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# BIOLOGY

## Lecturer Guide

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## Introduction to Biology & Its Modern Trends

1. The term **Biology** is derived from the Greek words meaning:

- A) Animal and discourse
- B) Life and study
- C) Plant and logic
- D) Nature and science

**Answer: Life and study**

2. The scientific study of life is known as:

- A) Ecology
- B) Biology
- C) Zoology
- D) Physiology

**Answer: Biology**

3. Who first formally used the term "**Biology**"?

- A) Aristotle
- B) Theophrastus
- C) Carl Linnaeus
- D) Lamarck

**Answer: Carl Linnaeus**

4. The study of animals is called:

- A) Botany
- B) Microbiology
- C) Zoology
- D) Morphology

**Answer: Zoology**

5. The study of plants is called:

- A) Zoology
- B) Botany
- C) Microbiology
- D) Anatomy

**Answer: Botany**

6. The study of microorganisms is called:

- A) Botany
- B) Zoology
- C) Microbiology
- D) Histology

**Answer: Microbiology**

7. The study of the form and structure of organisms is:

- A) Physiology
- B) Anatomy
- C) Morphology
- D) Histology

**Answer: Morphology**

8. The study of internal structure is called:

- A) Morphology
- B) Histology
- C) Anatomy
- D) Physiology

**Answer: Anatomy**

9. The microscopic study of tissues is called:

- A) Cytology
- B) Anatomy
- C) Histology
- D) Morphology

**Answer: Histology**

10. The study of cell structure and function is called:

- A) Histology
- B) Cytology
- C) Physiology
- D) Embryology

**Answer: Cytology**

11. The study of the functions of body parts is:

- A) Anatomy
- B) Physiology
- C) Morphology
- D) Histology

**Answer: Physiology**

12. The study of heredity and variation is:

- A) Ecology
- B) Genetics
- C) Embryology
- D) Taxonomy

**Answer: Genetics**

13. The study of fossils is called:

- A) Palaeontology
- B) Taxonomy
- C) Embryology
- D) Ecology

**Answer: Palaeontology**

14. The naming and classification of organisms is:

- A) Ecology
- B) Genetics
- C) Taxonomy
- D) Physiology

**Answer: Taxonomy**



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## Cell Structure & Functions

1) Who first used the term "cell" to describe the microscopic compartments in cork?

- A) Antonie van Leeuwenhoek
- B) Matthias Schleiden
- C) Robert Hooke
- D) Rudolf Virchow

**Answer: Robert Hooke**

2) Which of the following is NOT a tenet of the modern cell theory?

- A) All living organisms are composed of one or more cells.
- B) The cell is the basic unit of structure and function in living things.
- C) All cells contain a membrane-bound nucleus.
- D) All cells arise from pre-existing cells.

**Answer: All cells contain a membrane-bound nucleus.**

3) Which of the following is considered a major exception to the cell theory?

- A) Bacteria
- B) Fungi
- C) Viruses
- D) Plant cells

**Answer: Viruses**

4) The maximum useful magnification of a standard compound light microscope is approximately:

- A) 400x
- B) 1000-1500x
- C) 10,000x
- D) 1,000,000x

**Answer: 1000-1500x**

5) The ability of a microscope to distinguish two closely spaced points as separate is called its:

- A) Magnification
- B) Resolution

- C) Refraction
- D) Illumination

**Answer: Resolution**

6) Which type of microscope uses a beam of electrons to visualize the internal ultrastructure of thinly sliced specimens?

- M A) Phase-contrast microscope
- B) Scanning Electron Microscope (SEM)
- K C) Transmission Electron Microscope (TEM)
- D) Dark-field microscope

**Answer: Transmission Electron Microscope (TEM)**

7) Cryo-electron microscopy is particularly valuable because it:

- P A) Uses heavy metal stains for high contrast
- R B) Allows visualization of specimens in a near-native, hydrated state
- E C) Is ideal for observing living, moving cells
- P D) Has a resolution limit equal to light microscopy
- A

**Answer: Allows visualization of specimens in a near-native, hydrated state**

8) Cell fractionation, a technique to separate cellular components, primarily separates organelles based on their:

- T A) Color and electrical charge
- I B) Size and density
- O C) Magnetic properties
- D) Enzymatic activity
- N

**Answer: Size and density**

9) All cells, both prokaryotic and eukaryotic, are surrounded by:

- S A) A cell wall made of cellulose
- B) A phospholipid bilayer plasma membrane
- C) A capsule of glycoproteins
- D) A nuclear envelope

**Answer: A phospholipid bilayer plasma membrane**

**10) In a prokaryotic cell, the region where the genetic material is located is called the:**

- A) Nucleus
- B) Nucleolus
- C) Nucleoid
- D) Nuclear pore

**Answer: Nucleoid**

**11) A key structural difference between bacterial and archaeal cell membranes involves the type of linkage in their lipids:**

- A) Bacteria have ester linkages; Archaea have ether linkages.
- B) Archaea have peptidoglycan in their membranes.
- C) Bacteria have a true nucleus.
- D) Archaea have 80S ribosomes.

**Answer: Bacteria have ester linkages; Archaea have ether linkages.**

**12) The ribosomes found in the cytosol of eukaryotic cells are designated as:**

- A) 70S
- B) 80S
- C) 60S
- D) 50S

**Answer: 80S**

**13) Which cellular structure is the primary site for ribosomal RNA (rRNA) transcription and ribosomal subunit assembly?**

- A) Nucleus
- B) Nucleolus
- C) Rough Endoplasmic Reticulum
- D) Golgi Apparatus

**Answer: Nucleolus**

**14) Nuclear Pore Complexes (NPCs) primarily function to:**

- A) Synthesize DNA
- B) Regulate active transport of macromolecules

between nucleus and cytoplasm

C) Provide structural support to the nuclear envelope

D) Digest damaged organelles

**Answer: Regulate active transport of macromolecules between nucleus and cytoplasm**

**15) Proteins destined for secretion from the cell are synthesized by ribosomes attached to the:**

- A) Free ribosomes in the cytosol
- B) Rough Endoplasmic Reticulum
- C) Smooth Endoplasmic Reticulum
- D) Outer nuclear membrane

**Answer: Rough Endoplasmic Reticulum**

**16) Which of the following is NOT a primary function of the Smooth Endoplasmic Reticulum (SER)?**

- A) Lipid and steroid hormone synthesis
- B) Detoxification of drugs and poisons
- C) Storage of calcium ions
- D) Synthesis of secretory proteins

**Answer: Synthesis of secretory proteins**

**17) In muscle cells, the specialized form of smooth ER that stores calcium ions is called the:**

- A) Golgi apparatus
- B) Sarcoplasmic reticulum
- C) Peroxisome
- D) Lysosome

**Answer: Sarcoplasmic reticulum**

**18) The side of the Golgi apparatus that receives transport vesicles from the ER is known as the:**

- A) trans face
- B) maturing face
- C) cis face
- D) convex face

**Answer: cis face**





19) Lysosomes maintain their internal acidic pH primarily through the action of:

- A) Sodium-potassium pumps
- B) V-type H<sup>+</sup> ATPase pumps
- C) Simple diffusion of protons
- D) Calcium ion channels

Answer: V-type H<sup>+</sup> ATPase pumps

20) The process by which lysosomes digest a cell's own damaged organelles is called:

- A) Phagocytosis
- B) Autophagy
- C) Pinocytosis
- D) Exocytosis

Answer: Autophagy

21) Tay-Sachs disease is a lysosomal storage disorder resulting from a deficiency in which enzyme?

- A) Glucocerebrosidase
- B) Hexosaminidase A
- C) Catalase
- D) Cytochrome P450

Answer: Hexosaminidase A

22) The large central vacuole in plant cells is involved in all of the following EXCEPT:

- A) Storage of ions and metabolites
- B) Maintenance of turgor pressure
- C) Photosynthesis
- D) Waste sequestration

Answer: Photosynthesis

23) The infoldings of the inner mitochondrial membrane are called:

- A) Cristae
- B) Thylakoids
- C) Cisternae
- D) Grana

Answer: Cristae

24) According to the Endosymbiotic Theory, mitochondria are believed to have evolved from:

- A) Cyanobacteria
- B) Alpha-proteobacteria
- C) Archaea
- D) Early eukaryotic nuclei

Answer: Alpha-proteobacteria

25) Which organelle contains the enzyme catalase, responsible for breaking down hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>)?

- A) Peroxisome
- B) Lysosome
- C) Glyoxysome
- D) Golgi apparatus

Answer: Peroxisome

26) Glyoxysomes, specialized peroxisomes found in germinating seeds, are primarily involved in:

- A) The Calvin cycle
- B) The glyoxylate cycle (converting fats to carbohydrates)
- C) The Krebs cycle
- D) Photorespiration

Answer: The glyoxylate cycle (converting fats to carbohydrates)

27) The thickest filaments of the cytoskeleton, composed of tubulin, are called:

- A) Microfilaments
- B) Intermediate filaments
- C) Microtubules
- D) Myosin filaments

Answer: Microtubules

28) Which motor protein typically moves cargo toward the minus end (center) of microtubules?

- A) Kinesin
- B) Myosin
- C) Dynein
- D) Actin

Answer: Dynein



29) The characteristic "9+2" arrangement of microtubules is found in the core structure

(axoneme) of:

- A) Centrioles
- B) Microvilli
- C) Cilia and flagella
- D) The nuclear lamina

**Answer: Cilia and flagella**

30) The primary function of the centrosome in animal cells is to:

- A) Synthesize ATP
- B) Act as the Microtubule Organizing Center (MTOC)
- C) Digest cellular waste
- D) Store genetic material

**Answer: Act as the Microtubule Organizing Center (MTOC)**

31) According to the Fluid Mosaic Model, the plasma membrane is best described as:

- A) A static bilayer of proteins with embedded lipids
- B) A fluid bilayer of phospholipids with embedded proteins
- C) A rigid layer of cellulose with protein channels
- D) A single layer of phospholipids coated with carbohydrates

**Answer: A fluid bilayer of phospholipids with embedded proteins**

32) The role of cholesterol in the animal cell plasma membrane is to:

- A) Act as a hormone receptor
- B) Increase fluidity at low temperatures and decrease it at high temperatures
- C) Facilitate active transport of ions
- D) Synthesize steroid hormones

**Answer: Increase fluidity at low temperatures and decrease it at high temperatures**



33) The net movement of water across a selectively permeable membrane from an area of low solute concentration to high solute concentration is called:

- A) Simple diffusion
- B) Facilitated diffusion
- C) Osmosis
- D) Active transport

**Answer: Osmosis**

M

K

34) The Sodium-Potassium Pump (Na<sup>+</sup>/K<sup>+</sup> ATPase) is a classic example of:

- A) Simple diffusion
- B) Facilitated diffusion
- C) Primary active transport
- D) Secondary active transport

P

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35) Receptor-mediated endocytosis often involves the formation of specialized pits coated with the protein:

- A) Actin
- B) Clathrin
- C) Tubulin
- D) Keratin

P

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**Answer: Clathrin**

A

36) The primary structural component of the plant cell wall is:

- A) Chitin
- B) Cellulose microfibrils
- C) Peptidoglycan
- D) Collagen

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**Answer: Cellulose microfibrils**

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37) Plasmodesmata in plant cells serve to:

- A) Provide tensile strength
- B) Connect the cytoplasm of adjacent cells for communication
- C) Anchor the cell to the extracellular matrix
- D) Seal cells into leak-proof sheets

**Answer: Connect the cytoplasm of adjacent cells for communication**



**38) Which component of the animal extracellular matrix (ECM) provides great tensile strength?**

- A) Elastin
- B) Proteoglycans
- C) Collagen
- D) Fibronectin

**Answer: Collagen**

**39) Transmembrane proteins that link the extracellular matrix to the intracellular cytoskeleton are called:**

- A) Integrins
- B) Cadherins
- C) Connexins
- D) Claudins

**Answer: Integrins**

**40) Tight junctions in epithelial tissues primarily function to:**

- A) Allow passage of ions and small molecules
- B) Provide strong mechanical adhesion
- C) Create a seal preventing leakage between cells
- D) Anchor cells to the basal lamina

**Answer: Create a seal preventing leakage between cells**

**41) Gap junctions are composed of proteins called:**

- A) Integrins
- B) Cadherins
- C) Connexins
- D) Keratins

**Answer: Connexins**

**42) Stem cells that can give rise to all cell types in an organism, including extraembryonic tissues, are termed:**

- A) Pluripotent
- B) Multipotent
- C) Totipotent

D) Unipotent

**Answer: Totipotent**



**43) Induced Pluripotent Stem Cells (iPSCs) are created by:**

- A) Fertilizing an egg cell
- B) Reprogramming adult somatic cells
- C) Isolating cells from the inner cell mass of a blastocyst
- D) Fusing two different cell types

**Answer: Reprogramming adult somatic cells**

**M  
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**44) A major disadvantage associated with the use of iPSCs is:**

- A) They are ethically controversial to obtain.
- B) They cannot differentiate into many cell types.
- C) They carry a risk of tumor formation due to the reprogramming process.
- D) They are extremely difficult to culture in the lab.

**P  
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**Answer: They carry a risk of tumor formation due to the reprogramming process.**

**P  
A**

**45) A key structural difference between plant and animal cells is that plant cells possess:**

- A) Centrioles
- B) A cell wall and chloroplasts
- C) Lysosomes
- D) Numerous small vacuoles

**A  
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**Answer: A cell wall and chloroplasts**

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**46) The main carbohydrate storage molecule in plant cells is:**

- A) Glycogen
- B) Starch
- C) Cellulose
- D) Chitin

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**Answer: Starch**



**47) The main carbohydrate storage molecule in animal cells is:**

- A) Glycogen
- B) Starch

C) Cellulose

D) Sucrose

**Answer: Glycogen**

**48) Cytokinesis in plant cells occurs through the formation of a:**

A) Cleavage furrow

B) Contractile ring of actin and myosin

C) Cell plate

D) Septum

**Answer: Cell plate**

**49) Which of the following organelles is typically absent in plant cells?**

A) Mitochondria

B) Centrioles

C) Peroxisomes

D) Ribosomes

**Answer: Centrioles**

**50) The resolution limit of the naked human eye is approximately:**

A) 0.1 mm

B) 1  $\mu\text{m}$

C) 0.2 nm

D) 10 nm

**Answer: 0.1 mm**

**51) The Svedberg unit (S) is a measure of a particle's:**

A) Mass

B) Electrical charge

C) Sedimentation rate during centrifugation

D) Density

**Answer: Sedimentation rate during centrifugation**

**52) In a typical prokaryotic cell, the genetic material consists of:**

A) Multiple linear chromosomes with histones

B) A single circular chromosome, often with additional plasmids

C) DNA packaged within a double-membrane nucleus

D) RNA as the primary genetic material

**Answer: A single circular chromosome, often with additional plasmids**

**53) Binary fission is the primary method of cell division for:**

A) Animal cells

B) Plant cells

C) Prokaryotic cells

D) Fungal cells

**Answer: Prokaryotic cells**

**54) The outer mitochondrial membrane contains large channel-forming proteins called:**

A) ATP synthases

B) Porins

C) Cytochromes

D) Integrins

**Answer: Porins**

**55) Which of the following is NOT found within the mitochondrial matrix?**

A) Circular mitochondrial DNA (mtDNA)

B) 70S ribosomes

C) Enzymes for the Krebs cycle

D) Thylakoid membranes

**Answer: Thylakoid membranes**

**56) Stacks of thylakoid membranes (grana) are characteristic of which organelle?**

A) Mitochondrion

B) Chloroplast

C) Peroxisome

D) Lysosome

**Answer: Chloroplast**

**57) The light-independent reactions of photosynthesis (Calvin cycle) take place in the:**

A) Thylakoid lumen

B) Stroma of the chloroplast

C) Mitochondrial matrix



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D) Cytosol

**Answer: Stroma of the chloroplast**

**58) Which type of plastid is responsible for photosynthesis?**

- A) Chromoplast
- B) Leucoplast
- C) Chloroplast
- D) Amyloplast

**Answer: Chloroplast**

**59) Microfilaments (actin filaments) are primarily involved in:**

- A) Organizing the mitotic spindle
- B) Intracellular transport along microtubules
- C) Cell shape changes, muscle contraction, and cytokinesis
- D) Providing permanent mechanical strength to the nucleus

**Answer: Cell shape changes, muscle contraction, and cytokinesis**

**60) The drug Cytochalasin D affects cells by:**

- A) Stabilizing microtubules
- B) Depolymerizing microfilaments (actin)
- C) Disrupting intermediate filaments
- D) Inhibiting dynein motor proteins

**Answer: Depolymerizing microfilaments (actin)**

**61) The drug Taxol (paclitaxel) acts by:**

- A) Depolymerizing microtubules
- B) Stabilizing microtubules, preventing their disassembly
- C) Blocking actin polymerization
- D) Inhibiting myosin ATPase activity

**Answer: Stabilizing microtubules, preventing their disassembly**

**62) The nuclear lamina, which provides structural support to the nucleus, is composed of:**

- A) Microtubules
- B) Actin filaments

C) Intermediate filament proteins called lamins

D) Collagen fibers

**Answer: Intermediate filament proteins called lamins**

**63) Highly condensed, transcriptionally inactive chromatin is known as:**

- A) Euchromatin
- B) Heterochromatin
- C) Nucleosome
- D) Chromosome

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**Answer: Heterochromatin**

**64) Which of the following is NOT considered part of the endomembrane system?**

- A) The nuclear envelope
- B) Mitochondria
- C) The Golgi apparatus
- D) Lysosomes

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**Answer: Mitochondria**

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**65) N-linked glycosylation of proteins begins in the:**

- A) Golgi apparatus
- B) Smooth ER
- C) Rough ER
- D) Cytosol

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**Answer: Rough ER**

T

**66) The cisternal maturation model describes the movement and modification of cargo through the:**

- A) Nucleus
- B) Mitochondria
- C) Golgi apparatus
- D) Peroxisomes

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**Answer: Golgi apparatus**

S

**67) Primary lysosomes are formed by budding from the:**

- A) Rough ER
- B) Smooth ER
- C) trans-Golgi network

D) Plasma membrane

**Answer: trans-Golgi network**

**68) Contractile vacuoles in freshwater protists primarily function in:**

- A) Intracellular digestion
- B) Photosynthesis
- C) Osmoregulation (water balance)
- D) Lipid synthesis

**Answer: Osmoregulation (water balance)**

**69) The tonoplast is the membrane that surrounds the:**

- A) Nucleus
- B) Chloroplast
- C) Central vacuole in plant cells
- D) Lysosome

**Answer: Central vacuole in plant cells**

**70) The F<sub>0</sub>F<sub>1</sub> complex (ATP synthase) is located in the:**

- A) Outer mitochondrial membrane
- B) Inner mitochondrial membrane
- C) Mitochondrial matrix
- D) Intermembrane space

**Answer: Inner mitochondrial membrane**

**71) The initial steps in the beta-oxidation of very long-chain fatty acids occur in:**

- A) Mitochondria only
- B) Peroxisomes only
- C) Both mitochondria and peroxisomes
- D) The smooth endoplasmic reticulum

**Answer: Both mitochondria and peroxisomes**

**72) Which cytoskeletal element is non-polar and primarily provides high tensile strength?**

- A) Microtubules
- B) Microfilaments
- C) Intermediate filaments
- D) All of the above

**Answer: Intermediate filaments**

**73) The basal body of a cilium has a microtubule arrangement of:**

- A) 9+2
- B) 9+0
- C) 9+1
- D) 8+2

**Answer: 9+0**

**74) The bending movement of cilia and flagella is caused by:**

- A) Contraction of the basal body
- B) Dynein arms walking along adjacent microtubule doublets, causing sliding
- C) Depolymerization of the axoneme at the tip
- D) Action of myosin motor proteins

**Answer: Dynein arms walking along adjacent microtubule doublets, causing sliding**

**75) Pinocytosis refers to the process of:**

- A) Cellular "eating" of large particles
- B) Cellular "drinking" of extracellular fluid and dissolved solutes
- C) Receptor-mediated uptake of specific ligands
- D) Export of materials via vesicles

**Answer: Cellular "drinking" of extracellular fluid and dissolved solutes**

**76) Secondary active transport uses energy stored in:**

- A) ATP hydrolysis directly
- B) Light energy
- C) An electrochemical gradient of another ion (e.g., Na<sup>+</sup>)
- D) GTP hydrolysis

**Answer: An electrochemical gradient of another ion (e.g., Na<sup>+</sup>)**

**77) Aquaporins are specialized channel proteins that facilitate the transport of:**

- A) Sodium ions
- B) Glucose
- C) Water





D) Potassium ions

**Answer: Water**

**78) The middle lamella of plant cell walls is rich in:**

- A) Cellulose
- B) Lignin
- C) Pectin
- D) Chitin

**Answer: Pectin**

**79) Lignin, which provides rigidity and strength, is deposited in the:**

- A) Primary cell wall
- B) Secondary cell wall
- C) Plasma membrane
- D) Middle lamella

**Answer: Secondary cell wall**

**80) Hemidesmosomes function to:**

- A) Seal adjacent epithelial cells tightly together
- B) Anchor epithelial cells to the underlying basal lamina (ECM)
- C) Provide cytoplasmic channels for communication
- D) Facilitate cell-cell adhesion via cadherins

**Answer: Anchor epithelial cells to the underlying basal lamina (ECM)**

**81) Desmosomes are linked intracellularly to the:**

- A) Microtubule network
- B) Microfilament (actin) network
- C) Intermediate filament network (e.g., keratin)
- D) Nuclear lamina

**Answer: Intermediate filament network (e.g., keratin)**

**82) A primary function of the glycocalyx (cell coat) is:**

- A) ATP synthesis
- B) Cell recognition and adhesion
- C) DNA replication

D) Protein synthesis

**Answer: Cell recognition and adhesion**

**83) Integrins are involved in:**

- A) Mechanotransduction and outside-in signaling
- B) Forming tight seals between epithelial cells
- C) Creating pores for intercellular communication
- D) Digesting extracellular debris

