

AIIMS Paramedical Biology

Sample Paper – 7

Duration: 30 Minutes

Maximum Marks: 30

Instructions

- This paper contains **30** Multiple Choice Questions (Single Correct Answer), modelled on the Biology portion of **AIIMS Paramedical** entrance.
- Each correct answer carries **+1 mark**. A penalty of $-\frac{1}{3}$ mark is deducted for each incorrect answer. Unattempted questions carry **0** marks (no negative marking).
- Only **one** option is correct. Choose carefully.
- Syllabus level: **Class 11 & 12 NCERT Biology**
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.

Q1. In binomial nomenclature, the scientific name of the mango is written as *Mangifera indica*. Which of the following statements about this name is correct?

- (A) *Mangifera* is the genus name and *indica* is the species name (specific epithet).
- (B) *Mangifera* is the species name and *indica* is the genus name.
- (C) Both words together form the genus name only.
- (D) Both words together form the species name only.

Q2. Match the taxonomic aid with its correct description and choose the right option.

- (i) Museum (ii) Zoological park (iii) Taxonomic key
- (p) Wild animals are kept in protected conditions for study.
- (q) Preserved plant and animal specimens are stored for reference.



(r) A set of contrasting characters is used in a stepwise manner to identify organisms.

(A) (i)-p, (ii)-q, (iii)-r

(B) (i)-r, (ii)-p, (iii)-q

(C) (i)-q, (ii)-p, (iii)-r

(D) (i)-q, (ii)-r, (iii)-p

Q3. Which one of the following correctly identifies an infectious agent with its molecular nature?

(A) A viroid is an infectious protein with no nucleic acid.

(B) A viroid is a free, low-molecular-weight RNA without a protein coat.

(C) A prion is a naked single strand of RNA only.

(D) A virus has neither a nucleic acid nor a protein coat.

Q4. An organism in which the main plant body is diploid ($2n$) and only the gametes are haploid, with meiosis occurring at the time of gamete formation, shows which type of life cycle?

(A) Haplontic life cycle.

(B) Haplo-diplontic life cycle with a dominant gametophyte.

(C) Haplo-diplontic life cycle with two equal phases.

(D) Diplontic life cycle.

Q5. Which set of features is characteristic of the phylum Mollusca?

(A) Jointed appendages and a chitinous exoskeleton.

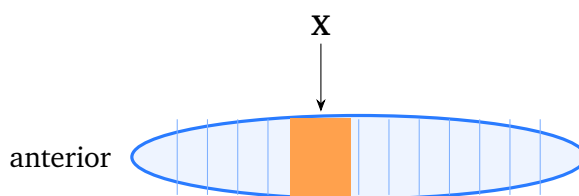
(B) A water-vascular system with tube feet.

(C) A soft body with a muscular foot, a visceral hump and a mantle, often with a calcareous shell.

(D) A notochord, paired gill slits and a post-anal tail.



- Q6.** Increase in the girth (thickness) of a woody stem is brought about by the activity of which type of meristem?
- (A) Apical meristem at the tips of root and shoot.
(B) Lateral meristem (vascular cambium and cork cambium).
(C) Intercalary meristem at the base of internodes.
(D) Ground meristem in the cortex.
- Q7.** The diagram shows the body of an earthworm (*Pheretima*). The prominent dark glandular band labelled X, found around segments 14–16 and important in cocoon formation, is the:



- (A) Clitellum.
(B) Prostomium.
(C) Typhlosole.
(D) Gizzard.
- Q8.** Which one of the following statements about ribosomes and cell inclusions is correct?
- (A) Ribosomes are bounded by a single membrane and store fat.
(B) Cell inclusions such as starch grains are membrane-bound organelles that synthesise protein.
(C) Ribosomes are made only of protein and contain no RNA.
(D) Ribosomes are non-membrane-bound and are the site of protein synthesis, while inclusions are non-living reserve materials lying free in the cytoplasm.
- Q9.** Which statement correctly contrasts mitosis with meiosis?



- (A) Mitosis produces four haploid cells, while meiosis produces two diploid cells.
- (B) Both mitosis and meiosis always produce haploid daughter cells.
- (C) Mitosis produces two genetically identical diploid cells, while meiosis produces four haploid cells with new combinations of genes.
- (D) Mitosis involves crossing over, while meiosis never does.

Q10. According to the pressure-flow (mass-flow) hypothesis of translocation in the phloem, sugars move from source to sink because:

- (A) Sugars are pushed only by gravity from leaves to roots.
- (B) Loading of sugar at the source raises the osmotic pressure there, water enters, and the resulting high turgor pressure drives the sap towards the sink where sugar is unloaded.
- (C) Sugars diffuse against the concentration gradient without any water movement.
- (D) Phloem sap is pumped by the heart-like contractions of sieve tubes.

