



General Instructions

- (i) The test is of 3 hours and 15 minutes duration.
- (ii) This test paper consists of 180 questions. The maximum marks are 720.
- (iii) Physics and Chemistry contains 45 questions each and Biology (Botany and Zoology) contains 90 questions.
- (iv) Each question carries +4 marks for correct answer and –1 mark for wrong answer.

91. Given below are two statements :

Statement I : The class name Reptilia refers to creeping or crawling mode of locomotion.

Statement II : All organisms belonging to Reptilia have three chambered heart.

In the light of the above statements, choose the *most appropriate* answer from the options given below :

- (A) Statement I is incorrect but Statement II is correct
- (B) Both Statement I and Statement II are correct
- (C) Both Statement I and Statement II are incorrect
- (D) Statement I is correct but Statement II is incorrect

Correct Answer: (D) Statement I is correct but Statement II is incorrect

Solution:

Step 1: Understanding the Question:

The question tests fundamental knowledge about the biological class Reptilia, specifically the

origin of its name and the anatomy of the reptilian heart.

Step 2: Detailed Explanation:

Statement I: The class name Reptilia is derived from the Latin word *repere* or *reptum*, which literally translates to "to creep or crawl." This accurately describes their typical mode of locomotion. Thus, Statement I is correct.

Statement II: While the majority of reptiles (like snakes, lizards, and turtles) possess a three-chambered heart (two atria and one partially divided ventricle), this is not true for *all* organisms in the class. Crocodilians (crocodiles, alligators, caimans) are reptiles but possess a fully developed four-chambered heart. The word "All" makes this statement factually incorrect. Thus, Statement II is incorrect.

Step 3: Final Answer:

Statement I is correct but Statement II is incorrect.

Quick Tip: In biology MCQ statements, absolute words like "All," "Always," or "None" are frequently red flags indicating a false statement due to known evolutionary exceptions (like the 4-chambered heart in crocodiles).

92. How many turns of Calvin cycle are required for the formation of three molecules of glucose ?

- (A) 18
- (B) 6
- (C) 3
- (D) 1

Correct Answer: (A) 18

Solution:

Step 1: Understanding the Question:

We need to determine the number of Calvin cycle turns required to synthesize a specific quantity of glucose molecules.

Step 2: Key Formula or Approach:

The Calvin cycle fixes one molecule of CO_2 per turn. Since a single glucose molecule ($C_6H_{12}O_6$) contains 6 carbon atoms, it requires the fixation of 6 CO_2 molecules. Therefore, 1 molecule of glucose requires 6 turns of the Calvin cycle.

Step 3: Detailed Explanation:

If 1 molecule of glucose = 6 turns, Then 3 molecules of glucose = 3×6 turns = 18 turns.

Step 4: Final Answer:

18 turns are required.

Quick Tip: Every single turn of the Calvin cycle produces one net Carbon atom ready for carbohydrate synthesis. N carbons required = N turns required.

93. Photorespiration reaction catalyzed by RuBisCo is shown below :



Identify "X" from the given options :

- (A) Malate
- (B) Phosphoenolpyruvate
- (C) 2-Phosphoglycolate
- (D) Oxaloacetate

Correct Answer: (C) 2-Phosphoglycolate

Solution:

Step 1: Understanding the Question:

The question requires identifying the second product formed during the oxygenation reaction

of RuBP catalyzed by the enzyme RuBisCO in the photorespiration pathway.

Step 2: Key Formula or Approach:

During normal photosynthesis (carboxylation), RuBP (5 carbons) + CO_2 (1 carbon) splits into two molecules of 3-PGA (3 carbons each). During photorespiration (oxygenation), RuBP (5 carbons) + O_2 splits into one molecule of 3-PGA (3 carbons) and one 2-carbon compound to account for the carbon balance.

Step 3: Detailed Explanation:

In the photorespiratory pathway, when RuBisCO binds to O_2 instead of CO_2 , the 5-carbon Ribulose-1,5-bisphosphate (RuBP) is cleaved into: - One molecule of 3-phosphoglycerate (3 carbons) - One molecule of phosphoglycolate (2 carbons), specifically 2-phosphoglycolate. Therefore, the unknown compound "X" is 2-Phosphoglycolate.

Step 4: Final Answer:

X is 2-Phosphoglycolate.

Quick Tip: Photorespiration is also called the C_2 cycle precisely because the first stable product unique to this wasteful pathway is the 2-carbon compound, 2-phosphoglycolate.

94. Given below are two statements :

Statement I : In gymnosperms, the male and female gametophytes remain within the sporangia.

Statement II : In gymnosperms, seeds are not covered.

In the light of the above statements, choose the *most appropriate* answer from the options given below :

- (A) Statement I is incorrect but Statement II is correct
- (B) Both Statement I and Statement II are correct
- (C) Both Statement I and Statement II are incorrect
- (D) Statement I is correct but Statement II is incorrect

Correct Answer: (B) Both Statement I and Statement II are correct

Solution:

Step 1: Understanding the Question:

We need to evaluate two anatomical and reproductive characteristics specific to Gymnosperms.

Step 2: Detailed Explanation:

Statement I: Unlike bryophytes and pteridophytes, in gymnosperms (and angiosperms), the male and female gametophytes do not have an independent, free-living existence. They remain retained within the sporangia (microsporangia and megasporangia) which are located on the sporophyte parent plant. Thus, Statement I is correct.

Statement II: The term "Gymnosperm" literally translates from Greek to "naked seed" (*gymnos* = naked, *sperma* = seed). Their ovules are not enclosed by an ovary wall before or after fertilization. Consequently, the resulting seeds remain exposed (uncovered). Thus, Statement II is also correct.

Step 3: Final Answer:

Both Statement I and Statement II are correct.

Quick Tip: A key evolutionary trend in plants is the progressive reduction of the gametophyte stage. In lower plants, it's independent; in seed plants (gymnosperms and angiosperms), it's highly reduced and strictly dependent on the sporophyte.

95. How many molecules of pyruvic acid are produced at the end of glycolysis from 206 molecules of glucose ?

- (A) 412
- (B) 206
- (C) 309
- (D) 103

Correct Answer: (A) 412

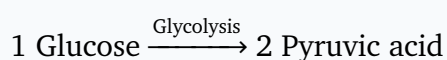
Solution:

Step 1: Understanding the Question:

We need to find the total yield of pyruvic acid from the glycolysis of a given number of glucose molecules.

Step 2: Key Formula or Approach:

Glycolysis is the metabolic pathway that converts a 6-carbon glucose molecule into two 3-carbon molecules of pyruvic acid (pyruvate).



Step 3: Detailed Explanation:

Since the ratio is 1:2, we simply multiply the starting number of glucose molecules by 2. Total Pyruvic acid = $206 \times 2 = 412$ molecules.

Step 4: Final Answer:

412 molecules of pyruvic acid are produced.

Quick Tip: Always perform a quick carbon balance check: Glucose has 6 carbons. Pyruvate has 3 carbons. Thus, $6 \div 3 = 2$ pyruvates must be formed per glucose to conserve carbon.

96. Match List-I with List-II.

List-I

A. Fusion of protoplasts between gametes

B. Fusion of two nuclei

C. Generation of haploid spores

List-II

I. Meiosis

II. Plasmogamy

III. Karyogamy

Choose the correct answer from the options given below :

(A) A-I, B-III, C-II

(B) A-II, B-III, C-I

(C) A-II, B-I, C-III

(D) A-III, B-II, C-I

Correct Answer: (B) A-II, B-III, C-I

Solution:

Step 1: Understanding the Question:

The question requires matching key stages of the sexual cycle in fungi (and general eukaryotic sexual reproduction) with their scientific terms.

