

TALLENTEX Biology

Sample Paper – 6

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.

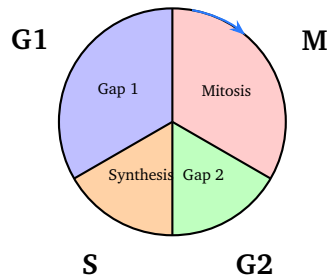
Multiple Choice Questions (Single Correct)

- Q1.** Which structure within the nucleus is responsible for the synthesis of ribosomal RNA (rRNA)?
- (A) Nucleolus
(B) Nuclear pore
(C) Nuclear envelope
(D) Chromatin
- Q2.** When an animal cell is placed in a hypotonic solution (a solution less concentrated than the cell's cytoplasm), water enters the cell by osmosis. What happens to the cell as a result?
- (A) It undergoes plasmolysis
(B) It becomes flaccid
(C) It shrinks and crenates



(D) It swells and may burst (cytolysis)

Q3. The diagram below shows the cell cycle. During which phase does DNA replication (chromosome duplication) occur?



- (A) G1 phase
- (B) G2 phase
- (C) S phase (Synthesis phase)
- (D) M phase (Mitosis)

Q4. Blood is classified as a connective tissue. Which component of blood is a living cell and is primarily responsible for carrying oxygen from the lungs to the body tissues?

- (A) Plasma
- (B) Red blood cells (Erythrocytes)
- (C) Platelets (Thrombocytes)
- (D) Fibrinogen

Q5. The inner lining of the small intestine has finger-like projections called villi, covered by a single layer of tall, column-shaped cells to maximise absorption of nutrients. What type of epithelial tissue is this?

- (A) Simple columnar epithelium
- (B) Stratified squamous epithelium
- (C) Cuboidal epithelium
- (D) Ciliated epithelium

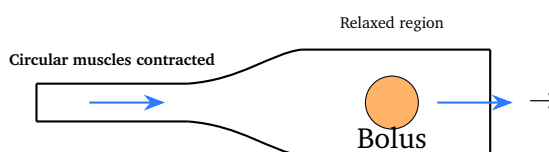


- Q6.** Spirogyra is a filamentous green alga commonly found in freshwater ponds. Which of the following features correctly describes Spirogyra?
- (A) It is a prokaryote with no membrane-bound organelles
 - (B) It reproduces exclusively by sexual reproduction
 - (C) Its cells have no cell wall
 - (D) It has ribbon-shaped, spiral chloroplasts and reproduces by conjugation
- Q7.** Rhizopus (bread mould) obtains its nutrition by the saprotrophic mode. Which of the following correctly describes saprotrophic nutrition?
- (A) Capturing and ingesting solid food particles
 - (B) Using sunlight to synthesise food from CO_2 and H_2O
 - (C) Secreting digestive enzymes onto dead organic matter and absorbing the digested products
 - (D) Living inside a host organism and deriving nutrients at the host's expense
- Q8.** Haemoglobin is the oxygen-carrying pigment found in red blood cells. In which part of the body does oxyhaemoglobin (haemoglobin bound to O_2) release oxygen?
- (A) Body tissues, where oxygen concentration is lower than in the blood
 - (B) Lungs, where oxygen pressure is highest
 - (C) Liver, which stores oxygen
 - (D) Heart, which pumps oxygenated blood
- Q9.** After ultrafiltration in the Bowman's capsule, the glomerular filtrate passes through the renal tubules. Which useful substance is *completely* reabsorbed from the filtrate back into the blood under normal healthy conditions?
- (A) Urea



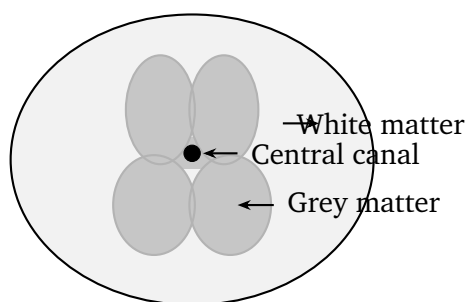
- (B) Glucose
- (C) Excess salts
- (D) Water only

Q10. Study the diagram below showing a cross-sectional view of part of the alimentary canal. What is the name of the mechanism illustrated, which moves food through the alimentary canal?



- (A) Absorption
- (B) Digestion
- (C) Segmentation
- (D) Peristalsis

Q11. The diagram below shows a cross-section of the human spinal cord. In which region is the grey matter (containing neuron cell bodies) located?