Q11. According to Blackman's law of limiting factors, when a biochemical process such as photosynthesis is governed by several factors, the rate of the process at any moment is determined by:

- (A) The factor that is present in the largest amount.
- (B) The average value of all the factors taken together.
- (C) The factor that is most favourable.
- (D) The factor that is nearest to its minimum (the factor in shortest supply).

Q12. Which pairing of a plant growth regulator with its effect is correct?

- (A) Absciscic acid — closes stomata during water stress and promotes seed dormancy.
- (B) Absciscic acid — promotes rapid stem elongation and bolting.



- (C) Ethylene — delays the ripening of fruits and keeps them green.
- (D) Ethylene — breaks seed dormancy by inhibiting respiration.

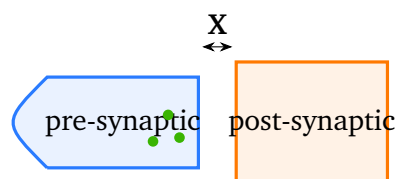
Q13. Which of the following correctly matches a digestive disorder with its description?

- (A) Jaundice is a disease in which the kidney turns yellow due to excess urea.
- (B) Constipation is the frequent passing of very watery stools with loss of fluids.
- (C) Jaundice is a condition in which the skin and eyes turn yellow due to deposition of bile pigments, usually from a liver disorder.
- (D) Diarrhoea is the hardening of the liver due to alcohol.

Q14. In a standard electrocardiogram (ECG), the QRS complex represents which electrical event of the heart?

- (A) Depolarisation (and contraction) of the atria.
- (B) Depolarisation of the ventricles, marking the beginning of ventricular contraction.
- (C) Repolarisation of the atria only.
- (D) The complete relaxation of the whole heart between beats.

Q15. The figure shows a chemical synapse. The narrow gap labelled **X** across which the chemical messenger diffuses from the pre-synaptic to the post-synaptic neuron is called the:



- (A) Node of Ranvier.
- (B) Myelin sheath.



- (C) Axon hillock.
- (D) Synaptic cleft.

Q16. A typical mature anther is described as dithecal and tetrasporangiate. This means that the anther has:

- (A) Two lobes (thecae) and a total of four pollen sacs (microsporangia).
- (B) One lobe and a single pollen sac.
- (C) Four lobes and two pollen sacs.
- (D) No pollen sacs at all.

Q17. Which of the following is *not* a function of the placenta in humans?

- (A) Supply of oxygen and nutrients from the mother to the foetus.
- (B) Removal of carbon dioxide and excretory wastes from the foetus.
- (C) Production of digestive enzymes to digest the mother's food in her stomach.
- (D) Secretion of hormones such as hCG, hPL, oestrogen and progesterone.

Q18. Amniocentesis is a foetal diagnostic test. Why is its use for sex determination banned by law in India?

- (A) Because the test cannot detect any genetic disorder.
- (B) Because it was being misused to identify and selectively abort female foetuses, leading to female foeticide.
- (C) Because it is used only to count the number of eggs in the ovary.
- (D) Because it permanently sterilises the mother.

Q19. In a cross between a pure tall pea plant (TT) and a pure dwarf pea plant (tt), all the F₁ plants are tall. According to Mendel's law of dominance, this is because:

- (A) The dwarf allele has been destroyed during the cross.



- (B) Both alleles blend to give an intermediate height.
- (C) The tall plants in F_1 are pure (homozygous) for tallness.
- (D) In the heterozygote (Tt), the dominant tall allele expresses itself and masks the recessive dwarf allele.

Q20. Haemophilia and red–green colour blindness in humans are inherited as:

- (A) X-linked recessive traits, so they appear more often in males.
- (B) Y-linked traits passed only from father to daughter.
- (C) Autosomal dominant traits seen equally in both sexes.
- (D) Traits carried only on the mitochondrial DNA.

Q21. Which of the following correctly describes a property of the genetic code?

- (A) The code is ambiguous; one codon can code for several different amino acids.
- (B) The code is non-universal; the same codon means a different amino acid in every species.
- (C) The code is degenerate; some amino acids are coded by more than one codon, yet each codon specifies only one amino acid.
- (D) The code is read with frequent overlapping of bases between codons.

Q22. During DNA replication, the enzyme that joins (seals) the short Okazaki fragments of the lagging strand into a continuous strand is:

- (A) Helicase.
- (B) DNA ligase.
- (C) RNA polymerase.
- (D) Topoisomerase (gyrase) only.

Q23. Arrange the following in the correct sequence of human evolution, from the earliest to the most recent.

- (A) *Homo sapiens* → *Homo erectus* → *Australopithecus*



- (B) *Homo erectus* → *Australopithecus* → *Homo habilis*
- (C) *Homo habilis* → *Australopithecus* → *Homo sapiens*
- (D) *Australopithecus* → *Homo habilis* → *Homo erectus* → *Homo sapiens*

Q24. Which one of the following correctly distinguishes active immunity from passive immunity?

