

TALLENTEX Biology

Sample Paper – 1

Duration: 23 Minutes

Maximum Marks: 60

Instructions

- This paper contains **15** Multiple Choice Questions (Single Correct Answer), modelled on the Biology portion of **TALLENTEX** entrance.
- Each correct answer carries **+4 marks**. There is a **penalty of –1 mark** for incorrect answers. Unattempted questions carry no penalty.
- Only **one** option is correct. Choose carefully.
- Syllabus: **NCERT Class 9 and Class 10 Biology**
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.

Q1. Which of the following types of substances can most easily cross the plasma membrane by simple diffusion without the aid of any transport protein?

- (A) Lipid-soluble (non-polar) molecules
- (B) Large protein molecules
- (C) Charged ions such as Na^+ and Cl^-
- (D) Polysaccharides

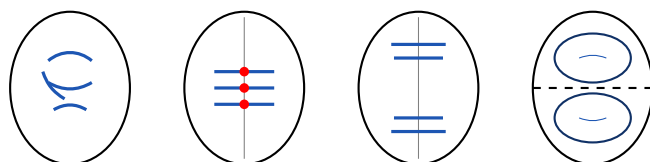
Q2. The smooth endoplasmic reticulum (SER) is distinct from the rough ER primarily because it lacks ribosomes. What is the **primary function** of the smooth ER in animal cells?

- (A) Synthesis of proteins for export
- (B) Lipid synthesis and detoxification of drugs and poisons
- (C) Production of ATP through cellular respiration



(D) Packaging of proteins into vesicles for secretion

Q3. The diagram below shows four successive stages of mitosis in an animal cell. In which of the labelled stages are the chromosomes aligned along the **equatorial plate** (metaphase plate) of the cell?



(I) Prophase (II) Metaphase (III) Anaphase (IV) Telophase

- (A) Stage I (Prophase)
- (B) Stage III (Anaphase)
- (C) Stage II (Metaphase)
- (D) Stage IV (Telophase)

Q4. Apical meristem is the type of meristematic tissue responsible for the primary growth in length of a plant. Where is apical meristem located?

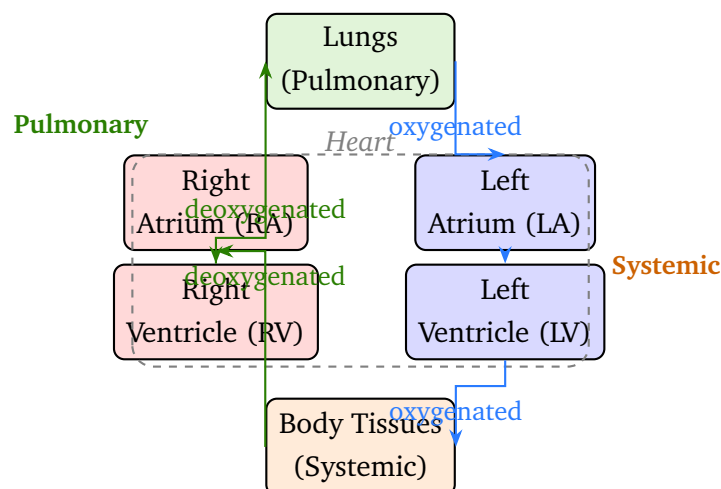
- (A) Only on the lateral sides of the stem
- (B) In the leaf lamina between the veins
- (C) In the root epidermis
- (D) At the tips of roots and shoots

Q5. Which of the following represents the **correct balanced equation** for photosynthesis?