**Answer: Mechanotransduction and outside-in signaling**

**84) Mature human red blood cells are considered an exception to cell theory because they:**

- A) Are surrounded by a cell wall
- B) Have multiple nuclei
- C) Lack a nucleus and cannot divide
- D) Contain chloroplasts

**Answer: Lack a nucleus and cannot divide**

**85) In an electron microscope, image formation depends on differences in:**

- A) Light absorption
- B) Electron scattering by the specimen
- C) Refractive index
- D) Fluorescence emission

**Answer: Electron scattering by the specimen**

**86) Super-resolution microscopy techniques (e.g., STED, PALM) can achieve resolutions down to approximately:**

- A) 200 nm
- B) 10-20 nm
- C) 2 μm
- D) 0.2 nm

**Answer: 10-20 nm**

**87) The bacterial flagellum is powered by:**

- A) ATP hydrolysis
- B) A proton (H<sup>+</sup>) gradient and a rotary motor
- C) Dynein motor proteins
- D) Myosin-actin interactions



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**Answer: A proton (H<sup>+</sup>) gradient and a rotary motor**

**88) The cell wall of fungi is primarily composed of:**

- A) Cellulose
- B) Chitin
- C) Peptidoglycan
- D) Silica

**Answer: Chitin**

**89) Which of the following is NOT a function of the plasma membrane?**

- A) Selective barrier for transport
- B) Cell signaling via receptors
- C) Synthesis of ribosomal RNA
- D) Cell adhesion and recognition

**Answer: Synthesis of ribosomal RNA**

**90) According to the Fluid Mosaic Model, integral membrane proteins are:**

- A) Static and immobile
- B) Able to drift laterally in the fluid lipid bilayer
- C) Only located on the external surface
- D) Covalently bound to phospholipid heads

**Answer: Able to drift laterally in the fluid lipid bilayer**

**91) Facilitated diffusion differs from simple diffusion in that it:**

- A) Requires energy from ATP
- B) Moves molecules against their concentration gradient
- C) Uses specific transport proteins (channels or carriers)
- D) Is only for non-polar molecules

**Answer: Uses specific transport proteins (channels or carriers)**

**92) The Sodium-Glucose Symporter in intestinal cells is an example of:**

- A) Simple diffusion
- B) Facilitated diffusion
- C) Primary active transport

D) Secondary active transport

**Answer: Secondary active transport**



**93) Exocytosis is the process by which cells:**

- A) Take in large particles
- B) Secrete macromolecules by vesicle fusion with the plasma membrane
- C) Import fluids and solutes
- D) Degrade internal organelles

**M**  
**K**  
**Answer: Secrete macromolecules by vesicle fusion with the plasma membrane**

**94) Polysomes (or polyribosomes) are:**

- A) Multiple ribosomes translating a single mRNA molecule simultaneously
- B) Aggregates of ribosomal RNA in the nucleolus
- C) Vesicles containing multiple enzymes
- D) Structures within the Golgi apparatus

**P**  
**R**  
**E**  
**Answer: Multiple ribosomes translating a single mRNA molecule simultaneously**

**P**  
**A**  
**R**  
**95) The cell theory was primarily formulated by:**

- A) Hooke, Leeuwenhoek, and Pasteur
- B) Schleiden, Schwann, and Virchow
- C) Brown, Palade, and de Duve
- D) Singer, Nicolson, and Mitchell

**A**  
**R**  
**Answer: Schleiden, Schwann, and Virchow**

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**96) Louis Pasteur's swan-neck flask experiment provided evidence against:**

- A) Cell theory
- B) The germ theory of disease
- C) Spontaneous generation of microorganisms
- D) The theory of evolution

**N**  
**S**  
**Answer: Spontaneous generation of microorganisms**



**97) Confocal microscopy improves image clarity by:**

- A) Using a laser and pinhole to eliminate out-of-focus light
- B) Employing electrons with very short

wavelengths

- C) Staining with heavy metals
- D) Converting phase differences to contrast

**Answer: Using a laser and pinhole to eliminate out-of-focus light**

**98) Scanning Electron Microscopy (SEM) is best used to produce images of:**

- A) Two-dimensional internal cross-sections
- B) Three-dimensional topographical views of surfaces
- C) Living, moving cells
- D) Fluorescently tagged proteins

**Answer: Three-dimensional topographical views of surfaces**

**99) Which organelle is often termed the "powerhouse" of the eukaryotic cell?**

- A) Nucleus
- B) Chloroplast
- C) Mitochondrion
- D) Lysosome

**Answer: Mitochondrion**

**100) The internal fluid-filled space of a chloroplast is called the:**

- A) Matrix
- B) Stroma
- C) Thylakoid lumen
- D) Cristae

**Answer: Stroma**

**101) The presence of cristae significantly increases the surface area of the:**

- A) Outer mitochondrial membrane
- B) Inner mitochondrial membrane
- C) Thylakoid membrane
- D) Nuclear envelope

**Answer: Inner mitochondrial membrane**

**102) Which organelle is considered semi-autonomous due to possessing its own DNA and ribosomes?**

- A) Lysosome

- B) Peroxisome
- C) Golgi apparatus
- D) Mitochondrion

**Answer: Mitochondrion**



**103) The primary cilium in many animal cells functions mainly as a:**

- A) Motile structure for fluid movement
- B) Sensory "antenna" for signal reception
- C) Site of protein synthesis
- D) Digestive compartment

**M  
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**Answer: Sensory "antenna" for signal reception**

**104) According to the signal hypothesis, proteins destined for secretion have a signal sequence that targets them to the:**

- A) Mitochondria
- B) Cytosol
- C) Endoplasmic Reticulum (ER)
- D) Nucleus

**P  
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P**

**Answer: Endoplasmic Reticulum (ER)**

**105) The addition and modification of carbohydrate chains on proteins (e.g., sulfation) primarily occurs in the:**

- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus
- D) Lysosomes

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**Answer: Golgi apparatus**

**106) The molecular tag mannose-6-phosphate directs proteins from the Golgi to:**

- A) The nucleus
- B) Lysosomes
- C) Mitochondria
- D) The plasma membrane for secretion

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**Answer: Lysosomes**

**107) The complete self-digestion of a cell by its own lysosomal enzymes is called:**

- A) Autophagy
- B) Apoptosis



- C) Autolysis
- D) Phagocytosis

**Answer: Autolysis**

**108) Which of the following processes does NOT occur within peroxisomes?**

- A) Detoxification of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>)
- B) Beta-oxidation of very long-chain fatty acids
- C) The Krebs (TCA) cycle
- D) Photorespiration (in plant cells)

**Answer: The Krebs (TCA) cycle**

**109) Which of the following is a component of the cytoskeleton?**

- A) Ribosome
- B) Peroxisome
- C) Microtubule
- D) Nucleolus

**Answer: Microtubule**

**110) The motor protein kinesin typically moves cargo along microtubules toward the:**

- A) Minus end (center)
- B) Plus end (periphery)
- C) Both directions equally
- D) It moves on microfilaments, not microtubules

**Answer: Plus end (periphery)**

**111) The motor protein myosin is primarily associated with which cytoskeletal element?**

- A) Microtubules
- B) Microfilaments (actin)
- C) Intermediate filaments
- D) Nuclear lamina

**Answer: Microfilaments (actin)**

**112) Cytoplasmic streaming (cyclosis) in plant cells is driven by the interaction of:**

- A) Microtubules and kinesin
- B) Actin and myosin
- C) Intermediate filaments and dynein
- D) Tubulin and dynein

**Answer: Actin and myosin**

**113) The mitotic spindle is primarily composed of:**

- A) Microfilaments
- B) Intermediate filaments
- C) Microtubules
- D) Collagen fibers

**Answer: Microtubules**

**114) The drug colchicine disrupts cell division by:**

- A) Stabilizing microtubules
- B) Inhibiting microtubule polymerization
- C) Depolymerizing microfilaments
- D) Blocking myosin activity

**Answer: Inhibiting microtubule polymerization**

**115) Which type of cell junction forms a direct cytoplasmic channel between adjacent animal cells?**

- A) Tight junction
- B) Adherens junction
- C) Desmosome
- D) Gap junction

**Answer: Gap junction**

**116) Adherens junctions are linked intracellularly to the:**

- A) Intermediate filament network
- B) Microfilament (actin) network via linker proteins like catenins
- C) Microtubule network
- D) Nuclear lamina

**Answer: Microfilament (actin) network via linker proteins like catenins**

**117) The extracellular matrix (ECM) of animal cells resists compression largely due to:**

- A) Collagen fibers
- B) Elastin
- C) Proteoglycans



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D) Fibronectin

**Answer: Proteoglycans**

**118) A plant cell placed in a hypertonic solution will likely undergo:**

- A) Swelling and bursting
- B) Shrinking and plasmolysis
- C) No net change
- D) Rapid division

**Answer: Shrinking and plasmolysis**

**119) Oxygen and carbon dioxide cross the plasma membrane via:**

- A) Simple diffusion
- B) Facilitated diffusion
- C) Active transport
- D) Endocytosis

**Answer: Simple diffusion**

**120) The GLUT transporters that move glucose into cells are examples of:**

- A) Channel proteins
- B) Carrier proteins for facilitated diffusion
- C) Active transport pumps
- D) Symporters

**Answer: Carrier proteins for facilitated diffusion**

**121) Vesicles budding from the Golgi apparatus are targeted to their correct destination based on:**

- A) Their lipid composition alone
- B) Molecular "zip codes" or protein tags
- C) Their size alone
- D) Random diffusion

**Answer: Molecular "zip codes" or protein tags**

**122) Which organelle is the primary site for the synthesis of phospholipids for cellular membranes?**

- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus

D) Mitochondrion

**Answer: Smooth ER**



**123) The enzymes of the electron transport chain are embedded in the:**

- A) Outer mitochondrial membrane
- B) Inner mitochondrial membrane
- C) Mitochondrial matrix
- D) Intermembrane space

**M** **Answer: Inner mitochondrial membrane**

**K** **124) The Calvin cycle uses ATP and NADPH produced in the:**

- A) Light-dependent reactions in the thylakoids
- B) Krebs cycle in the mitochondrial matrix
- C) Glyoxylate cycle in glyoxysomes
- D) Electron transport chain in the inner mitochondrial membrane

**P** **Answer: Light-dependent reactions in the thylakoids**

**R** **125) Coenocytic organisms have bodies that are:**

- A) Made of a single cell
- B) Not divided into separate cells (multinucleate)
- C) Prokaryotic in nature
- D) Lacking a nucleus

**E** **Answer: Not divided into separate cells (multinucleate)**

**P** **126) The "cell sap" found in the central vacuole of plant cells primarily contains:**

- A) Hydrolytic enzymes
- B) Chlorophyll
- C) Water, ions, sugars, and pigments
- D) Digestive enzymes for autophagy

**A** **Answer: Water, ions, sugars, and pigments**

**R** **127) A process that occurs in both mitochondria and chloroplasts is:**

- A) The Calvin cycle
- B) The Krebs cycle
- C) Chemiosmotic ATP synthesis



D) Beta-oxidation of fatty acids

**Answer: Chemiosmotic ATP synthesis**

**128) An important piece of evidence supporting the endosymbiotic origin of mitochondria and chloroplasts is that they:**

- A) Have single membranes like the ER
- B) Lack their own DNA
- C) Have their own circular DNA and 70S ribosomes
- D) Are produced by the Golgi apparatus

**Answer: Have their own circular DNA and 70S ribosomes**

**129) The outer membrane of the nuclear envelope is continuous with the membrane of the:**

- A) Golgi apparatus
- B) Rough Endoplasmic Reticulum
- C) Mitochondrion
- D) Plasma membrane

**Answer: Rough Endoplasmic Reticulum**

**130) In prokaryotic cells, transcription and translation are:**

- A) Separated by the nuclear envelope
- B) Coupled (occur simultaneously in the cytoplasm)
- C) Restricted to the nucleoid region only
- D) Regulated by spliceosomes

**Answer: Coupled (occur simultaneously in the cytoplasm)**

**131) The basal lamina is a specialized type of:**

- A) Cell junction
- B) Extracellular matrix (ECM)
- C) Cytoskeletal element
- D) Organelle

**Answer: Extracellular matrix (ECM)**

**132) A key structural difference between prokaryotic and eukaryotic flagella is:**

- A) Prokaryotic flagella are made of tubulin; eukaryotic are made of flagellin.

B) Prokaryotic flagella rotate; eukaryotic flagella bend using dynein motors.

C) Eukaryotic flagella are powered by a proton gradient; prokaryotic by ATP.

D) Only eukaryotic flagella are used for motility.

**Answer: Prokaryotic flagella rotate; eukaryotic flagella bend using dynein motors.**

**133) Which of the following is NOT a typical function of plasma membrane proteins?**

- A) Enzymatic activity
- B) Signal transduction
- C) Synthesis of ribosomal RNA
- D) Cell-cell recognition

**Answer: Synthesis of ribosomal RNA**

**134) The process by which a cell engulfs a large solid particle is called:**

- A) Pinocytosis
- B) Phagocytosis
- C) Receptor-mediated endocytosis
- D) Exocytosis

**Answer: Phagocytosis**

**135) In the plasma membrane, the hydrophilic heads of phospholipids face:**

- A) The interior of the bilayer
- B) The extracellular fluid and the cytosol
- C) Only the extracellular fluid
- D) Only the cytosol

**Answer: The extracellular fluid and the cytosol**

**136) The energy for primary active transport comes directly from:**

- A) The electrochemical gradient of Na<sup>+</sup>
- B) The hydrolysis of ATP
- C) Light energy
- D) The proton motive force

**Answer: The hydrolysis of ATP**

**137) For every ATP hydrolyzed, the Na<sup>+</sup>/K<sup>+</sup> pump transports:**

- A) 3 Na<sup>+</sup> out, 2 K<sup>+</sup> in



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- B) 2 Na<sup>+</sup> out, 3 K<sup>+</sup> in
- C) 3 Na<sup>+</sup> in, 2 K<sup>+</sup> out
- D) 2 Na<sup>+</sup> in, 3 K<sup>+</sup> out

**Answer: 3 Na<sup>+</sup> out, 2 K<sup>+</sup> in**

**138) Osmosis is best described as a special case of:**

- A) Facilitated diffusion
- B) Active transport
- C) Simple diffusion of water
- D) Bulk transport

**Answer: Simple diffusion of water**

**139) A plant cell with a cell wall placed in a hypotonic solution will become:**

- A) Flaccid
- B) Plasmolyzed
- C) Turgid
- D) Lysed (burst)

**Answer: Turgid**

**140) Which molecule would diffuse most readily across a pure phospholipid bilayer?**

- A) Sodium ion (Na<sup>+</sup>)
- B) Glucose
- C) Oxygen (O<sub>2</sub>)
- D) Potassium ion (K<sup>+</sup>)

**Answer: Oxygen (O<sub>2</sub>)**

**141) Voltage-gated and ligand-gated channels are specific types of:**

- A) Carrier proteins
- B) Channel proteins
- C) ATP-powered pumps
- D) Receptors not involved in transport

**Answer: Channel proteins**

**142) The release of neurotransmitters at a synapse is accomplished by:**

- A) Phagocytosis
- B) Pinocytosis
- C) Exocytosis
- D) Receptor-mediated endocytosis

**Answer: Exocytosis**

**143) A key advantage of small cell size is a high surface area-to-volume ratio, which allows for:**

- A) More efficient waste removal and nutrient uptake
- B) Greater capacity for DNA storage
- C) Increased structural strength
- D) A slower metabolic rate

**Answer: More efficient waste removal and nutrient uptake**



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**144) In cell fractionation, the pellet formed after the highest-speed centrifugation would be richest in:**

- A) Nuclei
- B) Mitochondria
- C) Ribosomes
- D) Microsomes (membrane fragments)

**Answer: Ribosomes**

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**145) Which technique is best for studying the dynamic movement of a specific protein in a living cell?**

- A) Transmission Electron Microscopy (TEM)
- B) Scanning Electron Microscopy (SEM)
- C) Fluorescence microscopy with GFP tagging
- D) Bright-field microscopy on stained, fixed cells

**Answer: Fluorescence microscopy with GFP tagging**

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**146) The stacking of thylakoids into grana in chloroplasts serves to:**

- A) Increase surface area for light-dependent reactions
- B) Provide structure for the Calvin cycle
- C) Store starch
- D) House enzymes for the Krebs cycle

**Answer: Increase surface area for light-dependent reactions**



**147) A function shared by both Smooth ER and peroxisomes is:**

- A) Protein synthesis
- B) Detoxification of harmful substances
- C) ATP synthesis
- D) RNA synthesis

**Answer: Detoxification of harmful substances**

**148) Which of the following is NOT a component of the cytoskeleton?**

- A) Microtubule
- B) Microfilament
- C) Intermediate filament
- D) Microvillus

**Answer: Microvillus**

**149) The formation of a cleavage furrow during animal cell cytokinesis is driven by a contractile ring composed of:**

- A) Tubulin and kinesin
- B) Actin and myosin
- C) Intermediate filaments
- D) Microtubules and dynein

**Answer: Actin and myosin**

**150) Which organelle(s) contain the enzyme catalase to break down hydrogen peroxide?**

- A) Lysosome only
- B) Peroxisome only
- C) Glyoxysome only
- D) Peroxisomes and glyoxysomes

**Answer: Peroxisomes and glyoxysomes**

**151) The flexibility and biconcave shape of red blood cells is provided by a network of cytoskeletal proteins primarily composed of:**

- A) Tubulin
- B) Spectrin and actin
- C) Keratin
- D) Lamin

**Answer: Spectrin and actin**

**152) Cytoplasmic streaming in plant cells, which moves chloroplasts, is facilitated by:**

- A) Microtubules and kinesin
- B) Actin filaments and myosin

- C) Intermediate filaments and dynein
- D) Microvilli and integrins

**Answer: Actin filaments and myosin**



**153) A characteristic feature of apoptosis (programmed cell death) is:**

- A) Cell swelling and bursting (lysis)
- B) Release of lysosomal enzymes causing inflammation
- C) Orderly cell shrinkage and fragmentation, often involving mitochondria
- D) Always being caused by external physical damage

**M  
K**

**Answer: Orderly cell shrinkage and fragmentation, often involving mitochondria**

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**154) The main function of the nucleoplasm is to:**

- A) Synthesize ribosomal subunits
- B) Provide a medium for chromatin and nucleoli
- C) Control molecular traffic via nuclear pores
- D) Store calcium ions

**Answer: Provide a medium for chromatin and nucleoli**

**155) The ABO blood group antigens on red blood cells are an example of cell recognition mediated by:**

- A) Phospholipids
- B) Glycolipids and glycoproteins of the glycocalyx
- C) Cholesterol molecules
- D) Integral channel proteins

**Answer: Glycolipids and glycoproteins of the glycocalyx**

**156) A symporter and an antiporter are both types of:**

- A) Ion channels
- B) Carrier proteins used in secondary active transport
- C) Primary active transport pumps
- D) Phospholipids

**Answer: Carrier proteins used in secondary active transport**

**157) Which structure is unique to the cell walls of bacteria?**

- A) Cellulose
- B) Chitin
- C) Peptidoglycan (murein)
- D) Lignin

**Answer: Peptidoglycan (murein)**

**158) The main role of the extracellular matrix (ECM) in animal tissues is to:**

- A) Carry out photosynthesis
- B) Provide structural support, adhesion, and signaling
- C) Synthesize proteins for secretion
- D) Generate ATP for cellular work

**Answer: Provide structural support, adhesion, and signaling**

**159) The Krebs (TCA) cycle takes place in the:**

- A) Mitochondrial matrix
- B) Mitochondrial intermembrane space
- C) Inner mitochondrial membrane
- D) Cytosol

**Answer: Mitochondrial matrix**

**160) The light-dependent reactions of photosynthesis occur in the:**

- A) Stroma
- B) Thylakoid membranes
- C) Mitochondrial cristae
- D) Cytosol

**Answer: Thylakoid membranes**

**161) Intermediate filaments are particularly important for:**

- A) Chromosome movement during mitosis
- B) Beating of cilia
- C) Providing mechanical strength and anchoring organelles
- D) Muscle contraction

**Answer: Providing mechanical strength and anchoring organelles**

**162) A Nuclear Localization Signal (NLS) on a protein directs it to the:**

- A) Mitochondria
- B) Endoplasmic reticulum
- C) Nucleus
- D) Peroxisome

**Answer: Nucleus**

**163) The process by which cells take in droplets of extracellular fluid and its dissolved contents is:**

- A) Phagocytosis
- B) Pinocytosis
- C) Autophagy
- D) Exocytosis

**Answer: Pinocytosis**

**164) The main function of the Golgi apparatus is:**

- A) Protein synthesis
- B) Modification, sorting, and packaging of proteins and lipids
- C) Cellular respiration
- D) Detoxification of drugs

**Answer: Modification, sorting, and packaging of proteins and lipids**

**165) Which organelle is most abundant in liver cells for detoxification functions?**

- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus
- D) Lysosome

**Answer: Smooth ER**

**166) Plasmodesmata are structures that connect the cytoplasm of adjacent:**

- A) Animal cells
- B) Plant cells
- C) Bacterial cells



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D) Fungal cells  
**Answer: Plant cells**

**167) Which of the following is NOT a function of lysosomes?**

- A) Autophagy
- B) Phagocytosis of foreign particles
- C) Synthesis of steroid hormones
- D) Autolysis

**Answer: Synthesis of steroid hormones**

**168) Simple diffusion and facilitated diffusion are both types of:**

- A) Active transport
- B) Passive transport
- C) Endocytosis
- D) Osmosis

**Answer: Passive transport**

**169) A characteristic of carrier proteins in facilitated diffusion is that they:**

- A) Hydrolyze ATP for energy
- B) Change conformation to move the solute across the membrane
- C) Form a permanent hydrophilic pore
- D) Move solutes against their concentration gradient

