

AIIMS Paramedical Biology

Sample Paper – 3

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**. Each incorrect answer carries a penalty of $-\frac{1}{3}$ mark. An unattempted question carries **0** mark.
- 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. Who proposed the five-kingdom system of classification that distributed organisms among Monera, Protista, Fungi, Plantae and Animalia?

- (A) Carolus Linnaeus
- (B) R. H. Whittaker
- (C) Ernst Haeckel
- (D) Charles Darwin

Q2. Which sequence lists the taxonomic categories in the correct ascending order (lowest to highest)?

- (A) Species → Genus → Order → Family → Class
- (B) Genus → Species → Family → Order → Class
- (C) Species → Genus → Family → Order → Class
- (D) Class → Order → Family → Genus → Species



- Q3.** In which class of fungi are the sexual spores produced inside a sac-like structure called the ascus?
- (A) Ascomycetes
 - (B) Basidiomycetes
 - (C) Phycomycetes
 - (D) Deuteromycetes
- Q4.** Which feature is characteristic of pteridophytes and distinguishes them from bryophytes?
- (A) Absence of a true vascular system
 - (B) Presence of well-differentiated vascular tissue (xylem and phloem)
 - (C) Production of seeds enclosed in fruits
 - (D) Complete absence of a sporophyte generation
- Q5.** Which statement correctly describes the body organisation of phylum Platyhelminthes?
- (A) They are radially symmetrical and diploblastic
 - (B) They possess a true coelom lined by mesoderm
 - (C) They have a complete digestive tract with mouth and anus
 - (D) They are dorso-ventrally flattened, acoelomate and bilaterally symmetrical
- Q6.** The arrangement of leaves on a stem or branch is known as:
- (A) Phyllotaxy
 - (B) Venation
 - (C) Aestivation
 - (D) Vernation
- Q7.** Which type of muscle tissue is involuntary, non-striated (smooth) and found in the walls of internal organs such as the intestine?



- (A) Skeletal (striated) muscle
- (B) Cardiac muscle
- (C) Smooth (visceral) muscle
- (D) Voluntary muscle of the limbs

Q8. Which statement about the mitochondrion is correct?

- (A) Its outer membrane is folded into cristae
- (B) The inner membrane is folded into cristae bearing the enzymes of oxidative phosphorylation
- (C) It is the principal site of protein synthesis in the cell
- (D) It lacks its own DNA and ribosomes

Q9. During which stage of meiosis I does crossing over (exchange of segments between homologous chromosomes) take place?

- (A) Pachytene of prophase I
- (B) Metaphase II
- (C) Anaphase II
- (D) Telophase I

Q10. Deficiency of which mineral element is most directly associated with chlorosis (yellowing of leaves) because it is a constituent of the chlorophyll molecule?

- (A) Calcium
- (B) Phosphorus
- (C) Potassium
- (D) Magnesium

Q11. In the C_4 pathway of photosynthesis, the first stable product formed when CO_2 is fixed in the mesophyll cells is:



- (A) 3-Phosphoglyceric acid (a 3-carbon acid)
- (B) Oxaloacetic acid (a 4-carbon acid)
- (C) Ribulose 1,5-bisphosphate
- (D) Pyruvic acid

Q12. In aerobic respiration, the final electron acceptor of the electron transport system, which combines with electrons and protons to form water, is:

- (A) Carbon dioxide
- (B) NAD^+
- (C) Molecular oxygen
- (D) Pyruvic acid

Q13. In the human alimentary canal, the maximum absorption of digested food (amino acids, glucose, fatty acids) takes place in the:

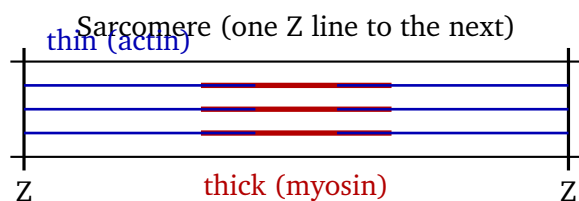
- (A) Small intestine
- (B) Stomach
- (C) Large intestine
- (D) Oesophagus

Q14. A person with blood group AB is sometimes called the “universal recipient” because their plasma:

- (A) Contains both anti-A and anti-B antibodies
- (B) Contains anti-A antibody only
- (C) Contains anti-B antibody only
- (D) Contains neither anti-A nor anti-B antibodies

Q15. According to the sliding filament theory of muscle contraction (see the sarcomere below), during contraction:





- (A) The thin and thick filaments both shorten in length
- (B) The thin (actin) filaments slide over the thick (myosin) filaments, shortening the sarcomere
- (C) The thick (myosin) filaments dissolve and reform
- (D) The Z lines move apart and the sarcomere lengthens

