termed?
A) Faunistic zoogeography
B) Biocoenotic zoogeography
C) Systematic zoogeography
D) Chorological zoogeography
Answer: B – Biocoenotic zoogeography

11. The pattern of animal distribution characterized by a species occurring across most or all of the world wherever suitable habitat exists is known as?
A) Discontinuous distribution

B) Endemic distribution
C) Cosmopolitan distribution
D) Isolated distribution
Answer: C – Cosmopolitan distribution

12. Animals with narrow, specific ecological requirements that confine them to particular habitats are termed?
A) Eurytopic
B) Cosmopolitan
C) Stenotopic
D) Eurythermal
Answer: C – Stenotopic

13. The distribution pattern where closely related taxa are found in two or more widely separated geographic areas with no populations in between is called?
A) Cosmopolitan
B) Discontinuous (Disjunct)
C) Bipolar
D) Continuous
Answer: B – Discontinuous (Disjunct)

14. The presence of lungfishes (Protopterus in Africa, Lepidosiren in South America, and Neoceratodus in Australia) is a classic example of which distribution pattern?
A) Cosmopolitan
B) Endemic
C) Bipolar
D) Discontinuous
Answer: D – Discontinuous

15. According to Darlington, the mechanism of discontinuous distribution where a population disappears from the central part of a formerly continuous range is called?
A) Dispersal across barriers
B) Vicariance
C) Extinction in intermediate regions
D) Adaptive radiation
Answer: C – Extinction in intermediate regions

16. The physical splitting of a continuous range due to the emergence of a new barrier like continental rifting or mountain uplift is known as?
A) Dispersal
B) Vicariance
C) Endemism
D) Migration
Answer: B – Vicariance

17. A species that is naturally restricted to a specific geographic region and not found anywhere else is said to have which type of distribution?
A) Cosmopolitan
B) Discontinuous
C) Endemic
D) Bipolar
Answer: C – Endemic

18. The Nilgai (Indian subcontinent), Giraffe (Africa), and Sloths (Neotropical region) are characteristic examples of which distribution pattern?
A) Cosmopolitan
B) Discontinuous
C) Isolated
D) Endemic
Answer: D – Endemic

19. Monotremes (egg-laying mammals) largely confined to Australia and New Guinea exemplify which type of animal distribution?
A) Cosmopolitan
B) Discontinuous
C) Isolated
D) Bipolar
Answer: C – Isolated

20. The distribution pattern exhibited by animals found in both Arctic and Antarctic regions but absent from intervening tropical zones is called?
A) Endemic
B) Discontinuous
C) Bipolar
D) Isolated
Answer: C – Bipolar

21. Which of the following is an example of a topographic barrier that separates the Palearctic and Oriental faunas?
A) Sahara Desert
B) Himalayas
C) Atlantic Ocean
D) Ural Mountains
Answer: B – Himalayas

22. The Sahara Desert acts as a sharp faunal boundary between which two zoogeographical regions?
A) Nearctic and Neotropical
B) Palearctic and Ethiopian

Wildlife

1. The study of relationships between organisms and their environment is called?
A) Biodiversity
B) Ecology
C) Biosphere
D) Zoology
Answer: B – Ecology

2. The variety of organisms within a particular habitat is known as?
A) Alpha diversity
B) Beta diversity
C) Gamma diversity
D) Delta diversity
Answer: A – Alpha diversity

3. A species native and restricted to a particular area is called?
A) Exotic
B) Feral
C) Endemic
D) Extinct
Answer: C – Endemic

4. Which conservation status faces extremely high risk of extinction?
A) Vulnerable
B) Endangered
C) Critically Endangered
D) Near Threatened
Answer: C – Critically Endangered

5. Conservation outside natural habitats is termed as?
A) In-situ conservation
B) Ex-situ conservation
C) Sustainable use
D) Habitat restoration
Answer: B – Ex-situ conservation

6. The natural home of an organism is its?
A) Niche
B) Territory
C) Habitat
D) Home range
Answer: C – Habitat

7. Regular seasonal two-way movement between areas is called?
A) Dispersal
B) Migration
C) Homing
D) Philopatry
Answer: B – Migration

