

TALLENTEX Biology

Sample Paper – 2

Duration: 23 Minutes

Maximum Marks: 60

Instructions

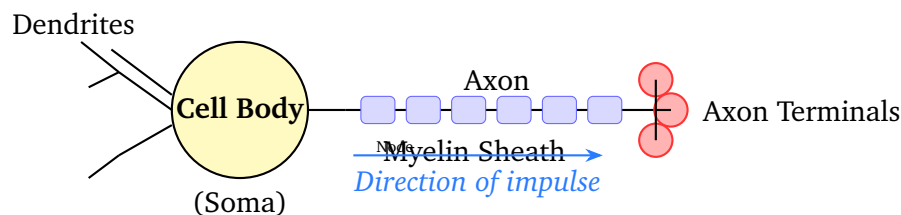
- This paper contains **15** Multiple Choice Questions (Single Correct Answer), modelled on the Biology portion of **TALLENTEX** entrance.
- Each correct answer carries **+4 marks**. There is a **penalty of –1 mark** for incorrect answers. Unattempted questions carry no penalty.
- Only **one** option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

Questions

- Q1. Mitochondria are called the “powerhouse of the cell” because they produce ATP through which process?
- (A) Photosynthesis
(B) Cellular respiration (oxidative phosphorylation)
(C) Protein synthesis
(D) Cell division
- Q2. Lysosomes are often called “suicidal bags” of the cell because:
- (A) They store food for the cell
(B) They produce energy
(C) They contain digestive enzymes that can digest the cell’s own contents if the membrane ruptures
(D) They help in cell division



Q3. Study the labeled diagram of a neuron shown below and answer the question.



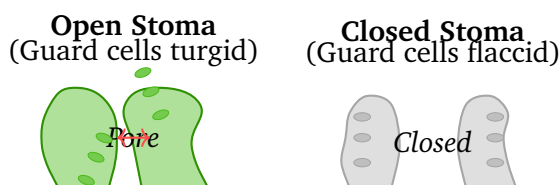
Which part of a neuron receives nerve impulses from other neurons?

- (A) Dendrites
- (B) Axon
- (C) Myelin sheath
- (D) Axon terminals

Q4. Fungi obtain nutrition by:

- (A) Photosynthesis
- (B) Chemosynthesis
- (C) Predation
- (D) Absorbing nutrients from dead organic matter (saprophytic nutrition)

Q5. Study the diagram of stomata below showing open and closed states, then answer the question.



Guard cells surrounding a stoma become turgid (swell up) when water enters them by osmosis. This results in:

- (A) Closure of the stoma
- (B) Reduction in photosynthesis rate



- (C) Opening of the stoma
- (D) Loss of CO₂ from the leaf

Q6. Bile produced by the liver and stored in the gallbladder plays a key role in:

- (A) Emulsification of fats (breaking large fat globules into smaller droplets)
- (B) Digestion of proteins
- (C) Synthesis of glucose
- (D) Absorption of minerals

Q7. During anaerobic respiration in yeast, glucose is converted to:

- (A) Lactic acid and CO₂
- (B) Pyruvate and O₂
- (C) Citric acid and water
- (D) Ethanol (ethyl alcohol) and CO₂

Q8. Which of the following correctly distinguishes arteries from veins?

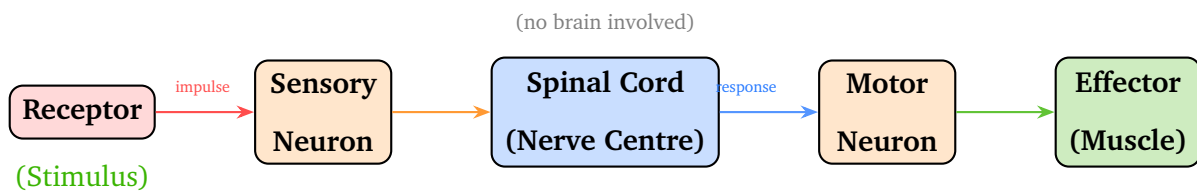
- (A) Arteries carry deoxygenated blood; veins carry oxygenated blood
- (B) Arteries carry blood away from the heart; veins carry blood toward the heart
- (C) Arteries have valves; veins do not
- (D) Arteries have thinner walls than veins

Q9. Which of the following substances is normally completely reabsorbed from the glomerular filtrate in a healthy person?

- (A) Urea
- (B) Creatinine
- (C) Glucose
- (D) Sodium ions (all sodium)



Q10. Study the diagram of a reflex arc below and answer the question.



In a reflex arc, the nerve signal travels in which sequence?