**Answer: Change conformation to move the solute across the membrane**

**170) The primary function of microvilli on intestinal epithelial cells is to:**

- A) Increase surface area for absorption
- B) Propel mucus along the surface
- C) Provide mechanical strength
- D) Serve as sensory receptors

**Answer: Increase surface area for absorption**

**171) Which cell type would be expected to have the most extensive network of Smooth ER?**

- A) Pancreatic cell secreting digestive enzymes
- B) Liver cell detoxifying alcohol
- C) Skeletal muscle cell contracting

D) Red blood cell transporting oxygen  
**Answer: Liver cell detoxifying alcohol**

**172) Transport through the nuclear pore complex is:**

- A) Free and non-selective for all molecules
- B) Selective, involving both passive diffusion and active transport
- C) Restricted to only mRNA exiting the nucleus
- D) Limited to only ribosomal proteins entering the nucleus

**Answer: Selective, involving both passive diffusion and active transport**

**173) In a muscle cell, calcium ions are stored at high concentration in the:**

- A) Nucleus
- B) Mitochondrion
- C) Sarcoplasmic reticulum (specialized SER)
- D) Golgi apparatus

**Answer: Sarcoplasmic reticulum (specialized SER)**

**174) A key difference between eukaryotic and prokaryotic mRNA is that eukaryotic mRNA:**

- A) Is not processed after transcription
- B) Undergoes processing (capping, polyadenylation, splicing)
- C) Is transcribed in the cytoplasm
- D) Is translated simultaneously with transcription

**Answer: Undergoes processing (capping, polyadenylation, splicing)**

**175) The term "semi-autonomous" applied to mitochondria and chloroplasts refers to their ability to:**

- A) Survive independently outside the cell
- B) Synthesize some of their own proteins using their own genetic system
- C) Control cell division
- D) Communicate directly with the nucleus via vesicles



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**15. The study of organism-environment interactions is:**

- A) Genetics
- B) Embryology
- C) Ecology
- D) Physiology

**Answer: Ecology**

**16. The study of development from zygote to birth is:**

- A) Genetics
- B) Embryology
- C) Physiology
- D) Cytology

**Answer: Embryology**

**17. The study of drugs and their effects is:**

- A) Pathology
- B) Immunology
- C) Pharmacology
- D) Physiology

**Answer: Pharmacology**

**18. The study of the immune system is:**

- A) Pathology
- B) Immunology
- C) Pharmacology
- D) Genetics

**Answer: Immunology**

**19. The study of diseases is called:**

- A) Immunology
- B) Pharmacology
- C) Pathology
- D) Physiology

**Answer: Pathology**

**20. The branch dealing with insects is:**

- A) Parasitology
- B) Ichthyology
- C) Entomology
- D) Herpetology

**Answer: Entomology**

**21. The industrial use of living systems is:**

- A) Biochemistry
- B) Biophysics
- C) Biotechnology
- D) Bioinformatics

**Answer: Biotechnology**

**22. The study of chemical processes in living organisms is:**

- A) Biophysics
- B) Biochemistry

C) Molecular Biology

D) Biotechnology

**Answer: Biochemistry**

 **23. Applying physics principles to biological phenomena is:**

- A) Biochemistry
- B) Biophysics
- C) Biotechnology
- D) Biogeography

**Answer: Biophysics**

**M** **24. The study of species distribution in geographical regions is:**

- K**
- A) Biophysics
  - B) Biogeography
  - C) Biostatistics
  - D) Bioeconomics

**Answer: Biogeography**

**P** **25. The use of statistics to analyze biological data is:**

- R**
- A) Biogeography
  - B) Bioeconomics
  - C) Biostatistics
  - D) Biophysics

**Answer: Biostatistics**

**P** **26. The cost-benefit analysis of biological projects is:**

- A**
- A) Biostatistics
  - B) Biogeography
  - C) Bioeconomics
  - D) Biotechnology

**Answer: Bioeconomics**

**R** **27. Which of the following is NOT a characteristic of life?**

- A**
- A) Metabolism
  - B) Homeostasis
  - C) Crystallization
  - D) Reproduction

**Answer: Crystallization**

**T** **28. All living organisms are composed of:**

- I**
- A) Tissues
  - B) Organs
  - C) Cells
  - D) Organ Systems

**Answer: Cells**

**O** **29. The basic structural and functional unit of life is the:**

- N**
- A) Tissue
  - B) Organ

**S**

- C) Cell
- D) Organelle

**Answer: Cell**

**30. The maintenance of a stable internal environment is:**

- A) Metabolism
- B) Homeostasis
- C) Adaptation
- D) Reproduction

**Answer: Homeostasis**

**31. The process of acquiring and utilizing energy is:**

- A) Homeostasis
- B) Metabolism
- C) Reproduction
- D) Growth

**Answer: Metabolism**

**32. Building complex molecules from simpler ones is:**

- A) Catabolism
- B) Anabolism
- C) Metabolism
- D) Homeostasis

**Answer: Anabolism**

**33. Breaking down molecules to release energy is:**

- A) Anabolism
- B) Catabolism
- C) Metabolism
- D) Synthesis

**Answer: Catabolism**

**34. The transmission of genetic material to offspring is:**

- A) Variation
- B) Heredity
- C) Adaptation
- D) Evolution

**Answer: Heredity**

**35. The raw material for evolution is provided by:**

- A) Heredity
- B) Variation
- C) Adaptation
- D) Reproduction

**Answer: Variation**

**36. Who is regarded as the Father of Zoology?**

- A) Theophrastus

- B) Aristotle
- C) Carl Linnaeus
- D) Robert Hooke

**Answer: Aristotle**

**37. Who is recognized as the Father of Botany?**

- A) Aristotle
- B) Theophrastus
- C) Carl Linnaeus
- D) Robert Hooke

**Answer: Theophrastus**

**38. Who coined the term "cell"?**

- A) Antonie van Leeuwenhoek
- B) Robert Hooke
- C) Matthias Schleiden
- D) Rudolf Virchow

**Answer: Robert Hooke**

**39. Who first observed living microorganisms?**

- A) Robert Hooke
- B) Carl Linnaeus
- C) Antonie van Leeuwenhoek
- D) Louis Pasteur

**Answer: Antonie van Leeuwenhoek**

**40. The Cell Theory was formulated by:**

- A) Hooke and Leeuwenhoek
- B) Schleiden and Schwann
- C) Virchow and Darwin
- D) Linnaeus and Aristotle

**Answer: Schleiden and Schwann**

**41. "Omnis cellula e cellula" was stated by:**

- A) Rudolf Virchow
- B) Charles Darwin
- C) Louis Pasteur
- D) Gregor Mendel

**Answer: Rudolf Virchow**

**42. The Theory of Evolution by Natural Selection was proposed by:**

- A) Darwin and Lamarck
- B) Darwin and Wallace
- C) Mendel and Darwin
- D) Linnaeus and Hooke

**Answer: Darwin and Wallace**

**43. The double helix structure of DNA was discovered by:**

- A) Mendel and Darwin
- B) Watson and Crick
- C) Schleiden and Schwann



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D) Hooke and Leeuwenhoek

**Answer: Watson and Crick**

**44. The Human Genome Project was completed in:**

A) 1990

B) 1995

C) 2001

D) 2003

**Answer: 2003**

**45. Which Muslim scientist is honored as the founder of medicine?**

A) Jabir Bin Hayan

B) Abdul Malik Asmai

C) Bu Ali Sina

D) Al-Razi

**Answer: Bu Ali Sina**

**46. Approximately how many bioelements are fundamental to life?**

A) 6

B) 16

C) 26

D) 92

**Answer: 16**

**47. Six major bioelements constitute what percentage of human body mass?**

A) 90%

B) 95%

C) 99%

D) 100%

**Answer: 99%**

**48. The most abundant bioelement in the human body is:**

A) Carbon

B) Hydrogen

C) Oxygen

D) Nitrogen

**Answer: Oxygen**

**49. Carbon accounts for what percentage of human body mass?**

A) 10%

B) 18%

C) 65%

D) 3%

**Answer: 18%**

**50. Hydrogen accounts for what percentage of human body mass?**

A) 65%

B) 18%

C) 10%

D) 3%

**Answer: 10%**



**51. Nitrogen accounts for what percentage of human body mass?**

A) 65%

B) 18%

C) 10%

D) 3%

**Answer: 3%**

**M** **52. Molecules with low molecular weight, like water, are called:**

**K**

A) Macromolecules

B) Micromolecules

C) Biomolecules

D) Organelles

**Answer: Micromolecules**

**P** **53. Molecules with high molecular weight, like proteins, are called:**

**R**

A) Micromolecules

B) Macromolecules

C) Bioelements

D) Compounds

**Answer: Macromolecules**

**E** **54. The correct sequence of biological organization from simplest to most complex is:**

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A) Cell → Tissue → Organ → Organ System

B) Tissue → Organ → Cell → Organ System

C) Organ → Tissue → Cell → Organ System

D) Organ System → Organ → Tissue → Cell

**Answer: Cell → Tissue → Organ → Organ System**

**55. A group of similar cells performing a specific function is a:**

A) Organ

B) Organ System

C) Tissue

D) Organism

**Answer: Tissue**

**56. A structure composed of multiple tissues is an:**

A) Organ System

B) Tissue

C) Organ

D) Organism

**Answer: Organ**

**57. A group of organs working together is an:**

- A) Tissue
- B) Organ
- C) Organ System
- D) Organism

**Answer: Organ System**

**58. An individual living entity is an:**

- A) Organ System
- B) Organ
- C) Tissue
- D) Organism

**Answer: Organism**

**59. A group of same species individuals in an area is a:**

- A) Community
- B) Population
- C) Ecosystem
- D) Biosphere

**Answer: Population**

**60. All populations of different species in an area form a:**

- A) Population
- B) Community
- C) Ecosystem
- D) Biosphere

**Answer: Community**

**61. A community plus its abiotic environment is an:**

- A) Population
- B) Community
- C) Ecosystem
- D) Biosphere

**Answer: Ecosystem**

**62. The global ecosystem encompassing all life is the:**

- A) Community
- B) Population
- C) Ecosystem
- D) Biosphere

**Answer: Biosphere**

**63. Organisms consisting of a single cell are:**

- A) Colonial
- B) Multicellular
- C) Unicellular
- D) Prokaryotic

**Answer: Unicellular**

**64. Loosely associated similar cells with little differentiation form a:**

- A) Unicellular organism
- B) Colonial organism
- C) Multicellular organism
- D) Tissue

**Answer: Colonial organism**

**65. Organisms composed of many differentiated cells are:**

- A) Unicellular
- B) Colonial
- C) Multicellular
- D) Prokaryotic

**Answer: Multicellular**

**66. Cells lacking a nucleus and membrane-bound organelles are:**

- A) Eukaryotic
- B) Prokaryotic
- C) Unicellular
- D) Multicellular

**Answer: Prokaryotic**

**67. Cells with a nucleus and membrane-bound organelles are:**

- A) Prokaryotic
- B) Eukaryotic
- C) Unicellular
- D) Colonial

**Answer: Eukaryotic**

**68. Which of the following is a principle of the Modern Cell Theory?**

- A) All cells arise spontaneously
- B) Cells contain hereditary material (DNA)
- C) Viruses are the basic unit of life
- D) All cells are prokaryotic

**Answer: Cells contain hereditary material (DNA)**

**69. Which of the following is an exception to the Cell Theory?**

- A) Bacteria
- B) Plant cells
- C) Viruses
- D) Animal cells

**Answer: Viruses**

**70. Mitochondria having their own DNA supports which theory?**

- A) Cell Theory
- B) Germ Theory
- C) Endosymbiotic Theory
- D) Evolutionary Theory

**Answer: Endosymbiotic Theory**



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**71. The first step in the scientific method is:**

- A) Hypothesis
- B) Experimentation
- C) Observation
- D) Conclusion

**Answer: Observation**

**72. A testable and falsifiable tentative explanation is a:**

- A) Theory
- B) Law
- C) Hypothesis
- D) Fact

**Answer: Hypothesis**

**73. Reasoning from general principles to specific predictions is:**

- A) Inductive reasoning
- B) Deductive reasoning
- C) Analytical reasoning
- D) Critical reasoning

**Answer: Deductive reasoning**

**74. Reasoning from specific observations to general principles is:**

- A) Deductive reasoning
- B) Inductive reasoning
- C) Analytical reasoning
- D) Critical reasoning

**Answer: Inductive reasoning**

**75. The variable manipulated by the experimenter is the:**

- A) Dependent variable
- B) Independent variable
- C) Controlled variable
- D) Constant variable

**Answer: Independent variable**

**76. The variable measured as the outcome is the:**

- A) Independent variable
- B) Dependent variable
- C) Controlled variable
- D) Constant variable

**Answer: Dependent variable**

**77. The group that does not receive the experimental treatment is the:**

- A) Experimental group
- B) Control group
- C) Variable group
- D) Test group

**Answer: Control group**

**78. A well-substantiated explanation of nature is a:**

- A) Hypothesis
- B) Law
- C) Theory
- D) Fact

**Answer: Theory**

**79. A concise statement describing how a natural phenomenon occurs is a:**

- A) Hypothesis
- B) Theory
- C) Scientific Law
- D) Principle

**Answer: Scientific Law**

**80. The causative agent of malaria is:**

- A) Virus
- B) Bacterium
- C) Plasmodium
- D) Fungus

**Answer: Plasmodium**

**81. The vector for human malaria is the:**

- A) Culex mosquito
- B) Aedes mosquito
- C) Anopheles mosquito
- D) Housefly

**Answer: Anopheles mosquito**

**82. Who first observed Plasmodium in human blood?**

- A) Ronald Ross
- B) A.F.A. King
- C) Laveran
- D) Edward Jenner

**Answer: Laveran**

**83. Who proved mosquitoes transmit malaria using sparrows?**

- A) Laveran
- B) King
- C) Ronald Ross
- D) Jenner

**Answer: Ronald Ross**

**84. Quinine, a historical malaria treatment, comes from the bark of the:**

- A) Deodar tree
- B) Cinchona tree
- C) Acacia tree
- D) Eucalyptus tree

**Answer: Cinchona tree**



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**85. The Aedes mosquito is the vector for:**

- A) Malaria
- B) Dengue fever
- C) Tuberculosis
- D) Cholera

**Answer: Dengue fever**

**86. The development of high-yield crops via selective breeding is part of biology's role in:**

- A) Disease control
- B) Environmental conservation
- C) Food production
- D) Biotechnology

**Answer: Food production**

**87. Using natural predators for pest control is called:**

- A) Chemical control
- B) Biological control
- C) Genetic engineering
- D) Hydroponics

**Answer: Biological control**

**88. The sustainable approach combining biological and minimal chemical pest control is:**

- A) Biological control
- B) Genetic engineering
- C) Integrated Pest Management
- D) Monoculture

**Answer: Integrated Pest Management**

**89. Who developed the first vaccine against smallpox?**

- A) Louis Pasteur
- B) Edward Jenner
- C) Robert Koch
- D) Alexander Fleming

**Answer: Edward Jenner**

**90. Vaccination stimulates the immune system to develop:**

- A) Passive immunity
- B) Active immunity
- C) Innate immunity
- D) Artificial immunity

**Answer: Active immunity**

**91. Using microorganisms to detoxify pollutants is:**

- A) Phytoremediation
- B) Bioremediation
- C) Bioaugmentation

D) Biostimulation

**Answer: Bioremediation**

**92. Using plants to remove environmental contaminants is:**

- A) Bioremediation
- B) Phytoremediation
- C) Bioaugmentation
- D) Biostimulation

**Answer: Phytoremediation**

**93. The study of genomes is called:**

- A) Proteomics
- B) Transcriptomics
- C) Genomics
- D) Metabolomics

**Answer: Genomics**

**94. The study of all RNA molecules is:**

- A) Genomics
- B) Proteomics
- C) Transcriptomics
- D) Metabolomics

**Answer: Transcriptomics**

**95. The study of proteins is called:**

- A) Genomics
- B) Transcriptomics
- C) Proteomics
- D) Metabolomics

**Answer: Proteomics**

**96. The study of small-molecule metabolites is:**

- A) Genomics
- B) Transcriptomics
- C) Proteomics
- D) Metabolomics

**Answer: Metabolomics**

**97. The application of computer science to biological data is:**

- A) Biotechnology
- B) Biophysics
- C) Bioinformatics
- D) Biochemistry

**Answer: Bioinformatics**

**98. Designing and constructing new biological systems is:**

- A) Biotechnology
- B) Synthetic Biology
- C) Genetic Engineering
- D) Molecular Biology

**Answer: Synthetic Biology**



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**99. A revolutionary genome editing technology is:**

- A) PCR
- B) CRISPR-Cas9
- C) Gel Electrophoresis
- D) Chromatography

**Answer: CRISPR-Cas9**

**100. The holistic study of complex interactions within biological systems is:**

- A) Systems Biology
- B) Molecular Biology
- C) Evolutionary Biology
- D) Environmental Biology

**Answer: Systems Biology**

**101. Which career involves diagnosis and treatment of human diseases?**

- A) Dentistry
- B) Medicine and Surgery
- C) Veterinary Medicine
- D) Physiotherapy

**Answer: Medicine and Surgery**

**102. Which career focuses on oral health and dental surgery?**

- A) Medicine
- B) Dentistry
- C) Pharmacology
- D) Physiotherapy

**Answer: Dentistry**

**103. The profession dealing with drug effects and development is:**

- A) Pathology
- B) Immunology
- C) Pharmacology
- D) Physiology

**Answer: Pharmacology**

**104. Restoring movement impaired by injury is the focus of:**

- A) Surgery
- B) Dentistry
- C) Physiotherapy
- D) Medicine

**Answer: Physiotherapy**

**105. The study and management of fish production is:**

- A) Agriculture
- B) Horticulture
- C) Fisheries

D) Forestry

**Answer: Fisheries**

**106. Improving crop production and farming practices is:**

- A) Horticulture
- B) Agriculture
- C) Forestry
- D) Animal Husbandry

**Answer: Agriculture**

**107. The care and breeding of livestock is:**

- A) Agriculture
- B) Horticulture
- C) Animal Husbandry
- D) Forestry

**Answer: Animal Husbandry**

**108. The science of gardening and cultivating plants is:**

- A) Agriculture
- B) Horticulture
- C) Forestry
- D) Animal Husbandry

**Answer: Horticulture**

**109. The management and conservation of forests is:**

- A) Agriculture
- B) Horticulture
- C) Forestry
- D) Animal Husbandry

**Answer: Forestry**

**110. Analyzing physical evidence from crime scenes is:**

- A) Biomedical Engineering
- B) Forensic Science
- C) Genetic Counselling
- D) Public Health

**Answer: Forensic Science**

**111. Designing and making medical equipment is:**

- A) Forensic Science
- B) Biomedical Engineering
- C) Genetic Counselling
- D) Veterinary Medicine

**Answer: Biomedical Engineering**

**112. Providing support on genetic conditions is:**

- A) Biomedical Engineering
- B) Forensic Science
- C) Genetic Counselling



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D) Public Health

**Answer: Genetic Counselling**

**113. Diagnosis and treatment of animal diseases is:**

- A) Medicine
- B) Dentistry
- C) Veterinary Medicine
- D) Physiotherapy

**Answer: Veterinary Medicine**

**114. Improving community health through education and policy is:**

- A) Biomedical Engineering
- B) Genetic Counselling
- C) Public Health
- D) Forensic Science

**Answer: Public Health**

**115. The variety of life at genetic, species, and ecosystem levels is:**

- A) Biodiversity
- B) Biogeography
- C) Bioeconomics
- D) Biotechnology

**Answer: Biodiversity**

**116. Approximately how many species are known to science?**

- A) 1 million
- B) 2.5 million
- C) 5 million
- D) 10 million

**Answer: 2.5 million**

**117. Over half of the known species are:**

- A) Plants
- B) Insects
- C) Mammals
- D) Birds

**Answer: Insects**

**118. The single greatest threat to biodiversity is:**

- A) Climate Change
- B) Pollution
- C) Habitat Loss
- D) Invasive Species

**Answer: Habitat Loss**

**119. International Biodiversity Day is celebrated on:**

- A) April 22
- B) May 22
- C) June 5

D) October 4

**Answer: May 22**

**120. The main taxonomic ranks in order are:**

- 
- A) Kingdom, Phylum, Class, Order, Family, Genus, Species
  - B) Domain, Kingdom, Class, Phylum, Order, Family, Genus, Species
  - C) Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species
  - D) Kingdom, Domain, Phylum, Class, Order, Family, Genus, Species

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Answer: Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species**

**121. Binomial nomenclature was introduced by:**

- A) Aristotle
- B) Theophrastus
- C) Carolus Linnaeus
- D) Robert Hooke

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Answer: Carolus Linnaeus**

**122. The scientific name of humans is:**

- A) Homo erectus
- B) Homo sapiens
- C) Rana tigrina
- D) Brassica campestris

**A  
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Answer: Homo sapiens**

**123. The Two-Kingdom system was proposed by:**

- A) Ernst Haeckel
- B) Robert Whittaker
- C) Aristotle
- D) Carl Woese

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Answer: Aristotle**

**124. The Five-Kingdom system was proposed by:**

- A) Ernst Haeckel
- B) Robert Whittaker
- C) Carl Woese
- D) Carolus Linnaeus

**Answer: Robert Whittaker**

**125. The Three-Domain system was proposed by:**

- A) Ernst Haeckel
- B) Robert Whittaker
- C) Carl Woese
- D) Carolus Linnaeus

**Answer: Carl Woese**



126. The three domains are:

- A) Monera, Protista, Eukarya
- B) Archaea, Bacteria, Eukarya
- C) Prokaryota, Eukaryota, Protista
- D) Plantae, Animalia, Fungi

**Answer: Archaea, Bacteria, Eukarya**

127. Primitive prokaryotes living in extreme environments belong to domain:

- A) Bacteria
- B) Eukarya
- C) Archaea
- D) Protista

**Answer: Archaea**

128. "True bacteria" with peptidoglycan cell walls belong to domain:

- A) Archaea
- B) Bacteria
- C) Eukarya
- D) Protista

**Answer: Bacteria**

129. All eukaryotic organisms belong to domain:

- A) Archaea
- B) Bacteria
- C) Eukarya
- D) Monera

**Answer: Eukarya**

130. Acellular, obligate intracellular parasites are:

- A) Bacteria
- B) Fungi
- C) Viruses
- D) Protozoa

**Answer: Viruses**

131. Infectious agents composed only of protein are:

- A) Viruses
- B) Viroids
- C) Prions
- D) Bacteria

**Answer: Prions**

132. Infectious particles of circular RNA only are:

- A) Viruses
- B) Viroids
- C) Prions
- D) Bacteria

**Answer: Viroids**

133. The use of harmful biological agents like bacteria as weapons is:

- A) Biodefense
- B) Biological Warfare
- C) Biotechnology
- D) Bioremediation

**Answer: Biological Warfare**

134. The international treaty prohibiting biological weapons is the:

- A) Geneva Protocol
- B) Biological Weapons Convention
- C) Paris Agreement
- D) Kyoto Protocol

**Answer: Biological Weapons Convention**

135. Anthrax is caused by the bacterium:

- A) Bacillus anthracis
- B) Clostridium botulinum
- C) Yersinia pestis
- D) Salmonella typhi

**Answer: Bacillus anthracis**

136. Botulinum toxin is produced by:

- A) Bacillus anthracis
- B) Clostridium botulinum
- C) Yersinia pestis
- D) Salmonella typhi

**Answer: Clostridium botulinum**

137. Measures to protect against biological threats constitute:

- A) Biological Warfare
- B) Biodefense
- C) Bioterrorism
- D) Biosafety

**Answer: Biodefense**

138. The early identification of biological threats relies on:

- A) Prevention
- B) Surveillance and Detection
- C) Preparedness
- D) Research and Development

**Answer: Surveillance and Detection**

139. The 'omics' field that studies the complete set of DNA is:

- A) Transcriptomics
- B) Proteomics
- C) Genomics
- D) Metabolomics

**Answer: Genomics**



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**140. The 'omics' field that studies all RNA molecules is:**

- A) Genomics
- B) Transcriptomics
- C) Proteomics
- D) Metabolomics

**Answer: Transcriptomics**

**141. The 'omics' field that studies proteins is:**

- A) Genomics
- B) Transcriptomics
- C) Proteomics
- D) Metabolomics

**Answer: Proteomics**

**142. The 'omics' field that studies small-molecule metabolites is:**

- A) Genomics
- B) Transcriptomics
- C) Proteomics
- D) Metabolomics

**Answer: Metabolomics**

**143. Designing and constructing new biological parts is the focus of:**

- A) Biotechnology
- B) Genetic Engineering
- C) Synthetic Biology
- D) Molecular Biology

**Answer: Synthetic Biology**

**144. Standardized genetic parts used in synthetic biology are called:**

- A) Plasmids
- B) Vectors
- C) BioBricks
- D) Enzymes

**Answer: BioBricks**

**145. Producing insulin using genetically modified E. coli is an example of:**

- A) Biotechnology
- B) Synthetic Biology
- C) Genetic Engineering
- D) All of the above

**Answer: All of the above**

**146. Organisms used to clean up oil spills demonstrate:**

- A) Bioremediation
- B) Phytoremediation
- C) Bioaugmentation
- D) Biostimulation

**Answer: Bioremediation**

**147. The Quranic verse "We made every living thing from water" hints at:**

- A) The importance of water for life
- B) The aquatic origin of life
- C) The composition of protoplasm
- D) All of the above

**Answer: All of the above**

**148. New characteristics arising at each level of organization are:**

- A) Inherited properties
- B) Emergent properties
- C) Fundamental properties
- D) Reductive properties

**Answer: Emergent properties**

**149. The average adult human body is composed of approximately how many cells?**

- A) 1 trillion
- B) 30 trillion
- C) 100 trillion
- D) 1 quadrillion

**Answer: 30 trillion**

**150. In plants, roots, stems, and leaves are:**

- A) Reproductive organs
- B) Vegetative organs
- C) Supportive organs
- D) Photosynthetic organs

**Answer: Vegetative organs**

**151. In plants, flowers are:**

- A) Vegetative organs
- B) Reproductive organs
- C) Supportive organs
- D) Photosynthetic organs

**Answer: Reproductive organs**

**152. The scientific name of the frog is:**

- A) Rana temporaria
- B) Rana tigrina
- C) Homo sapiens
- D) Brassica campestris

**Answer: Rana tigrina**

**153. The scientific name of the mustard plant is:**

- A) Brassica nigra
- B) Brassica oleracea
- C) Brassica campestris
- D) Rana tigrina

**Answer: Brassica campestris**

**154. The bark of the Cinchona tree yields:**

- A) Quinine



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- B) Penicillin
- C) Aspirin
- D) Morphine

**Answer: Quinine**

**155. People sleeping near smoky fires had less malaria because smoke:**

- A) Kills Plasmodium
- B) Repels mosquitoes
- C) Purifies the air
- D) Increases temperature

**Answer: Repels mosquitoes**

**156. Radioactive isotopes like Carbon-14 are used in research as:**

- A) Fuel
- B) Medicine
- C) Tracers
- D) Fertilizers

**Answer: Tracers**

**157. Trace elements like zinc often act as:**

- A) Hormone components
- B) Enzyme cofactors
- C) Oxygen carriers
- D) Structural components

**Answer: Enzyme cofactors**

**158. Iron in hemoglobin is crucial for:**

- A) Enzyme function
- B) Oxygen transport
- C) Nerve impulse transmission
- D) Hormone synthesis

**Answer: Oxygen transport**

**159. Iodine is a key component of the hormone:**

- A) Insulin
- B) Thyroxine
- C) Adrenaline
- D) Estrogen

**Answer: Thyroxine**

**160. Sodium and potassium ions are vital for:**

- A) Oxygen transport
- B) Enzyme cofactors
- C) Nerve impulse transmission
- D) Bone formation

**Answer: Nerve impulse transmission**

**161. The oldest known fossil is of a:**

- A) Dinosaur
- B) Cyanobacterium
- C) Fungus

- D) Algae

**Answer: Cyanobacterium**

**162. The primary chemical component of genetic material is:**

- A) Protein
- B) Lipid
- C) Carbohydrate
- D) Nucleic Acid

**Answer: Nucleic Acid**

**163. A major component of biological membranes is:**

- A) Nucleic acids
- B) Lipids
- C) Carbohydrates
- D) Water

**Answer: Lipids**

**164. The main function of xylem tissue in plants is:**

- A) Food conduction
- B) Water conduction
- C) Photosynthesis
- D) Storage

**Answer: Water conduction**

**165. The organelle responsible for cellular respiration is the:**

- A) Chloroplast
- B) Ribosome
- C) Mitochondrion
- D) Nucleus

**Answer: Mitochondrion**

**166. The organelle responsible for photosynthesis is the:**

- A) Mitochondrion
- B) Ribosome
- C) Chloroplast
- D) Nucleus

**Answer: Chloroplast**

**167. Ribosomes are specialized for:**

- A) Cellular respiration
- B) Photosynthesis
- C) Protein synthesis
- D) Lipid synthesis

**Answer: Protein synthesis**

**168. Which of the following is a renewable source of energy?**

- A) Coal
- B) Solar Energy
- C) Natural Gas



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D) Petroleum

**Answer: Solar Energy**

**169. Which of the following is a renewable natural resource?**

A) Coal

B) Petroleum

C) Forests

D) Natural Gas

**Answer: Forests**

**170. Pasteurization is a method of:**

A) Food preservation

B) Vaccination

C) Cloning

D) Genetic engineering

**Answer: Food preservation**

**171. The process of weaning in animal husbandry refers to:**

A) Helping deliver a baby animal

B) Accustoming a young animal to food other than mother's milk

C) Medicating sick animals

D) Branding animals

**Answer: Accustoming a young animal to food other than mother's milk**

**172. In sewage treatment, the precipitate produced is called:**

A) Effluent

B) Sludge

C) Methane

D) Biosolid

**Answer: Sludge**

**173. Methane produced during sewage treatment can be used as:**

A) Fertilizer

B) An energy source

C) Drinking water

D) Animal feed

**Answer: An energy source**

**174. The study of the distribution of organisms in different geographical regions is:**

A) Biogeography

B) Biophysics

C) Bioeconomics

D) Biostatistics

**Answer: Biogeography**

**175. Applying mathematical models to understand biological systems is:**

A) Biophysics

B) Biochemistry

C) Computational Biology

D) Biogeography

**Answer: Computational Biology**

**176. The hypothesis "All mammals have hair" tested on whales is an example of:**

A) Inductive reasoning

B) Deductive reasoning

C) Analytical reasoning

D) Critical reasoning

**Answer: Deductive reasoning**

**177. Observing that sparrows, eagles, and parrots have wings to conclude all birds have wings uses:**

A) Deductive reasoning

B) Inductive reasoning

C) Analytical reasoning

D) Critical reasoning

**Answer: Inductive reasoning**

**178. The principle that refuted spontaneous generation is:**

A) Biogenesis

B) Omnis cellula e cellula

C) Natural Selection

D) Germ Theory

**Answer: Omnis cellula e cellula**

**179. The theory proposing that chloroplasts evolved from free-living prokaryotes is:**

A) Cell Theory

B) Germ Theory

C) Endosymbiotic Theory

D) Evolutionary Theory

**Answer: Endosymbiotic Theory**

**180. Multinucleated muscle fibers are an exception to the Cell Theory due to:**

A) Being acellular

B) Losing their nucleus

C) Being formed by cell fusion

D) Containing their own DNA

**Answer: Being formed by cell fusion**

**181. Mammalian red blood cells lose their nucleus to:**

A) Increase surface area

B) Optimize oxygen transport

C) Become multinucleated

D) Support endosymbiosis

**Answer: Optimize oxygen transport**



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# MK PREPARATIONS



**182. Plant sieve tube elements lose their nucleus to:**

- A) Enhance photosynthesis
- B) Optimize food conduction
- C) Become multinucleated
- D) Support endosymbiosis

**Answer: Optimize food conduction**



**183. Golden Rice is genetically engineered to produce:**

- A) Vitamin C
- B) Beta-carotene (Vitamin A)
- C) Iron
- D) Protein

**Answer: Beta-carotene (Vitamin A)**

**184. Bt cotton is engineered for resistance against:**

- A) Drought
- B) Insects
- C) Fungal diseases
- D) Viruses

**Answer: Insects**

**185. The first cloned mammal was:**

- A) A mouse
- B) A cow
- C) Dolly the sheep
- D) A frog

**Answer: Dolly the sheep**

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D) Beta-oxidation of fatty acids

**Answer: Chemiosmotic ATP synthesis**

**128) An important piece of evidence supporting the endosymbiotic origin of mitochondria and chloroplasts is that they:**

- A) Have single membranes like the ER
- B) Lack their own DNA
- C) Have their own circular DNA and 70S ribosomes
- D) Are produced by the Golgi apparatus

**Answer: Have their own circular DNA and 70S ribosomes**

**129) The outer membrane of the nuclear envelope is continuous with the membrane of the:**

- A) Golgi apparatus
- B) Rough Endoplasmic Reticulum
- C) Mitochondrion
- D) Plasma membrane

**Answer: Rough Endoplasmic Reticulum**

**130) In prokaryotic cells, transcription and translation are:**

- A) Separated by the nuclear envelope
- B) Coupled (occur simultaneously in the cytoplasm)
- C) Restricted to the nucleoid region only
- D) Regulated by spliceosomes

**Answer: Coupled (occur simultaneously in the cytoplasm)**

**131) The basal lamina is a specialized type of:**

- A) Cell junction
- B) Extracellular matrix (ECM)
- C) Cytoskeletal element
- D) Organelle

**Answer: Extracellular matrix (ECM)**

**132) A key structural difference between prokaryotic and eukaryotic flagella is:**

- A) Prokaryotic flagella are made of tubulin; eukaryotic are made of flagellin.

B) Prokaryotic flagella rotate; eukaryotic flagella bend using dynein motors.

C) Eukaryotic flagella are powered by a proton gradient; prokaryotic by ATP.

D) Only eukaryotic flagella are used for motility.

**Answer: Prokaryotic flagella rotate; eukaryotic flagella bend using dynein motors.**

**133) Which of the following is NOT a typical function of plasma membrane proteins?**

- A) Enzymatic activity
- B) Signal transduction
- C) Synthesis of ribosomal RNA
- D) Cell-cell recognition

**Answer: Synthesis of ribosomal RNA**

**134) The process by which a cell engulfs a large solid particle is called:**

- A) Pinocytosis
- B) Phagocytosis
- C) Receptor-mediated endocytosis
- D) Exocytosis

**Answer: Phagocytosis**

**135) In the plasma membrane, the hydrophilic heads of phospholipids face:**

- A) The interior of the bilayer
- B) The extracellular fluid and the cytosol
- C) Only the extracellular fluid
- D) Only the cytosol

**Answer: The extracellular fluid and the cytosol**

**136) The energy for primary active transport comes directly from:**

- A) The electrochemical gradient of Na<sup>+</sup>
- B) The hydrolysis of ATP
- C) Light energy
- D) The proton motive force

**Answer: The hydrolysis of ATP**

**137) For every ATP hydrolyzed, the Na<sup>+</sup>/K<sup>+</sup> pump transports:**

- A) 3 Na<sup>+</sup> out, 2 K<sup>+</sup> in



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D) Fungal cells

**Answer: Plant cells**

**167) Which of the following is NOT a function of lysosomes?**

- A) Autophagy
- B) Phagocytosis of foreign particles
- C) Synthesis of steroid hormones
- D) Autolysis

**Answer: Synthesis of steroid hormones**

**168) Simple diffusion and facilitated diffusion are both types of:**

- A) Active transport
- B) Passive transport
- C) Endocytosis
- D) Osmosis

**Answer: Passive transport**

**169) A characteristic of carrier proteins in facilitated diffusion is that they:**

- A) Hydrolyze ATP for energy
- B) Change conformation to move the solute across the membrane
- C) Form a permanent hydrophilic pore
- D) Move solutes against their concentration gradient

**Answer: Change conformation to move the solute across the membrane**

**170) The primary function of microvilli on intestinal epithelial cells is to:**

- A) Increase surface area for absorption
- B) Propel mucus along the surface
- C) Provide mechanical strength
- D) Serve as sensory receptors

**Answer: Increase surface area for absorption**

**171) Which cell type would be expected to have the most extensive network of Smooth ER?**

- A) Pancreatic cell secreting digestive enzymes
- B) Liver cell detoxifying alcohol
- C) Skeletal muscle cell contracting

D) Red blood cell transporting oxygen

**Answer: Liver cell detoxifying alcohol**

**172) Transport through the nuclear pore complex is:**

- A) Free and non-selective for all molecules
- B) Selective, involving both passive diffusion and active transport
- C) Restricted to only mRNA exiting the nucleus
- D) Limited to only ribosomal proteins entering the nucleus

**Answer: Selective, involving both passive diffusion and active transport**

**173) In a muscle cell, calcium ions are stored at high concentration in the:**

- A) Nucleus
- B) Mitochondrion
- C) Sarcoplasmic reticulum (specialized SER)
- D) Golgi apparatus

**Answer: Sarcoplasmic reticulum (specialized SER)**

**174) A key difference between eukaryotic and prokaryotic mRNA is that eukaryotic mRNA:**

- A) Is not processed after transcription
- B) Undergoes processing (capping, polyadenylation, splicing)
- C) Is transcribed in the cytoplasm
- D) Is translated simultaneously with transcription

**Answer: Undergoes processing (capping, polyadenylation, splicing)**

**175) The term "semi-autonomous" applied to mitochondria and chloroplasts refers to their ability to:**

- A) Survive independently outside the cell
- B) Synthesize some of their own proteins using their own genetic system
- C) Control cell division
- D) Communicate directly with the nucleus via vesicles



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**Answer: Synthesize some of their own proteins using their own genetic system**

**176) Which organelle is involved in the synthesis of carbohydrates for the plant cell wall?**

- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus
- D) Mitochondrion

**Answer: Golgi apparatus**

**177) Both mitochondria and chloroplasts contain:**

- A) A single circular DNA molecule and 70S ribosomes
- B) Multiple linear chromosomes and 80S ribosomes
- C) No DNA of their own
- D) Thylakoid membranes

**Answer: A single circular DNA molecule and 70S ribosomes**

**178) The movement of chromosomes during cell division is orchestrated by the:**

- A) Microfilament network
- B) Intermediate filament network
- C) Microtubule-based spindle apparatus
- D) Endoplasmic reticulum

**Answer: Microtubule-based spindle apparatus**

**179) Peroxisomes and glyoxysomes are both:**

- A) Surrounded by a double membrane
- B) Involved in lipid metabolism and detoxification
- C) Sites of protein synthesis
- D) Derived from the Golgi apparatus

**Answer: Involved in lipid metabolism and detoxification**

**180) Proteins destined for use within the cytoplasm are typically synthesized on:**

- A) Free ribosomes in the cytosol

- B) Ribosomes bound to the Rough ER
- C) Ribosomes inside mitochondria
- D) Ribosomes on the nuclear envelope

**Answer: Free ribosomes in the cytosol**

**181) The extensive network of membranes involved in protein and lipid synthesis is the:**

- A) Golgi apparatus
- B) Endoplasmic reticulum
- C) Lysosomal system
- D) Peroxisomal network

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**Answer: Endoplasmic reticulum**

**182) The formation of the mitotic spindle is organized by the:**

- A) Centrioles in the centrosome (in animal cells)
- B) Nucleolus
- C) Ribosomes
- D) Peroxisomes

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**Answer: Centrioles in the centrosome (in animal cells)**

P

**183) Which of the following can be classified as a non-membrane bound organelle?**

- A) Peroxisome
- B) Lysosome
- C) Glyoxysome
- D) Ribosome

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A

**Answer: Ribosome**

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**184) Which substance can cross the lipid bilayer of the plasma membrane most easily?**

- A) Sodium ion (Na<sup>+</sup>)
- B) Glucose
- C) A small, nonpolar molecule like oxygen
- D) A large, polar amino acid

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**Answer: A small, nonpolar molecule like oxygen**

S

**185) Which of the following is found in both prokaryotic and eukaryotic cells?**

- A) Centriole
- B) Mitochondria
- C) Endoplasmic reticulum

D) Ribosomes

**Answer: Ribosomes**

**186) Membrane-bound organelles are absent in which type of organism?**

- A) Saccharomyces (yeast)
- B) Plants
- C) Animals
- D) Streptococcus (bacteria)

**Answer: Streptococcus (bacteria)**

**187) Which statement about plastids is true?**

- A) They are surrounded by a single membrane.
- B) They are the "powerhouse" of the plant cell.
- C) They are found in all eukaryotic organisms.
- D) They contain their own DNA and ribosomes.

**Answer: They contain their own DNA and ribosomes.**

**188) Who is credited with the discovery and naming of lysosomes?**

- A) George Palade
- B) Christian de Duve
- C) Camillo Golgi
- D) Rudolf Virchow

**Answer: Christian de Duve**

**189) The electron transport chain and oxidative phosphorylation occur on the:**

- A) Outer mitochondrial membrane
- B) Inner mitochondrial membrane
- C) Mitochondrial matrix
- D) Intermembrane space

**Answer: Inner mitochondrial membrane**

**190) The component of the plasma membrane that helps regulate its fluidity across a range of temperatures is:**

- A) Integral proteins
- B) Phospholipids
- C) Glycoproteins
- D) Cholesterol

**Answer: Cholesterol**

**191) Each centriole is composed of how many microtubule triplets arranged in a circle?**

- A) 9
- B) 27 (9 triplets)
- C) 6
- D) 18

**Answer: 9**

**192) The dark-independent reactions of photosynthesis (Calvin cycle) fix carbon dioxide in the:**

- A) Thylakoid lumen
- B) Stroma of the chloroplast
- C) Mitochondrial matrix
- D) Cytosol

**Answer: Stroma of the chloroplast**

**193) Out of the following, which set of structures is found only in plant cells?**

- A) Vacuole, Chloroplast, Ribosomes
- B) Chloroplast, Cell Wall, Large Central Vacuole
- C) Chloroplast, Microtubules, Peroxisomes
- D) Chloroplast, Cell Wall, Mitochondria

**Answer: Chloroplast, Cell Wall, Large Central Vacuole**

**194) Which of the following is NOT a function of the cell membrane?**

- A) Providing a large surface area for reactions
- B) Separating various organelles within the cell
- C) Producing lipids and proteins
- D) Separating the cell from its external environment

**Answer: Producing lipids and proteins**

**195) Neurotransmitters are released from the presynaptic neuron into the synaptic cleft via:**

- A) Simple Diffusion
- B) Osmosis
- C) Active Transport
- D) Exocytosis

**Answer: Exocytosis**



196) The principle "Omnis cellula e cellula" (all cells come from cells) is attributed to:

- A) Louis Pasteur
- B) Rudolf Virchow
- C) Theodor Schwann
- D) August Weismann

**Answer: Rudolf Virchow**

197) Which microscopy technique is best for viewing unstained, living cells by converting refractive index differences into contrast?

- A) Bright-field microscopy
- B) Dark-field microscopy
- C) Phase-contrast microscopy
- D) Fluorescence microscopy

**Answer: Phase-contrast microscopy**

198) The proteins within a biological membrane that determine most of its specific functions are:

- A) Phospholipids
- B) Cholesterol
- C) Carbohydrates
- D) Proteins

**Answer: Proteins**

199) The movement of a substance against its concentration gradient, requiring energy, is called:

- A) Diffusion
- B) Facilitated diffusion
- C) Active transport
- D) Osmosis

**Answer: Active transport**

200) Which organelle is primarily responsible for the synthesis of steroid hormones?

- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus
- D) Mitochondria

**Answer: Smooth ER**

201) The cellular structure that gives red blood cells their flexible, biconcave shape is the:

- A) Cell wall
- B) Spectrin-based cytoskeleton network
- C) Central vacuole
- D) Cholesterol-rich membrane

**Answer: Spectrin-based cytoskeleton network**



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202) Which of the following are sites for protein synthesis?