Step 2: Detailed Explanation:

The sexual cycle in fungi typically involves three sequential steps: **A. Plasmogamy:** The first step is the fusion of the cytoplasm (protoplasms) of two motile or non-motile gametes or mating types. (*A* → *II*) **B. Karyogamy:** Following plasmogamy, the two haploid nuclei within the fused cell combine to form a single diploid nucleus (zygote). "Karyo" means nucleus. (*B* → *III*) **C. Meiosis:** The diploid zygote undergoes reductional division (meiosis) to generate haploid sexual spores, resetting the chromosomal count. (*C* → *I*)

Matching results: A-II, B-III, C-I.

Step 3: Final Answer:

The correct matching is A-II, B-III, C-I.

Quick Tip: The prefixes are a dead giveaway: *Plasmo-* = plasma/cytoplasm; *Karyo-* = nucleus. Knowing just one root word can often solve the entire matching question!

97. Mitochondrial inner membrane encloses _____

- (A) aqueous humor
- (B) matrix
- (C) cytosol
- (D) mucus

Correct Answer: (B) matrix

Solution:

Step 1: Understanding the Question:

Identify the specific biological compartment contained within the inner membrane of a mitochondrion.

Step 2: Detailed Explanation:

A mitochondrion has a double-membrane structure: an outer membrane and an inner membrane. - The space between the outer and inner membranes is the intermembrane space. - The inner compartment, fully enclosed by the highly folded inner membrane (cristae), is filled with a dense, homogeneous substance called the **mitochondrial matrix**. This matrix contains the enzymes for the Krebs cycle, mitochondrial DNA, and ribosomes.

Other options: - Aqueous humor is fluid in the eye. - Cytosol is the fluid of the main cell cytoplasm outside organelles. - Mucus is a secretory substance of mucous membranes.

Step 3: Final Answer:

The inner membrane encloses the matrix.

Quick Tip: Remember: Glycolysis happens in the Cytosol. The Krebs cycle happens in the Matrix. The Electron Transport Chain happens on the Inner Membrane.

98. Phyllotaxy is the pattern of arrangement of _____ on the stem or branch.

- (A) sepals
- (B) leaves
- (C) flowers
- (D) fruits

Correct Answer: (B) leaves

Solution:

Step 1: Understanding the Question:

Define the botanical term "Phyllotaxy".

Step 2: Detailed Explanation:

In botany terminology: - **Phyllotaxy** is defined as the pattern of arrangement of **leaves** on a stem or branch. It is usually of three types: alternate, opposite, and whorled. - The arrangement of flowers on a floral axis is termed **Inflorescence**. - The arrangement of sepals or petals in a floral bud is termed **Aestivation**.

Step 3: Final Answer:

Phyllotaxy is the pattern of arrangement of leaves.

Quick Tip: The Greek root word *phyllo* always refers to leaves. Examples: Chlorophyll (green leaf), Mesophyll (middle leaf), Phyllotaxy (leaf arrangement).

99. Mad cow disease is caused by _____

- (A) *Mycoplasma* sp.
- (B) prions
- (C) viroids
- (D) *Aspergillus* sp.

Correct Answer: (B) prions

Solution:

Step 1: Understanding the Question:

Identify the infectious agent responsible for Mad Cow Disease (Bovine Spongiform Encephalopathy).

Step 2: Detailed Explanation:

Certain infectious neurological diseases are caused by abnormally folded proteins. These infectious proteinaceous particles are called **prions**. Prions are unique because they lack nucleic acids (DNA/RNA) entirely. The most notable diseases caused by prions are Bovine Spongiform Encephalopathy (BSE), commonly called "Mad cow disease" in cattle, and its human analog, Creutzfeldt-Jakob disease (CJD).

Step 3: Final Answer:

Mad cow disease is caused by prions.

Quick Tip: Differentiate the acellular agents: Viruses = DNA/RNA + Protein coat. Viroids = RNA only (infects plants). Prions = Protein only (causes neurological diseases).

100. Cell theory was formulated by _____

- (A) Antonie Van Leeuwenhoek
- (B) Schleiden and Schwann
- (C) Robert Brown
- (D) Singer and Nicolson

Correct Answer: (B) Schleiden and Schwann

Solution:**Step 1: Understanding the Question:**

Identify the scientists who originally formulated the biological Cell Theory.

Step 2: Detailed Explanation:

Let's review the contributions of the scientists listed: - **Antonie Van Leeuwenhoek:** First saw and described a living cell. - **Robert Brown:** Discovered the nucleus. - **Singer and Nicolson:** Proposed the Fluid Mosaic Model of the cell membrane. - **Matthias Schleiden** (a German botanist, 1838) and **Theodore Schwann** (a British zoologist, 1839) together formulated the

Cell Theory, which states that all plants and animals are composed of cells and products of cells. (Later modified by Rudolf Virchow to include that all cells arise from pre-existing cells).

Step 3: Final Answer:

Cell theory was formulated by Schleiden and Schwann.

Quick Tip: Remember "SS": Schleiden (Plants) and Schwann (Animals) formulated the Cell Theory. Rudolf Virchow added the phrase *Omnis cellula-e cellula* to complete it.

101. Which of the following plant growth regulators promotes internode elongation prior to flowering in cabbage ?

- (A) Ethephon
- (B) Absciscic acid
- (C) Gibberellin
- (D) Indole butyric acid

Correct Answer: (C) Gibberellin

Solution:

Step 1: Understanding the Question:

Identify the plant hormone responsible for the sudden elongation of internodes just before flowering in rosette plants like cabbage.

Step 2: Detailed Explanation:

Plants with a rosette habit (like cabbage and beet) have extremely shortened internodes, keeping the leaves tightly packed near the ground. Just prior to flowering, these plants undergo a process called **bolting**, which is characterized by a massive and rapid elongation of the internodes to elevate the flowers. This physiological response is strictly promoted by the application or natural surge of **Gibberellins**.

Step 3: Final Answer:

Gibberellin promotes internode elongation.

Quick Tip: Whenever you see the terms "rosette habit," "cabbage," "beet," or "bolting," immediately link the answer to Gibberellins. It is one of their most distinct physiological roles.

102. Which pigment has absorption peak at 700 nm in the photosynthetic reaction centre PS I (P700) ?

- (A) Carotenoids
- (B) Chlorophyll b
- (C) Chlorophyll a
- (D) Xanthophylls

Correct Answer: (C) Chlorophyll a

Solution:

Step 1: Understanding the Question:

Identify the specific pigment molecule that constitutes the reaction center of Photosystem I (PS I) and absorbs light at 700 nm.

Step 2: Detailed Explanation:

In the thylakoid membranes of chloroplasts, pigments are organized into two light-harvesting complexes called Photosystem I (PS I) and Photosystem II (PS II). Each photosystem has a single "reaction center" molecule where the primary photochemical event (electron ejection) occurs. The reaction center is always formed by a specific molecule of **Chlorophyll a**. - In PS I, the reaction center Chlorophyll a has an absorption peak at 700 nm, hence it is called P700. - In PS II, the reaction center Chlorophyll a has an absorption peak at 680 nm, hence it is called P680. Other pigments (Chlorophyll b, carotenoids, xanthophylls) act as antennae molecules to funnel light energy to the reaction center.

Step 3: Final Answer:

The pigment is Chlorophyll a.

Quick Tip: Only Chlorophyll 'a' can act as the reaction center for both photosystems. All other pigments are strictly accessory pigments.