- (A) Receptor → Sensory neuron → Spinal cord → Motor neuron → Effector
- (B) Effector → Motor neuron → Brain → Sensory neuron → Receptor
- (C) Receptor → Motor neuron → Brain → Sensory neuron → Effector
- (D) Receptor → Brain → Spinal cord → Motor neuron → Effector

Q11. Deficiency of iodine leads to the enlargement of the thyroid gland (goitre) because:

- (A) Iodine is a component of insulin
- (B) Iodine deficiency stimulates insulin production
- (C) The thyroid needs iodine to produce TSH
- (D) Iodine is required for the synthesis of thyroxine; without it the thyroid gland enlarges trying to compensate

Q12. In Hydra, the mode of asexual reproduction called budding involves:

- (A) The parent organism splitting into two equal halves
- (B) A small outgrowth (bud) developing on the parent's body that eventually detaches to form a new organism
- (C) The formation of spores that germinate
- (D) The fusion of two gametes

Q13. Mendel crossed two hybrid tall pea plants ($Tt \times Tt$). The ratio of tall to dwarf plants in the F_2 generation is:



- (A) 1:1
- (B) 2:1
- (C) 3:1
- (D) 1:2:1

Q14. The main chemical compounds responsible for depletion of the ozone layer in the stratosphere are:

- (A) Carbon dioxide and methane
- (B) Sulphur dioxide and nitrogen oxides
- (C) Ammonia and hydrogen sulphide
- (D) Chlorofluorocarbons (CFCs)

Q15. Which type of variation is passed on from parents to offspring and thus plays a role in evolution?

- (A) Variation due to cutting off a limb
- (B) Variation arising from changes in the DNA (genetic variation)
- (C) Variation due to exposure to excessive sunlight
- (D) Variation due to learning a new skill



Detailed Solutions

Sol. 1.

Solution**Concept:** Cellular respiration and ATP synthesis.**Explanation:** Mitochondria are the sites of aerobic cellular respiration. They use oxygen to break down glucose through a series of reactions (glycolysis → Krebs cycle → oxidative phosphorylation / electron transport chain), producing a large amount of ATP (adenosine triphosphate). Because ATP is the main energy currency of the cell, mitochondria are aptly called the “powerhouse of the cell.”**Why other options are wrong:**

- (A) Photosynthesis occurs in chloroplasts, not mitochondria.
- (C) Protein synthesis occurs at ribosomes.
- (D) Cell division is controlled by the nucleus and centrosomes.

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

Sol. 2.

Solution**Concept:** Structure and function of lysosomes.**Explanation:** Lysosomes are membrane-bound organelles containing powerful hydrolytic (digestive) enzymes such as proteases, lipases, and nucleases. Under normal conditions, the membrane keeps these enzymes contained. If the lysosomal membrane ruptures – due to cell damage, disease, or programmed cell death – these enzymes are released into the cytoplasm and digest the cell’s own proteins, lipids, and nucleic acids, effectively destroying the cell from within. This is why they are called “suicidal bags.”**Why other options are wrong:**

- (A) Food storage is associated with vacuoles.
- (B) Energy production is a function of mitochondria.
- (D) Cell division is regulated by the nucleus and spindle apparatus.

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

Sol. 3.

Solution

Concept: Structure of a neuron – parts and functions.

Explanation: A neuron has three major structural components: the cell body (soma), dendrites, and the axon. **Dendrites** are short, branched projections that extend from the cell body. Their primary function is to receive incoming nerve impulses (signals) from other neurons at junctions called synapses and transmit them toward the cell body.

The axon carries the impulse *away* from the cell body toward the next neuron or effector organ. The myelin sheath insulates the axon and speeds up transmission. The axon terminals release neurotransmitters into the synapse.

Why other options are wrong:

- (B) The axon transmits impulses *away* from the cell body.
- (C) The myelin sheath is an insulating covering, not a receptor.
- (D) Axon terminals *transmit* impulses to the next cell; they do not receive from other neurons (typically).

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

Sol. 4.

Solution

Concept: Nutritional mode of fungi (Kingdom Fungi).

Explanation: Fungi are **heterotrophic** organisms – they cannot make their own food. Most fungi are **saprophytes**: they secrete digestive enzymes (extracellular digestion) onto dead and decaying organic matter, break it down into simpler molecules, and then absorb the nutrients through their cell walls. This mode is called saprophytic nutrition or absorptive heterotrophy. It plays a vital ecological role in decomposition and nutrient cycling.

Why other options are wrong:

- (A) Photosynthesis requires chlorophyll; fungi have none.
- (B) Chemosynthesis is performed by certain bacteria using inorganic compounds.
- (C) Predation involves capturing and consuming prey – not characteristic of fungi.



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

Sol. 5.

Solution

Concept: Stomatal mechanism – role of guard cells.