- (A) $6\text{CO}_2 + 6\text{H}_2\text{O} \xrightarrow{\text{light, chlorophyll}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
- (B) $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy}$
- (C) $6\text{CO}_2 + \text{H}_2\text{O} \xrightarrow{\text{light}} \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$
- (D) $6\text{H}_2\text{O} \xrightarrow{\text{light}} 2\text{H}_2 + \text{O}_2$



- Q6.** Amoeba obtains its nutrition by the holozoic mode. What is the **correct sequence** of steps involved in holozoic nutrition in Amoeba?
- (A) Digestion → Ingestion → Assimilation
(B) Ingestion → Digestion → Absorption → Assimilation → Egestion
(C) Ingestion → Absorption → Digestion → Egestion
(D) Absorption → Digestion → Egestion → Assimilation
- Q7.** Complete aerobic cellular respiration of one molecule of glucose involves glycolysis, the Krebs cycle, and oxidative phosphorylation. What is the **total net number of ATP molecules** produced from the complete aerobic oxidation of one glucose molecule?
- (A) 2 ATP
(B) 4 ATP
(C) 38 ATP
(D) 18 ATP
- Q8.** Study the simplified diagram of the human circulatory system given below. Based on the diagram, why is human blood circulation referred to as “**double circulation**”?

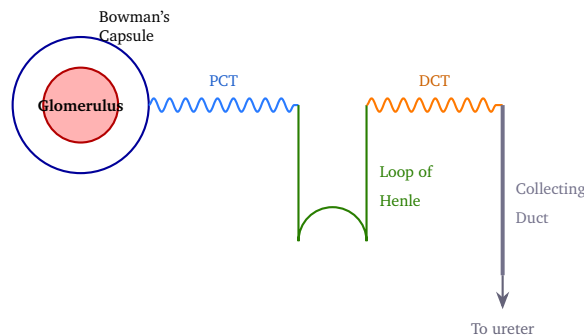


- (A) Blood passes through the heart only once per complete cycle
(B) The heart has two auricles and two ventricles separated by a septum



- (C) Blood is oxygenated twice in the lungs during each cycle
- (D) Blood passes through the heart **twice** in each complete cycle — once through the pulmonary circuit and once through the systemic circuit

Q9. The diagram below shows the structure of a nephron. Where does **ultra-filtration** (the initial filtering of blood under pressure) take place?



- (A) Bowman's capsule / Glomerulus
 - (B) Loop of Henle
 - (C) Collecting duct
 - (D) Distal convoluted tubule (DCT)
- Q10.** A nerve impulse travels along a neuron and reaches the end of an axon terminal. What chemical substance is released into the **synaptic cleft** to transmit the signal to the next neuron?
- (A) Hormone
 - (B) Neurotransmitter
 - (C) Enzyme
 - (D) Antibody
- Q11.** When a shoot is exposed to unidirectional light (phototropism), it bends towards the source of light. Which plant hormone is primarily responsible for this response by **promoting cell elongation on the shaded side** of the shoot?



- (A) Gibberellin
- (B) Cytokinin
- (C) Auxin (IAA — Indole Acetic Acid)
- (D) Absciscic acid (ABA)

Q12. Binary fission is the mode of asexual reproduction in Amoeba. What correctly describes the **fate of the parent cell** during binary fission?

- (A) The parent cell divides into many daughter cells simultaneously
- (B) The parent cell gives birth to young Amoeba and survives
- (C) The parent cell forms resistant spores before division
- (D) The parent cell divides into **exactly two** daughter cells, with the parent cell itself ceasing to exist as a separate entity

Q13. Mendel crossed a **pure-breeding tall** pea plant (TT) with a **pure-breeding dwarf** pea plant (tt). All plants of the F_1 generation were tall. The most correct explanation for this observation is:

- (A) Tallness is dominant over dwarfness; all F_1 plants have genotype Tt and express the dominant phenotype
- (B) Dwarfness is dominant, but it was suppressed in F_1
- (C) Both traits blended to give medium-height plants which appeared tall
- (D) The dwarf allele was permanently lost during fertilisation

Q14. Consider the following food chain:

Grass $\longrightarrow$ Grasshopper $\longrightarrow$ Frog $\longrightarrow$ Snake $\longrightarrow$ Eagle

What is the **trophic level and ecological role** of the grasshopper in this food chain?