103. Sphenopsida class belongs to

- (A) pteridophytes
- (B) bryophytes
- (C) angiosperms
- (D) gymnosperms

Correct Answer: (A) pteridophytes

Solution:

Step 1: Understanding the Question:

Identify the major plant group to which the class Sphenopsida belongs.

Step 2: Detailed Explanation:

According to botanical classification, the group **Pteridophytes** (ferns and horsetails) is further subdivided into four classes: 1. **Psilopsida** (e.g., *Psilotum*) 2. **Lycopsida** (e.g., *Selaginella*, *Lycopodium*) 3. **Sphenopsida** (e.g., *Equisetum* - horsetails) 4. **Pteropsida** (e.g., *Dryopteris*, *Pteris*, *Adiantum*)

Therefore, Sphenopsida is a class of pteridophytes.

Step 3: Final Answer:

Sphenopsida belongs to pteridophytes.

Quick Tip: Memorize the representative member of Sphenopsida: *Equisetum* (Horsetail). It is known for having silica in its stems, making them rough to the touch.

104. Which of the following represents the correct sequence of arrangement of bones in the lower limb of humans ?

- (A) Femur-tarsal-patella-tibia
- (B) Femur-tibia-patella-tarsal
- (C) Patella-femur-tibia-tarsal
- (D) Femur-patella-tibia-tarsal

Correct Answer: (D) Femur-patella-tibia-tarsal

Solution:

Step 1: Understanding the Question:

Identify the correct proximal-to-distal (top-to-bottom) sequence of bones in the human leg.

Step 2: Detailed Explanation:

The bones of the human lower limb, starting from the hip joint down to the foot, are arranged sequentially as follows: 1. **Femur:** The thigh bone, which is the longest and heaviest bone in the body. 2. **Patella:** The knee cap, a cup-shaped sesamoid bone that covers the knee ventrally. 3. **Tibia and Fibula:** The two bones of the lower leg. The tibia is the larger, weight-bearing shin bone. 4. **Tarsals:** The ankle bones (7 in number). 5. **Metatarsals:** The bones of the sole (5 in number). 6. **Phalanges:** The toe bones (14 in number).

Matching this downward sequence with the given options, the correct progression is Femur → Patella → Tibia → Tarsal.

Step 3: Final Answer:

The correct sequence is Femur-patella-tibia-tarsal.

Quick Tip: To remember the sequence, visualize your own leg from top to bottom: Thigh (Femur) → Knee (Patella) → Shin (Tibia) → Ankle (Tarsal).

105. Which of the following plant growth regulators is used as herbicide ?

- (A) Gibberellin
- (B) 2,4-D
- (C) Kinetin
- (D) Absciscic acid

Correct Answer: (B) 2,4-D

Solution:

Step 1: Understanding the Question:

Identify which of the listed plant growth regulators (hormones) acts as a weed killer (herbicide).

Step 2: Detailed Explanation:

Synthetic auxins are heavily used in agriculture. **2,4-D** (2,4-dichlorophenoxyacetic acid) is a widely used synthetic auxin. It is specifically used as an herbicide to kill dicotyledonous (broad-leaved) weeds. Interestingly, it selectively kills dicot weeds but does not affect mature monocotyledonous plants, making it incredibly useful for preparing weed-free lawns and cereal crops. The other options (Gibberellin, Kinetin, Absciscic acid) do not have this selective herbicidal property.

Step 3: Final Answer:

The herbicide is 2,4-D.

Quick Tip: Agent Orange, a notorious defoliant used during the Vietnam War, was a 50:50 mixture of 2,4-D and 2,4,5-T (both synthetic auxins).

106. Genus represents

- (A) a group of closely related families
- (B) an individual plant or animal
- (C) a population of plants and animals
- (D) a group of closely related species

Correct Answer: (D) a group of closely related species

Solution:

Step 1: Understanding the Question:

Define the taxonomic category "Genus".

Step 2: Detailed Explanation:

In the biological taxonomic hierarchy, categories are arranged in a specific sequence: Kingdom → Phylum → Class → Order → Family → Genus → Species. Each category represents an aggregate of the category immediately below it: - A Family is a group of related genera. - A **Genus** comprises a group of related **species** which have more characters in common in comparison to species of other genera. For example, the genus *Panthera* includes closely related species like lion (*P. leo*), tiger (*P. tigris*), and leopard (*P. pardus*).

Step 3: Final Answer:

Genus represents a group of closely related species.

Quick Tip: Remember the hierarchy using a mnemonic like: "King Philip Came Over For Good Soup" (Kingdom, Phylum, Class, Order, Family, Genus, Species). A higher category always groups the "closely related" members of the category directly below it.

107. The plastid that stores xanthophyll is known as

- (A) amyloplast
- (B) chloroplast

- (C) chromoplast
(D) aleuroplast

Correct Answer: (C) chromoplast

Solution:

Step 1: Understanding the Question:

Identify the type of plastid responsible for storing colored pigments like xanthophylls.

Step 2: Detailed Explanation:

Plastids are classified based on the type of pigments they contain and their function: 1.

Chloroplasts: Contain chlorophyll and carotenoids, responsible for trapping light energy for photosynthesis. 2. **Chromoplasts:** Contain fat-soluble carotenoid pigments like carotene, **xanthophylls**, and others. These give the part of the plant a yellow, orange, or red color (found in fruits and flowers). 3. **Leucoplasts:** Colorless plastids that store nutrients: - **Amyloplasts:** Store carbohydrates/starch. - **Elaioplasts:** Store oils and fats. - **Aleuroplasts:** Store proteins.

Step 3: Final Answer:

The plastid that stores xanthophyll is the chromoplast.

Quick Tip: The prefix "chromo-" means color. If the question asks about storing colorful pigments (yellow/orange/red) that aren't for active photosynthesis, chromoplast is always the answer.

108. In water, frogs respire using _____

- (A) trachea
(B) skin
(C) buccal cavity
(D) lungs

Correct Answer: (B) skin

Solution:

Step 1: Understanding the Question:

Identify the primary respiratory organ utilized by frogs when they are submerged in water.

Step 2: Detailed Explanation:

Frogs exhibit two distinct modes of respiration depending on their environment: - **On land:** They respire primarily using the buccal cavity, skin, and lungs (pulmonary respiration). - **In water:** Frogs cannot use their lungs underwater. Instead, they rely entirely on cutaneous respiration, which means they respire by exchanging dissolved oxygen and carbon dioxide directly through their highly vascularized, moist **skin**.

Step 3: Final Answer:

In water, frogs respire using their skin.

Quick Tip: Cutaneous (skin) respiration is also the exclusive method of breathing for frogs during both summer sleep (aestivation) and winter sleep (hibernation).

109. Which of the following is not a characteristic of chordates ?

- (A) Presence of post anal part (tail)
- (B) Presence of notochord
- (C) Central nervous system is dorsal
- (D) Absence of gills

Correct Answer: (D) Absence of gills

Solution:

Step 1: Understanding the Question:

Identify the statement that contradicts the fundamental defining features of animals belonging to the phylum Chordata.

Step 2: Detailed Explanation:

The phylum Chordata is defined by four fundamental, hallmark characteristics present at some stage of their development: 1. Presence of a solid, unjointed rod called a **notochord**. 2. A single, hollow, **dorsal nerve cord** (central nervous system). 3. Presence of **pharyngeal gill slits** (gills). 4. Presence of a **post-anal tail**.