Q16. Transfer of pollen grains from the anther of a flower to the stigma of a different plant of the same species is called:

- (A) Autogamy
- (B) Geitonogamy
- (C) Xenogamy (cross-pollination)
- (D) Cleistogamy

Q17. In human males, the process of spermatogenesis (formation of sperms) occurs within the:

- (A) Seminiferous tubules of the testes
- (B) Epididymis
- (C) Vas deferens
- (D) Prostate gland

Q18. In which assisted reproductive technique is an ovum fertilised by sperm outside the body and the resulting early embryo (zygote/8-cell stage) then transferred into the fallopian tube?

- (A) GIFT (Gamete Intra Fallopian Transfer)
- (B) ICSI (Intra Cytoplasmic Sperm Injection)



- (C) IUI (Intra Uterine Insemination)
- (D) ZIFT (Zygote Intra Fallopian Transfer)

Q19. The ABO blood group system in humans is a classic example of:

- (A) A single pair of alleles showing complete dominance only
- (B) Multiple alleles, where the gene I has three alleles (I^A , I^B , i)
- (C) Polygenic inheritance controlled by many genes
- (D) Sex-linked inheritance carried on the X chromosome

Q20. Genes that are located close together on the same chromosome tend to be inherited together. This phenomenon is called:

- (A) Independent assortment
- (B) Codominance
- (C) Linkage
- (D) Pleiotropy

Q21. During translation, the genetic code carried by mRNA is read in groups of three bases called codons. The molecule that brings the correct amino acid to the ribosome by base-pairing its anticodon with the codon is:

- (A) Transfer RNA (tRNA)
- (B) Messenger RNA (mRNA)
- (C) Ribosomal RNA (rRNA)
- (D) DNA polymerase

Q22. In the *lac* operon of *Escherichia coli*, which molecule acts as the inducer that switches the operon “on” by inactivating the repressor?

- (A) Glucose
- (B) Allolactose (a derivative of lactose)
- (C) The repressor protein itself

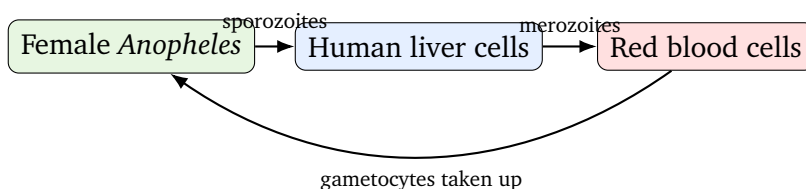


(D) RNA polymerase

Q23. According to the Hardy–Weinberg principle, the sum of allele frequencies in a population is expressed as $p + q = 1$. The corresponding expression for the genotype frequencies is:

- (A) $p + q + 2pq = 1$
- (B) $p^2 + q^2 = 1$
- (C) $p^2 + 2pq + q^2 = 1$
- (D) $2p + 2q = 1$

Q24. The malarial parasite *Plasmodium* is transmitted to humans through the bite of:



- (A) Female *Anopheles* mosquito
- (B) Male *Culex* mosquito
- (C) Housefly (*Musca*)
- (D) *Aedes* mosquito

Q25. Typhoid fever in humans is caused by the bacterium:

- (A) *Streptococcus pneumoniae*
- (B) *Plasmodium vivax*
- (C) *Wuchereria bancrofti*
- (D) *Salmonella typhi*

Q26. In a sewage treatment plant, the activated sludge produced during secondary (biological) treatment is rich in:

- (A) Aerobic microbes that consume the organic matter of the effluent



- (B) Pure mineral salts only
- (C) Antibiotics that kill all bacteria
- (D) Heavy metals deliberately added to the water

Q27. Which heat-stable enzyme is used in the Polymerase Chain Reaction (PCR) to synthesise new DNA strands at the high temperatures of the cycle?