- (A) In active immunity the body receives ready-made antibodies, while in passive immunity it makes its own antibodies.
- (B) In active immunity the host's own body produces antibodies in response to an antigen, while in passive immunity ready-made antibodies are given directly to the body.
- (C) Both active and passive immunity are produced only by vaccination.
- (D) Active immunity acts at once and is short-lived, while passive immunity is slow and lifelong.

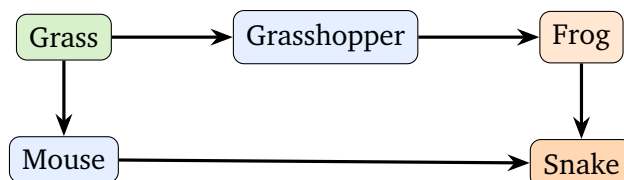
Q25. Ringworm in humans, marked by dry, scaly lesions on the skin, scalp and nails, is caused by:

- (A) Fungi belonging to genera such as *Microsporum*, *Trichophyton* and *Epidermophyton*.
- (B) A protozoan named *Plasmodium*.
- (C) A bacterium named *Salmonella*.
- (D) A roundworm named *Ascaris*.

Q26. Microbes grown in large bioreactors (fermenters) are used to obtain many useful products. Which pairing of a microbe with its product is correct?

- (A) *Penicillium notatum* — produces the alcohol of beer.
- (B) *Saccharomyces cerevisiae* — produces the antibiotic streptomycin.
- (C) *Aspergillus niger* — produces statins that lower cholesterol.
- (D) *Penicillium notatum* — produces the antibiotic penicillin.

- Q27.** A good cloning vector used in recombinant DNA technology must possess which of the following features?
- (A) It should have no origin of replication so that it cannot multiply.
 - (B) It should have an origin of replication, a selectable marker, and unique recognition sites for restriction enzymes.
 - (C) It should lack any selectable marker so that transformed cells cannot be identified.
 - (D) It should be a very large piece of DNA with thousands of restriction sites.
- Q28.** In India, the body set up to make decisions on the safety of introducing genetically modified organisms for public use and on research involving such organisms is the:
- (A) Indian Council of Medical Research (ICMR) only.
 - (B) World Trade Organisation (WTO).
 - (C) Botanical Survey of India (BSI).
 - (D) Genetic Engineering Appraisal Committee (GEAC).
- Q29.** The relationship between gross primary productivity (GPP) and net primary productivity (NPP) of an ecosystem is best expressed as:
- (A) $NPP = GPP - \text{respiration losses (R) of the producers.}$
 - (B) $NPP = GPP + \text{respiration losses (R).}$
 - (C) $NPP = GPP \times \text{respiration losses (R).}$
 - (D) NPP and GPP are always exactly equal.
- Q30.** The diagram shows part of a food web in a grassland. Using the arrows (which point from the food to the consumer), which organism in this web occupies the role of a top carnivore?



- (A) Grass, because it makes its own food.
- (B) Grasshopper, because it eats grass.
- (C) Snake, because no arrow leaves it; it is eaten by no other organism shown.
- (D) Mouse, because it eats grass directly.



Detailed Solutions**Q1.****Solution**

Concept — Binomial nomenclature: Carolus Linnaeus introduced the two-word naming system in which every species is given a scientific name made of two parts.

Step 1 — The two components: The first word is the genus (generic) name and is written with a capital first letter. The second word is the specific epithet (species name) and is written in small letters.

Step 2 — Apply to the example: In *Mangifera indica*, *Mangifera* is the genus and *indica* is the specific epithet. The whole name is italicised (or underlined when handwritten).

Why other options are wrong:

- (B) reverses the roles of the two words.
- (C) and (D) wrongly treat both words together as a single genus or single species name.

Final Answer: *Mangifera* is the genus and *indica* the specific epithet ⇒ **A**

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

Q2.**Solution**

Concept — Taxonomic aids: Tools such as museums, zoological parks, herbaria, botanical gardens and keys help in the study and identification of organisms.

Step 1 — Museum: A museum keeps collections of preserved plant and animal specimens for study and reference, so (i) matches (q).

Step 2 — Zoological park and key: In a zoological park (zoo), wild animals are kept in protected conditions, so (ii) matches (p). A taxonomic key uses a series of contrasting characters used stepwise to identify an organism, so (iii) matches (r).

Why other options are wrong:

- (A), (B) and (D) mismatch at least one pair, for example placing live animals in the museum or making the key a place that stores specimens.

Final Answer: (i)-q, (ii)-p, (iii)-r ⇒ **C**



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

Q3.

Solution

Concept — Acellular infectious agents: Viruses, viroids and prions are sub-cellular agents that differ in their molecular make-up.