8. An animal that eats only plants is called?
A) Carnivore
B) Omnivore
C) Herbivore
D) Insectivore
Answer: C – Herbivore

9. Maximum individuals an environment can support is?
A) Population density
B) Carrying capacity
C) Limiting factor
D) Mortality rate
Answer: B – Carrying capacity

10. Regulation of body temperature by physiological means is?
A) Poikilothermy
B) Homeothermy
C) Hibernation
D) Aestivation
Answer: B – Homeothermy

11. A species with disproportionately large effect on ecosystem is called?
A) Flagship species
B) Keystone species
C) Umbrella species
D) Indicator species
Answer: B – Keystone species

12. The International conservation organization founded in 1961 is?
A) IUCN
B) WWF
C) CITES
D) UNEP
Answer: B – WWF

13. A wetland of international importance is called?
A) Biosphere reserve
B) Ramsar site
C) National park
D) Game reserve
Answer: B – Ramsar site

14. The branch of zoology dealing with birds is?
A) Herpetology
B) Ornithology
C) Ichthyology
D) Entomology
Answer: B – Ornithology

15. Non-living components of environment are called?
A) Biotic factors
B) Abiotic factors
C) Edaphic factors
D) Environmental factors
Answer: B – Abiotic factors

16. The linear sequence of energy transfer in an ecosystem is?
A) Food web
B) Trophic level
C) Food chain
D) Biomass pyramid
Answer: C – Food chain

17. Which principle states wildlife has worth independent of human utility?
A) Intergenerational equity
B) Public trust doctrine
C) Intrinsic value principle
D) Anthropocentrism
Answer: C – Intrinsic value principle

18. The variety of life at genetic, species and ecosystem levels is?
A) Ecology
B) Biodiversity
C) Biosphere
D) Niche
Answer: B – Biodiversity

19. The leading cause of contemporary wildlife declines is termed?
A) Natural selection
B) The sixth mass extinction
C) Genetic erosion
D) Ecological succession
Answer: B – The sixth mass extinction

20. Introduction of species that outcompete natives is called?
A) Habitat fragmentation
B) Overexploitation
C) Invasive alien species
D) Pollution
Answer: C – Invasive alien species

21. A protected area with minimal human disturbance for science is IUCN Category?
A) Ia
B) II
C) IV
D) VI
Answer: A – Ia

22. Moving species to new areas due to climate change is called?
A) Reintroduction
B) Reinforcement
C) Assisted colonization
D) Translocation
Answer: C – Assisted colonization

23. The population assessment method involving capture and recapture is?
A) Transect survey
B) Camera trapping
C) Capture-mark-recapture
D) Acoustic monitoring
Answer: C – Capture-mark-recapture

24. The national park known for Himalayan Brown Bear in Pakistan is?
A) Khunjerab
B) Deosai
C) Hingol
D) Lal Suhanra
Answer: B – Deosai

25. The critically endangered mammal of Indus River is?
A) Snow leopard
B) Markhor
C) Indus River dolphin
D) Balochistan bear
Answer: C – Indus River dolphin

26. The veterinary drug causing vulture decline is?
A) Penicillin
B) Ivermectin
C) Diclofenac
D) Paracetamol
Answer: C – Diclofenac

27. The largest freshwater lake in Pakistan is?
A) Haleji Lake
B) Keenjhar Lake

Conservation Biology

1. Conservation biology is best defined as which of the following?
A) The study of animal behavior in the wild.
B) The science of protecting and restoring biodiversity.
C) The management of zoos and captive breeding.
D) A discipline focused only on saving popular species.
Answer: The science of protecting and restoring biodiversity.

2. What are the three main levels at which biodiversity is measured?
A) Species, community, ecosystem.
B) Genetic, species, ecosystem.
C) Individual, population, landscape.
D) Cellular, organismal, ecological.
Answer: Genetic, species, ecosystem.

3. Which human activity is considered the single greatest threat to biodiversity worldwide?
A) Overharvesting.
B) Climate change.
C) Habitat loss and fragmentation.
D) Introduction of invasive species.
Answer: Habitat loss and fragmentation.

4. What term describes the number of different species in a given area?
A) Genetic diversity.
B) Species richness.
C) Ecosystem diversity.
D) Population density.
Answer: Species richness.