- A) Nucleolus and Ribosomes
- B) Ribosomes only
- C) Golgi apparatus and Ribosomes
- D) Smooth ER and Ribosomes

**Answer: Ribosomes only**

203) The function of the nucleolus is to synthesize and assemble:

- A) DNA
- B) Ribosomal subunits
- C) ATP
- D) Phospholipids

**Answer: Ribosomal subunits**

204) Which of the following organelles has a double membrane and is involved in cellular respiration?

- A) Lysosome
- B) Peroxisome
- C) Mitochondrion
- D) Vacuole

**Answer: Mitochondrion**

205) The process by which lysosomes digest worn-out organelles is known as:

- A) Phagocytosis
- B) Autophagy
- C) Pinocytosis
- D) Exocytosis

**Answer: Autophagy**

206) Which of the following is a characteristic of prokaryotic cells?

- A) Presence of a nuclear envelope
- B) 80S ribosomes
- C) Division by mitosis
- D) Presence of a nucleoid region

**Answer: Presence of a nucleoid region**

**207) The folds of the inner mitochondrial membrane are called cristae and their function is to:**

- A) Increase surface area for ATP production
- B) Store calcium ions
- C) Synthesize proteins
- D) Package enzymes for export

**Answer: Increase surface area for ATP production**

**208) The structure that forms during cytokinesis in plant cells, eventually developing into the new cell wall, is the:**

- A) Cleavage furrow
- B) Cell plate
- C) Phragmoplast
- D) Contractile ring

**Answer: Cell plate**

**209) Which organelle is responsible for breaking down hydrogen peroxide into water and oxygen?**

- A) Lysosome
- B) Peroxisome
- C) Glyoxysome
- D) Both B and C

**Answer: Both B and C**

**210) The term "fluid" in the Fluid Mosaic Model of the membrane refers to the:**

- A) Movement of phospholipids and proteins within the bilayer
- B) Aqueous environment inside and outside the cell
- C) Flow of ions through channels
- D) Movement of the entire membrane

**Answer: Movement of phospholipids and proteins within the bilayer**



**211) The main function of the Rough Endoplasmic Reticulum is:**

- A) Lipid synthesis
- B) Protein synthesis and initial modification
- C) Detoxification
- D) Calcium storage

**M Answer: Protein synthesis and initial modification**

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**212) The model that describes the plasma membrane as a phospholipid bilayer with embedded proteins is the:**

- A) Unit Membrane Model
- B) Fluid Mosaic Model
- C) Sandwich Model
- D) Induced Fit Model

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**Answer: Fluid Mosaic Model**

**P**

**213) Which organelle is known as the "suicidal bag" of the cell?**

- A) Golgi apparatus
- B) Lysosome
- C) Peroxisome
- D) Vacuole

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**A**

**Answer: Lysosome**

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**214) The organelle that modifies, sorts, and packages proteins for secretion is the:**

- A) Nucleus
- B) Rough ER
- C) Golgi apparatus
- D) Lysosome

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**Answer: Golgi apparatus**

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**215) Which of the following is a double-membraned organelle?**

- A) Ribosome
- B) Lysosome
- C) Peroxisome
- D) Chloroplast

**Answer: Chloroplast**



216) The movement of water from a dilute solution to a concentrated solution across a semipermeable membrane is:

- A) Diffusion
- B) Active transport
- C) Osmosis
- D) Facilitated diffusion

**Answer: Osmosis**

217) Which of the following is a function of the cytoskeleton?

- A) Storage of genetic material
- B) Maintenance of cell shape and intracellular transport
- C) Site of protein synthesis
- D) ATP production

**Answer: Maintenance of cell shape and intracellular transport**

218) The organelle responsible for photosynthesis in plant cells is the:

- A) Mitochondrion
- B) Chloroplast
- C) Peroxisome
- D) Leucoplast

**Answer: Chloroplast**

219) Which of the following organelles contains its own DNA?

- A) Lysosome
- B) Golgi apparatus
- C) Peroxisome
- D) Mitochondrion

**Answer: Mitochondrion**

220) The structure that separates the nucleus from the cytoplasm is the:

- A) Plasma membrane
- B) Nuclear envelope
- C) Cell wall
- D) Endoplasmic reticulum

**Answer: Nuclear envelope**

221) Which cellular structure is composed of rRNA and proteins and is the site of protein synthesis?

- A) Nucleolus
- B) Ribosome
- C) Golgi apparatus
- D) Lysosome

**Answer: Ribosome**



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222) The organelle involved in lipid synthesis and detoxification in liver cells is the:

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- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus
- D) Lysosome

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**Answer: Smooth ER**

R

223) The structure that provides mechanical support and shape to plant cells is the:

E

- A) Plasma membrane
- B) Cell wall
- C) Cytoskeleton
- D) Extracellular matrix

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A

**Answer: Cell wall**

R

224) The organelle responsible for ATP production through oxidative phosphorylation is the:

A

- A) Nucleus
- B) Chloroplast
- C) Mitochondrion
- D) Peroxisome

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**Answer: Mitochondrion**

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225) Which organelle is involved in the breakdown of fatty acids and detoxification of hydrogen peroxide?

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- A) Lysosome
- B) Peroxisome
- C) Glyoxysome
- D) Golgi apparatus

**Answer: Peroxisome**



226) The structure that facilitates cell movement and is composed of microtubules in a 9+2 arrangement is the:

- A) Cilium
- B) Microvillus
- C) Desmosome
- D) Tight junction

**Answer: Cilium**

227) The storage carbohydrate in animal cells is:

- A) Cellulose
- B) Starch
- C) Glycogen
- D) Sucrose

**Answer: Glycogen**

228) Which of the following is present in both animal and plant cells?

- A) Centrioles
- B) Cell wall
- C) Large central vacuole
- D) Mitochondria

**Answer: Mitochondria**

229) The process by which cells engulf large particles is called:

- A) Pinocytosis
- B) Phagocytosis
- C) Exocytosis
- D) Osmosis

**Answer: Phagocytosis**

230) Which of the following is a characteristic of facilitated diffusion?

- A) Requires ATP
- B) Moves molecules against their concentration gradient
- C) Uses carrier or channel proteins
- D) Is only for lipid-soluble molecules

**Answer: Uses carrier or channel proteins**

231) The organelle that contains digestive enzymes and breaks down cellular waste is

the:

- A) Vacuole
- B) Peroxisome
- C) Lysosome
- D) Glyoxysome

**Answer: Lysosome**

232) Which cellular structure is involved in cell division and organization of microtubules?

- A) Centriole
- B) Nucleolus
- C) Ribosome
- D) Peroxisome

**Answer: Centriole**

233) The structure that stores calcium ions in muscle cells is the:

- A) Golgi apparatus
- B) Sarcoplasmic reticulum
- C) Lysosome
- D) Peroxisome

**Answer: Sarcoplasmic reticulum**

234) Which organelle is responsible for the synthesis of secretory proteins?

- A) Smooth ER
- B) Rough ER
- C) Golgi apparatus
- D) Lysosome

**Answer: Rough ER**

235) The structure that connects adjacent plant cells and allows communication is the:

- A) Desmosome
- B) Gap junction
- C) Plasmodesma
- D) Tight junction

**Answer: Plasmodesma**

236) Which cellular structure is involved in the modification, sorting, and packaging of proteins for secretion?

- A) Nucleus



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- B) Rough ER
- C) Golgi apparatus
- D) Lysosome

**Answer: Golgi apparatus**

**237) The structure that provides tensile strength and anchors the nucleus is the:**

- A) Microtubule
- B) Microfilament
- C) Intermediate filament
- D) Actin filament

**Answer: Intermediate filament**

**238) Which organelle contains enzymes for the Krebs cycle and electron transport chain?**

- A) Nucleus
- B) Chloroplast
- C) Mitochondrion
- D) Peroxisome

**Answer: Mitochondrion**

**239) The structure that forms a selective barrier controlling the movement of substances in and out of the cell is the:**

- A) Cell wall
- B) Plasma membrane
- C) Nuclear envelope
- D) Endoplasmic reticulum

**Answer: Plasma membrane**

**240) Which cellular component is involved in the synthesis of ribosomal RNA?**

- A) Nucleus
- B) Nucleolus
- C) Ribosome
- D) Golgi apparatus

**Answer: Nucleolus**

**241) The structure that stores pigments, ions, and waste in plant cells is the:**

- A) Chloroplast
- B) Central vacuole
- C) Nucleus

- D) Peroxisome

**Answer: Central vacuole**



**242) Which organelle is involved in the synthesis of steroid hormones?**

- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus
- D) Mitochondrion

**M Answer: Smooth ER**

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**243) The structure that provides a pathway for the transport of materials within the cell is the:**

- A) Cytoskeleton
- B) Endoplasmic reticulum
- C) Golgi apparatus
- D) Lysosome

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**Answer: Endoplasmic reticulum**

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**244) Which cellular structure is involved in the breakdown of damaged organelles through autophagy?**

- A) Peroxisome
- B) Lysosome
- C) Glyoxysome
- D) Golgi apparatus

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**Answer: Lysosome**

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**245) The structure that contains cristae and a matrix is the:**

- A) Chloroplast
- B) Mitochondrion
- C) Nucleus
- D) Peroxisome

**Answer: Mitochondrion**

**246) Which organelle is involved in the conversion of light energy into chemical energy?**



- A) Mitochondrion
- B) Chloroplast
- C) Peroxisome

D) Lysosome

**Answer: Chloroplast**

**247) The structure that contains thylakoids and stroma is the:**

- A) Mitochondrion
- B) Chloroplast
- C) Nucleus
- D) Peroxisome

**Answer: Chloroplast**

**248) Which cellular component is involved in the synthesis of membrane phospholipids?**

- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus
- D) Lysosome

**Answer: Smooth ER**

**249) The structure that contains hydrolytic enzymes and an acidic interior is the:**

- A) Peroxisome
- B) Lysosome
- C) Glyoxysome
- D) Golgi apparatus

**Answer: Lysosome**

**250) Which organelle is involved in the detoxification of drugs and poisons in liver cells?**

- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus
- D) Mitochondrion

**Answer: Smooth ER**

**251) The structure that contains catalase and is involved in beta-oxidation of fatty acids is the:**

- A) Lysosome
- B) Peroxisome
- C) Glyoxysome
- D) Golgi apparatus

**Answer: Peroxisome**

**252) Which cellular structure is involved in the synthesis of proteins for export?**

- A) Free ribosomes
- B) Bound ribosomes on Rough ER
- C) Smooth ER
- D) Golgi apparatus

**Answer: Bound ribosomes on Rough ER**

**253) The structure that contains chlorophyll and carries out the light-dependent reactions of photosynthesis is the:**

- A) Stroma
- B) Thylakoid membrane
- C) Cristae
- D) Matrix

**Answer: Thylakoid membrane**

**254) Which organelle is involved in the storage and release of calcium ions in cells?**

- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus
- D) Lysosome

**Answer: Smooth ER**

**255) The structure that contains the enzymes for the Calvin cycle is the:**

- A) Thylakoid lumen
- B) Stroma of chloroplast
- C) Mitochondrial matrix
- D) Cytosol

**Answer: Stroma of chloroplast**

**256) Which cellular component is involved in the assembly of ribosomal subunits?**

- A) Nucleus
- B) Nucleolus
- C) Ribosome
- D) Golgi apparatus

**Answer: Nucleolus**

**257) The structure that contains pores for the exchange of materials between nucleus and cytoplasm is the:**



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- A) Nuclear envelope
- B) Plasma membrane
- C) Cell wall
- D) Endoplasmic reticulum

**Answer: Nuclear envelope**

**258) Which organelle is involved in the synthesis of carbohydrates for the plant cell wall?**

- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus
- D) Mitochondrion

**Answer: Golgi apparatus**

**259) The structure that contains a circular DNA molecule and 70S ribosomes is the:**

- A) Nucleus
- B) Mitochondrion
- C) Chloroplast
- D) Both B and C

**Answer: Both B and C**

**260) Which cellular structure is involved in the movement of chromosomes during cell division?**

- A) Microtubules
- B) Microfilaments
- C) Intermediate filaments
- D) Actin filaments

**Answer: Microtubules**

**261) The structure that contains a double membrane and is involved in lipid metabolism is the:**

- A) Peroxisome
- B) Glyoxysome
- C) Both A and B
- D) Lysosome

**Answer: Both A and B**

**262) Which organelle is involved in the synthesis of proteins for use within the cytoplasm?**

- A) Free ribosomes
- B) Bound ribosomes on Rough ER
- C) Smooth ER
- D) Golgi apparatus

**Answer: Free ribosomes**

**263) The structure that contains a network of membranes and is involved in protein synthesis and modification is the:**

- A) Golgi apparatus
- B) Endoplasmic reticulum
- C) Lysosome
- D) Peroxisome

**Answer: Endoplasmic reticulum**

**264) Which cellular component is involved in the formation of the mitotic spindle?**

- A) Centrioles
- B) Nucleolus
- C) Ribosomes
- D) Peroxisomes

**Answer: Centrioles**

**265) The structure that contains a single membrane and is involved in the breakdown of hydrogen peroxide is the:**

- A) Lysosome
- B) Peroxisome
- C) Glyoxysome
- D) Both B and C

**Answer: Both B and C**

**266) Which organelle is involved in the synthesis of proteins for lysosomes?**

- A) Free ribosomes
- B) Bound ribosomes on Rough ER
- C) Smooth ER
- D) Golgi apparatus

**Answer: Bound ribosomes on Rough ER**

**267) The structure that contains a phospholipid bilayer and embedded proteins is the:**

- A) Cell wall



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- B) Plasma membrane
- C) Nuclear envelope
- D) Endoplasmic reticulum

**Answer: Plasma membrane**

**268) Which cellular structure is involved in the transport of vesicles along microtubules?**

- A) Kinesin and dynein
- B) Myosin and actin
- C) Tubulin and actin
- D) Keratin and vimentin

**Answer: Kinesin and dynein**

**269) The structure that contains a rigid layer of cellulose and provides support to plant cells is the:**

- A) Plasma membrane
- B) Cell wall
- C) Extracellular matrix
- D) Cytoskeleton

**Answer: Cell wall**

**270) Which organelle is involved in the synthesis of ATP through photophosphorylation?**

- A) Mitochondrion
- B) Chloroplast
- C) Peroxisome
- D) Lysosome

**Answer: Chloroplast**

**271) The structure that contains a double membrane and is involved in the storage of genetic material is the:**

- A) Nucleus
- B) Mitochondrion
- C) Chloroplast
- D) All of the above

**Answer: Nucleus**

**272) Which cellular component is involved in the synthesis of RNA?**

- A) Nucleus
- B) Nucleolus

- C) Ribosome
- D) Golgi apparatus

**Answer: Nucleus**



**273) The structure that contains a network of microfilaments and is involved in cell motility is the:**

- A) Cytoskeleton
- B) Endoplasmic reticulum
- C) Golgi apparatus
- D) Lysosome

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**Answer: Cytoskeleton**

**274) Which organelle is involved in the synthesis of proteins for the plasma membrane?**

- A) Free ribosomes
- B) Bound ribosomes on Rough ER
- C) Smooth ER
- D) Golgi apparatus

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**Answer: Bound ribosomes on Rough ER**

**275) The structure that contains a membrane and is involved in the storage of starch in plant cells is the:**

- A) Chloroplast
- B) Amyloplast
- C) Central vacuole
- D) Peroxisome

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**Answer: Amyloplast**

**276) Which cellular structure is involved in the synthesis of ribosomal proteins?**

- A) Nucleus
- B) Nucleolus
- C) Ribosome
- D) Golgi apparatus

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**Answer: Ribosome**

**277) The structure that contains a double membrane and is involved in the synthesis of ATP through oxidative phosphorylation is the:**

- A) Nucleus



- B) Chloroplast
- C) Mitochondrion
- D) Peroxisome

**Answer: Mitochondrion**

**278) Which of the following is a function of the cytoskeleton?**

- A) Storage of genetic material
- B) Intracellular transport and cell shape maintenance
- C) Site of protein synthesis
- D) ATP production

**Answer: Intracellular transport and cell shape maintenance**

**279) The site of cellular respiration in eukaryotic cells is the:**

- A) Nucleus
- B) Chloroplast
- C) Mitochondrion
- D) Lysosome

**Answer: Mitochondrion**

**280) Which organelle is involved in packaging and modifying proteins for secretion?**

- A) Nucleus
- B) Rough ER
- C) Golgi apparatus
- D) Peroxisome

**Answer: Golgi apparatus**

**281) The structure that contains digestive enzymes and breaks down cellular waste is the:**

- A) Vacuole
- B) Peroxisome
- C) Lysosome
- D) Glyoxysome

**Answer: Lysosome**

**282) Which cellular structure is responsible for maintaining turgor pressure in plant cells?**

- A) Cell wall

- B) Chloroplast
- C) Central vacuole
- D) Nucleus

**Answer: Central vacuole**

**283) The organelle that contains chlorophyll and carries out photosynthesis is the:**

- A) Mitochondrion
- B) Chloroplast
- C) Peroxisome
- D) Leucoplast

**Answer: Chloroplast**

**284) Which structure is involved in the synthesis of lipids and detoxification?**

- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus
- D) Lysosome

**Answer: Smooth ER**

**285) The structure that provides mechanical support and shape to plant cells is the:**

- A) Plasma membrane
- B) Cell wall
- C) Cytoskeleton
- D) Extracellular matrix

**Answer: Cell wall**

**286) Which organelle is responsible for the synthesis of ATP through oxidative phosphorylation?**

- A) Nucleus
- B) Chloroplast
- C) Mitochondrion
- D) Peroxisome

**Answer: Mitochondrion**

**287) The structure that separates the contents of the nucleus from the cytoplasm is the:**

- A) Plasma membrane
- B) Nuclear envelope
- C) Cell wall



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D) Endoplasmic reticulum

**Answer: Nuclear envelope**

**288) Which cellular component is composed of rRNA and proteins and is the site of protein synthesis?**

- A) Nucleolus
- B) Ribosome
- C) Golgi apparatus
- D) Lysosome

**Answer: Ribosome**

**289) The structure that contains the cell's genetic material is the:**

- A) Nucleus
- B) Mitochondrion
- C) Chloroplast
- D) Ribosome

**Answer: Nucleus**

**290) Which organelle is involved in the breakdown of fatty acids and detoxification of hydrogen peroxide?**

- A) Lysosome
- B) Peroxisome
- C) Glyoxysome
- D) Golgi apparatus

**Answer: Peroxisome**

**291) The structure that facilitates cell movement and is composed of microtubules in a 9+2 arrangement is the:**

- A) Cilium
- B) Microvillus
- C) Desmosome
- D) Tight junction

**Answer: Cilium**

**292) Which cellular structure is involved in cell division and organization of microtubules?**

- A) Centriole
- B) Nucleolus
- C) Ribosome

D) Peroxisome

**Answer: Centriole**

**293) The structure that stores calcium ions in muscle cells is the:**

- A) Golgi apparatus
- B) Sarcoplasmic reticulum
- C) Lysosome
- D) Peroxisome

**Answer: Sarcoplasmic reticulum**

**294) Which organelle is responsible for the synthesis of secretory proteins?**

- A) Smooth ER
- B) Rough ER
- C) Golgi apparatus
- D) Lysosome

**Answer: Rough ER**

**295) The structure that connects adjacent plant cells and allows communication is the:**

- A) Desmosome
- B) Gap junction
- C) Plasmodesma
- D) Tight junction

**Answer: Plasmodesma**

**296) Which cellular structure is involved in the modification, sorting, and packaging of proteins for secretion?**

- A) Nucleus
- B) Rough ER
- C) Golgi apparatus
- D) Lysosome

**Answer: Golgi apparatus**

**297) The structure that provides tensile strength and anchors the nucleus is the:**

- A) Microtubule
- B) Microfilament
- C) Intermediate filament
- D) Actin filament

**Answer: Intermediate filament**





**298) Which organelle contains enzymes for the Krebs cycle and electron transport chain?**

- A) Nucleus
- B) Chloroplast
- C) Mitochondrion
- D) Peroxisome



**Answer: Mitochondrion**

**299) The structure that forms a selective barrier controlling the movement of substances in and out of the cell is the:**

- A) Cell wall
- B) Plasma membrane
- C) Nuclear envelope
- D) Endoplasmic reticulum

**Answer: Plasma membrane**

**300) Which cellular component is involved in the synthesis of ribosomal RNA?**

- A) Nucleus
- B) Nucleolus
- C) Ribosome
- D) Golgi apparatus

**Answer: Nucleolus**

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## 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 O<sub>2</sub> and CO<sub>2</sub> 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<sup>+</sup>/K<sup>+</sup> pump moves:**

- A) 2 Na<sup>+</sup> in, 3 K<sup>+</sup> out  
B) 3 Na<sup>+</sup> in, 2 K<sup>+</sup> out  
C) 2 Na<sup>+</sup> out, 3 K<sup>+</sup> in  
D) 3 Na<sup>+</sup> out, 2 K<sup>+</sup> in

**Answer: 3 Na<sup>+</sup> out, 2 K<sup>+</sup> in**

**16. Which energy source directly powers the sodium-potassium pump?**

- A) The Na<sup>+</sup> concentration gradient  
B) The K<sup>+</sup> 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



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- 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**



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**39. Denaturation of a protein results in the loss of its:**

- A) Primary structure
- B) Amino acid sequence
- C) Three-dimensional shape and function
- D) Peptide bonds

**Answer: Three-dimensional shape and function**

**40. A triglyceride is formed by linking:**

- A) Glycerol to three fatty acids
- B) Glycerol to two fatty acids and a phosphate
- C) Amino acids into a chain
- D) Sugars into a polysaccharide

**Answer: Glycerol to three fatty acids**

**41. Unsaturated fatty acids have:**

- A) No double bonds
- B) One or more double bonds
- C) Maximum hydrogen atoms
- D) A straight hydrocarbon chain