Step 1 — Viroid: A viroid is a free, very small, low-molecular-weight, single-stranded RNA molecule that lacks a protein coat. It causes diseases such as potato spindle tuber disease.

Step 2 — Prion and virus: A prion is an abnormal infectious protein with no nucleic acid (it causes mad-cow disease). A virus has both a nucleic acid (DNA or RNA) and a protein coat (capsid).

Why other options are wrong:

- (A) describes a prion, not a viroid.
- (C) a prion is a protein, not naked RNA.
- (D) a virus does have nucleic acid and a protein coat.

Final Answer: A viroid is a free low-molecular-weight RNA without a protein coat
⇒

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

Q4.

Solution

Concept — Plant life-cycle patterns: Plants show three patterns: haplontic (dominant haploid), diplontic (dominant diploid) and haplo-diplontic (both phases multicellular).

Step 1 — Read the clues: The question says the main body is diploid ($2n$), only the gametes are haploid, and meiosis occurs at gamete formation. This is gametic meiosis.

Step 2 — Name the pattern: A life cycle with a dominant diploid plant body and haploid gametes formed by meiosis is the diplontic life cycle, as seen in seed plants (angiosperms) and most algae like *Fucus*.

Why other options are wrong:



- (A) In a haplontic cycle the main body is haploid and the zygote is the only diploid cell.
- (B) and (C) Haplo-diplontic cycles have both a multicellular gametophyte and a multicellular sporophyte, not just haploid gametes.

Final Answer: A dominant diploid body with haploid gametes is the diplontic life cycle $\Rightarrow$

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

Q5.

Solution

Concept — Phylum Mollusca: Mollusca is the second largest animal phylum and includes snails, mussels, octopuses and squids.

Step 1 — Key features: The body is soft and is divided into a head, a muscular foot used for movement, and a visceral hump. A soft fold of skin called the mantle covers the visceral hump and often secretes a hard calcareous shell.

Step 2 — Match the option: Option (C) lists a soft body with a muscular foot, a visceral hump and a mantle, with a shell, all of which are molluscan features.

Why other options are wrong:

- (A) describes Arthropoda (jointed appendages, chitinous exoskeleton).
- (B) describes Echinodermata (water-vascular system, tube feet).
- (D) describes Chordata (notochord, gill slits, post-anal tail).

Final Answer: A soft body with a muscular foot, visceral hump and mantle defines Mollusca $\Rightarrow$

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

Q6.

Solution

Concept — Types of meristem: Meristems are regions of actively dividing cells. They are classified by position as apical, intercalary and lateral.

Step 1 — Lateral meristem: The vascular cambium and the cork cambium are lateral meristems that lie along the sides of the stem and root. Their division adds new cells outward and inward, increasing the girth (secondary growth).



Step 2 — Confirm the others: Apical meristems at the tips bring about increase in length (primary growth), and intercalary meristems at the bases of internodes and leaves also add to length, mainly in grasses.

Why other options are wrong:

- (A) and (C) Apical and intercalary meristems increase length, not girth.
- (D) Ground meristem is a primary meristem that forms ground tissue, not the girth-adding cambia.

Final Answer: Increase in girth is caused by the lateral meristem (cambia) ⇒ **B**

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

Q7.

Solution

Concept — Earthworm morphology: The earthworm *Pheretima* has a long segmented body with certain specialised regions.

Step 1 — Identify the band: A prominent dark glandular girdle around segments 14, 15 and 16 is the clitellum. The figure marks this band as X.

Step 2 — Its role: The clitellum secretes material that forms the cocoon in which the fertilised eggs are laid, so it is important in reproduction.

Why other options are wrong:

- (B) The prostomium is a small lobe overhanging the mouth at the front end.
- (C) The typhlosole is an internal fold of the intestine, not an external band.
- (D) The gizzard is an internal grinding organ in the gut.

Final Answer: The glandular band on segments 14–16 is the clitellum ⇒ **A**

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



Q8.

Solution

Concept — Ribosomes and cell inclusions: Ribosomes are the protein factories of the cell, while inclusions are stored non-living substances.

Step 1 — Ribosomes: Ribosomes are not bounded by any membrane. Each is made of two subunits containing ribosomal RNA and proteins, and they are the site where amino acids are joined to form proteins.

Step 2 — Cell inclusions: Inclusions such as starch grains, glycogen and oil droplets are non-living reserve substances that lie free in the cytoplasm; they are not membrane-bound organelles.

Why other options are wrong:

- (A) Ribosomes have no membrane and do not store fat.
- (B) Inclusions are not membrane-bound and do not make protein.
- (C) Ribosomes contain rRNA, so they are not protein only.

Final Answer: Ribosomes are non-membrane-bound protein-synthesis sites; inclusions are free non-living reserves $\Rightarrow$ **D**

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

Q9.