5. An endangered species is officially defined as one that is:
A) Likely to become threatened in the near future.
B) Restricted to a very small geographic range.
C) In immediate danger of extinction throughout all or much of its range.
D) No longer found in the wild.
Answer: In immediate danger of extinction throughout all or much of its range.

6. The process by which pollutants become more concentrated in successive trophic levels is called:
A) Bioaccumulation.
B) Eutrophication.
C) Biological magnification.
D) Genetic drift.
Answer: Biological magnification.

7. What is the minimum viable population (MVP)?
A) The largest population an environment can support.
B) The smallest population size that can avoid extinction in the foreseeable future.
C) The number of individuals in a habitat fragment.
D) The effective breeding population size.
Answer: The smallest population size that can avoid extinction in the foreseeable future.

8. Which formula is used to estimate the effective population size (N_e)?
A) $N_e = N_m + N\_f$.
B) $N_e = (4N_mN\_f)/(N_m + N\_f)$.
C) $N_e = N_t / 2$.
D) $N_e = N_m \times N\_f$.
Answer: $(4N_mN\_f)/(N_m + N\_f)$.

9. What does an "extinction vortex" describe?
A) A rapid increase in population size.
B) The interaction of small population size, genetic drift, and inbreeding leading to extinction.
C) The natural background rate of species loss.
D) The process of habitat fragmentation.
Answer: The interaction of small population size, genetic drift, and inbreeding leading to extinction.

10. Biodiversity hotspots are characterized primarily by having:
A) Very low human population density.
B) High numbers of endemic species under significant threat.
C) The world's largest protected areas.
D) Extremely stable climatic conditions.
Answer: High numbers of endemic species under significant threat.

11. Which greenhouse gas is primarily responsible for the anthropogenic enhancement of Earth's natural greenhouse effect?
A) Methane (CH_4).
B) Nitrous oxide (N_2O).
C) Carbon dioxide (CO_2).
D) Ozone (O_3).
Answer: Carbon dioxide (CO_2).

12. The primary cause of stratospheric ozone depletion is the release of:
A) Carbon dioxide from burning fossil fuels.
B) Sulfur dioxide from industrial processes.
C) Chlorofluorocarbons (CFCs).
D) Methane from agriculture.
Answer: Chlorofluorocarbons (CFCs).

13. What is the main cause of seasonal "dead zones" in coastal waters, such as in the Gulf of Mexico?
A) Oil spills.
B) Thermal pollution from power plants.
C) Nutrient runoff leading to eutrophication.
D) Direct dumping of industrial waste.
Answer: Nutrient runoff leading to eutrophication.

14. What conservation strategy involves an extensive region with a strictly protected core surrounded by buffer zones allowing sustainable use?
A) Habitat corridor.
B) Biodiversity hotspot.
C) Zoned reserve.
D) Ex situ conservation.
Answer: Zoned reserve.

15. The innate human emotional connection to and desire to affiliate with nature and other life forms is termed:
A) Biophobia.
B) Biodiversity.
C) Biophilia.
D) Bioethics.
Answer: Biophilia.

16. Acid precipitation is primarily caused by atmospheric emissions of:
A) Carbon monoxide and ozone.
B) Sulfur oxides and nitrogen oxides.
C) Methane and CFCs.
D) Particulate matter and lead.
Answer: Sulfur oxides and nitrogen oxides.

17. Which of the following is a key example of an ecosystem service?
A) Production of timber.
B) Water purification by wetlands.
C) Revenue from ecotourism.
D) Genetic material for crop breeding.
Answer: Water purification by wetlands.

18. The decline of the Illinois greater prairie chicken population was primarily reversed by:
A) Banning hunting.
B) Reducing pesticide use.
C) Translocating birds to increase genetic variation.
D) Creating large habitat corridors.
Answer: Translocating birds to increase genetic variation.

19. Dams and water diversions primarily threaten aquatic biodiversity by causing:
A) Increased water temperature.
B) Habitat loss and fragmentation.
C) Introduction of invasive species.
D) A decrease in water pH.
Answer: Habitat loss and fragmentation.