**Answer: One or more double bonds**

**42. The main difference between a phospholipid and a triglyceride is the replacement of one fatty acid with a:**

- A) Carbohydrate group
- B) Phosphate-containing polar group
- C) Cholesterol molecule
- D) Protein chain

**Answer: Phosphate-containing polar group**

**43. In an aqueous environment, phospholipids spontaneously form a bilayer because they are:**

- A) Hydrophobic
- B) Amphipathic
- C) Nonpolar
- D) Glycosylated

**Answer: Amphipathic**

**44. Which lipid acts as a precursor for steroid hormones and is a component of animal cell membranes?**

- A) Triglyceride
- B) Phospholipid
- C) Cholesterol
- D) Prostaglandin

**Answer: Cholesterol**

**45. The experiment by Frye and Edidin, fusing mouse and human cells, demonstrated the:**

- A) Asymmetry of membrane lipids

- B) Lateral movement of membrane proteins
- C) Impermeability of the membrane to ions
- D) Role of cholesterol in fluidity

**Answer: Lateral movement of membrane proteins**

**46. Membrane carbohydrates are important for:**

- A) Energy storage
- B) Cell-cell recognition
- C) Active transport
- D) Protein synthesis

**Answer: Cell-cell recognition**

**47. Which substance would cross a lipid bilayer most rapidly by simple diffusion?**

- A) Glucose
- B) Na<sup>+</sup> ion
- C) A small, nonpolar molecule like O<sub>2</sub>
- D) A large, polar amino acid

**Answer: A small, nonpolar molecule like O<sub>2</sub>**

**48. A plant cell in a hypotonic solution will become:**

- A) Flaccid
- B) Turgid
- C) Plasmolyzed
- D) Crenated

**Answer: Turgid**

**49. Plasmolysis occurs when a plant cell is placed in a(n):**

- A) Hypotonic solution
- B) Isotonic solution
- C) Hypertonic solution
- D) Aquaporin-rich solution

**Answer: Hypertonic solution**

**50. A carrier protein that transports glucose down its concentration gradient is an example of:**

- A) Active transport
- B) Simple diffusion
- C) Facilitated diffusion
- D) Osmosis

**Answer: Facilitated diffusion**

**51. Ion channels that open or close in response to a stimulus are called:**

- A) Aquaporins
- B) Gated channels
- C) Symporters
- D) ATPases

**Answer: Gated channels**



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**52. The proton pump is an electrogenic pump that actively transports:**

- A) Na<sup>+</sup> out of the cell
- B) H<sup>+</sup> out of the cell
- C) K<sup>+</sup> into the cell
- D) Cl<sup>-</sup> out of the cell

**Answer: H<sup>+</sup> out of the cell**

**53. The energy for the cotransport of sucrose with H<sup>+</sup> in plant cells is directly provided by:**

- A) ATP hydrolysis
- B) The H<sup>+</sup> electrochemical gradient
- C) Light energy
- D) The sucrose concentration gradient

**Answer: The H<sup>+</sup> electrochemical gradient**

**54. Familial hypercholesterolemia is linked to a defect in:**

- A) Cholesterol synthesis
- B) LDL receptors
- C) Na<sup>+</sup>/K<sup>+</sup> pumps
- D) Gap junctions

**Answer: LDL receptors**

**55. Which junction in animal cells forms a seal to prevent fluid leakage between cells?**

- A) Desmosome
- B) Gap junction
- C) Tight junction
- D) Adhering junction

**Answer: Tight junction**

**56. Plasmodesmata in plant cells are functionally similar to which structure in animal cells?**

- A) Tight junctions
- B) Desmosomes
- C) Gap junctions
- D) The extracellular matrix

**Answer: Gap junctions**

**57. The building blocks of proteins are:**

- A) Nucleotides
- B) Monosaccharides
- C) Amino acids
- D) Fatty acids

**Answer: Amino acids**

**58. A peptide bond forms between the \_\_\_\_\_ of one amino acid and the \_\_\_\_\_ of another.**

- A) R group; R group
- B) Amino group; carboxyl group
- C) Carboxyl group; amino group

D) Alpha carbon; R group

**Answer: Carboxyl group; amino group**

**59. The alpha-helix is stabilized primarily by:**

- A) Disulfide bridges
- B) Hydrogen bonds along the peptide backbone
- C) Ionic bonds
- D) Hydrophobic interactions

**Answer: Hydrogen bonds along the peptide backbone**

**60. Quaternary structure applies to proteins that:**

- A) Are denatured
- B) Consist of a single polypeptide chain
- C) Have multiple polypeptide subunits
- D) Are fully saturated with hydrogen

**Answer: Have multiple polypeptide subunits**

**61. The diversity of protein function stems primarily from the:**

- A) Variety of amino acid R groups
- B) Presence of a peptide backbone
- C) Universal genetic code
- D) Ability to form disulfide bonds

**Answer: Variety of amino acid R groups**

**62. Which factor is least likely to cause protein denaturation?**

- A) High temperature
- B) Change to neutral pH (pH 7)
- C) High concentration of salt
- D) Organic solvents

**Answer: Change to neutral pH (pH 7)**

**63. The "lock and key" model refers to the specificity of:**

- A) Membrane transport
- B) Enzyme-substrate interaction
- C) Osmosis
- D) Protein denaturation

**Answer: Enzyme-substrate interaction**

**64. Which monomer is correctly paired with its polymer?**

- A) Glucose – Lipid
- B) Amino acid – Protein
- C) Nucleotide – Polysaccharide
- D) Fatty acid – Nucleic acid

**Answer: Amino acid – Protein**

**65. Dehydration synthesis reactions are used to form:**

- A) Polymers from monomers
- B) Monomers from polymers



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- C) ATP from ADP  
D) All of the above

**Answer: Polymers from monomers**

**66. Hydrolysis is involved in:**

- A) Building starch from glucose  
B) Breaking down proteins into amino acids  
C) Forming DNA strands  
D) Synthesizing triglycerides

**Answer: Breaking down proteins into amino acids**

**67. A structural isomer of glucose is:**

- A) Galactose  
B) Fructose  
C) Ribose  
D) Both A and B

**Answer: Fructose**

**68. Lactose is a disaccharide composed of:**

- A) Glucose + Glucose  
B) Glucose + Fructose  
C) Glucose + Galactose  
D) Fructose + Galactose

**Answer: Glucose + Galactose**

**69. Sucrose is the transport sugar in plants and is made from:**

- A) Two glucose molecules  
B) Glucose and fructose  
C) Glucose and galactose  
D) Many glucose molecules

**Answer: Glucose and fructose**

**70. Glycogen is a highly branched polymer of glucose used for energy storage in:**

- A) Plants  
B) Animals  
C) Fungi  
D) Bacteria

**Answer: Animals**

**71. Which statement about nucleic acids is false?**

- A) DNA contains thymine; RNA contains uracil  
B) DNA is usually double-stranded; RNA is usually single-stranded  
C) Both DNA and RNA contain deoxyribose sugar  
D) Nucleotides are linked by phosphodiester bonds

**Answer: Both DNA and RNA contain deoxyribose sugar**

**72. The complementary DNA strand to 5'-ATCG-3' is:**

- A) 5'-TAGC-3'  
B) 5'-GCTA-3'  
C) 5'-CGAT-3'  
D) 5'-ATCG-3'

**Answer: 5'-CGAT-3'**

**73. NAD<sup>+</sup> and FAD are nucleotide derivatives that function as:**

- A) Energy storage molecules  
B) Electron carriers  
C) Structural components  
D) Genetic material

**Answer: Electron carriers**

**74. The beta-pleated sheet is a type of protein secondary structure held together by:**

- A) Peptide bonds  
B) Hydrogen bonds between different polypeptide strands  
C) Disulfide bonds  
D) Ionic bonds between R groups

**Answer: Hydrogen bonds between different polypeptide strands**

**75. Hydrophobic interactions in a protein's tertiary structure involve:**

- A) Attraction between nonpolar side chains away from water  
B) Hydrogen bonds between polar side chains  
C) Ionic bonds between charged side chains  
D) Covalent disulfide bridges

**Answer: Attraction between nonpolar side chains away from water**

**76. The functional group that defines an amino acid is the:**

- A) Carboxyl group  
B) Amino group  
C) Both amino and carboxyl groups  
D) Phosphate group

**Answer: Both amino and carboxyl groups**

**77. The R group (side chain) of the amino acid serine is polar because it contains a(n):**

- A) Methyl group  
B) Sulfhydryl group  
C) Hydroxyl group  
D) Carboxyl group

**Answer: Hydroxyl group**

**78. A protein's specific function is determined by its:**



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- A) Size
- B) Sequence of amino acids
- C) Location in the cell
- D) Ability to bind water

**Answer: Sequence of amino acids**

**79. Which level of protein structure is stabilized by interactions between R groups?**

- A) Primary
- B) Secondary
- C) Tertiary
- D) Both B and C

**Answer: Tertiary**

**80. Hemoglobin's quaternary structure consists of:**

- A) One polypeptide chain
- B) Two identical polypeptide chains
- C) Four polypeptide chains (two alpha, two beta)
- D) A single alpha helix

**Answer: Four polypeptide chains (two alpha, two beta)**

**81. Sickle cell anemia is caused by a single amino acid substitution in:**

- A) Insulin
- B) Hemoglobin
- C) Collagen
- D) Actin

**Answer: Hemoglobin**

**82. Which lipid is NOT built from fatty acids?**

- A) Triglyceride
- B) Phospholipid
- C) Cholesterol
- D) Oil

**Answer: Cholesterol**

**83. Trans fats are unhealthy because they:**

- A) Are polyunsaturated
- B) Increase HDL ("good") cholesterol
- C) Have kinks that improve fluidity
- D) Increase LDL ("bad") cholesterol and promote heart disease

**Answer: Increase LDL ("bad") cholesterol and promote heart disease**

**84. The primary role of carbohydrates is:**

- A) Long-term energy storage
- B) Information storage
- C) Structural support and energy storage
- D) Catalyzing reactions

**Answer: Structural support and energy storage**

**85. A glycosidic linkage is found in:**

- A) Proteins
- B) Nucleic acids
- C) Polysaccharides
- D) Triglycerides

**Answer: Polysaccharides**

**86. A nucleotide without a phosphate group is called a:**

- A) Nucleoside
- B) Nucleic acid
- C) Purine
- D) Pyrimidine

**Answer: Nucleoside**

**87. The backbone of a nucleic acid strand consists of alternating:**

- A) Sugars and phosphates
- B) Bases and sugars
- C) Bases and phosphates
- D) Nucleotides and amino acids

**Answer: Sugars and phosphates**

**88. The enzyme that breaks down starch but not cellulose recognizes the difference in:**

- A) Monomer identity
- B) Glycosidic linkage (alpha vs. beta)
- C) Chain length
- D) Presence of branching

**Answer: Glycosidic linkage (alpha vs. beta)**

**89. The term "amphipathic" describes a molecule that has:**

- A) Both polar and nonpolar regions
- B) Only polar regions
- C) Only nonpolar regions
- D) A ring structure

**Answer: Both polar and nonpolar regions**

**90. The movement of vesicles from the Golgi to the plasma membrane for secretion involves:**

- A) Phagocytosis
- B) Exocytosis
- C) Receptor-mediated endocytosis
- D) Pinocytosis

**Answer: Exocytosis**

**91. The force that drives osmosis is the:**

- A) ATP hydrolysis
- B) Concentration gradient of water
- C) Active transport of solutes



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D) Electrical charge difference

**Answer: Concentration gradient of water**

**92. A solution with a greater solute concentration than the cell's interior is:**

- A) Hypotonic
- B) Isotonic
- C) Hypertonic
- D) Osmotic

**Answer: Hypertonic**

**93. A red blood cell placed in distilled water will:**

- A) Shrink
- B) Swell and burst
- C) Remain unchanged
- D) Become turgid

**Answer: Swell and burst**

**94. The contractile vacuole of Paramecium is an adaptation for:**

- A) Active transport in a hypertonic environment
- B) Osmoregulation in a hypotonic environment
- C) Phagocytosis of food
- D) Protein synthesis

**Answer: Osmoregulation in a hypotonic environment**

**95. The GLUT1 transporter for glucose is an example of:**

- A) An active uniporter
- B) A passive symporter
- C) A passive uniporter (facilitated diffusion)
- D) A channel protein

**Answer: A passive uniporter (facilitated diffusion)**

**96. Which statement about the Na<sup>+</sup>/K<sup>+</sup> pump is true?**

- A) It generates an electrical gradient
- B) It moves ions down their concentration gradient
- C) It does not require ATP
- D) It transports equal numbers of Na<sup>+</sup> and K<sup>+</sup>

**Answer: It generates an electrical gradient**

**97. Secondary active transport uses the energy from \_\_\_\_\_ to drive transport of another substance.**

- A) ATP directly
- B) Light
- C) An electrochemical gradient
- D) GTP

**Answer: An electrochemical gradient**

**98. Which process is used by white blood cells to engulf bacteria?**

- A) Pinocytosis
- B) Phagocytosis
- C) Receptor-mediated endocytosis
- D) Exocytosis

**Answer: Phagocytosis**

**99. The LDL receptor is key in the process of:**

- A) Exocytosis of cholesterol
- B) Receptor-mediated endocytosis of cholesterol
- C) Active transport of Na<sup>+</sup>
- D) Facilitated diffusion of glucose

**Answer: Receptor-mediated endocytosis of cholesterol**

**100. Desmosomes are anchored to \_\_\_\_\_ inside the cell.**

- A) Microtubules
- B) Microfilaments
- C) Intermediate filaments
- D) The extracellular matrix

**Answer: Intermediate filaments**

**101. The blood-brain barrier is formed by:**

- A) Gap junctions between capillary cells
- B) Tight junctions between capillary cells
- C) Desmosomes between neurons
- D) Plasmodesmata in brain tissue

**Answer: Tight junctions between capillary cells**

**102. Connexin is the protein that forms:**

- A) Tight junctions
- B) Desmosomes
- C) Gap junctions
- D) Adhering junctions

**Answer: Gap junctions**

**103. The chemical reaction that joins two monosaccharides is:**

- A) Hydrolysis
- B) Dehydration synthesis
- C) Phosphorylation
- D) Oxidation

**Answer: Dehydration synthesis**

**104. Maltose is a disaccharide of two glucose molecules linked by a(n) \_\_\_\_\_ bond.**

- A) Alpha-1,4-glycosidic
- B) Beta-1,4-glycosidic
- C) Peptide
- D) Ester

**Answer: Alpha-1,4-glycosidic**



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**105. Cellulose indigestibility by humans is due to the lack of an enzyme that breaks \_\_\_\_\_ linkages.**

- A) Alpha-1,4-glycosidic
- B) Beta-1,4-glycosidic
- C) Peptide
- D) Phosphodiester

**Answer: Beta-1,4-glycosidic**

**106. The sugar in RNA is \_\_\_\_\_; in DNA it is \_\_\_\_\_.**

- A) Deoxyribose; ribose
- B) Ribose; deoxyribose
- C) Glucose; fructose
- D) Galactose; glucose

**Answer: Ribose; deoxyribose**

**107. In a DNA double helix, the two strands are:**

- A) Identical in sequence
- B) Parallel
- C) Antiparallel
- D) Held together by peptide bonds

**Answer: Antiparallel**

**108. Which base is unique to RNA?**

- A) Adenine
- B) Guanine
- C) Cytosine
- D) Uracil

**Answer: Uracil**

**109. The sequence of amino acids in a polypeptide is determined by the sequence of:**

- A) Fatty acids
- B) Nucleotides in DNA
- C) Sugars in glycogen
- D) Phospholipids in the membrane

**Answer: Nucleotides in DNA**

**110. The amino acid that can form disulfide bridges is:**

- A) Glycine
- B) Cysteine
- C) Serine
- D) Alanine

**Answer: Cysteine**

**111. Protein motifs, like the helix-turn-helix, are examples of conserved:**

- A) Primary structure
- B) Supersecondary structure
- C) Tertiary structure

D) Quaternary structure

**Answer: Supersecondary structure**

**112. Domains in proteins are:**

- A) Always formed by separate polypeptide chains
- B) Functional and structural units within a polypeptide
- C) Only found in denatured proteins
- D) The same as alpha helices

**Answer: Functional and structural units within a polypeptide**

**113. In a triglyceride, the fatty acids are attached to glycerol by \_\_\_\_\_ bonds.**

- A) Glycosidic
- B) Peptide
- C) Ester
- D) Phosphodiester

**Answer: Ester**

**114. A lipid that is liquid at room temperature is most likely:**

- A) Saturated
- B) Unsaturated
- C) A steroid
- D) A trans fat

**Answer: Unsaturated**

**115. The main energy storage molecule in animals is:**

- A) Starch
- B) Cellulose
- C) Glycogen
- D) Chitin

**Answer: Glycogen**

**116. The primary function of molecular chaperones is to:**

- A) Degrade misfolded proteins
- B) Help other proteins fold correctly
- C) Transport proteins across membranes
- D) Act as enzymes in metabolic pathways

**Answer: Help other proteins fold correctly**

**117. Which factor would NOT cause protein denaturation?**

- A) Heating to 100°C
- B) Adding strong acid or base
- C) Placing in an isotonic solution
- D) Adding organic solvents like alcohol

**Answer: Placing in an isotonic solution**

**118. The bond between two amino acids is called a:**



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- A) Glycosidic bond
- B) Peptide bond
- C) Ester bond
- D) Phosphodiester bond

**Answer: Peptide bond**

**119. The alpha-helix and beta-pleated sheet are stabilized by hydrogen bonds between atoms of the:**

- A) Side chains (R groups)
- B) Peptide backbone
- C) Carboxyl and amino termini
- D) Adjacent cysteine residues

**Answer: Peptide backbone**

**120. The ultimate source of energy for active transport is usually:**

- A) The concentration gradient
- B) ATP
- C) Sunlight
- D) Heat

**Answer: ATP**

**121. Which of these can diffuse directly through the lipid bilayer?**

- A) Glucose
- B) K<sup>+</sup>
- C) CO<sub>2</sub>
- D) Na<sup>+</sup>

**Answer: CO<sub>2</sub>**

**122. Osmotic pressure is the pressure required to:**

- A) Prevent osmosis into a given solution
- B) Cause plasmolysis
- C) Power the sodium pump
- D) Open ion channels

**Answer: Prevent osmosis into a given solution**

**123. A plant cell with a pressure potential of 0 is:**

- A) Turgid
- B) Flaccid
- C) Plasmolyzed
- D) Lysed

**Answer: Flaccid**

**124. Which transport process is most selective and saturable?**

- A) Simple diffusion
- B) Facilitated diffusion via carrier proteins
- C) Osmosis
- D) Diffusion through ion channels

**Answer: Facilitated diffusion via carrier proteins**

**125. The resting membrane potential of a cell is primarily due to the diffusion of:**

- A) Na<sup>+</sup>
- B) K<sup>+</sup>
- C) Cl<sup>-</sup>
- D) Ca<sup>2+</sup>

**Answer: K<sup>+</sup>**

**126. An ABC transporter is a type of:**

- A) Channel protein
- B) Carrier protein that uses ATP
- C) Gap junction protein
- D) Phospholipid flipase

**Answer: Carrier protein that uses ATP**

**127. In the H<sup>+</sup>/sucrose cotransporter in plants, sucrose moves into the cell against its gradient coupled with the movement of H<sup>+</sup>:**

- A) Into the cell down its gradient
- B) Out of the cell against its gradient
- C) Into the cell against its gradient
- D) Out of the cell down its gradient

**Answer: Into the cell down its gradient**

**128. The cell structure that would be most involved in phagocytosis is the:**

- A) Lysosome
- B) Ribosome
- C) Nucleus
- D) Chloroplast

**Answer: Lysosome**

**129. Pinocytosis involves the uptake of:**

- A) Large solid particles
- B) Specific ligands via receptors
- C) Extracellular fluid and dissolved solutes
- D) Only water

**Answer: Extracellular fluid and dissolved solutes**

**130. After receptor-mediated endocytosis, the vesicle coat protein that is quickly removed is:**

- A) Cadherin
- B) Connexin
- C) Clathrin
- D) Integrin

**Answer: Clathrin**



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## Cell Cycle

1. What is the series of events a eukaryotic cell undergoes from its formation until it divides into two daughter cells called?

- A) Mitosis
- B) Interphase
- C) Cell Cycle
- D) Cytokinesis

**Answer: Cell Cycle**

2. Who proposed the principle that all cells arise from pre-existing cells?

- A) Walther Flemming
- B) Rudolf Virchow
- C) Edouard van Beneden
- D) Oscar Hertwig

**Answer: Rudolf Virchow**

3. Which phase of the cell cycle is characterized by high metabolic activity and preparation for division but no visible division?

- A) M Phase
- B) Cytokinesis
- C) Interphase
- D) G<sub>0</sub> Phase

**Answer: Interphase**

4. Approximately what percentage of the total cell cycle time is occupied by interphase in a typical mammalian cell?

- A) 50%
- B) 75%
- C) 90%
- D) 10%

**Answer: 90%**

5. During which sub-phase of interphase does the cell grow, synthesize proteins and organelles, and produce enzymes for DNA replication?

- A) S Phase
- B) G<sub>2</sub> Phase
- C) G<sub>1</sub> Phase
- D) M Phase

**Answer: G<sub>1</sub> Phase**

6. DNA replication occurs during which specific phase of the cell cycle?

- A) G<sub>1</sub> Phase
- B) G<sub>2</sub> Phase
- C) S Phase



D) Prophase

**Answer: S Phase**

7. The result of DNA replication in the S phase is that each chromosome consists of two identical:

- A) Homologous chromosomes
- B) Sister chromatids
- C) Centromeres
- D) Kinetochores

**M**

**K**

**Answer: Sister chromatids**

8. During which gap phase does the cell synthesize proteins necessary for cell division, such as tubulin for spindle fibers?