Solution

Concept — Mitosis versus meiosis: Mitosis maintains the chromosome number, while meiosis halves it during the formation of gametes or spores.

Step 1 — Mitosis: One round of division produces two daughter cells that are genetically identical to the parent and have the same (diploid) chromosome number. It is used for growth and repair.

Step 2 — Meiosis: Two successive divisions produce four cells with half the chromosome number (haploid). Crossing over and independent assortment create new combinations of genes.

Why other options are wrong:

- (A) reverses the products of the two divisions.
- (B) mitosis gives diploid, not haploid, cells.
- (D) crossing over is a feature of meiosis, not mitosis.

Final Answer: Mitosis gives two identical diploid cells; meiosis gives four varied



haploid cells $\Rightarrow$

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

Q10.

Solution

Concept — Pressure-flow hypothesis: This is the accepted explanation for the long-distance transport of sugars (translocation) in the phloem.

Step 1 — At the source: Sugar made in the leaf is actively loaded into the sieve tubes. This raises the solute concentration, so water enters from the nearby xylem by osmosis, building up a high turgor (hydrostatic) pressure.

Step 2 — Flow to the sink: The high pressure pushes the phloem sap as a mass towards the sink (root, fruit, growing tissue), where sugar is unloaded, water leaves, and the pressure falls. So sap flows from high pressure to low pressure.

Why other options are wrong:

- (A) Translocation can occur upward too, so gravity alone is not the cause.
- (C) Sugar moves with water, not by diffusion against a gradient.
- (D) Sieve tubes have no heart-like pump.

Final Answer: High turgor pressure built at the source drives the sap to the sink $\Rightarrow$

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

Q11.

Solution

Concept — Blackman's law of limiting factors: When a process is affected by more than one factor, its rate is set by the single factor that is in shortest supply at that moment.

Step 1 — The principle: If a chemical process is conditioned by several factors, the rate is limited by the pace of the slowest (most limiting) factor, that is the one nearest to its minimum value.

Step 2 — Apply to photosynthesis: For example, on a bright sunny day light is plentiful, so carbon dioxide may become the limiting factor; increasing only light will not raise the rate further until more carbon dioxide is supplied.



Why other options are wrong:

- (A) and (C) The factor in largest amount or the most favourable factor does not limit the rate.
- (B) The rate is not an average of all the factors.

Final Answer: The rate is fixed by the factor nearest its minimum (in shortest supply) $\Rightarrow$ **D**

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

Q12.

Solution

Concept — Absciscic acid and ethylene: Absciscic acid (ABA) is a stress and dormancy hormone, while ethylene is the gaseous ripening hormone.

Step 1 — Absciscic acid: ABA closes the stomata during water stress to reduce water loss, and it promotes dormancy of seeds and buds. It is therefore called the stress hormone.

Step 2 — Ethylene: Ethylene hastens the ripening of fruits and the senescence and abscission of leaves and flowers; it does not delay ripening.

Why other options are wrong:

- (B) Rapid stem elongation and bolting are caused by gibberellins, not ABA.
- (C) Ethylene promotes, not delays, ripening.
- (D) Ethylene does not break dormancy by inhibiting respiration.

Final Answer: ABA closes stomata in water stress and promotes dormancy $\Rightarrow$ **A**

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

Q13.

Solution

Concept — Disorders of the digestive system: Common disorders include jaundice, vomiting, diarrhoea and constipation, each with a clear cause.

Step 1 — Jaundice: In jaundice the liver is affected and bile pigments (bilirubin) are deposited in the skin and the white of the eyes, turning them yellow.

Step 2 — Compare the others: Diarrhoea is the frequent passing of watery stools,



constipation is the irregular and difficult passing of hardened stools, and neither involves the kidney turning yellow.

Why other options are wrong:

- (A) Jaundice affects the liver, and the skin and eyes turn yellow, not the kidney.
- (B) The description of watery stools fits diarrhoea, not constipation.
- (D) Hardening of the liver due to alcohol is cirrhosis, not diarrhoea.

Final Answer: Jaundice is yellowing of skin and eyes from bile pigments in a liver disorder $\Rightarrow$ **C**

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

Q14.

Solution

Concept — Electrocardiogram (ECG): An ECG is a record of the electrical activity of the heart and shows characteristic waves named P, QRS and T.

Step 1 — The QRS complex: The QRS complex represents the depolarisation (electrical activation) of the ventricles, which immediately triggers their contraction and the pumping of blood.

Step 2 — The other waves: The P wave represents atrial depolarisation (atrial contraction), while the T wave represents the repolarisation of the ventricles as they relax.

Why other options are wrong:

- (A) Atrial depolarisation is the P wave.
- (C) Atrial repolarisation is hidden within the QRS complex and is not what it represents.
- (D) The QRS complex is an active electrical event, not the resting phase.