Option (D) claims the "Absence of gills." Since the presence of pharyngeal gill slits is a defining mandatory feature of all chordate embryos (and adults in some classes like fishes), declaring their absence makes this statement incorrect.

Step 3: Final Answer:

Absence of gills is not a characteristic of chordates.

Quick Tip: Contrast Chordates with Non-chordates to avoid confusion: Chordates have a dorsal, hollow nerve cord and a ventral heart. Non-chordates have a ventral, solid nerve cord and a dorsal heart (if present).

110. Smooth endoplasmic reticulum _____

- (A) is a site for the synthesis of carbohydrates
- (B) has ribosomes attached to its surface
- (C) is the major site for the synthesis of lipids
- (D) is actively involved in protein synthesis

Correct Answer: (C) is the major site for the synthesis of lipids

Solution:**Step 1: Understanding the Question:**

Identify the primary physiological function of the Smooth Endoplasmic Reticulum (SER).

Step 2: Detailed Explanation:

The Endoplasmic Reticulum (ER) exists in two forms: 1. **Rough Endoplasmic Reticulum (RER)**: Has ribosomes attached to its outer surface, giving it a rough appearance. Because of ribosomes, its primary function is **protein synthesis** and secretion. 2. **Smooth Endoplasmic Reticulum (SER)**: Devoid of ribosomes. Its primary function is the **synthesis of lipids**. In animal cells, lipid-like steroidal hormones are also synthesized in the SER. It also plays a key role in the detoxification of drugs.

Thus, options claiming ribosome attachment or protein synthesis apply to RER, not SER. Synthesis of carbohydrates is primarily linked to chloroplasts (in plants) or cytosol.

Step 3: Final Answer:

Smooth endoplasmic reticulum is the major site for the synthesis of lipids.

Quick Tip: Associate "Smooth" with "Slippery fats" (lipids) and "Rough" with the "Bumpy machines" (ribosomes) that make proteins.

111. Which of the following are characteristics of prokaryotic cells ?

- (a) Ribosomes are made of 50S and 30S subunits
- (b) They can have plasmids
- (c) They contain mesosome
- (d) They have peroxisomes

Choose the correct answer from the options given below :

- (A) (a), (b) and (c) only
- (B) (b) and (c) only
- (C) (a) and (c) only
- (D) (a), (c) and (d) only

Correct Answer: (A) (a), (b) and (c) only

Solution:

Step 1: Understanding the Question:

Identify which of the four provided statements accurately describe the internal structures of a prokaryotic cell (like bacteria).

Step 2: Detailed Explanation:

Let's analyze each statement: (a) **Ribosomes:** Prokaryotes possess 70S ribosomes, which are composed of two subunits: a larger 50S subunit and a smaller 30S subunit. (True) (b) **Plasmids:** Many bacteria contain small, circular, extrachromosomal DNA molecules known as plasmids, which often carry genes for antibiotic resistance. (True) (c) **Mesosomes:** A specialized membranous structure called the mesosome is formed by the infolding of the plasma membrane into the cell. It functions analogously to mitochondria for respiration in bacteria. (True) (d) **Peroxisomes:** Prokaryotes entirely lack membrane-bound organelles. Peroxisomes are single-membrane-bound organelles found exclusively in eukaryotic cells. (False)

Therefore, only statements (a), (b), and (c) are correct characteristics of prokaryotes.

Step 3: Final Answer:

The correct options are (a), (b) and (c) only.

Quick Tip: The defining feature of a prokaryote is the complete absence of any membrane-bound organelles (no nucleus, no mitochondria, no chloroplasts, no ER, no Golgi, no peroxisomes). If an option includes one of these, it is immediately wrong.

112. Match List-I with List-II.

List-I	List-II
A. Cristae	I. Flat membrane sacs in stroma of chloroplast
B. Cisternae	II. Infoldings in mitochondria
C. Thylakoids	III. Cell membrane
D. Phospholipid	IV. Disc shaped sacs in the Golgi apparatus

Choose the correct answer from the options given below :

(A) A-IV, B-III, C-I, D-II

(B) A-III, B-IV, C-I, D-II

(C) A-II, B-IV, C-I, D-III

(D) A-II, B-IV, C-III, D-I

Correct Answer: (C) A-II, B-IV, C-I, D-III

Solution:

Step 1: Understanding the Question:

We need to correctly match cellular structures to their definitions or locations.

Step 2: Detailed Explanation:

Let's pair each biological term with its correct description: **A. Cristae:** These are the deep, finger-like infoldings of the inner membrane of **mitochondria** that increase surface area for ATP production. ($A \rightarrow II$) **B. Cisternae:** These are the stacked, flat, disc-shaped membranous sacs that constitute the **Golgi apparatus** and Endoplasmic Reticulum. ($B \rightarrow IV$) **C. Thylakoids:** These are the flattened, coin-like membrane sacs located in the stroma of the **chloroplast**, which contain chlorophyll for light reactions. ($C \rightarrow I$) **D. Phospholipid:** The fundamental structural lipid molecule that forms the lipid bilayer of the **cell membrane**. ($D \rightarrow III$)

Matching results: A-II, B-IV, C-I, D-III.

Step 3: Final Answer:

The correct matching is A-II, B-IV, C-I, D-III.

Quick Tip: Do not confuse **Cristae** (inner folds of Mitochondria) with **Cisternae** (stacked sacs of the Golgi). This is one of the most frequently tested vocabulary mix-ups in cytology!

113. Which of the following statements related to pituitary gland are correct ?

- (a) It is divided anatomically into adenohypophysis and neurohypophysis
- (b) It secretes follicle stimulating hormone
- (c) It secretes melanocyte stimulating hormone
- (d) It does not secrete prolactin

Choose the correct answer from the options given below :

- (A) (b) and (c) only
- (B) (a) and (d) only
- (C) (a), (b) and (c) only
- (D) (c) and (d) only

Correct Answer: (C) (a), (b) and (c) only

Solution:

Step 1: Understanding the Question:

Evaluate four statements regarding the anatomy and endocrine secretions of the human pituitary gland.

Step 2: Detailed Explanation:

Let's verify each statement: (a) The pituitary gland is anatomically divided into an anterior lobe (adenohypophysis) and a posterior lobe (neurohypophysis). (True) (b) The pars distalis region of the adenohypophysis secretes gonadotropins, one of which is Follicle Stimulating Hormone (FSH). (True) (c) The pars intermedia region of the adenohypophysis secretes Melanocyte Stimulating Hormone (MSH). (True) (d) The adenohypophysis secretes Prolactin (PRL), which regulates the growth of mammary glands and milk production. Therefore, saying it "does not secrete prolactin" is false. (False)

Thus, only statements (a), (b), and (c) are correct.

Step 3: Final Answer:

The correct options are (a), (b) and (c) only.

Quick Tip: Remember the six main anterior pituitary hormones using the mnemonic "FLAT PEG": FSH, LH, ACTH, TSH, Prolactin, Endorphins (ignored in basic biology), GH.

114. Which of the following statements regarding photorespiration are correct ?

- (a) Do not occur in C3 plants
- (b) CO_2 is consumed and O_2 is generated
- (c) Phosphoglycolate is formed

(d) No synthesis of ATP and NADPH

Choose the correct answer from the options given below :

(A) (a) and (b) only

(B) (a) and (d) only

(C) (c) and (d) only

(D) (b) and (d) only

Correct Answer: (C) (c) and (d) only

Solution:

Step 1: Understanding the Question:

Evaluate statements to identify the true characteristics of photorespiration.