- (A) Producer (first trophic level)
- (B) Primary consumer (second trophic level)



- (C) Secondary consumer (third trophic level)
- (D) Tertiary consumer (fourth trophic level)

Q15. Diseases can be caused by bacteria, viruses, protozoa, or fungi. Which of the following diseases is caused by **bacteria**?

- (A) Polio
- (B) Malaria
- (C) Typhoid
- (D) Dengue



Detailed Solutions

Q1.

Solution

Concept: Plasma membrane structure and selective permeability.

The plasma membrane is a phospholipid bilayer. The core of the bilayer is hydrophobic (non-polar). Therefore, **lipid-soluble (non-polar) molecules** such as steroid hormones, O_2 , CO_2 , and ethanol can dissolve in the lipid core and diffuse freely across the membrane without needing any carrier protein.

Why other options are wrong:

- (B) Large protein molecules cannot cross; they are too large and hydrophilic.
- (C) Charged ions (Na^+ , Cl^-) require ion channels or pumps because the hydrophobic core repels charges.
- (D) Polysaccharides are large, polar molecules; they require receptor-mediated endocytosis.

Answer: (A) [Go Back to Q 1](#)

Q2.

Solution

Concept: Organelle function — smooth endoplasmic reticulum.

The **smooth ER** (lacking ribosomes) is the primary site of:

- Lipid (phospholipid and steroid) synthesis
- Detoxification of drugs, alcohol, and metabolic by-products (especially in liver cells)
- Calcium ion storage (in muscle cells)

Why other options are wrong:

- (A) Protein synthesis is the function of *rough* ER (which has ribosomes).
- (C) ATP production occurs in mitochondria.
- (D) Packaging of proteins into vesicles is the function of the Golgi apparatus.

Answer: (B) [Go Back to Q 2](#)



Q3.

Solution

Concept: Stages of mitosis and chromosome behaviour.

During **Metaphase** (Stage II in the diagram), spindle fibres attach to the centromeres of each chromosome and pull them to the middle of the cell. The chromosomes line up along the **metaphase plate** (equatorial plate), a plane equidistant from both poles.

Why other options are wrong:

- **(A) Prophase:** Chromosomes condense and become visible, but have not yet aligned.
- **(B) Anaphase:** Sister chromatids separate and move to *opposite poles*; they are no longer at the equator.
- **(D) Telophase:** Nuclear envelopes re-form around each set of chromosomes at the poles; chromosomes decondense.

Answer: (C) [Go Back to Q 3](#)

Q4.

Solution

Concept: Types of meristematic tissue in plants.

Meristematic tissue consists of actively dividing cells. There are three types based on position:

- **Apical meristem** — present at the **tips of roots and shoots**; responsible for increase in length (primary growth).
- **Lateral meristem** (vascular cambium, cork cambium) — responsible for increase in girth (secondary growth).
- **Intercalary meristem** — present at the base of internodes (e.g., grasses).

Why other options are wrong: Options (A), (B), and (C) do not describe the location of apical meristem.

Answer: (D) [Go Back to Q 4](#)

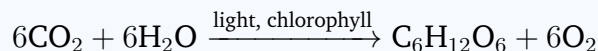


Q5.

Solution

Concept: Balanced chemical equation for photosynthesis.

The overall equation for photosynthesis is:



This shows 6 molecules of CO_2 and 6 molecules of H_2O combining in the presence of light and chlorophyll to produce one molecule of glucose and 6 molecules of oxygen.

Why other options are wrong:

- (B) This is the equation for *aerobic respiration* (reverse of photosynthesis).
- (C) Unbalanced — only 1 H_2O and 1 O_2 are shown.
- (D) This represents photolysis of water only, not the complete photosynthesis equation.

Answer: (A) [Go Back to Q 5](#)

Q6.

Solution

Concept: Holozoic nutrition — steps in Amoeba.