Final Answer: The QRS complex marks ventricular depolarisation and the start of ventricular contraction $\Rightarrow$ **B**

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



Q15.

Solution

Concept — Chemical synapse: A synapse is the junction across which one neuron passes a signal to the next neuron using a chemical messenger.

Step 1 — Identify the gap: The narrow space between the pre-synaptic membrane and the post-synaptic membrane is the synaptic cleft, labelled X in the figure.

Step 2 — How it works: A nerve impulse causes vesicles in the pre-synaptic knob to release a neurotransmitter such as acetylcholine. The chemical diffuses across the synaptic cleft and binds receptors on the post-synaptic membrane, starting a new impulse.

Why other options are wrong:

- (A) A node of Ranvier is a gap in the myelin sheath along an axon, not a synapse gap.
- (B) The myelin sheath is the insulating cover of an axon.
- (C) The axon hillock is the part of the cell body where the axon begins.

Final Answer: The gap across which the neurotransmitter diffuses is the synaptic cleft ⇒ **D**

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

Q16.

Solution

Concept — Structure of the anther: The anther is the pollen-producing part of the stamen.

Step 1 — Dithecous: A typical anther has two lobes, and each lobe is called a theca. Because there are two thecae, the anther is described as dithecous (bilobed).

Step 2 — Tetrasporangiate: Each theca usually contains two microsporangia (pollen sacs), so the whole anther has four pollen sacs in all, making it tetrasporangiate. Inside the pollen sacs, microspore mother cells undergo meiosis to form pollen grains.

Why other options are wrong:

- (B), (C) and (D) give the wrong number of lobes or pollen sacs; a dithecous,



tetrasporangiate anther has exactly two lobes and four pollen sacs.

Final Answer: Ditheous, tetrasporangiate means two lobes and four pollen sacs

⇒

Answer: (A) [Go Back to Q 16](#)

Q17.

Solution

Concept — The placenta: The placenta is the structure that connects the developing foetus to the wall of the mother's uterus and is the lifeline of the foetus.

Step 1 — Its true functions: It supplies oxygen and nutrients from the mother to the foetus, removes carbon dioxide and nitrogenous wastes from the foetus, and acts as an endocrine gland secreting hormones such as hCG, hPL, oestrogen and progesterone.

Step 2 — Find the false statement: The placenta does not produce enzymes to digest the mother's food in her stomach; digestion of the mother's food occurs in her own alimentary canal and is unrelated to the placenta.

Why other options are wrong:

- (A), (B) and (D) are all genuine functions of the placenta, so they are not the exception asked for.

Final Answer: Producing enzymes to digest the mother's food is NOT a placental function ⇒

Answer: (C) [Go Back to Q 17](#)

Q18.

Solution

Concept — Amniocentesis: Amniocentesis is a procedure in which a sample of amniotic fluid is drawn to study the foetal cells and detect chromosomal or metabolic disorders before birth.

Step 1 — Its legitimate use: By examining the foetal cells, it can reveal genetic abnormalities such as Down's syndrome and certain sex-linked disorders.

Step 2 — The misuse: Because the test also reveals the sex of the foetus, it was being misused to identify female foetuses, which were then selectively aborted



(female foeticide). To stop this, the law in India bans amniocentesis for sex determination.

Why other options are wrong:

- (A) The test can detect genetic disorders, so this is false.
- (C) It is not used to count eggs in the ovary.
- (D) It does not sterilise the mother.

Final Answer: It was banned for sex determination because it led to female foeticide $\Rightarrow$ **B**

Answer: (B) [Go Back to Q 18](#)

Q19.

Solution

Concept — Law of dominance: Mendel's first principle states that in a heterozygote one allele (the dominant one) expresses itself fully and masks the effect of the other (recessive) allele.

Step 1 — The cross: TT (tall) $\times$ tt (dwarf) gives F_1 plants that are all Tt (heterozygous).

Step 2 — The reason for tallness: In the heterozygote Tt, the dominant tall allele T expresses itself and hides the recessive dwarf allele t, so every F_1 plant is tall even though it carries the dwarf allele.

Why other options are wrong:

- (A) The dwarf allele is not destroyed; it reappears in the F_2 generation.
- (B) There is no blending; the F_1 is fully tall, not intermediate.
- (C) The F_1 tall plants are heterozygous (Tt), not pure.

Final Answer: The dominant tall allele in Tt masks the recessive dwarf allele $\Rightarrow$ **D**

Answer: (D) [Go Back to Q 19](#)



Q20.

Solution

Concept — X-linked recessive disorders: Some genes lie on the X chromosome. A recessive allele on the X is expressed in a male whenever it is present, because the male has only one X.

Step 1 — The inheritance pattern: Both haemophilia and red–green colour blindness are X-linked recessive traits. A male (XY) shows the trait with a single copy of the defective allele, whereas a female (XX) shows it only if both her X chromosomes carry it.