Step 2: Detailed Explanation:

Let's examine each statement: (a) Photorespiration is a major characteristic and a wasteful process occurring primarily in **C3 plants**. C4 plants have evolved mechanisms to avoid it. Thus, stating it "does not occur in C3 plants" is incorrect. (False) (b) Photorespiration occurs when RuBisCO acts as an oxygenase. It **consumes** O_2 and ultimately releases (generates) CO_2 . This statement asserts the exact opposite. (False) (c) The first stable products of photorespiration are one molecule of 3-phosphoglycerate and one molecule of the 2-carbon compound, **phosphoglycolate**. (True) (d) Unlike cellular respiration or normal photosynthesis, photorespiration is a highly wasteful process because there is **no synthesis of sugars, ATP, or NADPH**. It actually consumes ATP. (True)

Therefore, only statements (c) and (d) are correct.

Step 3: Final Answer:

The correct options are (c) and (d) only.

Quick Tip: Photorespiration does exactly what its name implies: it respire (consumes O_2 , releases CO_2) in the presence of photons (light), completely undoing the goal of photosynthesis without producing any ATP energy!

115. Which of the following statements is incorrect ?

(A) Fibrinogen is produced from fibrin (B) Blood coagulates in response to an injury (C) Blood clot consists of fibrins (D) Fibrin is produced from fibrinogen

Correct Answer: (A) Fibrinogen is produced from fibrin

Solution:

Step 1: Understanding the Question:

Identify the factually wrong statement regarding the blood coagulation (clotting) cascade.

Step 2: Detailed Explanation:

Let's analyze the statements based on the mechanism of blood coagulation: - Upon injury, a cascade of enzymatic reactions is triggered to prevent excessive blood loss. Blood coagulates in response to an injury. (Option B is correct). - A blood clot is essentially a network of threads called **fibrins**, in which dead and damaged formed elements of blood are trapped. (Option C is correct). - Fibrins are formed by the conversion of inactive **fibrinogens** present in the plasma by the enzyme thrombin. Thus, fibrin is produced from fibrinogen. (Option D is correct). - Consequently, stating that "Fibrinogen is produced from fibrin" implies the reverse of the actual biological pathway, making it factually backward and incorrect.

Step 3: Final Answer:

The incorrect statement is that fibrinogen is produced from fibrin.

Quick Tip: In biological naming, the suffix "-ogen" always means "generator of" or an inactive precursor (e.g., Fibrinogen generates Fibrin; Pepsinogen generates Pepsin). Therefore, the "-ogen" form is always the starting material!

116. Arrange the following taxonomic categories in ascending order.

(a) Genus

(b) Class

- (c) Order
- (d) Phylum
- (e) Family
- (f) Kingdom
- (g) Species

Choose the correct answer from the options given below :

- (A) (f), (c), (b), (g), (d), (e), (a)
- (B) (g), (a), (e), (c), (b), (d), (f)
- (C) (a), (c), (d), (g), (f), (b), (e)
- (D) (g), (c), (d), (b), (e), (a), (f)

Correct Answer: (B) (g), (a), (e), (c), (b), (d), (f)

Solution:

Step 1: Understanding the Question:

We need to arrange the standard taxonomic hierarchy in ascending order, meaning from the lowest (most specific) category to the highest (most inclusive) category.

Step 2: Detailed Explanation:

The obligate taxonomic categories from smallest (most specific) to largest (most general) are:

1. **Species** (g) 2. **Genus** (a) 3. **Family** (e) 4. **Order** (c) 5. **Class** (b) 6. **Phylum** (or Division in plants) (d) 7. **Kingdom** (f)

Arranging the assigned letters sequentially yields: (g) → (a) → (e) → (c) → (b) → (d) → (f).

Step 3: Final Answer:

The correct option is (2) (g), (a), (e), (c), (b), (d), (f).

Quick Tip: Mnemonic for descending order: **K**eeps **P**onds **C**lean **O**r **F**rogs **G**et **S**ick (Kingdom, Phylum, Class, Order, Family, Genus, Species). Simply reverse it for ascending order.

117. Select the correct sequence of experiments that led to a gradual understanding of photo-

synthesis in green plants.

- (A) Production of glucose → role of air → release of oxygen → absorption spectra of chlorophyll a and b
- (B) Absorption spectra of chlorophyll a and b → production of glucose → release of oxygen → role of air
- (C) Role of air → release of oxygen → production of glucose → absorption spectra of chlorophyll a and b
- (D) Release of oxygen → production of glucose → absorption spectra of chlorophyll a and b → role of air

Correct Answer: (C) Role of air → release of oxygen → production of glucose → absorption spectra of chlorophyll a and b

Solution:

Step 1: Understanding the Question:

The question asks for the chronological historical timeline of discoveries related to the process of photosynthesis.

Step 2: Detailed Explanation:

Following the historical timeline detailed in standard biology curricula: 1. **Role of air (1770):** Joseph Priestley performed bell jar experiments with a mouse and a mint plant, demonstrating that plants restore to the air whatever breathing animals and burning candles remove. 2. **Release of oxygen (1779):** Jan Ingenhousz showed that sunlight is essential for plants to purify the air, and later noted that only the green parts of the plant release bubbles (oxygen). 3. **Production of glucose (1854):** Julius von Sachs provided evidence that green parts in plants produce glucose, which is usually stored as starch. 4. **Absorption/Action spectra (1888):** T.W. Engelmann used a prism to split light into its spectral components and illuminated a green alga (*Cladophora*). He described the first action spectrum of photosynthesis, corresponding to the absorption spectra of chlorophyll a and b.

The correct sequence is: Role of air → Release of oxygen → Production of glucose → Absorption spectra.

Step 3: Final Answer:

The correct sequence is given by option (3).

Quick Tip: Link the scientists chronologically: Priestley (Air) → Ingenhousz (O_2 bubbles) → Sachs (Starch/Glucose) → Engelmann (Prism/Spectrum).

118. Match List-I with List-II.

List-I	List-II
A. Starch	I. Fights infection
B. Antibody	II. Energy storage
C. Concanavalin A	III. Glucose transport
D. Glut-4	IV. Lectin

Choose the correct answer from the options given below :

- (A) A-I, B-II, C-III, D-IV
- (B) A-I, B-II, C-IV, D-III
- (C) A-II, B-I, C-IV, D-III
- (D) A-II, B-I, C-III, D-IV

Correct Answer: (C) A-II, B-I, C-IV, D-III

Solution:

Step 1: Understanding the Question:

We need to correctly match biological molecules/proteins from a standard biomolecules table with their primary physiological functions.

Step 2: Detailed Explanation:

Let's pair each molecule with its function: **A. Starch:** A complex carbohydrate (polysaccharide) serving as the primary **energy storage** molecule in plants. ($A \rightarrow II$) **B. Antibody:** Specialized proteins (immunoglobulins) produced by the immune system to identify and neutralize foreign objects. They help **fight infection**. ($B \rightarrow I$) **C. Concanavalin A:** A carbohydrate-binding

protein. Such proteins are classified as **lectins**. ($C \rightarrow IV$) **D. GLUT-4:** An insulin-regulated protein that facilitates **glucose transport** into cells, particularly in fat and muscle tissue. ($D \rightarrow III$)

Matching results: A-II, B-I, C-IV, D-III.

Step 3: Final Answer:

The correct option is (3) A-II, B-I, C-IV, D-III.

Quick Tip: GLUT-4 stands for GLUcose Transporter type 4. Even if you forget the others, knowing this abbreviation immediately solves part D.