Explanation: Guard cells are specialised kidney-shaped cells that flank the stomatal pore. Their inner walls (facing the pore) are thicker than their outer walls. When guard cells absorb water by osmosis (e.g., in bright light when K^+ ions accumulate), they become **turgid**. Due to the differential wall thickness, the thinner outer wall bulges outward more than the inner wall, causing the guard cells to curve away from each other. This **opens the stomatal pore**, allowing gas exchange (CO_2 in, O_2 and water vapour out).

When water leaves the guard cells (at night or under water stress), they become **flaccid** and straighten, closing the pore.

Why other options are wrong:

- (A) Turgidity *opens* the stoma, not closes it.
- (B) Open stoma allows more CO_2 entry, which *increases* photosynthesis.
- (D) CO_2 loss (if it occurs) is a consequence of open stoma, not the result of guard cells becoming turgid per se; the question asks what turgidity results in, which is opening.

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

Sol. 6.

Solution

Concept: Role of bile in digestion.

Explanation: Bile is an alkaline fluid produced by the liver and stored in the gallbladder. It is released into the small intestine (duodenum) when fatty food arrives. Bile does **not** contain digestive enzymes, but it contains bile salts that **emulsify fats** – they break large fat globules into tiny droplets (micelles), thereby greatly increasing the surface area available for the enzyme *lipase* to act on. This is essential for efficient fat digestion and subsequent absorption.

Why other options are wrong:

- (B) Protein digestion is performed by proteases (pepsin, trypsin); bile has no role.



- (C) Glucose synthesis (gluconeogenesis) occurs in liver cells, not via bile.
- (D) Mineral absorption is facilitated by the intestinal epithelium and specific transporters, not bile.

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

Sol. 7.

Solution

Concept: Anaerobic respiration (fermentation) in yeast.

Explanation: In the absence of oxygen, yeast carries out **alcoholic fermentation**. Pyruvate (produced from glucose during glycolysis) is converted to **ethanol (ethyl alcohol)** and **carbon dioxide** by the enzyme pyruvate decarboxylase, followed by alcohol dehydrogenase. This reaction regenerates NAD^+ so that glycolysis can continue.



Why other options are wrong:

- (A) Lactic acid + CO_2 is produced during anaerobic respiration in *animal muscle cells*, not yeast.
- (B) Pyruvate is an intermediate; O_2 is not a product of anaerobic respiration.
- (C) Citric acid is part of the aerobic Krebs cycle; water is not produced in anaerobic conditions.

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

Sol. 8.

Solution

Concept: Structure and function of arteries and veins.

Explanation: **Arteries** carry blood *away from* the heart to body organs. They have thick, elastic, muscular walls to withstand high blood pressure. **Veins** carry blood *toward* the heart from body organs. They have thinner walls and contain **valves** to prevent backflow (since blood pressure is lower in veins). Note: The pulmonary artery is an exception carrying deoxygenated blood, and the pulmonary vein carries oxygenated blood – but the general rule is about direction,



not oxygen content.

Why other options are wrong:

- (A) This is generally incorrect (reversed) for systemic circulation; the defining difference is direction, not oxygen content.
- (C) *Veins* have valves; arteries generally do not (except at the heart outlet).
- (D) Arteries have *thicker* walls than veins because of higher pressure.

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

Sol. 9.

Solution

Concept: Kidney tubule reabsorption – glomerular filtrate processing.

Explanation: The glomerulus filters blood under pressure to form the **glomerular filtrate**, which contains water, glucose, amino acids, urea, creatinine, salts, and other small molecules. As this filtrate passes through the proximal convoluted tubule (PCT), **glucose** is completely reabsorbed by active transport (via glucose transporters) back into the bloodstream in a healthy person. The blood glucose level is normally below the renal threshold (~ 180 mg/dL), so all filtered glucose is reclaimed. If glucose appears in urine (glucosuria), it indicates diabetes or renal disease.

Why other options are wrong:

- (A) Urea is partially reabsorbed but a significant amount remains to be excreted.
- (B) Creatinine is not reabsorbed; it is completely excreted (used to measure GFR).
- (D) Sodium ions are largely reabsorbed but regulated by hormones (aldosterone); not *completely* reabsorbed in all conditions.

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



Sol. 10.

Solution

Concept: Reflex arc – components and direction of impulse.

Explanation: A reflex arc is the neural pathway that mediates a reflex action. The signal travels in the following fixed sequence:

- (a) **Receptor** – detects the stimulus (e.g., pain, heat).
- (b) **Sensory (afferent) neuron** – carries impulse to the spinal cord.
- (c) **Spinal cord (nerve centre)** – processes and integrates the signal (often via interneurons); the brain is *not* involved in simple spinal reflexes.
- (d) **Motor (efferent) neuron** – carries response signal away from the spinal cord.
- (e) **Effector (muscle/gland)** – produces the response (e.g., withdrawing hand).