Step 2 — The consequence: For this reason these conditions appear far more often in males than in females, and a carrier mother can pass them to her sons.

Why other options are wrong:

- (B) They are X-linked, not Y-linked.
- (C) They are recessive, not autosomal dominant.
- (D) They are carried on the X chromosome, not on mitochondrial DNA.

Final Answer: Both are X-linked recessive traits, more common in males $\Rightarrow$ **A**

Answer: (A) [Go Back to Q 20](#)

Q21.

Solution

Concept — Properties of the genetic code: The genetic code has several well-defined features: it is triplet, degenerate, unambiguous, nearly universal, non-overlapping and comma-less.

Step 1 — Degeneracy: Degenerate means that some amino acids are coded by more than one codon. For example, leucine is coded by six different codons.

Step 2 — Unambiguous too: Even though several codons may code for the same amino acid, each individual codon codes for only one amino acid, so the code is also unambiguous. Option (C) states both facts correctly.

Why other options are wrong:

- (A) The code is unambiguous, not ambiguous; one codon never codes for several amino acids.
- (B) The code is nearly universal, not different in every species.
- (D) The code is non-overlapping; bases are not shared between adjacent



codons.

Final Answer: The code is degenerate yet each codon codes only one amino acid
⇒

Answer: (C) [Go Back to Q 21](#)

Q22.

Solution

Concept — Enzymes of DNA replication: Replication needs a team of enzymes, each with a specific job.

Step 1 — The lagging strand: The lagging strand is made in short pieces called Okazaki fragments. These fragments must be joined together to make one continuous strand.

Step 2 — Role of DNA ligase: The enzyme DNA ligase seals the nicks between adjacent Okazaki fragments by forming phosphodiester bonds, producing a continuous lagging strand.

Why other options are wrong:

- (A) Helicase unwinds and separates the two parental strands.
- (C) RNA polymerase (primase) lays down the RNA primers.
- (D) Topoisomerase (gyrase) only relieves the supercoiling ahead of the fork; it does not seal fragments.

Final Answer: The enzyme that joins Okazaki fragments is DNA ligase ⇒

Answer: (B) [Go Back to Q 22](#)

Q23.

Solution

Concept — Human evolution: The line leading to modern humans passed through several ancestral forms over millions of years.

Step 1 — The earliest forms: *Australopithecus*, found in Africa, walked erect and used stones. *Homo habilis* (the “handy man”) was the first true human-like form, with a larger brain.

Step 2 — The later forms: *Homo erectus* had a still larger brain and probably used fire, and finally *Homo sapiens* (modern humans) arose. So the sequence is



Australopithecus → *Homo habilis* → *Homo erectus* → *Homo sapiens*.

Why other options are wrong:

- (A), (B) and (C) all place a later form before an earlier one, reversing or jumbling the true order.

Final Answer: *Australopithecus* → *Homo habilis* → *Homo erectus* → *Homo sapiens*
⇒ ☐ D

Answer: (D) [Go Back to Q 23](#)

Q24.

Solution

Concept — Active and passive immunity: Immunity acquired during one's life can be active (self-made) or passive (received ready-made).

Step 1 — Active immunity: When antigens (through infection or vaccination) enter the body, the host's own immune system makes antibodies and memory cells. This immunity develops slowly but is long-lasting.

Step 2 — Passive immunity: Here ready-made antibodies are given directly to the body, for example the antibodies a baby gets through mother's milk or an injection of anti-tetanus serum. It acts at once but is short-lived.

Why other options are wrong:

- (A) reverses the two definitions.
- (C) Passive immunity is not produced by vaccination.
- (D) reverses the speed and duration; active immunity is slow and long-lasting.

Final Answer: In active immunity the body makes its own antibodies; in passive immunity they are given ready-made ⇒ ☐ B

Answer: (B) [Go Back to Q 24](#)



Q25.

Solution

Concept — Ringworm: Ringworm is one of the most common fungal (mycotic) diseases of humans.

Step 1 — The cause: It is caused by fungi belonging to the genera *Microsporum*, *Trichophyton* and *Epidermophyton*. These fungi grow in warm, moist parts of the skin.

Step 2 — The symptoms: The infection produces dry, scaly, ring-shaped lesions with itching on the skin, scalp and nails. It spreads through contact and shared articles such as towels.

Why other options are wrong:

- (B) *Plasmodium* is a protozoan that causes malaria.
- (C) *Salmonella* is a bacterium that causes typhoid.
- (D) *Ascaris* is a roundworm causing ascariasis, not ringworm.

Final Answer: Ringworm is caused by fungi such as *Microsporum*, *Trichophyton* and *Epidermophyton* ⇒ A

Answer: (A) [Go Back to Q 25](#)

Q26.