20. The rosy periwinkle (Catharanthus roseus) is significant in conservation because it provides:
A) High-quality timber.
B) Alkaloids used to treat leukemia and Hodgkin's lymphoma.
C) A model for genetic studies.
D) Excellent erosion control.
Answer: Alkaloids used to treat leukemia and Hodgkin's lymphoma.

21. The "critical load" for an ecosystem refers to the amount of a pollutant, such as nitrogen, that:
A) Causes immediate species extinction.
B) Can be absorbed without damaging ecosystem integrity.
C) Is needed for optimal plant growth.
D) Is released annually by human activities.
Answer: Can be absorbed without damaging ecosystem integrity.

22. Which international treaty is specifically aimed at phasing out ozone-depleting substances?
A) Kyoto Protocol.
B) Paris Agreement.
C) Montreal Protocol.
D) Convention on Biological Diversity.
Answer: Montreal Protocol.

23. The study of organisms and their interactions within urban environments is called:
A) Landscape ecology.
B) Urban ecology.
C) Conservation biology.
D) Restoration ecology.
Answer: Urban ecology.

24. The primary purpose of creating movement corridors between habitat fragments is to:
A) Increase edge effects.
B) Promote dispersal and genetic exchange.
C) Isolate predator populations.
D) Facilitate human recreation.
Answer: Promote dispersal and genetic exchange.
25. Approximately what percentage of Earth's land surface is currently under some form of official protection?
A) About 7%.
B) About 15%.
C) About 25%.
D) About 50%.
Answer: About 7%.
26. The dramatic recovery of bird populations like the bald eagle and peregrine falcon followed the ban on which pesticide?
A) PCBs.
B) DDT.
C) Lead shot.
D) Atrazine.
Answer: DDT.
27. Sustainable development is defined as meeting the needs of the present:
A) By maximizing economic growth.
B) Without compromising the ability of future generations to meet their own needs.
C) Through technological innovation alone.
D) Primarily by protecting all natural areas from human use.
Answer: Without compromising the ability of future generations to meet their own needs.
28. Which trophic level is most severely affected by the biological magnification of toxins like PCBs or mercury?
A) Primary producers.
B) Primary consumers.
C) Secondary consumers.
D) Top-level carnivores.
Answer: Top-level carnivores.
29. The primary anthropogenic sources of increased fixed nitrogen in the biosphere are:
A) Volcanic eruptions and lightning.
B) Industrial fertilizers and fossil fuel combustion.
C) Natural nitrogen-fixing bacteria.
D) Decomposition of organic matter.
Answer: Industrial fertilizers and fossil fuel combustion.
30. The current rapid increase in atmospheric CO_2 concentration is mainly due to:
A) Volcanic activity.
B) Burning of fossil fuels and deforestation.
C) Cellular respiration by all organisms.
D) Ocean outgassing.
Answer: Burning of fossil fuels and deforestation.
31. What defines an invasive (introduced) species?
A) A species that is native but very abundant.
B) A non-native species that spreads rapidly and harms native communities.
C) Any species that is endangered.
D) A species that increases local biodiversity.
Answer: A non-native species that spreads rapidly and harms native communities.
32. The catastrophic decline of the Atlantic bluefin tuna is a classic example of which threat?
A) Habitat loss.
B) Overharvesting.
C) Climate change.
D) Pollution.
Answer: Overharvesting.
33. The main ecological benefit of establishing marine reserves is to:
A) Increase immediate fishing yields within the reserve.
B) Allow fish populations to recover and "spill over" into adjacent areas.
C) Facilitate deep-sea mining operations.
D) Serve as dumping grounds for waste.
Answer: Allow fish populations to recover and "spill over" into adjacent areas.
34. Small populations lose genetic diversity primarily due to:
A) Increased mutation rates.
B) Inbreeding and genetic drift.
C) Stronger natural selection.
D) High levels of gene flow.
Answer: Inbreeding and genetic drift.
35. The variety of different ecosystems on Earth is a measure of:
A) Genetic diversity.
B) Species diversity.
C) Ecosystem diversity.