119. The number of vertebrae in a human is

- (A) 206
- (B) 7
- (C) 12
- (D) 26

Correct Answer: (D) 26

Solution:

Step 1: Understanding the Question:

State the total number of bones that comprise the vertebral column (spine) of an adult human.

Step 2: Detailed Explanation:

The human vertebral column develops from 33 individual vertebrae. However, during growth into adulthood, some of the lower vertebrae fuse together. The adult vertebral column consists of exactly **26** serially arranged units: - 7 Cervical vertebrae (neck) - 12 Thoracic vertebrae (chest) - 5 Lumbar vertebrae (lower back) - 1 Sacral bone (formed by the fusion of 5 sacral vertebrae) - 1 Coccygeal bone (formed by the fusion of 4 coccygeal vertebrae) Total = $7 + 12 + 5 + 1 + 1 = 26$ bones.

Step 3: Final Answer:

The number of vertebrae in an adult human is 26.

Quick Tip: Do not confuse the 26 vertebrae of the spine with the 206 bones of the entire adult human skeleton!

120. Endomembrane system includes

- (A) Golgi complex, chloroplast, peroxisomes and vacuole
- (B) endoplasmic reticulum, Golgi complex, lysosomes and vacuole
- (C) endoplasmic reticulum, chloroplast, peroxisomes and vacuole
- (D) mitochondria, chloroplast, peroxisomes and vacuole

Correct Answer: (B) endoplasmic reticulum, Golgi complex, lysosomes and vacuole

Solution:

Step 1: Understanding the Question:

Identify the specific group of cellular organelles that collectively constitute the "endomembrane system".

Step 2: Detailed Explanation:

The endomembrane system is a group of organelles inside a eukaryotic cell that work together to modify, package, and transport lipids and proteins. An organelle is considered part of this system if its functions are highly coordinated with the others. The system strictly includes:

1. **Endoplasmic Reticulum (ER)** (synthesizes materials)
2. **Golgi complex** (modifies and packages materials)
3. **Lysosomes** (vesicles containing enzymes packaged by the Golgi)
4. **Vacuoles** (derived from ER and Golgi)

Organelles like mitochondria, chloroplasts, and peroxisomes are **not** part of the endomembrane system because their functions are largely independent and their membranes are not directly continuous with the others.

Step 3: Final Answer:

It includes the endoplasmic reticulum, Golgi complex, lysosomes and vacuole.

Quick Tip: An easy way to rule out wrong answers: Mitochondria and Chloroplasts are semi-autonomous (have their own DNA) and work independently of the packaging-and-shipping network, so they are never part of the endomembrane system.

121. Length of the stem at time 0 is 20 cm. The arithmetic growth rate is 30 cm per day. What is the length of the stem at the end of the 7th day ?

- (A) 460 cm
- (B) 50 cm
- (C) 170 cm
- (D) 230 cm

Correct Answer: (D) 230 cm

Solution:**Step 1: Understanding the Question:**

Calculate the final length of a plant stem experiencing constant arithmetic growth over a specific number of days.

Step 2: Key Formula or Approach:

Arithmetic growth implies growth at a constant absolute rate. The mathematical expression for arithmetic growth is a simple linear equation:

$$L_t = L_0 + r t$$

where: L_t = length at time t L_0 = initial length at time $t = 0$ r = growth rate (elongation per unit time) t = time

Step 3: Detailed Explanation:

Given parameters: Initial length, $L_0 = 20$ cm Growth rate, $r = 30$ cm/day Time, $t = 7$ days

Substitute the values into the arithmetic growth equation:

$$L_7 = 20 \text{ cm} + (30 \text{ cm/day} \times 7 \text{ days})$$

$$L_7 = 20 + 210$$

$$L_7 = 230 \text{ cm}$$

Step 4: Final Answer:

The length of the stem is 230 cm.

Quick Tip: Arithmetic growth is linear ($y = mx + c$), characterized by a constant amount of growth per unit time. Geometric growth is exponential ($W_1 = W_0 e^{rt}$), characterized by constant percentage growth.

122. Match List-I with List-II.

List-I	List-II
A. Spherical	I. Vibrio
B. Rod	II. Cocci
C. Comma	III. Spirilla
D. Spirillum	IV. Bacilli

Choose the correct answer from the options given below :

- (A) A-II, B-IV, C-I, D-III
- (B) A-I, B-III, C-II, D-IV
- (C) A-III, B-II, C-I, D-IV
- (D) A-II, B-I, C-IV, D-III

Correct Answer: (A) A-II, B-IV, C-I, D-III

Solution:

Step 1: Understanding the Question:

Match the common morphological shapes of bacteria (List I) with their scientific taxonomic terminology (List II).

Step 2: Detailed Explanation:

Bacteria are grouped into four major categories based on their shape: **A. Spherical:** Bacteria that are round or spherical are called **Coccus** (plural: Cocci). ($A \rightarrow II$) **B. Rod:** Bacteria that are rod-shaped are called **Bacillus** (plural: Bacilli). ($B \rightarrow IV$) **C. Comma:** Bacteria shaped like a comma are called **Vibrio**. ($C \rightarrow I$) **D. Spirillum:** Bacteria that have a spiral or helical shape are naturally called **Spirillum** (plural: Spirilla). ($D \rightarrow III$)

Matching results: A-II, B-IV, C-I, D-III.

Step 3: Final Answer:

The correct option is (1) A-II, B-IV, C-I, D-III.

Quick Tip: Think of common diseases: *Vibrio cholerae* (comma-shaped cholera bacteria), *Lactobacillus* (rod-shaped in milk), *Streptococcus* (chains of spheres causing strep throat).

123. The number of action potentials generated by sino-arterial node (SAN) in a healthy human is _____ per minute.

- (A) 120 - 140
- (B) 28 - 30
- (C) 70 - 75
- (D) 100 - 110

Correct Answer: (C) 70 - 75

Solution:

Step 1: Understanding the Question:

Identify the natural firing rate of the primary pacemaker of the human heart.

Step 2: Detailed Explanation:

The Sino-atrial Node (SAN) is a specialized patch of nodal tissue located in the right upper corner of the right atrium. It is uniquely auto-excitabile, meaning it can generate action potentials without any external stimuli. The SAN generates the maximum number of action potentials compared to other parts of the nodal system, driving the rhythmic contraction of the entire heart. It produces **70 to 75** action potentials per minute in a healthy resting adult, which perfectly corresponds to the normal resting heart rate (average of 72 beats per minute). For this reason, the SAN is called the primary "pacemaker" of the heart.

Step 3: Final Answer:

The number of action potentials generated is 70 - 75 per minute.

Quick Tip: The number of action potentials generated by the SAN is exactly equal to your heart rate. An average resting heart rate is widely known as 72 beats per minute, which falls directly in the 70-75 range.

124. Match List-I with List-II.

List-I	List-II
A. Family	I. Sapindales
B. Genus	II. Dicotyledonae
C. Class	III. Anacardiaceae
D. Phylum	IV. Angiospermae
E. Order	V. Mangifera

Choose the correct answer from the options given below :

(A) A-III, B-V, C-II, D-IV, E-I

(B) A-I, B-V, C-II, D-IV, E-III

(C) A-II, B-I, C-III, D-IV, E-V

(D) A-II, B-III, C-V, D-I, E-IV

Correct Answer: (A) A-III, B-V, C-II, D-IV, E-I

Solution:

Step 1: Understanding the Question:

The question requires matching various taxonomic categories with their specific nomenclature based on the biological classification of the mango plant (*Mangifera indica*).