- A) G<sub>1</sub> Phase
- B) S Phase
- C) G<sub>2</sub> Phase
- D) G<sub>0</sub> Phase

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**Answer: G<sub>2</sub> Phase**

9. A temporary or permanent non-dividing state that cells may enter from the G<sub>1</sub> phase is called:

- A) S Phase
- B) G<sub>2</sub> Phase
- C) G<sub>0</sub> Phase
- D) Metaphase

**Answer: G<sub>0</sub> Phase**

10. Which of the following cell types typically enters the G<sub>0</sub> phase permanently?

- A) Skin epithelial cells
- B) Intestinal lining cells
- C) Neurons
- D) Red blood cell precursors

**Answer: Neurons**

11. The type of cell division that ensures the daughter cells have the same number of chromosomes as the parent cell is:

- A) Meiosis
- B) Binary Fission
- C) Mitosis
- D) Apoptosis

**Answer: Mitosis**



12. Mitosis occurs in which type of cells in a multicellular organism?

- A) Germ-line cells
- B) Gametes
- C) Somatic cells

## 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) IP<sub>3</sub>
- B) DAG
- C) cAMP
- D) Ca<sup>2+</sup>

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**Answer: cAMP**

**8. What is the primary role of protein phosphatases in signal transduction pathways?**

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- 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 IP<sub>3</sub> (inositol trisphosphate) trigger the release of?**



## Enzymes

1. What is the term for the sum of all chemical reactions within a living organism?

- A) Anabolism
- B) Catabolism
- C) Metabolism
- D) Enzymology

**Answer: Metabolism**

2. Who first introduced the concept of metabolism?

- A) Emil Fischer
- B) Daniel Koshland
- C) Ibn-e-Nafees
- D) Wilhelm Kuhne

**Answer: Ibn-e-Nafees**

3. Which metabolic process involves the synthesis of complex molecules and consumes energy?

- A) Catabolism
- B) Glycolysis
- C) Anabolism
- D) Hydrolysis

**Answer: Anabolism**

4. What is the primary chemical nature of most enzymes?

- A) Carbohydrates
- B) Lipids
- C) Proteins
- D) Nucleic acids

**Answer: Proteins**

5. What are the only non-protein enzymes called?

- A) Coenzymes
- B) Apoenzymes
- C) Ribozymes
- D) Holoenzymes

**Answer: Ribozymes**

6. Enzymes speed up reactions by lowering what?

- A) Free energy
- B) Activation energy
- C) Kinetic energy
- D) Potential energy

**Answer: Activation energy**

7. The region of an enzyme where the substrate binds is called the:

- A) Allosteric site
- B) Cofactor site

- C) Active site
- D) Binding groove

**Answer: Active site**

8. What term describes the non-protein components required for the activity of many enzymes?

- A) Substrates
- B) Products
- C) Cofactors
- D) Inhibitors

**Answer: Cofactors**

9. Inorganic cofactors, such as  $Zn^{2+}$  or  $Mg^{2+}$ , are also known as:

- A) Coenzymes
- B) Prosthetic groups
- C) Activators
- D) Apoenzymes

**Answer: Activators**

10. Which organic cofactor is loosely attached to an enzyme and often derived from vitamins?

- A) Prosthetic group
- B) Coenzyme
- C) Activator
- D) Apoenzyme

**Answer: Coenzyme**

11. A cofactor that is covalently and permanently bound to an enzyme is called a:

- A) Coenzyme
- B) Activator
- C) Prosthetic group
- D) Apoenzyme

**Answer: Prosthetic group**

12. An enzyme without its cofactor is called an:

- A) Holoenzyme
- B) Coenzyme
- C) Apoenzyme
- D) Prosthetic enzyme

**Answer: Apoenzyme**

13. The functional enzyme, consisting of an apoenzyme and its cofactor, is called a:

- A) Coenzyme
- B) Ribozyme
- C) Prosthetic group
- D) Holoenzyme

**Answer: Holoenzyme**



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## Bioenergetics

1. Which metabolic process releases energy by splitting complex molecules into smaller components?

- A) Anabolism
- B) Catabolism
- C) Photosynthesis
- D) Fermentation

**Answer: Catabolism**

2. In aerobic respiration, what is the final electron acceptor?

- A)  $\text{NAD}^+$
- B) FAD
- C) Oxygen
- D) Carbon dioxide

**Answer: Oxygen**

3. Glycolysis occurs in which cellular location?

- A) Mitochondrial matrix
- B) Cytosol
- C) Inner mitochondrial membrane
- D) Stroma

**Answer: Cytosol**

4. The net ATP yield from glycolysis per glucose molecule is:

- A) 1 ATP
- B) 2 ATP
- C) 4 ATP
- D) 36 ATP

**Answer: 2 ATP**

5. Which molecule is produced when pyruvate is converted to acetyl CoA?

- A) Glucose
- B) Oxaloacetate
- C) NADH
- D)  $\text{FADH}_2$

**Answer: NADH**

6. The citric acid cycle takes place in which part of the mitochondrion?

- A) Intermembrane space
- B) Outer membrane
- C) Matrix
- D) Cristae

**Answer: Matrix**

7. How many NADH molecules are produced per glucose molecule in the citric acid cycle?

- A) 2



- B) 4
- C) 6
- D) 8

**Answer: 6**

8. The chemiosmotic synthesis of ATP is driven by:

- A) A sodium ion gradient
- B) A proton gradient
- C) Direct transfer of phosphate
- D) Reduction of oxygen

**Answer: A proton gradient**

9. Which complex in the electron transport chain directly receives electrons from  $\text{FADH}_2$ ?

- A) Complex I
- B) Complex II
- C) Complex III
- D) Complex IV

**Answer: Complex II**

10. What is the maximum ATP yield from one molecule of glucose during aerobic respiration?

- A) 2 ATP
- B) 12 ATP
- C) 36-38 ATP
- D) 42 ATP

**Answer: 36-38 ATP**

11. Anaerobic respiration uses which of the following as a terminal electron acceptor?

- A) Oxygen
- B) Nitrate
- C)  $\text{NAD}^+$
- D) Pyruvate

**Answer: Nitrate**

12. Fermentation regenerates which molecule to keep glycolysis operating?

- A) ATP
- B)  $\text{NAD}^+$
- C) Glucose
- D) Pyruvate

**Answer:  $\text{NAD}^+$**

13. Alcohol fermentation produces which end product?

- A) Lactic acid
- B) Ethanol
- C) Acetyl CoA



## Chromosome & DNA

**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**



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## 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  $\alpha$ -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



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## 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:**

- M
- A) Genetic screening
  - B) Gene therapy
  - C) Genetic counselling
  - D) DNA sequencing
- K

**Answer: Gene therapy**

**9. Fermentation is best described as:**

- P
- 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
- R
- E

**Answer: The mass culture of microorganisms to produce any product**

**10. Alcoholic fermentation is carried out by:**

- P
- A) Lactobacillus
  - B) Streptococcus
  - C) Saccharomyces cerevisiae
  - D) Escherichia coli
- A
- R

**Answer: Saccharomyces cerevisiae**

**11. Lactic acid fermentation is primarily performed by:**

- T
- A) Yeast
  - B) Molds
  - C) Lactobacillus
  - D) Viruses
- I

**Answer: Lactobacillus**

**12. Which of the following is a product of lactic acid fermentation?**

- O
- A) Ethanol and CO<sub>2</sub>
  - B) Lactic acid
  - C) Acetic acid
  - D) Formic acid
- N
- S

**Answer: Lactic acid**

**13. A device that provides an optimal environment for microbial growth and product formation is a:**



- A) Centrifuge

## Pharmacology

1. What is the scientific study of drugs, including their composition and medical applications, called?

- A) Pharmacy
- B) Toxicology
- C) Pharmacology
- D) Biochemistry

**Answer: Pharmacology**

2. The term "pharmacology" is derived from which language?

- A) Latin
- B) Greek
- C) Arabic
- D) French

**Answer: Greek**

3. Which term was used for pharmacology until 1890?

- A) Pharmacognosy
- B) Materia Medica
- C) Therapeutics
- D) Posology

**Answer: Materia Medica**

4. What is any chemical substance that alters normal body function when absorbed into a living organism called?

- A) Toxin
- B) Drug
- C) Enzyme
- D) Hormone

**Answer: Drug**

5. Which of the following is used in diagnosis, cure, treatment, or prevention of disease?

- A) Pharmaceutical drug
- B) Addictive drug
- C) Hallucinogen
- D) Narcotic

**Answer: Pharmaceutical drug**

6. What is an important part of the medical field that relies on pharmacology called?

- A) Surgery
- B) Pharmacotherapy
- C) Diagnostics
- D) Epidemiology

**Answer: Pharmacotherapy**

7. Which drugs are sold only on a physician's order?

- A) OTC drugs
- B) Prescription drugs
- C) Herbal drugs
- D) Nutraceuticals

**Answer: Prescription drugs**

8. What are drugs considered safe enough to be sold without a prescription called?

- A) Prescription drugs
- B) Controlled substances
- C) Over-the-counter drugs
- D) Ethical drugs

**Answer: Over-the-counter drugs**

9. Which of the following is NOT a source of drugs?

- A) Synthetic
- B) Plants
- C) Fungi
- D) Sunlight

**Answer: Sunlight**

10. Which drug is an example of a synthetic drug?

- A) Penicillin
- B) Morphine
- C) Aspirin
- D) Quinine

**Answer: Aspirin**

11. From which fungus is Penicillin derived?

- A) Aspergillus
- B) Penicillium notatum
- C) Saccharomyces
- D) Candida

**Answer: Penicillium notatum**

12. Digitalis, a cardiotonic, is obtained from which plant?

- A) Opium poppy
- B) Foxglove
- C) Cinchona
- D) Cannabis

**Answer: Foxglove**

13. Morphine is extracted from which plant?

- A) Foxglove
- B) Opium poppy
- C) Cinchona
- D) Cannabis

**Answer: Opium poppy**

## Biostatistics & Computational Biology

1. Biostatistics is best defined as the application of statistical principles to which fields?

- A) Physics and Chemistry
- B) Economics and Business
- C) Biology, Medicine, and Health Sciences
- D) Engineering and Technology

**Answer: Biology, Medicine, and Health Sciences**

2. Which of the following is NOT a common measure of central tendency?

- A) Mean
- B) Range
- C) Median
- D) Mode

**Answer: Range**

3. The formula for the arithmetic mean for ungrouped data is:

- A)  $\frac{\sum fx}{\sum f}$
- B)  $\frac{\sum x}{n}$
- C)  $\frac{n+1}{2}$
- D)  $\frac{\text{Highest}-\text{Lowest}}{2}$

**Answer:  $\frac{\sum x}{n}$**

4. In a dataset, the value that appears most frequently is called the:

- A) Mean
- B) Median
- C) Mode
- D) Range

**Answer: Mode**

5. The middle value in an ordered dataset is known as the:

- A) Mean
- B) Median
- C) Mode
- D) Standard Deviation

**Answer: Median**

6. Which measure of dispersion is calculated as the difference between the highest and lowest values?

- A) Variance

B) Standard Deviation

C) Range

D) Percentile

**Answer: Range**

7. Standard Deviation is a measure of:

A) Central Tendency

B) Data Dispersion

C) Data Frequency

D) Data Accuracy

**Answer: Data Dispersion**

8. The 50th percentile in a dataset is equivalent to the:

A) Mean

B) Mode

C) Median

D) First Quartile

**Answer: Median**

9. In a normal distribution curve, what percentage of data lies within one standard deviation of the mean?

A) 25%

B) 50%

C) 68%

D) 95%

**Answer: 68%**

10. Which graphical representation uses bars of equal width but variable heights?

A) Pie Chart

B) Line Graph

C) Bar Chart

D) Scatter Plot

**Answer: Bar Chart**

11. Error bars on a bar chart typically represent variability using:

A) Mean or Median

B) Range or Standard Deviation

C) Mode or Percentile

D) Variance or Mean

**Answer: Range or Standard Deviation**

12. In an experiment, the variable that is manipulated by the researcher is called the:

A) Dependent Variable



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## 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

## 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?

- M  
K
- 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?

- P  
R
- A) Predation
  - B) Parasitism
  - C) Herbivory
  - D) Commensalism

**Answer: Herbivory**

10. A +/- interaction where one organism derives nourishment from a host is?

- E  
P  
A
- A) Herbivory
  - B) Predation
  - C) Parasitism
  - D) Mutualism

**Answer: Parasitism**

11. A ++ interaction benefiting both species is?

- R  
A  
T
- A) Commensalism
  - B) Mutualism
  - C) Predation
  - D) Competition

**Answer: Mutualism**

12. A +/0 interaction where one species benefits and the other is unaffected is?

- I  
O  
N
- A) Mutualism
  - B) Commensalism
  - C) Amensalism
  - D) Parasitism

**Answer: Commensalism**

13. The variety of different kinds of organisms in a community is its?



- S
- A) Relative abundance
  - B) Species richness
  - C) Species diversity

## Systematics, Phylogeny & Tree of Life

1. In the binomial nomenclature system, what is the correct format for writing the scientific name of humans?

- A) Homo Sapiens
- B) homo sapiens
- C) *Homo sapiens*
- D) *Homo Sapiens*

Answer: *Homo sapiens*

2. Which of the following taxonomic ranks is the most inclusive?

- A) Order
- B) Family
- C) Phylum
- D) Genus

Answer: Phylum

3. The three-domain system of classification includes:

- A) Protista, Fungi, Plantae
- B) Bacteria, Archaea, Eukarya
- C) Monera, Protista, Animalia
- D) Prokaryota, Eukaryota, Virus

Answer: Bacteria, Archaea, Eukarya

4. A phylogenetic tree that depicts evolutionary relationships based on shared derived characters is called a:

- A) Phenogram
- B) Cladogram
- C) Phylogram
- D) Dendrogram

Answer: Cladogram

5. Similar structures in different species due to common ancestry are termed:

- A) Analogous
- B) Homologous
- C) Homoplastic
- D) Convergent

Answer: Homologous

6. The evolutionary history of a group of organisms is known as:

- A) Taxonomy
- B) Systematics
- C) Phylogeny
- D) Cladistics

Answer: Phylogeny

7. Which kingdom in the five-kingdom system includes multicellular, photosynthetic

organisms?

- A) Fungi
- B) Plantae
- C) Animalia
- D) Protista

Answer: Plantae

8. A taxon that includes an ancestor and all of its descendants is:

- A) Paraphyletic
- B) Polyphyletic
- C) Monophyletic
- D) Periphyletic

Answer: Monophyletic

9. The principle that favors the simplest explanation in cladogram construction is:

- A) Maximum likelihood
- B) Parsimony
- C) Outgroup analysis
- D) Synapomorphy

Answer: Parsimony

10. Horizontal gene transfer is a process where genes move between:

- A) Parent and offspring
- B) Different species in the same generation
- C) Mitochondria and nucleus
- D) Homologous chromosomes

Answer: Different species in the same generation

11. The science of naming, describing, and classifying organisms is:

- A) Phylogenetics
- B) Systematics
- C) Taxonomy
- D) Cladistics

Answer: Taxonomy

12. In a cladogram, the point where two lineages diverge is called a:

- A) Root
- B) Node
- C) Branch
- D) Tip

Answer: Node

13. Which of the following is a shared derived character for mammals?

- A) Vertebrae
- B) Jaws



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## Viruses

**1. Who first discovered viruses using a filtration experiment with Tobacco Mosaic Disease?**

- A) Louis Pasteur
- B) Robert Koch
- C) Dmitri Iwanowsky
- D) W.M. Stanley

**Answer: Dmitri Iwanowsky**

**2. The outer protein shell of a virus is called the:**

- A) Envelope
- B) Capsomere
- C) Capsid
- D) Nucleocapsid

**Answer: Capsid**

**3. Individual protein subunits that assemble to form a viral capsid are known as:**

- A) Peplomers
- B) Capsomeres
- C) Prions
- D) Viroids

**Answer: Capsomeres**

**4. A virus that lacks a lipid bilayer outside its capsid is termed a:**

- A) Enveloped virus
- B) Naked virus
- C) Bacteriophage
- D) Retrovirus

**Answer: Naked virus**

**5. Viruses that specifically infect bacterial cells are called:**

- A) Retroviruses
- B) Bacteriophages
- C) Adenoviruses
- D) Picornaviruses

**Answer: Bacteriophages**

**6. The Baltimore classification system categorizes viruses primarily based on:**

- A) Host organism and disease symptoms
- B) Genome type and replication strategy
- C) Capsid symmetry and size
- D) Presence or absence of an envelope

**Answer: Genome type and replication strategy**

**7. Human Immunodeficiency Virus (HIV) is classified as a:**

- 
- A) Double-stranded DNA virus
  - B) Single-stranded RNA retrovirus
  - C) Double-stranded RNA virus
  - D) Single-stranded DNA virus

**Answer: Single-stranded RNA retrovirus**

**8. Viral host specificity is mainly determined by:**

- M**
- A) The shape of the capsid
  - B) Interaction between viral surface proteins and host cell receptors
  - C) The type of viral nucleic acid
  - D) The presence of a lipid envelope

**K**

**Answer: Interaction between viral surface proteins and host cell receptors**

**9. A virus that requires a host cell to replicate is best described as a/an:**

- P**
- A) Facultative intracellular parasite
  - B) Obligate intracellular parasite
  - C) Extracellular pathogen
  - D) Autotrophic organism

**R**

**Answer: Obligate intracellular parasite**

**E**

**10. The viral replication cycle that results in the immediate rupture and death of the host cell is the:**

- P**
- A) Lysogenic cycle
  - B) Lytic cycle
  - C) Latent cycle
  - D) Persistent cycle

**A**

**Answer: Lytic cycle**

**R**

**11. Integrated viral DNA within a bacterial chromosome during lysogeny is called a:**

- A**
- A) Provirus
  - B) Virion
  - C) Prophage
  - D) Retrovirus

**T**

**Answer: Prophage**

**I**

**12. In genetic engineering, modified viruses are often used as:**

- O**
- A) Antibiotics
  - B) Vectors for gene delivery
  - C) Primary energy sources
  - D) Food additives

**N**

**Answer: Vectors for gene delivery**

**S**

**13. The primary cellular targets of HIV are:**

- A) Red blood cells
- B) Helper T-lymphocytes (CD4+ cells)

## Bacteria

1. Which of the following is NOT a characteristic of prokaryotic cells?

- A) Presence of a membrane-bound nucleus
- B) Presence of ribosomes
- C) Genetic material in the form of circular DNA
- D) Cell wall containing peptidoglycan in many species

**Answer: Presence of a membrane-bound nucleus**

2. The three-domain system of classification divides organisms into Bacteria, Archaea, and what else?

- A) Protista
- B) Eukarya
- C) Monera
- D) Fungi

**Answer: Eukarya**

3. Who first discovered bacteria using a simple microscope and called them "animalcules"?

- A) Louis Pasteur
- B) Robert Koch
- C) Antonie van Leeuwenhoek
- D) Christian Gram

**Answer: Antonie van Leeuwenhoek**

4. Which scientist developed the Gram staining technique?

- A) Robert Koch
- B) Louis Pasteur
- C) Christian Gram
- D) Edward Jenner

**Answer: Christian Gram**

5. Bacteria that retain the crystal violet stain and appear purple are termed:

- A) Gram-negative
- B) Gram-variable
- C) Gram-positive
- D) Acid-fast

**Answer: Gram-positive**

6. The primary structural component of the bacterial cell wall is:

- A) Cellulose
- B) Chitin
- C) Peptidoglycan
- D) Lignin

**Answer: Peptidoglycan**

7. Which structure is used by bacteria for motility?

- A) Pili
- B) Flagella
- C) Capsule
- D) Mesosome

**Answer: Flagella**

8. Bacterial flagella are composed primarily of which protein?

- A) Actin
- B) Tubulin
- C) Flagellin
- D) Pilin

**Answer: Flagellin**

9. Thin, hair-like appendages involved in bacterial conjugation are called:

- A) Flagella
- B) Cilia
- C) Fimbriae
- D) Pili

**Answer: Pili**

10. The protective, gelatinous layer outside the cell wall of some bacteria is the:

- A) Slime layer
- B) Capsule
- C) S-layer
- D) Glycocalyx

**Answer: Capsule**

11. Bacteria that require oxygen for growth are classified as:

- A) Anaerobes
- B) Facultative anaerobes
- C) Aerobes
- D) Microaerophiles

**Answer: Aerobes**

12. Bacteria that can grow in the presence or absence of oxygen are called:

- A) Obligate aerobes
- B) Obligate anaerobes
- C) Facultative anaerobes
- D) Capnophiles

**Answer: Facultative anaerobes**

13. The process by which bacteria reproduce asexually is known as:

- A) Conjugation
- B) Binary fission



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## Protists

1. Which feature definitively separates protists from prokaryotic organisms?

- A) Presence of a cell wall
- B) Membrane-bound nucleus and organelles
- C) Ability to perform photosynthesis
- D) Unicellular body plan

**Answer: Membrane-bound nucleus and organelles**

2. The evolutionary relationship of Kingdom Protista is best described as:

- A) Monophyletic
- B) Paraphyletic
- C) Polyphyletic
- D) Holophyletic

**Answer: Paraphyletic**

3. What is the primary basis for grouping diverse organisms into the protist kingdom?

- A) Shared common ancestry
- B) Similar modes of reproduction
- C) They do not fit into other eukaryotic kingdoms
- D) All are microscopic

**Answer: They do not fit into other eukaryotic kingdoms**

4. Which characteristic is NOT typical of most protists?

- A) Presence in aquatic environments
- B) Prokaryotic cellular structure
- C) Unicellular or simple multicellular organization
- D) Lack of embryonic development

**Answer: Prokaryotic cellular structure**

5. Which scientist is credited with proposing the five-kingdom classification system?

- A) Carl Woese
- B) Robert Whittaker
- C) Ernst Haeckel
- D) Herbert Copeland

**Answer: Robert Whittaker**

6. Animal-like protists are collectively known as:

- A) Algae
- B) Protozoa
- C) Slime molds
- D) Oomycetes

**Answer: Protozoa**

7. The locomotory structure formed by temporary extensions of cytoplasm is called:

- A) Cilium
- B) Flagellum
- C) Pseudopod
- D) Axopod

**Answer: Pseudopod**

8. Amoebic dysentery is caused by which parasitic protist?

- A) Giardia lamblia
- B) Entamoeba histolytica
- C) Trypanosoma brucei
- D) Plasmodium vivax

**Answer: Entamoeba histolytica**

9. Zooflagellates primarily move using which structure?

- A) Pseudopodia
- B) Cilia
- C) One or more whip-like flagella
- D) Gliding motility

**Answer: One or more whip-like flagella**

10. African sleeping sickness is transmitted by the tsetse fly and caused by:

- A) Leishmania spp.
- B) Trypanosoma brucei
- C) Plasmodium falciparum
- D) Trichomonas vaginalis

**Answer: Trypanosoma brucei**

11. Ciliates are characterized for movement and feeding by numerous:

- A) Flagella
- B) Pseudopodia
- C) Short, hair-like cilia
- D) Tentacles

**Answer: Short, hair-like cilia**

12. A classic example of a ciliate protist often studied in labs is:

- A) Amoeba proteus
- B) Euglena gracilis
- C) Paramecium caudatum
- D) Plasmodium malariae

**Answer: Paramecium caudatum**

13. The organelle in freshwater protists that expels excess water is the:

- A) Food vacuole
- B) Contractile vacuole

## Plants Forms & Functions

1. Which of the following is a macronutrient essential for chlorophyll synthesis?

- A) Iron
- B) Magnesium
- C) Boron
- D) Zinc

**Answer: Magnesium**

2. Chlorosis in older leaves is a typical deficiency symptom of which element?

- A) Nitrogen
- B) Calcium
- C) Sulphur
- D) Phosphorus

**Answer: Nitrogen**

3. Carnivorous plants like the Venus flytrap primarily supplement their diet with insects to obtain:

- A) Water
- B) Carbon
- C) Phosphorus
- D) Nitrogen

**Answer: Nitrogen**

4. The primary site for gaseous exchange in plant leaves is the:

- A) Cuticle
- B) Palisade mesophyll
- C) Stomata
- D) Epidermis

**Answer: Stomata**

5. During daylight, when photosynthesis is active, a plant typically shows a net intake of:

- A) Oxygen and release of carbon dioxide
- B) Carbon dioxide and release of oxygen
- C) Both oxygen and carbon dioxide
- D) Neither gas

**Answer: Carbon dioxide and release of oxygen**

6. Which tissue is responsible for the transport of organic solutes like sucrose throughout the plant?

- A) Xylem
- B) Phloem
- C) Collenchyma
- D) Sclerenchyma

**Answer: Phloem**

7. The movement of water from root hair cells into the cortex follows a water potential gradient and is primarily driven by:

- A) Active transport
- B) Osmosis
- C) Capillary action
- D) Transpiration pull

**Answer: Osmosis**

**M**  
**K**  
8. The pathway where water moves through the interconnected cytoplasm of plant cells via plasmodesmata is the:

- A) Apoplast pathway
- B) Symplast pathway
- C) Vacuolar pathway
- D) Transmembrane pathway

**Answer: Symplast pathway**

**P**  
**R**  
**E**  
9. Which component of the TACT theory refers to the attraction between water molecules and the walls of xylem vessels?