Holozoic nutrition involves the following steps in order:

- (a) **Ingestion** — food particle engulfed by pseudopodia (phagocytosis) forming a food vacuole.
- (b) **Digestion** — enzymes secreted into the food vacuole break down food.
- (c) **Absorption** — digested nutrients absorbed into the cytoplasm.
- (d) **Assimilation** — absorbed nutrients used for energy, growth, and repair.
- (e) **Egestion** — undigested material expelled from the cell.

Why other options are wrong: Options (A), (C), and (D) have incorrect sequences (e.g., digestion before ingestion, or absorption before digestion).

Answer: (B) [Go Back to Q 6](#)



Q7.

Solution

Concept: ATP yield from aerobic respiration of one glucose molecule.

The complete aerobic oxidation of one glucose molecule yields approximately **38 ATP** (in the classical textbook accounting):

Stage	Net ATP
Glycolysis (cytoplasm)	2 ATP (net)
Pyruvate oxidation (link reaction)	0 ATP directly
Krebs cycle (mitochondrial matrix)	2 ATP
Oxidative phosphorylation (ETC)	34 ATP
Total	38 ATP

Why other options are wrong:

- **(A) 2 ATP:** Only the net yield from glycolysis alone (anaerobic).
- **(B) 4 ATP:** Gross ATP from glycolysis without considering NADH oxidation.
- **(D) 18 ATP:** Not a standard value from any stage of aerobic respiration.

Answer: (C) [Go Back to Q 7](#)

Q8.

Solution

Concept: Double circulation in the human heart.

In humans, blood passes through the **heart twice** in a single complete circuit:

- Pulmonary circuit:** Deoxygenated blood from the right ventricle is pumped to the lungs, gets oxygenated, and returns to the left atrium.
- Systemic circuit:** Oxygenated blood from the left ventricle is pumped to all body tissues, becomes deoxygenated, and returns to the right atrium.

This ensures complete separation of oxygenated and deoxygenated blood, making circulation more efficient.

Why other options are wrong:

- **(A)** Incorrect — blood passes through the heart *twice*, not once.
- **(B)** The four chambers explain the *structure*, not the term “double circulation.”



- (C) Blood is oxygenated only once per cycle — in the lungs.

Answer: (D) [Go Back to Q 8](#)

Q9.

Solution

Concept: Structure of nephron and location of ultrafiltration.

Ultrafiltration is the process by which blood is filtered under high hydrostatic pressure in the **glomerulus** (a dense capillary network inside the Bowman's capsule). Blood pressure forces water, ions, glucose, urea, and other small molecules through the capillary walls into the Bowman's capsule, forming the **glomerular filtrate**.

Why other options are wrong:

- (B) **Loop of Henle:** Site of concentration gradient maintenance and water/salt reabsorption, not primary filtration.
- (C) **Collecting duct:** Site of final water reabsorption (ADH-regulated); not filtration.
- (D) **DCT:** Site of selective secretion and reabsorption of ions; not ultrafiltration.

Answer: (A) [Go Back to Q 9](#)

Q10.

Solution

Concept: Synapse and chemical transmission of nerve impulses.

A **synapse** is the junction between two neurons. When a nerve impulse reaches the axon terminal, it triggers the release of chemicals called **neurotransmitters** (e.g., acetylcholine, dopamine) from synaptic vesicles into the synaptic cleft. These neurotransmitters bind to receptors on the post-synaptic membrane and generate a new impulse in the next neuron.

Why other options are wrong:

- (A) **Hormone:** Hormones are released into the bloodstream by endocrine glands, not at synapses.



- (C) **Enzyme:** Enzymes catalyse chemical reactions; they are not released at synapses to transmit signals.
- (D) **Antibody:** Antibodies are immune proteins produced by B-lymphocytes; not involved in nerve transmission.

Answer: (B) [Go Back to Q 10](#)

Q11.

Solution

Concept: Plant hormones and phototropism.