Step 2: Detailed Explanation:

Let us classify the mango plant step-by-step:

A. Family: Mango belongs to the family **Anacardiaceae**. ($A \rightarrow III$)

B. Genus: The genus name of mango is **Mangifera**. ($B \rightarrow V$)

C. Class: Mango is a dicotyledonous plant, so its class is **Dicotyledonae**. ($C \rightarrow II$)

D. Phylum / Division: As a flowering plant, its division is **Angiospermae**. ($D \rightarrow IV$)

E. Order: Mango belongs to the order **Sapindales**. ($E \rightarrow I$)

Combining these, the correct match sequence is A-III, B-V, C-II, D-IV, E-I.

Step 3: Final Answer:

The correct matching is option (A).

Quick Tip: Always memorize the complete classification table of common organisms given in the NCERT text (Mango, Wheat, Housefly, Human) as direct matching questions are frequently derived from it.

125. Which of the following is not a part of human central neural system ?

(A) Pericardium

(B) Arachnoid

(C) Dura mater

(D) Pia mater

Correct Answer: (A) Pericardium

Solution:

Step 1: Understanding the Question:

The question asks to identify the structure that is completely unrelated to the human Central Neural System (CNS).

Step 2: Detailed Explanation:

The central neural system, which includes the brain and the spinal cord, is covered and protected by three layers of connective tissue called the cranial meninges. These layers are:

1. **Dura mater:** The tough, fibrous outermost layer.
2. **Arachnoid mater:** The delicate, web-like middle layer.
3. **Pia mater:** The thin, highly vascular innermost layer that adheres closely to the brain.

The **Pericardium**, however, is the double-walled sac containing the heart and the roots of the great vessels. It has no structural or functional relationship with the central neural system.

Step 3: Final Answer:

Pericardium is not a part of the central neural system.

Quick Tip: Remember the layers of the meninges from outside to inside using the mnemonic **DAP**: Dura mater, Arachnoid, Pia mater. Pericardium (*peri* = around, *cardium* = heart) is exclusively for the heart.

126. Given below are two statements :

Statement I : Chromosomes are fully condensed at the end of prophase I.

Statement II : Meiosis I resembles mitosis.

In the light of the above statements, choose the *most appropriate* answer from the options given below :

- (A) Statement I is incorrect, but Statement II is true
- (B) Both Statement I and Statement II are true
- (C) Both Statement I and Statement II are false
- (D) Statement I is correct, but Statement II is false

Correct Answer: (D) Statement I is correct, but Statement II is false

Solution:

Step 1: Understanding the Question:

We need to evaluate the validity of two statements relating to the stages of cell division (Meiosis and Mitosis).

Step 2: Detailed Explanation:

Statement I: The final stage of Prophase I is diakinesis. This stage is marked by the terminalisation of chiasmata and the chromosomes becoming fully condensed. The meiotic spindle is assembled to prepare the homologous chromosomes for separation. Therefore, Statement I is factually correct.

Statement II: Meiosis I is a reductional division where homologous chromosomes separate, reducing the chromosome number by half. It does not resemble mitosis. Instead, it is **Meiosis II** (an equational division where sister chromatids separate) that closely resembles a normal mitotic division. Thus, Statement II is incorrect.

Step 3: Final Answer:

Statement I is correct, but Statement II is false.

Quick Tip: Meiosis I = Reductional division (homologous chromosomes separate). Meiosis II = Equational division (sister chromatids separate), which is why it is often described as resembling mitosis.

127. Match List-I with List-II.

List-I**A. Marginal placentation****B. Axile placentation****C. Parietal placentation****D. Free central placentation****List-II****I. Argemone****II. Tomato****III. Primrose****IV. Pea**

Choose the correct answer from the options given below :

(A) A-IV, B-II, C-I, D-III

(B) A-II, B-IV, C-I, D-III

(C) A-IV, B-II, C-III, D-I

(D) A-IV, B-III, C-I, D-II

Correct Answer: (A) A-IV, B-II, C-I, D-III

Solution:**Step 1: Understanding the Question:**

The question asks to match different types of placentation (the arrangement of ovules within the ovary) with the plant examples that exhibit them.

Step 2: Detailed Explanation:

Let's match each placentation type with its classic example:

A. Marginal placentation: The placenta forms a ridge along the ventral suture of the ovary, and ovules are borne on this ridge forming two rows. Example: **Pea**. ($A \rightarrow IV$)

B. Axile placentation: The placenta is axial, and the ovules are attached to it in a multilocular ovary. Examples: China rose, **Tomato**, and lemon. ($B \rightarrow II$)

C. Parietal placentation: Ovules develop on the inner wall of the ovary or on the peripheral part. Examples: Mustard and **Argemone**. ($C \rightarrow I$)

D. Free central placentation: Ovules are borne on a central axis, and septa are absent. Examples: Dianthus and **Primrose**. ($D \rightarrow III$)

Matching results: A-IV, B-II, C-I, D-III.

Step 3: Final Answer:

The correct matching is option (A).

Quick Tip: Placentation examples are high-yield questions. Memorize the key pairs: Marginal = Pea; Axile = Tomato, Lemon, China rose; Parietal = Mustard, Argemone; Free central = Dianthus, Primrose; Basal = Sunflower, Marigold.

128. Symbiotic association between fungi and algae are called

- (A) chrysophytes
- (B) lichens
- (C) sponges
- (D) mycorrhiza

Correct Answer: (B) lichens

Solution:

Step 1: Understanding the Question:

Identify the biological term for a specific mutually beneficial (symbiotic) relationship between a fungus and an alga.

Step 2: Detailed Explanation:

Let's analyze the terms:

- **Lichens** are dual organisms formed by the symbiotic association of a fungus (mycobiont) and an alga or cyanobacterium (phycobiont). The algal component provides food via photosynthesis, while the fungal component provides shelter, water, and minerals.
- **Mycorrhiza** refers to a symbiotic association between a fungus and the roots of higher plants (like pines or orchids), not algae.
- **Chrysophytes** is a group of algae that includes diatoms and golden algae.
- **Sponges** are simple, multicellular animals belonging to the phylum Porifera.

Step 3: Final Answer:

The symbiotic association is called lichens.

Quick Tip: Do not confuse Lichens (Algae + Fungi) with Mycorrhiza (Fungi + Roots of higher plants). Lichens are also excellent bioindicators as they do not grow in polluted (specifically SO_2 polluted) areas.

129. Which of the following is not a prokaryote ?

- (A) Fungi
- (B) Bacteria
- (C) Blue green algae
- (D) Mycoplasma

Correct Answer: (A) Fungi

Solution:

Step 1: Understanding the Question:

Identify the organism from the given options that is a eukaryote rather than a prokaryote.

Step 2: Detailed Explanation:

Prokaryotes are single-celled organisms that lack a true membrane-bound nucleus and other membrane-bound organelles. They all belong to the Kingdom Monera.

- **Bacteria**, **Blue-green algae** (cyanobacteria), and **Mycoplasma** are all members of Kingdom Monera and are therefore prokaryotes.
- **Fungi**, however, belong to the Kingdom Fungi. They possess a well-defined nucleus and membrane-bound organelles, making them **eukaryotes**.

Step 3: Final Answer:

Fungi are not prokaryotes.

Quick Tip: Blue-green algae is a misnomer; they are actually cyanobacteria (prokaryotes) and not true algae (which are eukaryotic). Fungi form their own entirely separate eukaryotic kingdom.