Lecturer Zoology Solved Past Papers

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1. At cytokinesis in plants, a structure phragmoplast is formed from vesicles which originate from.
A) Lysosome
B) Centriole
C) Golgi complex
D) Glyoxisomes
Answer: Golgi complex

2. An alpha helix is an example of ---- structure of proteins.
A) Primary
B) Secondary
C) Tertiary
D) Quaternary
Answer: Secondary

3. Central dogma of molecular biology is.
A) DNA-RNA-Protein
B) DNA-DNA-Protein
C) RNA-Protein-DNA
D) RNA-DNA-Protein
Answer: DNA-RNA-Protein

4. An enzyme---the activation energy of reaction.
A) Lowers
B) Raises
C) Does not affect
D) None of these
Answer: Lowers

5. Which cell type you will prefer to take nucleus for cloning?
A) B-cell
B) RBC
C) Embryonic cell
D) Sperm
Answer: Embryonic cell

6. Where do you transfer nucleus for cloning?
A) Enucleated cell
B) Enucleated egg
C) Egg
D) Sperm
Answer: Enucleated egg

7. With respect to outside, the inside of a neuron at rest is.
A) More negatively charged
B) More positively charged
C) Same charges
D) Zero electronic potential
Answer: More negatively charged

8. What is the normal resting potential of a neuron?
A) -70 mv
B) +70 mv
C) 0 mv
D) -90 mv
Answer: -70 mv

9. What are the characters of stem cells?
A) Self renewing
B) Can differentiate into other cells
C) Both a & b
D) None of these
Answer: Both a & b

10. Prions are made of.
A) Viruses
B) DNA
C) RNA
D) Proteins
Answer: Proteins

11. Larva of sponges is called.
A) Amphiblastula
B) Trochophore
C) Pinnaria
D) Segetaria
Answer: Amphiblastula

12. Sycon belongs to class.
A) Desmospongia
B) Hexactinellida
C) Calcarea
D) Porifera
Answer: Calcarea

13. The class corals is.
A) Anthozoa
B) Scyphozoa
C) Hydrozoa
D) Actinozoa
Answer: Anthozoa

14. The true nervous system was first developed in.
A) Annelida
B) Cnidarians
C) Flatworms
D) Sponges
Answer: Flatworms

15. These are free living Platyhelminthes.
A) Cestodes
B) Trematodes
C) Turbellaria
D) Nematodes
Answer: Turbellaria

16. Which of the following are responsible to cause Klinefelter's syndrome?
A) XO
B) XXY
C) XY

D) XYY
Answer: XXY
17. Why there is no duplication of DNA between Meiosis I and Meiosis II?
A) To produce genetically identical cells
B) To increase genetic variability
C) To reduce the chromosome number to haploid in the resulting daughter cells
D) The chromosome duplicate twice during meiosis
Answer: To reduce the chromosome number to haploid in the resulting daughter cells
18. Why are there more males with color blindness than female?
A) The gene is found on the Y chromosome
B) The recessive gene is masked by another X chromosome in females
C) Color blindness is an X linked dominant trait
D) All the sons of an affected male have the disaster
Answer: The recessive gene is masked by another X chromosome in females
19. During meiosis the chromatids become daughter chromosomes during.
A) Prophase I
B) Metaphase II
C) Anaphase II
D) Telophase I
Answer: Anaphase II
20. Which of the following is correct with Aneuploidy?
A) 3n+1
B) 4n+1
C) All individuals die before birth
D) 2n+1
Answer: 2n+1
21. The genetic disorder sickle cell anemia is an example of.
A) Pleiotropy
B) Heterozygous dominance
C) Epistasis
D) Homozygous dominance
Answer: Pleiotropy
22. The X-ray diffraction studies by----played key role to the discovery of DNA structure.
A) Watson & Crick
B) Franklin
C) Meselson & Stahl
D) Chargaff
Answer: Franklin
23. Triplet code of CAT in DNA is represented as --- in mRNA and ---- in tRNA.
A) GAA, CAT
B) CAT, CAT
C) GTA, CAU
D) GUA, CAU
Answer: GUA, CAU
24. Turner's syndrome.
A) The cell contain 45 chromosomes
B) 50% offspring inherit the disease
C) There is an increased risk of hypertension
D) The patient is below the average height
Answer: The cell contain 45 chromosomes
25. The following is a steroid hormone.
A) Corticotrophin hormone (ACTH)
B) Aldosteron
C) Growth hormone
D) Thyroid stimulating hormone (TSH)
Answer: Aldosteron
26. Insulin.
A) Is secreted as pro-insulin
B) Is steroid hormone
C) Is required for glucose uptake in all tissues
D) Increase the uptake of lipoprotein
Answer: Is secreted as pro-insulin
27. These are schizocoelic phyla.
A) Porifera, Coelentrata & Platyhelminthes
B) Annelida, Arthropoda & Mollusca
C) Platyhelminthes, Aschelminthes & Annelida
D) Arthropoda, Mollusca & Echinodermata
Answer: Annelida, Arthropoda & Mollusca
28. Petromyzoan belongs to.
A) Agnatha
B) Gnathostomata
C) Protochordata
D) Eurochordata
Answer: Agnatha
29. Lateral line system is present in.
A) Fish
B) Frog
C) Reptile
D) Dinosaur
Answer: Fish
30. Classification of arthropods is based on number and structure of.
A) Eyes and wings
B) Body segments and appendages
C) Muscles and ligaments
D) Gills and hearts
Answer: Body segments and appendages
31. The uniqueness of adult echinoderms is due to.
A) Penta-radial symmetry, hydrocoele
B) Bilateral symmetry, hydrocoele
C) Bilateral symmetry, endocoele
D) Penta-radial symmetry, endocoele
Answer: Penta-radial symmetry, hydrocoele
32. The larval form of liver fluke has cilia.
A) Redia
B) Sporocyst