- (A) Restriction endonuclease
- (B) *Taq* DNA polymerase
- (C) DNA ligase
- (D) Reverse transcriptase

Q28. The first clinical gene therapy was given to a girl suffering from a disorder caused by the deficiency of the enzyme:

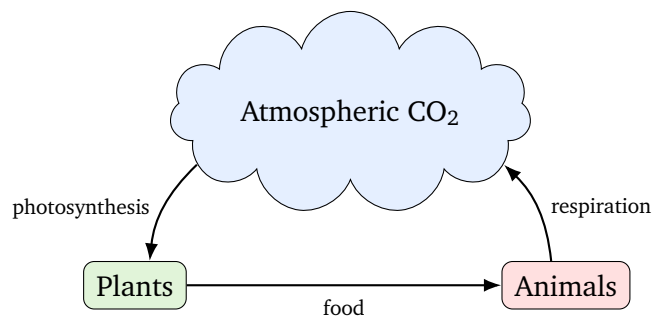
- (A) Insulin
- (B) Amylase
- (C) Adenosine deaminase (ADA)
- (D) DNA polymerase

Q29. In an ecosystem, green plants that synthesise their own organic food using sunlight are categorised as:

- (A) Producers (autotrophs)
- (B) Primary consumers
- (C) Decomposers
- (D) Tertiary consumers

Q30. In the carbon cycle shown below, which two processes respectively *remove* carbon dioxide from the atmosphere and *return* it to the atmosphere?





- (A) Respiration removes it; photosynthesis returns it
- (B) Combustion removes it; decomposition returns it
- (C) Both processes only remove carbon dioxide
- (D) Photosynthesis removes it; respiration returns it



Detailed Solutions

Q1.

Solution

Concept — Systems of classification: Over time biologists moved from two-kingdom to five-kingdom systems as more was learnt about cell structure and nutrition.

Step 1 — Identify the proposer: The five-kingdom system (Monera, Protista, Fungi, Plantae, Animalia) was proposed by **R. H. Whittaker** in 1969.

Step 2 — Basis used: He used cell structure, body organisation, mode of nutrition, reproduction and phylogenetic relationships.

Why other options are wrong:

- Linnaeus gave the two-kingdom system and binomial nomenclature.
- Haeckel proposed a three-kingdom idea (added Protista), not five.
- Darwin proposed the theory of evolution, not a kingdom system.

Final Answer: R. H. Whittaker proposed the five-kingdom system $\Rightarrow$ **B**

Answer: (B) [Go Back to Q1](#)

Q2.

Solution

Concept — Taxonomic hierarchy: The categories from lowest to highest are Species, Genus, Family, Order, Class, Phylum/Division, Kingdom.

Step 1 — Start at the bottom: Species is the smallest unit, grouped into a Genus.

Step 2 — Continue upward: Related genera form a Family, families form an Order, orders form a Class.

Why other options are wrong:

- Option A places Order before Family, which is incorrect.
- Option B places Genus before Species, reversing the lowest pair.
- Option D is descending (highest to lowest), not ascending.

Final Answer: Species $\rightarrow$ Genus $\rightarrow$ Family $\rightarrow$ Order $\rightarrow$ Class $\Rightarrow$ **C**

Answer: (C) [Go Back to Q2](#)



Q3.

Solution

Concept — Classification of fungi: Fungi are grouped by the type of sexual spore and reproductive structure they produce.

Step 1 — Recall the ascus: An ascus is a sac-like structure inside which ascospores (sexual spores) are formed.

Step 2 — Match the class: Fungi producing ascospores in an ascus belong to the class **Ascomycetes** (the sac fungi), e.g. *Penicillium*, *Aspergillus*, yeast.

Why other options are wrong:

- Basidiomycetes form basidiospores on a basidium.
- Phycomycetes form aplanospores/zoospores in sporangia.
- Deuteromycetes (Fungi Imperfecti) reproduce only asexually.

Final Answer: Ascospores form inside an ascus in Ascomycetes $\Rightarrow$ **A**

Answer: (A) [Go Back to Q3](#)

Q4.

Solution

Concept — Pteridophytes: Pteridophytes (ferns and their allies) are the first true land plants to have vascular tissue.

Step 1 — Key difference from bryophytes: Bryophytes lack vascular tissue, whereas pteridophytes possess well-differentiated **xylem and phloem**.

Step 2 — Other features: They are seedless and the dominant phase is the diploid sporophyte.

Why other options are wrong:

- Option A (absence of vascular system) describes bryophytes, not pteridophytes.
- Pteridophytes do not produce seeds or fruits.
- They do have a well-developed sporophyte generation.

Final Answer: Presence of well-differentiated vascular tissue $\Rightarrow$ **B**

Answer: (B) [Go Back to Q4](#)



Q5.

Solution

Concept — Platyhelminthes (flatworms): This phylum is defined by a flat, acoelomate, bilaterally symmetrical body.

Step 1 — Symmetry and germ layers: They are bilaterally symmetrical and triploblastic.

Step 2 — Body cavity and shape: They have no body cavity (acoelomate) and the body is dorso-ventrally flattened.

Why other options are wrong:

- They are not radially symmetrical or diploblastic (that is Cnidaria).
- They lack a true coelom.
- Their gut is incomplete (a single opening), not a complete tract.