This is why reflex actions are fast – they bypass the brain.

Why other options are wrong:

- (B) This is the reverse sequence; it is incorrect.
- (C) Motor neuron and brain are not in the typical spinal reflex pathway in this order.
- (D) In spinal reflexes, the signal goes to the spinal cord (not the brain) first.

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

Sol. 11.

Solution

Concept: Thyroid gland, thyroxin synthesis, and goitre.

Explanation: The thyroid gland produces the hormone **thyroxin** (T₄) and tri-iodothyronine (T₃), both of which contain iodine atoms in their structure. When iodine intake is insufficient, the thyroid gland cannot produce adequate thyroxin. This leads to low thyroxin levels in the blood, which triggers the pituitary gland to release more **TSH** (thyroid-stimulating hormone) to try to compensate. Continuous TSH stimulation causes the thyroid cells to proliferate and the gland to enlarge, resulting in **goitre**.

Why other options are wrong:



- (A) Insulin is produced by the pancreas and contains no iodine.
- (B) Insulin production is unrelated to iodine levels.
- (C) TSH is produced by the pituitary, not the thyroid; the thyroid needs iodine to produce *thyroxin*.

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

Sol. 12.

Solution

Concept: Asexual reproduction – budding in Hydra.

Explanation: **Budding** is a form of asexual reproduction in which a new organism develops from a small outgrowth (bud) on the body of the parent. In Hydra, repeated mitotic cell divisions cause a small projection (bud) to form on the parent's body wall. This bud grows, develops its own tentacles and mouth, and eventually detaches to lead an independent life as a genetically identical new organism. Budding allows rapid reproduction without the need for gametes or fertilization.

Why other options are wrong:

- (A) Splitting into two equal halves describes *binary fission* (e.g., Amoeba, Paramecium).
- (C) Spore formation is seen in fungi and some bacteria.
- (D) Fusion of gametes is *sexual reproduction*.

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

Sol. 13.

Solution

Concept: Mendel's Law of Segregation – monohybrid cross (F_2 generation).

Explanation: When two hybrid tall plants (Tt) are crossed, the Punnett square gives:

	T	t
T	TT	Tt
t	Tt	tt

Genotypic ratio: $1 TT : 2 Tt : 1 tt$

Phenotypic ratio: 3 Tall ($TT + Tt$) : 1 Dwarf (tt) = **3:1**



The allele T (tall) is dominant over t (dwarf/short), so both TT and Tt appear tall.

Why other options are wrong:

- (A) 1:1 is the result of a test cross ($Tt \times tt$).
- (B) 2:1 does not arise in a standard monohybrid cross.
- (D) 1:2:1 is the *genotypic* ratio, not the phenotypic ratio.

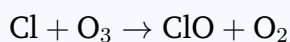
Answer: (C) [Go Back to Q 13](#)

Sol. 14.

Solution

Concept: Ozone layer depletion – causes and responsible chemicals.

Explanation: The ozone layer in the stratosphere (15–35 km altitude) protects Earth from harmful ultraviolet (UV-B and UV-C) radiation. **Chlorofluorocarbons (CFCs)** – synthetic chemicals once widely used in refrigerants, aerosol sprays, and foam blowing agents – are the primary culprits of ozone depletion. In the stratosphere, UV radiation breaks down CFCs, releasing highly reactive chlorine free radicals. Each Cl atom can destroy up to 100,000 ozone molecules in a chain reaction:



Why other options are wrong:

- (A) CO_2 and methane are greenhouse gases causing global warming, not ozone depletion.
- (B) SO_2 and NO_x cause acid rain, not significant ozone depletion.
- (C) Ammonia and H_2S are localised pollutants with no significant stratospheric ozone effect.

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



Sol. 15.

Solution

Concept: Heritable vs. non-heritable variation – basis of evolution.

Explanation: For evolution to occur, variation must be **heritable** – it must be encoded in the **DNA** and passed from parents to offspring through reproduction.

Genetic variation arises from mutations (changes in DNA sequence), genetic recombination during meiosis (crossing over, random assortment), and fertilization. These changes alter allele frequencies in a population over generations, driving natural selection and evolution.

Acquired characteristics – changes due to use/disuse, injury, or learning – affect only the individual's somatic (body) cells, not the germ cells (egg/sperm). They are **not inherited** by offspring (as disproved by Weismann and confirmed by modern genetics).

Why other options are wrong:

- (A) Cutting off a limb is a somatic change; it does not alter the genome.
- (C) Sunburn affects somatic skin cells; no DNA change is transmitted to gametes.
- (D) Learned skills alter neural connections (phenotype), not the genotype.

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

Answer Key

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