C) Miracidium
D) Metacercaria
Answer: Miracidium
33. Which of the following is evidence that molluscs and annelids may have a common ancestor?
A) They have setae
B) They have trochophore larva
C) Neither group has lungs
D) They include both marine and terrestrial animals
Answer: They have trochophore larva
34. The arboreal adaptations are those that help the animal to live in and on.
A) Burrows
B) Air
C) Trees
D) Rocks
Answer: Trees
35. Ctenoid scales are present on the bodies of.
A) Chondrichthyes
B) Osteichthyes
C) Cyclostomes
D) Myxini
Answer: Osteichthyes
36. This is not a characteristic of primates.
A) Opposable digits
B) A well developed cerebrum
C) Binocular vision
D) A cloaca
Answer: A cloaca
37. Birds that fly at high altitude need an especially efficient respiratory system because.
A) At high altitude the air sacs do not function
B) There is little oxygen in the atmosphere at high altitude
C) At high altitude birds flap their wings faster
D) There is little carbon dioxide at high altitude
Answer: There is little oxygen in the atmosphere at high altitude
38. When cell wall is removed from plant cell then it is called.
A) Protoplast
B) Protoblast
C) Myoplast
D) Prothallus
Answer: Protoplast
39. The virus used during cell fusion technique is.
A) Rous sarcoma
B) Influenza
C) Retrovirus
D) Sendai
Answer: Sendai
40. Nucleolar organizer contains ---- tRNA genes.
A) 45
B) 450
C) 4500
D) 2500
Answer: 450
41. Nucleolar organizer is separated from rest of chromosome by.
A) Primary constriction
B) Chromosome
C) Secondary constriction
D) Centromere
Answer: Secondary constriction
42. This chemical inhibits protein synthesis in prokaryotes.
A) Amanitin
B) Cycloheximide
C) Penicillin
D) Chloramphenicol
Answer: Chloramphenicol
43. Linker region have ---- base pairs when nucleosome repeat after every 200bp.
A) 34
B) 44
C) 54
D) 64
Answer: 54
44. Nucleic acid absorbs ultraviolet light at.
A) 320 nm
B) 260 nm
C) 480 nm
D) 660 nm
Answer: 260 nm
45. RNA polymerase III transcribe the genes of.
A) tRNA
B) mRNA
C) rRNA
D) All of these
Answer: tRNA
46. Re-initiation of DNA duplication within the same cycle is prevented in.
A) Eukaryotes
B) Prokaryotes
C) Viroids
D) Viruses
Answer: Eukaryotes
47. Thymine dimers damage in DNA is produced by ---- radiations.
A) Gamma
B) Infra-red
C) Ultraviolet
D) All of these
Answer: Ultraviolet
48. Which one of the following is initiation codon?
A) UGU
B) UAG
C) AUA