130. Arrange the following elements in descending order of their contribution to percentage weight of the human body.

- (a) Oxygen (b) Carbon
(c) Hydrogen (d) Nitrogen

Choose the correct answer from the options given below :

- (A) (b), (a), (c), (d)
(B) (a), (b), (c), (d)
(C) (c), (a), (b), (d)
(D) (b), (c), (d), (a)

Correct Answer: (B) (a), (b), (c), (d)

Solution:

Step 1: Understanding the Question:

We need to arrange four major chemical elements in the decreasing order of their percentage weight contribution to the human body.

Step 2: Detailed Explanation:

Based on the standard elemental analysis of the human body, the percentage weight of these elements is roughly:

1. **Oxygen (O):** 65%
2. **Carbon (C):** 18.5%
3. **Hydrogen (H):** 9.5%
4. **Nitrogen (N):** 3.3%

Descending order (highest to lowest) is Oxygen > Carbon > Hydrogen > Nitrogen.

This corresponds to the sequence (a), (b), (c), (d).

Step 3: Final Answer:

The correct descending sequence is (a), (b), (c), (d).

Quick Tip: Water makes up about 60-70% of the human body by weight, and since oxygen is much heavier than hydrogen (16:2 mass ratio in H_2O), Oxygen is overwhelmingly the most abundant element by mass in the body!

131. Which one of the following statements is incorrect ?

- (A) β -cells of pancreas secrete insulin
- (B) α -cells of pancreas secrete glucagon
- (C) α -cells of pancreas secrete insulin
- (D) Glucagon stimulates glycogenolysis

Correct Answer: (C) α -cells of pancreas secrete insulin

Solution:

Step 1: Understanding the Question:

Identify the factually incorrect statement regarding the endocrine functions of the human pancreas.

Step 2: Detailed Explanation:

The endocrine portion of the pancreas consists of Islets of Langerhans, which contain primarily two types of cells:

- α (**alpha**) **cells:** Secrete the hormone **glucagon**, which increases blood sugar levels by stimulating glycogenolysis (breakdown of glycogen into glucose). Thus, statements (B) and (D) are correct.
- β (**beta**) **cells:** Secrete the hormone **insulin**, which decreases blood sugar levels by promoting cellular glucose uptake. Thus, statement (A) is correct.

Statement (C) claims that α -cells secrete insulin, which is entirely false.

Step 3: Final Answer:

The statement " α -cells of pancreas secrete insulin" is incorrect.

Quick Tip: Alpha = Glucagon (raises blood glucose). Beta = Insulin (lowers blood glucose). They are antagonistic hormones that regulate sugar homeostasis.

132. Which of the following are characteristic features of Solanaceae family ?

- (a) Flowers are bisexual and actinomorphic
- (b) Calyx have five sepals and are united
- (c) Androecium have five stamens and are epipetalous
- (d) Ovary is inferior

Choose the correct answer from the options given below :

- (A) (b), (c) and (d) only
- (B) (a), (b) and (c) only
- (C) (d) only
- (D) (a) and (b) only

Correct Answer: (B) (a), (b) and (c) only

Solution:

Step 1: Understanding the Question:

Identify the correct morphological and floral characteristics that define the plant family Solanaceae (the potato family).

Step 2: Detailed Explanation:

Let's review the diagnostic features of the Solanaceae family:

- (a) The flowers are indeed **bisexual** (hermaphrodite) and typically **actinomorphic** (radially symmetrical). (Correct)
- (b) The calyx consists of **five sepals** that are fused (**united**/gamosepalous), and often persistent. (Correct)
- (c) The androecium consists of **five stamens** that are attached to the petals (**epipetalous**). (Correct)
- (d) The gynoecium features a bicarpellary, syncarpous ovary that is **superior**, not inferior. (Incorrect)

Therefore, statements (a), (b), and (c) correctly describe the Solanaceae family.

Step 3: Final Answer:

The correct characteristics are (a), (b), and (c) only.

Quick Tip: The floral formula for Solanaceae is: $\oplus K_{(5)} C_{(5)} A_5 \underline{G}_{(2)}$. The underline under G signifies a superior ovary!

133. Given below are two statements :

Statement I : When any plane passing through the central axis of the body divides the organism into two identical halves, it is called radial symmetry.

Statement II : In phylum Echinodermata, both adults and larvae are radially symmetrical.

In the light of the above statements, choose the *most appropriate* answer from the options given below :

- (A) Statement I is incorrect but Statement II is correct
- (B) Both Statement I and Statement II are correct
- (C) Both Statement I and Statement II are incorrect
- (D) Statement I is correct but Statement II is incorrect

Correct Answer: (D) Statement I is correct but Statement II is incorrect

Solution:

Step 1: Understanding the Question:

We need to evaluate the definitions of animal symmetry and its specific manifestation across the life stages of echinoderms.

Step 2: Detailed Explanation:

Statement I: This is the exact, textbook definition of radial symmetry. Examples include Coelenterates (cnidarians) and Ctenophores, where any vertical plane passing through the

central axis creates mirrored halves. Thus, Statement I is correct.

Statement II: Echinoderms present a unique evolutionary case regarding symmetry. The **adult echinoderms** (like starfish) exhibit secondary **radial** symmetry (specifically pentamerous radial symmetry). However, their **larvae** (like bipinnaria) are exclusively **bilaterally** symmetrical. Therefore, the claim that both life stages are radially symmetrical is factually wrong. Thus, Statement II is incorrect.

Step 3: Final Answer:

Statement I is correct, but Statement II is incorrect.

Quick Tip: Echinodermata is a favorite topic in exams due to this symmetry shift. Always remember:
Adult = Radial, Larva = Bilateral!

134. The correct sequence of adult cell cycle phases is

- (A) S-M-G2-G1
- (B) G1-G2-S-M
- (C) G1-M-G2-S
- (D) G1-S-G2-M

Correct Answer: (D) G1-S-G2-M

Solution:

Step 1: Understanding the Question:

Identify the correct chronological order of the stages in a standard eukaryotic cell cycle.

Step 2: Detailed Explanation:

The cell cycle consists of Interphase and M-phase. Interphase is further divided into three sequential phases to prepare the cell for division:

1. **G1 phase (Gap 1):** The cell grows and carries out normal metabolism.

2. **S phase (Synthesis):** DNA replication occurs.
3. **G2 phase (Gap 2):** The cell prepares for mitosis and synthesizes necessary proteins.
4. **M phase (Mitosis/Meiosis):** The actual cell division occurs, resulting in two daughter cells.

The correct chronological sequence is therefore $G1 \rightarrow S \rightarrow G2 \rightarrow M$.

Step 3: Final Answer:

The correct sequence is G1-S-G2-M.

Quick Tip: S-phase is sandwiched right in the middle of the two Gap phases. The cell must finish DNA synthesis (S) before it can enter the second gap (G2) for final pre-mitotic checks.

135. In frogs, the number of pairs of cranial nerves arising from the brain are

- (A) 12
- (B) 6
- (C) 9
- (D) 10

Correct Answer: (D) 10

Solution:

Step 1: Understanding the Question:

Identify the exact number of cranial nerve pairs present in the nervous system of a frog.

Step 2: Detailed Explanation:

The peripheral nervous system of a frog includes cranial nerves that emerge directly from the brain and spinal nerves that emerge from the spinal cord.

Unlike mammals and birds (which possess 12 pairs of cranial nerves), amphibians like frogs possess exactly **10 pairs** of cranial nerves.

Step 3: Final Answer:

Frogs have 10 pairs of cranial nerves.

Quick Tip: Fish and amphibians = 10 pairs of cranial nerves. Reptiles, birds, and mammals (amniotes) = 12 pairs of cranial nerves.