- (A) In the inner butterfly-shaped (H-shaped) region
- (B) In the outer region surrounding the grey matter
- (C) Only in the dorsal horn
- (D) Only in the ventral horn

Q12. Cytokinin is a plant hormone that promotes cell division (cytokinesis). Which additional effect is cytokinin well known for?



- (A) Promoting stomatal closure during drought
- (B) Causing apical dominance by inhibiting lateral buds
- (C) Delaying leaf senescence (ageing) and promoting lateral bud growth
- (D) Promoting seed dormancy and inhibiting germination

Q13. Vegetative propagation is the production of new plants from vegetative parts without the involvement of seeds. Which of the following is a correct example of *natural* vegetative propagation?

- (A) Fertilisation of an ovule to form a seed
- (B) New plants developing from the notches on the leaf margins of *Bryophyllum*
- (C) Production of pollen grains in the anthers
- (D) Germination of a seed into a seedling

Q14. In humans, females have the sex chromosome combination XX and males have XY. Which statement correctly explains why the sex of the child is determined by the father and not the mother?

- (A) Females produce eggs carrying both X and Y chromosomes
- (B) Males produce only Y-bearing sperm
- (C) The mother's X chromosome decides the sex of the child
- (D) Mothers produce only X-bearing eggs; the father produces both X-bearing and Y-bearing sperm — so the type of sperm that fertilises the egg determines the child's sex

Q15. Which of the following is an example of a **non-biodegradable** substance that accumulates in the environment and causes long-term pollution?

- (A) Vegetable peels
- (B) Plastic bags
- (C) Cow dung
- (D) Dried leaves



Detailed Solutions

Q1.

Solution

Concept: Nucleus — structure and function

The **nucleolus** is a dense, membrane-less body found inside the nucleus. It is the site of ribosomal RNA (rRNA) synthesis and ribosome assembly. The rRNA genes are transcribed here, and the resulting rRNA combines with proteins to form ribosomal subunits, which are then exported to the cytoplasm.

Why other options are wrong:

- (B) Nuclear pores are channels in the nuclear envelope that regulate the transport of molecules (like mRNA, proteins) between the nucleus and cytoplasm; they do not synthesise rRNA.
- (C) The nuclear envelope is a double membrane that encloses the nucleus, providing a boundary; it has no role in rRNA synthesis.
- (D) Chromatin is the complex of DNA and histone proteins that forms chromosomes; it carries the genetic information but the nucleolus specifically handles rRNA synthesis.

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

Q2.

Solution

Concept: Osmosis — behaviour of animal cells in hypotonic solutions

In a **hypotonic solution**, the external solution has a lower solute concentration (higher water potential) than the cell's cytoplasm. Water moves into the cell by osmosis along the concentration gradient. Since animal cells have no rigid cell wall, the incoming water causes the cell to **swell** and, if the influx continues, the cell membrane ruptures — a process called **cytolysis** (lysis).

Why other options are wrong:

- (A) Plasmolysis is the shrinkage of the cell membrane away from the cell wall in a *plant* cell placed in a hypertonic solution; animal cells do not undergo plasmolysis.
- (B) Flaccidity refers to a plant cell losing turgor in a hypertonic environment; in animal cells placed in a hypotonic solution, the cell gains water, not loses



it.

- (C) Shrinkage and crenation occur when an animal cell is placed in a *hypertonic* solution (water leaves the cell).

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

Q3.

Solution

Concept: Cell cycle phases — DNA replication

The cell cycle consists of interphase (G1, S, G2) and the mitotic phase (M). DNA replication occurs exclusively during the **S (Synthesis) phase**. During S phase, each chromosome is duplicated to form two identical sister chromatids joined at the centromere, so the cell's DNA content doubles from 2N to 4N.

Why other options are wrong:

- (A) G1 (Gap 1) is the growth phase after division; the cell grows in size and prepares for DNA replication, but does not replicate DNA.
- (B) G2 (Gap 2) is the growth phase after DNA replication; the cell prepares for mitosis by synthesising proteins and organelles, but DNA replication is already complete.
- (D) M phase (Mitosis) is when the duplicated chromosomes are separated and two daughter cells are formed; no new DNA replication occurs here.

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

Q4.

Solution

Concept: Blood as connective tissue — role of red blood cells

Blood is a fluid connective tissue. **Red blood cells (erythrocytes)** are living cells (though mature mammalian RBCs lack a nucleus) packed with haemoglobin, which binds oxygen in the lungs and releases it in the body tissues. RBCs are the primary oxygen carriers.

Why other options are wrong:

- (A) Plasma is the liquid matrix of blood consisting mainly of water, proteins,



salts, and dissolved substances; it transports dissolved materials but does not carry oxygen.