- A) Transpiration pull
- B) Adhesion
- C) Cohesion
- D) Tension

**Answer: Adhesion**

**A**  
**R**  
10. Mature sieve tube elements in phloem lack which cellular structure?

- A) Cell wall
- B) Cytoplasm
- C) Nucleus
- D) Vacuole

**Answer: Nucleus**

**T**  
**I**  
11. The opening of stomata is associated with the guard cells becoming:

- A) Flaccid
- B) Turgid
- C) Plasmolyzed
- D) Dehydrated

**Answer: Turgid**

**O**  
**N**  
**S**  
12. According to the starch-sugar interconversion theory, stomata open when guard cell solute potential decreases due to an increase in:

- A) Starch
- B) Glucose
- C) Potassium ions

## Kingdome Animalia

1. Which of the following is NOT a characteristic of all animals?

- A) Multicellularity
- B) Presence of a coelom
- C) Heterotrophic nutrition
- D) Eukaryotic cells

**Answer: Presence of a coelom**

2. The body cavity that is completely lined by mesoderm is called:

- A) Pseudocoelom
- B) Haemocoel
- C) Coelom
- D) Acoelom

**Answer: Coelom**

3. Animals belonging to phylum Porifera are commonly known as:

- A) Roundworms
- B) Flatworms
- C) Sponges
- D) Jellyfish

**Answer: Sponges**

4. The special cells unique to cnidarians that contain stinging organelles are called:

- A) Choanocytes
- B) Nematocysts
- C) Cnidocytes
- D) Flame cells

**Answer: Cnidocytes**

5. Which of the following exhibits radial symmetry?

- A) Earthworm
- B) Planaria
- C) Hydra
- D) Snail

**Answer: Hydra**

6. The skeletal elements found in sponges are called:

- A) Spicules
- B) Setae
- C) Radula
- D) Notochord

**Answer: Spicules**

7. Which phylum includes animals that are diploblastic and have a gastrovascular cavity with a single opening?

- A) Platyhelminthes

B) Cnidaria

C) Nematoda

D) Annelida

**Answer: Cnidaria**

8. The free-swimming, ciliated larva characteristic of many mollusks and annelids is the:

- A) Trochophore
- B) Planula
- C) Nauplius
- D) Bipinnaria

**Answer: Trochophore**

9. In protostomes, the blastopore develops into the:

- A) Anus
- B) Mouth
- C) Coelom
- D) Notochord

**Answer: Mouth**

10. Which of the following is an example of a pseudocoelomate animal?

- A) Earthworm
- B) Roundworm
- C) Flatworm
- D) Snail

**Answer: Roundworm**

11. The body of an annelid is characterized by:

- A) Radial symmetry
- B) Metameric segmentation
- C) A mantle and shell
- D) Jointed appendages

**Answer: Metameric segmentation**

12. The rasping tongue-like organ found in most mollusks is the:

- A) Radula
- B) Mantle
- C) Proboscis
- D) Siphon

**Answer: Radula**

13. Which class of arthropods includes animals with two pairs of antennae and biramous appendages?

- A) Insecta
- B) Crustacea
- C) Arachnida



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## 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



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## 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 CO<sub>2</sub>
- 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 PCO<sub>2</sub>

**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) O<sub>2</sub> and hemoglobin
- B) CO<sub>2</sub> and water
- C) CO and plasma
- D) H<sup>+</sup> and bicarbonate

**Answer: CO<sub>2</sub> 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?

- M  
K
- 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 PCO<sub>2</sub> are located in the:

- P  
R
- A) Carotid bodies
  - B) Aortic bodies
  - C) Medulla oblongata
  - D) Lungs

**Answer: Medulla oblongata**

10. Surfactant is produced by which type of alveolar cells?

- E  
P  
A
- 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:

- R  
A  
T
- 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?

- I  
O  
N  
S
- 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 PO<sub>2</sub>
  - B) Increased PCO<sub>2</sub> and H<sup>+</sup>
  - C) Increased lactic acid

## Circulation

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



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## 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**

**M** 8. The functional unit of the vertebrate kidney is the:

- A) Glomerulus
- B) Bowman's capsule
- C) Nephron
- D) Collecting duct

**Answer: Nephron**

**P** 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)**

**P** 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**

**A** 11. Animals that maintain constant internal osmolarity regardless of environment are:

- A) Osmoconformers
- B) Osmoregulators
- C) Stenohaline
- D) Euryhaline

**Answer: Osmoregulators**

**O** 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**

**N** 13. Malpighian tubules are excretory structures found in:

- A) Earthworms

## 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



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## 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<sup>+</sup>)
- B) Chloride (Cl<sup>-</sup>)
- C) Sodium (Na<sup>+</sup>)
- D) Calcium (Ca<sup>2+</sup>)

**Answer: Sodium (Na<sup>+</sup>)**

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?

- M
- K
- A) Rest and digest
  - B) Fight or flight
  - C) Sleep and arousal
  - D) Nutrient absorption

**Answer: Fight or flight**

9. Saltatory conduction occurs in:

- P
- R
- 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?

- E
- P
- A
- R
- 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
- T
- I
- A) Sodium
  - B) Potassium
  - C) Calcium
  - D) Chloride

**Answer: Chloride**

12. Broca's area is primarily involved in:

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- N
- S
- 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

## 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



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## 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:

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## Behaviour

**1. Ethology is best defined as the scientific study of:**

- A) Human psychology in laboratory 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**



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## 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.**



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## PPSC, FPSC, SPSC, KPPSC, AJKPSC & BPSC LECTURER BIOLOGY & ZOOLOGY MOST REPEATED & PAST PAPERS MCQs

1. The amphibians and the \_\_\_\_\_ represent the two major branches of the tetrapod lineage.

- A) reptiles
- B) birds
- C) tennospondyls
- D) amniotes

**Answer: amniotes**

2. Which of the following statements about hair is true?

- A) it is homologous to feathers
- B) it is a dermal structure
- C) it is found in all mammals
- D) it is possessed by all endotherms

**Answer: it is found in all mammals**

3. The endoskeleton of the echinoderms is composed of.

- A) keratin ossicles
- B) calcareous ossicles
- C) keratin spicules
- D) calcareous spicules

**Answer: calcareous ossicles**

4. The first hormone that was isolated.

- A) thyroxine
- B) vasopressin
- C) secretin
- D) adrenaline

**Answer: secretin**

5. The ultimate source of organic variations is.

- A) sexual reproduction
- B) hormonal action
- C) natural selection
- D) mutation

**Answer: mutation**

6. The structure of molluscs that forms the shell and houses the gills is the.

- A) mantle
- B) epidermis
- C) gastrovascular cavity
- D) odontophore

**Answer: mantle**

7. In an ecosystem, which one shows one way passage?

- A) nitrogen
- B) carbon
- C) potassium
- D) free energy

**Answer: free energy**

8. The central fluid filled cavity of the blastula is known as.

- A) archenteron
- B) blastocoel
- C) blastocyst
- D) morula

**Answer: blastocoel**

9. The mammalian skull may be characterized as \_\_\_\_\_.

- A) anapsid
- B) diapsid
- C) biaspid
- D) synapsid

**Answer: synapsid**

10. The first terrestrial tetrapods were probably the.

- A) rhipidistians
- B) amniotes
- C) coelacanth
- D) leptocephalans

**Answer: rhipidistians**

11. Which of the following phyla of animals is exclusively marine?

- A) protozoa
- B) porifera
- C) echinodermata
- D) mollusca

**Answer: echinodermata**

12. A normal green male Maize is crossed with albino female. The progeny is albino because.

- A) trait for albinism is dominant
- B) the albinos have biochemical to destroy plastids derived from green male
- C) plastids are inherited from female parent
- D) green plastids of male must have mutated



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**Answer: plastids are inherited from female parent**

**13. Sertoli cells are found in.**

- A) liver
- B) seminiferous tubules
- C) pancreas
- D) gut

**Answer: seminiferous tubules**

**14. The sum total of the populations of the same kind of organisms constitute.**

- A) colony
- B) genus
- C) species
- D) community

**Answer: species**

**15. A molluscan shell is made of three layers arranged from the outside to the inside.**

- A) periostracum, prismatic layer, nacreous layer
- B) mantle layer, prismatic layer, periostracum
- C) nacreous layer, periostracum, mantle layer
- D) none of these

**Answer: periostracum, prismatic layer, nacreous layer**

**16. Which one of the following can achieve protection and conservation of biodiversity?**

- A) eco-development
- B) biosphere reserve
- C) national park
- D) game sanctuary

**Answer: biosphere reserve**

**17. Lamarck's "Theory of Organic Evolution" is based upon.**

- A) effect of environment
- B) use and disuse of body parts
- C) inheritance of acquired characters
- D) all of these

**Answer: all of these**

**18. Myxoedema in adults is caused due to.**

- A) hyperthyroidism
- B) deficiency of thyroid hormone
- C) overproduction of PTH
- D) deficiency of PTH

**Answer: deficiency of thyroid hormone**

**19. "The animals of colder countries have small ears, short tail and limbs to avoid more loss of heat" is the theme of.**

- A) Allen's law
- B) Dollo's law

C) Gause's law

D) Cope's Law

**Answer: Allen's law**

**20. Testosterone is secreted by.**

- A) sertoli cells
- B) leydig cells
- C) spermatocyte
- D) histiocyte

**Answer: leydig cells**

**21. Changing from a bilaterally symmetrical larval form to a radially symmetrical adult involves relocation of various parts. In this process, the left side becomes the \_\_\_\_\_ and the right side becomes the \_\_\_\_\_.**

- A) aboral surface, oral surface
- B) anterior surface, posterior surface
- C) dorsal surface, ventral surface
- D) oral surface, aboral surface

**Answer: oral surface, aboral surface**

**22. The class name Myxini, or the hagfishes, refers to their.**

- A) lack of eyes
- B) unique circulatory system
- C) production of slime
- D) parasitic lifestyle

**Answer: production of slime**

**23. The earliest therians (mammals) evolved in the \_\_\_\_\_.**

- A) Permian
- B) Triassic
- C) Cretaceous
- D) Cenozoic

**Answer: Triassic**

**24. The development of limbs probably aided the first amphibians in.**

- A) finding mates
- B) swimming
- C) moving between bodies of water
- D) none of these

**Answer: moving between bodies of water**

**25. Which of the following is odd one?**

- A) cockroach, spider, silver-fish
- B) whale, bat, lizard
- C) star-fish, sea-cucumber, sea-urchin
- D) cray-fish, cuttle-fish hag-fish

**Answer: cray-fish, cuttle-fish hag-fish**

**26. ABO blood group system is due to.**

- A) multifactor inheritance



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- B) incomplete dominance
- C) multiple allelism
- D) epistasis

**Answer: multiple allelism**

**27. In human beings, the eggs are.**

- A) microleccthal
- B) macroleccthal
- C) mesoleccthal
- D) electihal

**Answer: mesoleccthal**

**28. Pyramid of numbers deal with number of.**

- A) species in area
- B) sub-species in a community
- C) individuals in a community
- D) individuals in a trophic level

**Answer: individuals in a trophic level**

**29. The morphogenetic movement change the hollow spherical blastula into a/an.**

- A) embryonic disc
- B) gastrula
- C) morula
- D) neurula

**Answer: gastrula**

**30. The dominant second trophic level, in a lake ecosystem, is.**

- A) benthos
- B) plankton
- C) zooplankton
- D) phytoplankton

**Answer: zooplankton**

**31. Which of the following classes of molluscs is thought to be the most primitive or closest to the ancestral form?**

- A) caudofoveata
- B) solenogastres
- C) monoplacophora
- D) polyplacophora

**Answer: monoplacophora**

**32. Similar niches different communalities or in different regions are commonly occupied by species possessing similar habits, adaptations and adjustments, Such species are called.**

- A) ecological equivalent
- B) ecotypes
- C) ecological dominants
- D) diverse species

**Answer: ecological equivalent**

**33. Best suited examples given in favour of Lamarckian Theory are.**

- A) elongation of neck and fore limbs of African giraffe
- B) loss of limbs in snakes
- C) both (a) and (b)
- D) none of these

**Answer: both (a) and (b)**

**34. Diabetes mellitus is due to deficiency of.**

- A) LH
- B) FSH
- C) glucagon
- D) insulin

**Answer: insulin**

**35. Which of these classes is characterized by no anus, no suckers, articulated ossicles, and a madreporite on the oral surface?**

- A) crinoidea
- B) ophiuroidea
- C) asteroidea
- D) echinoidea

**Answer: ophiuroidea**

**36. The derivation of the genus name assigned to the invasive marine lampreys found in the Great Lakes refers to their.**

- A) ability to be parthenogenetic
- B) rasping mouthparts
- C) holding on to rocks in a stream
- D) parasitic nature

**Answer: holding on to rocks in a stream**

**37. Unlike reptiles, the first mammals were characterized by \_\_\_\_\_.**

- A) continuously replaced teeth
- B) only one set of teeth during the lifetime
- C) continuously growing teeth
- D) two sets of teeth during the lifetime

**Answer: two sets of teeth during the lifetime**

**38. Some amphibians have \_\_\_\_\_, which are pigmented cells in the skin.**

- A) chromatophores
- B) osteoblasts
- C) miracidia
- D) none of these

**Answer: chromatophores**

**39. The hearts of amphibians have.**

- A) one atria and one ventricle
- B) two atria and one ventricle
- C) one atria and two ventricles



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**563. Which of the following evolved from a group of carnivorous pelycosaurs?**

- A) Therapids
- B) Labyrinthodonts
- C) Anurans
- D) Theropods

**Answer: Therapids**

**564. The freshwater fish that survived the Devonian period possessed?**

- A) Efficient gills
- B) Lungs
- C) Countercurrent flow
- D) Paedomorphosis

**Answer: Lungs**

**565. It mates with Tt. What will be characteristic of offspring?**

- A) 75% recessive
- B) 50% recessive
- C) 25% recessive
- D) All dominant

**Answer: 50% recessive**

**566. The trochophore larva indicates a common ancestry for which of the following pairs?**

- A) Mollusca-Annelida
- B) Mollusca-Cnidaria
- C) Mollusca-Cephalopoda
- D) Mollusca-Nematoda

**Answer: Mollusca-Annelida**

**567. The characters of no shell, integumental scales, a reduced head and being dioecious describes which of the following molluscs?**

- A) Caudofoveata
- B) Solenogastres
- C) Monoplacophora
- D) Polyplacophora

**Answer: Solenogastres**

**568. Which of the following facts make Lamarckism doubtful?**

- A) Neck of giraffe elongated for grazing from high trees
- B) Trees of high altitudes have sloppy branches to avoid deposition of snow
- C) Deer is fast runner for protection from predators
- D) Indian ladies have been getting their ears pierced since ages but pierced ears are not inherited

**Answer: Indian ladies have been getting their ears pierced since ages but pierced ears are not inherited**

**569. HCG is secreted by?**

- A) Placenta
- B) Ovary
- C) Thymus
- D) Thyroid

**Answer: Placenta**

**570. The echinoderms have developed the ability to exploit many sources of food. The sea stars are \_\_\_\_\_, the sea urchins are \_\_\_\_\_, and the sea cucumbers are \_\_\_\_\_?**

- A) Planktivores, herbivores, worms
- B) Carnivores, herbivores, deposit feeders
- C) Herbivores, detritivores, algae
- D) Detritivores, carnivores, plankton

**Answer: Carnivores, herbivores, deposit feeders**

**571. The respiratory apparatus of agnathans may be characterized by?**

- A) Lack of gill filaments
- B) Lack of an operculum
- C) The presence of a spiracle
- D) Acting as a filter feeding mechanism

**Answer: Lack of an operculum**

**572. The first well-known fossil of a tetrapod was \_\_\_\_\_?**

- A) In the genus Sphenodon
- B) In the genus Latimeria
- C) In the genus Ichthyostega
- D) In the genus Desmognathus

**Answer: In the genus Ichthyostega**

**573. In a genetic cross having recessive epistasis, F<sub>2</sub> phenotypic ratio would be?**

- A) 9:6:1
- B) 15:1
- C) 9:3:4
- D) 12:3:1

**Answer: 9:3:4**

**574. Cross between AaBB and aaBB will form?**

- A) 1 AaBB: 1 aaBB
- B) All AaBB
- C) 3 AaBB: 1 aaBB
- D) 1 AaBB: 3 aaBB

**Answer: 1 AaBB: 1 aaBB**



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**Answer: Synthesize some of their own proteins using their own genetic system**

**176) Which organelle is involved in the synthesis of carbohydrates for the plant cell wall?**

- A) Rough ER
- B) Smooth ER
- C) Golgi apparatus
- D) Mitochondrion

**Answer: Golgi apparatus**

**177) Both mitochondria and chloroplasts contain:**

- A) A single circular DNA molecule and 70S ribosomes
- B) Multiple linear chromosomes and 80S ribosomes
- C) No DNA of their own
- D) Thylakoid membranes

**Answer: A single circular DNA molecule and 70S ribosomes**

**178) The movement of chromosomes during cell division is orchestrated by the:**

- A) Microfilament network
- B) Intermediate filament network
- C) Microtubule-based spindle apparatus
- D) Endoplasmic reticulum

**Answer: Microtubule-based spindle apparatus**

**179) Peroxisomes and glyoxysomes are both:**

- A) Surrounded by a double membrane
- B) Involved in lipid metabolism and detoxification
- C) Sites of protein synthesis
- D) Derived from the Golgi apparatus

**Answer: Involved in lipid metabolism and detoxification**

**180) Proteins destined for use within the cytoplasm are typically synthesized on:**

- A) Free ribosomes in the cytosol

- B) Ribosomes bound to the Rough ER
- C) Ribosomes inside mitochondria
- D) Ribosomes on the nuclear envelope

**Answer: Free ribosomes in the cytosol**

**181) The extensive network of membranes involved in protein and lipid synthesis is the:**

- A) Golgi apparatus
- B) Endoplasmic reticulum
- C) Lysosomal system
- D) Peroxisomal network

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**Answer: Endoplasmic reticulum**

**182) The formation of the mitotic spindle is organized by the:**

- A) Centrioles in the centrosome (in animal cells)
- B) Nucleolus
- C) Ribosomes
- D) Peroxisomes

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**Answer: Centrioles in the centrosome (in animal cells)**

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**183) Which of the following can be classified as a non-membrane bound organelle?**

- A) Peroxisome
- B) Lysosome
- C) Glyoxysome
- D) Ribosome

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**Answer: Ribosome**

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**184) Which substance can cross the lipid bilayer of the plasma membrane most easily?**

- A) Sodium ion (Na<sup>+</sup>)
- B) Glucose
- C) A small, nonpolar molecule like oxygen
- D) A large, polar amino acid

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**Answer: A small, nonpolar molecule like oxygen**

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**185) Which of the following is found in both prokaryotic and eukaryotic cells?**

- A) Centriole
- B) Mitochondria
- C) Endoplasmic reticulum