Auxin (IAA — Indole-3-Acetic Acid) is the plant hormone responsible for phototropism. When light falls from one direction:

- (a) Auxin migrates from the illuminated side to the **shaded side** of the shoot tip.
- (b) Higher concentration of auxin on the shaded side causes **greater cell elongation** there.
- (c) The unequal elongation causes the shoot to **bend towards the light source**.

Why other options are wrong:

- (A) **Gibberellin:** Promotes stem elongation, seed germination, and fruit growth, but is not primarily responsible for phototropism.
- (B) **Cytokinin:** Promotes cell division and delays leaf senescence; not involved in phototropism.
- (D) **Absciscic acid:** A growth inhibitor; promotes stomatal closure and seed dormancy.

Answer: (C) [Go Back to Q 11](#)

Q12.

Solution

Concept: Binary fission as a mode of asexual reproduction.

In **binary fission**, the parent Amoeba:

- (a) First undergoes karyokinesis (nuclear division) to form two nuclei.



- (b) Then undergoes cytokinesis (cytoplasmic division) to produce **exactly two daughter cells**.
- (c) The parent cell completely divides into the two daughters — the parent **ceases to exist** as a separate individual.

This means Amoeba is theoretically immortal as a lineage because there is no dead parent body left behind.

Why other options are wrong:

- (A) Multiple fission (not binary) produces many daughter cells simultaneously.
- (B) Amoeba does not give birth in the animal sense; the parent is consumed in division.
- (C) Spore formation is a different mode of reproduction (sporulation), seen in fungi and some bacteria.

Answer: (D) [Go Back to Q 12](#)

Q13.

Solution

Concept: Mendel's law of dominance and F_1 generation.

When Mendel crossed pure tall (TT) $\times$ pure dwarf (tt):

$$TT \times tt \longrightarrow \text{All } Tt (F_1)$$

All F_1 plants have the genotype Tt . Since **tallness is dominant over dwarfness**, all F_1 plants express the tall phenotype. The recessive dwarf allele (t) is present but not expressed.

Why other options are wrong:

- (B) Dwarfness is recessive, not dominant.
- (C) Blending inheritance was disproved by Mendel; traits appear in discrete forms, not blended.
- (D) The dwarf allele (t) is not lost; it reappears in $1/4$ of F_2 plants as tt .

Answer: (A) [Go Back to Q 13](#)



Q14.

Solution**Concept:** Trophic levels in a food chain.

In the food chain: Grass → Grasshopper → Frog → Snake → Eagle

Organism	Trophic Level	Role
Grass	1st	Producer
Grasshopper	2nd	Primary Consumer
Frog	3rd	Secondary Consumer
Snake	4th	Tertiary Consumer
Eagle	5th	Quaternary Consumer

The grasshopper feeds directly on the producer (grass) and is therefore a **primary consumer** at the second trophic level.

Why other options are wrong: Option (A) is wrong because grasshopper eats grass (it is not a producer). Options (C) and (D) are higher trophic levels belonging to frog and snake respectively.

Answer: (B) [Go Back to Q 14](#)

Q15.

Solution**Concept:** Causative organisms of common diseases.

Disease	Causative Organism	Type
Polio	Poliovirus	Virus
Malaria	<i>Plasmodium</i> spp.	Protozoa
Typhoid	<i>Salmonella typhi</i>	Bacterium
Dengue	Dengue virus	Virus

Typhoid is caused by the gram-negative bacterium *Salmonella typhi*, transmitted through contaminated food and water.

Why other options are wrong:

- **(A) Polio:** Caused by poliovirus; prevented by the oral polio vaccine (OPV).
- **(B) Malaria:** Caused by the protozoan *Plasmodium*; transmitted by the *Anopheles* mosquito.
- **(D) Dengue:** Caused by dengue virus (flavivirus); transmitted by *Aedes aegypti* mosquito.



Answer: (C) [Go Back to Q 15](#)



Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	B	3	C	4	D	5	A
6	B	7	C	8	D	9	A	10	B
11	C	12	D	13	A	14	B	15	C