- (C) Platelets (thrombocytes) are cell fragments involved in blood clotting (haemostasis); they do not carry oxygen.
- (D) Fibrinogen is a plasma protein that is converted to fibrin during clot formation; it plays a role in clotting, not oxygen transport.

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

Q5.

Solution

Concept: Epithelial tissue types — simple columnar epithelium

The inner lining of the small intestine is covered by **simple columnar epithelium** — a single layer of tall, column-shaped cells. This arrangement maximises absorptive surface area (especially with microvilli forming the brush border). Some cells also have goblet cells secreting mucus for lubrication.

Why other options are wrong:

- (B) Stratified squamous epithelium consists of multiple layers of flat cells; it lines surfaces subjected to wear and tear (skin, oesophagus, mouth) — not the absorptive lining of the small intestine.
- (C) Cuboidal epithelium has cube-shaped cells and lines kidney tubules, glands, and ducts; it is not the lining of the small intestine's villi.
- (D) Ciliated epithelium bears hair-like cilia that beat to move substances; it lines the trachea and fallopian tubes, not the villi of the small intestine.

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

Q6.

Solution

Concept: Algae — Spirogyra features

Spirogyra is a eukaryotic, filamentous green alga. Its most distinctive feature is its **ribbon-shaped, spiral chloroplasts** (which give it the name “Spiro”). It reproduces sexually by **conjugation**, in which two filaments lie parallel and protoplasts



from one filament migrate through conjugation tubes into the cells of the other filament to form zygospores.

Why other options are wrong:

- (A) Spirogyra is a *eukaryote*; its cells have membrane-bound organelles including a distinct nucleus and chloroplasts.
- (B) Spirogyra also reproduces asexually by fragmentation; it does not use only sexual reproduction.
- (C) Spirogyra cells have a cellulose cell wall, which is characteristic of plant-like organisms.

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

Q7.

Solution

Concept: Saprotrophic nutrition — Rhizopus (bread mould)

Saprotrophic (saprophytic) nutrition is the mode of nutrition in which an organism secretes **extracellular digestive enzymes** onto dead and decaying organic matter. The enzymes break down complex organic molecules into simpler, soluble ones, which are then **absorbed** by the organism. Rhizopus (bread mould) is a classic example.

Why other options are wrong:

- (A) Capturing and ingesting solid food particles describes *holozoic* nutrition, as seen in Amoeba.
- (B) Using sunlight to make food from CO₂ and H₂O describes *autotrophic* (photosynthetic) nutrition in plants and algae.
- (D) Living inside a host and taking nutrients at the host's expense describes *parasitic* nutrition, as in *Cuscuta* or tapeworms.

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



Q8.

Solution

Concept: Haemoglobin and oxygen transport — release of oxygen at tissues

Haemoglobin binds oxygen in the lungs (where O_2 partial pressure is high) to form oxyhaemoglobin. When blood reaches the **body tissues**, the partial pressure of oxygen is lower (because cells are constantly consuming O_2). This lower pO_2 causes oxyhaemoglobin to dissociate, releasing O_2 that diffuses into the cells for cellular respiration.

Why other options are wrong:

- (B) In the lungs, oxygen pressure is *high*, which is where haemoglobin *picks up* (associates with) oxygen to form oxyhaemoglobin — not where it is released.
- (C) The liver does not store oxygen; it performs metabolic functions such as detoxification, protein synthesis, and bile production.
- (D) The heart pumps blood but does not cause oxyhaemoglobin to release oxygen; release is governed by tissue oxygen levels.

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

Q9.

Solution

Concept: Tubular reabsorption in the nephron — complete reabsorption of glucose

After ultrafiltration, the glomerular filtrate contains water, glucose, amino acids, urea, salts, and other small molecules. As the filtrate passes through the proximal convoluted tubule, **glucose** is completely reabsorbed back into the peritubular capillaries by active transport under normal blood glucose levels. No glucose appears in the urine of a healthy individual.

Why other options are wrong:

- (A) Urea is partially reabsorbed but most of it remains in the filtrate and is excreted in urine; it is a waste product of protein metabolism.
- (C) Excess salts are selectively reabsorbed or excreted depending on the body's needs; they are not completely reabsorbed.
- (D) Water is extensively reabsorbed (especially under ADH action) but not *completely*; some water is always lost in urine.



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

Q10.

Solution

Concept: Peristalsis in the alimentary canal

Peristalsis is the wave-like, rhythmic contraction and relaxation of the smooth muscles in the wall of the alimentary canal. Circular muscles contract behind the food bolus (narrowing the lumen) while the region ahead relaxes (widening), pushing the bolus forward. This mechanism moves food from the oesophagus through the stomach, small intestine, and large intestine.