Solution

Concept — Microbial products from fermenters: Many useful substances such as antibiotics, organic acids and enzymes are produced by growing microbes in large bioreactors.

Step 1 — Penicillin: The antibiotic penicillin, the first antibiotic discovered by Alexander Fleming, is produced by the mould *Penicillium notatum* (also written *Penicillium chrysogenum*).

Step 2 — Check the other pairs: Beer alcohol is made by yeast (*Saccharomyces cerevisiae*); streptomycin comes from *Streptomyces*, not yeast; and statins come from the yeast *Monascus purpureus*, not *Aspergillus niger*, which gives citric acid.

Why other options are wrong:

- (A) *Penicillium* makes penicillin, not beer alcohol.
- (B) Yeast makes alcohol, not streptomycin.
- (C) *Aspergillus niger* yields citric acid, not statins.



Final Answer: *Penicillium notatum* produces the antibiotic penicillin $\Rightarrow$ **D**

Answer: (D) [Go Back to Q 26](#)

Q27.

Solution

Concept — Cloning vectors: A cloning vector is a DNA molecule (often a plasmid) that carries a foreign piece of DNA into a host cell and multiplies it.

Step 1 — Essential features: A good vector must have an origin of replication (ori) so it can multiply inside the host, a selectable marker (such as an antibiotic-resistance gene) to pick out transformed cells, and unique restriction sites where foreign DNA can be inserted.

Step 2 — Why these matter: Without an ori the vector cannot copy itself; without a marker we cannot tell which cells took up the recombinant DNA; and unique restriction sites allow the DNA to be cut and joined neatly.

Why other options are wrong:

- (A) A vector with no origin of replication cannot multiply, so it is useless.
- (C) Without a selectable marker, transformed cells cannot be identified.
- (D) A very large vector with thousands of sites would be hard to handle and would cut at many unwanted places.

Final Answer: A good vector needs an ori, a selectable marker and unique restriction sites $\Rightarrow$ **B**

Answer: (B) [Go Back to Q 27](#)

Q28.

Solution

Concept — Biosafety in India: Because genetic modification can have unforeseen effects, the Government of India set up a regulatory body to oversee GM organisms.

Step 1 — The body: The Genetic Engineering Appraisal Committee (GEAC) makes decisions about the validity of GM research and the safety of releasing genetically modified organisms for public services such as agriculture.

Step 2 — Its purpose: It examines proposals and grants or refuses permission, helping to ensure that GM crops and products are safe for people and the environ-



ment.

Why other options are wrong:

- (A) The ICMR coordinates medical research, not GM-organism clearance.
- (B) The WTO deals with international trade rules.
- (C) The Botanical Survey of India surveys plant wealth, not GMO safety.

Final Answer: GM-organism safety in India is decided by the GEAC $\Rightarrow$ **D**

Answer: (D) [Go Back to Q 28](#)

Q29.

Solution

Concept — Primary productivity: Gross primary productivity (GPP) is the total rate at which producers capture and store energy; net primary productivity (NPP) is what is left for the next trophic level after the producers use some for their own respiration.

Step 1 — The relationship: Producers use a part of the gross energy fixed for their own respiration (R). The energy remaining as new biomass is the net primary productivity, so

$$NPP = GPP - R.$$

Step 2 — Its meaning: NPP is the biomass available for the consumption of herbivores and decomposers, while GPP is always larger because part of it is respired away.

Why other options are wrong:

- (B) and (C) use addition or multiplication, which are incorrect operations.
- (D) NPP is always less than GPP because of respiration, so they are not equal.

Final Answer: $NPP = GPP - \text{respiration losses of the producers}$ $\Rightarrow$ **A**

Answer: (A) [Go Back to Q 29](#)



Q30.

Solution

Concept — Food chain and food web: In a food web, arrows point from the food (prey) to the consumer that eats it, showing the direction of energy flow.

Step 1 — Trace the arrows: Grass is eaten by the grasshopper and the mouse; the grasshopper is eaten by the frog; the frog and the mouse are both eaten by the snake. So energy flows up to the snake.

Step 2 — Find the top carnivore: The snake has arrows pointing into it but no arrow leaving it, meaning nothing in this web eats the snake. It is therefore the top carnivore (the final consumer).

Why other options are wrong:

- (A) Grass is the producer, the start of the chain, not a carnivore.
- (B) and (D) The grasshopper and the mouse are primary consumers (herbivores) that are themselves eaten by others.

Final Answer: The snake, eaten by no other organism shown, is the top carnivore
⇒

Answer: (C) [Go Back to Q 30](#)



Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	C	3	B	4	D	5	C
6	B	7	A	8	D	9	C	10	B
11	D	12	A	13	C	14	B	15	D
16	A	17	C	18	B	19	D	20	A
21	C	22	B	23	D	24	B	25	A
26	D	27	B	28	D	29	A	30	C