Why other options are wrong:

- (A) Absorption is the process by which digested nutrients pass from the intestinal lining into the blood/lymph; it is not a movement mechanism.
- (B) Digestion refers to the chemical and mechanical breakdown of food into simpler molecules; it does not describe the transport of food.
- (C) Segmentation is rhythmic local contractions that mix food with digestive juices but do not produce net forward movement; peristalsis produces directional movement.

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

Q11.

Solution

Concept: Spinal cord cross-section — location of grey matter

In the spinal cord, **grey matter** (which contains neuron cell bodies, dendrites, and unmyelinated axons) is located in the **inner butterfly-shaped (H-shaped) region**. The surrounding outer region is white matter (containing myelinated axons that form ascending and descending tracts). This arrangement is the *reverse* of the brain, where grey matter (cortex) is on the outside.

Why other options are wrong:

- (B) The outer region is white matter, consisting mainly of myelinated nerve fibres; it does not contain neuron cell bodies.
- (C) Grey matter is not restricted to only the dorsal horn; it forms the com-



plete H-shaped region including both dorsal and ventral horns and the intermediate zone.

- (D) Similarly, grey matter is not confined to the ventral horn alone; both the dorsal and ventral horns together form the butterfly/H-shape.

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

Q12.

Solution

Concept: Cytokinin — role in plants

Cytokinins are plant hormones produced primarily in roots and transported to shoots. Besides promoting cell division, they are well known for: (1) **delaying leaf senescence** (ageing and yellowing) by preventing protein breakdown in leaves, and (2) **promoting lateral bud growth** by counteracting the apical dominance imposed by auxin.

Why other options are wrong:

- (A) Stomatal closure during drought is primarily caused by *abscisic acid* (ABA), not cytokinin.
- (B) Apical dominance (inhibition of lateral buds) is caused by *auxin* (IAA); cytokinins actually *overcome* apical dominance and encourage lateral bud growth.
- (D) Seed dormancy and inhibition of germination are associated with *abscisic acid* (ABA); cytokinins generally promote growth processes rather than dormancy.

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

Q13.

Solution

Concept: Vegetative propagation — natural methods

Bryophyllum (also known as the “miracle leaf” or “leaf of life”) is a classic example of **natural vegetative propagation by leaves**. Adventitious buds develop in the notches along the leaf margins. When a leaf falls to the ground, each notch bud can grow into a complete new plant. This is entirely natural and requires no human



intervention.

Why other options are wrong:

- (A) Fertilisation of an ovule to form a seed is *sexual* reproduction, not vegetative propagation.
- (C) Production of pollen grains in anthers is part of the *sexual reproduction* process (male gametophyte formation); it is not vegetative propagation.
- (D) Germination of a seed into a seedling is a result of *sexual reproduction*; the seed itself was formed by fertilisation.

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

Q14.

Solution

Concept: Sex chromosomes and sex determination in humans

In human females (XX), all eggs produced by meiosis carry **one X chromosome** (only X-type eggs). In human males (XY), sperm are of two types: **50% carry an X chromosome** and **50% carry a Y chromosome**. If an X-bearing sperm fertilises the X-bearing egg, the offspring is XX (female); if a Y-bearing sperm fertilises the egg, the offspring is XY (male). Thus, the **father's sperm type** determines the sex of the child.

Why other options are wrong:

- (A) Females always produce only X-bearing eggs, never Y-bearing eggs; so the mother cannot contribute a Y chromosome.
- (B) Males do not produce *only* Y-bearing sperm; half the sperm carry X and half carry Y.
- (C) The mother's X chromosome is always passed on (to all children) and cannot determine sex; every child receives one X from the mother.

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



Q15.

Solution**Concept:** Biodegradable vs non-biodegradable substances

Plastic bags are made of synthetic polymers (polyethylene) that microorganisms cannot break down. They persist in the environment for hundreds of years, causing soil pollution, water pollution, harm to animals (ingestion), and blockage of drainage systems. This makes them a major non-biodegradable pollutant.

Why other options are wrong:

- (A) Vegetable peels are organic matter that decompose readily by the action of bacteria and fungi; they are *biodegradable*.
- (C) Cow dung is an organic waste that decomposes naturally and is even used as manure and biogas feedstock; it is *biodegradable*.
- (D) Dried leaves are plant material that decompose through microbial action to form humus; they are *biodegradable*.

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

Answer Key

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