Final Answer: Dorso-ventrally flattened, acoelomate, bilaterally symmetrical ⇒

D

Answer: (D) [Go Back to Q5](#)

Q6.

Solution

Concept — Leaf arrangement terms: Several terms describe how parts are arranged on a plant.

Step 1 — Define phyllotaxy: Phyllotaxy is the pattern of arrangement of leaves on the stem or branch (alternate, opposite, whorled).

Step 2 — Distinguish the others: Venation = pattern of veins in a leaf; aestivation = arrangement of floral parts in a bud; vernation = arrangement of young leaves in a bud.

Why other options are wrong: Options B, C and D refer to veins, floral buds and young leaves respectively, not to leaf arrangement on the stem.

Final Answer: Arrangement of leaves on the stem is phyllotaxy ⇒ A

Answer: (A) [Go Back to Q6](#)



Q7.

Solution

Concept — Types of muscle tissue: The three types are skeletal (striated, voluntary), cardiac (striated, involuntary) and smooth (non-striated, involuntary).

Step 1 — Match the description: Involuntary + non-striated + walls of internal organs = **smooth (visceral) muscle**.

Step 2 — Location: Smooth muscle lines the alimentary canal, blood vessels and other hollow organs.

Why other options are wrong:

- Skeletal/voluntary limb muscle is striated and under conscious control.
- Cardiac muscle is striated though involuntary, and is restricted to the heart.

Final Answer: Smooth (visceral) muscle $\Rightarrow$ **C**

Answer: (C) [Go Back to Q7](#)

Q8.

Solution

Concept — Mitochondrion: It is the “power house” of the cell, the site of aerobic respiration and ATP synthesis.

Step 1 — Membrane structure: It has a smooth outer membrane and an **inner membrane folded into cristae**.

Step 2 — Function of cristae: The cristae increase surface area and carry the electron transport chain enzymes of oxidative phosphorylation.

Why other options are wrong:

- It is the inner membrane, not the outer, that forms cristae.
- Protein synthesis is mainly the job of ribosomes/ER.
- Mitochondria do possess their own DNA and ribosomes.

Final Answer: Inner membrane folded into cristae bearing oxidative phosphorylation enzymes $\Rightarrow$ **B**

Answer: (B) [Go Back to Q8](#)



Q9.

Solution

Concept — Crossing over: Crossing over is the exchange of segments between non-sister chromatids of homologous chromosomes, a source of genetic variation.

Step 1 — Locate the stage: Prophase I has five sub-stages: leptotene, zygotene, pachytene, diplotene, diakinesis.

Step 2 — Crossing over stage: Crossing over occurs at the **pachytene** sub-stage, when bivalents are fully formed.

Why other options are wrong: Metaphase II, anaphase II and telophase I are later stages where crossing over does not occur.

Final Answer: Crossing over occurs at pachytene of prophase I $\Rightarrow$ A

Answer: (A) [Go Back to Q9](#)

Q10.

Solution

Concept — Mineral deficiency symptoms: Each essential element has a typical deficiency symptom.

Step 1 — Role of magnesium: Magnesium is a central constituent of the chlorophyll molecule.

Step 2 — Symptom: Its deficiency reduces chlorophyll, causing **chlorosis** (yellowing) of leaves.

Why other options are wrong:

- Calcium deficiency affects meristems and root tips.
- Phosphorus deficiency causes dark green/purple leaves.
- Potassium deficiency causes scorched leaf margins, not chlorophyll loss directly.

Final Answer: Magnesium deficiency causes chlorosis $\Rightarrow$ D

Answer: (D) [Go Back to Q10](#)



Q11.

Solution

Concept — C₄ pathway: In C₄ plants, CO₂ is first fixed in mesophyll cells by the enzyme PEP carboxylase.

Step 1 — The acceptor: The primary CO₂ acceptor is phosphoenolpyruvate (PEP), a 3-carbon compound.

Step 2 — First stable product: PEP + CO₂ gives **oxaloacetic acid (OAA)**, a 4-carbon acid; hence the name C₄.

Why other options are wrong:

- 3-PGA is the first product of the C₃ (Calvin) pathway.
- RuBP is the acceptor in C₃, not a product here.
- Pyruvic acid is regenerated later, not the first fixation product.

Final Answer: Oxaloacetic acid (4-carbon) ⇒ **B**

Answer: (B) [Go Back to Q11](#)

Q12.

Solution

Concept — Electron transport system: In the ETS, electrons pass down a chain of carriers, releasing energy used to make ATP (oxidative phosphorylation).

Step 1 — The terminal acceptor: At the end of the chain, electrons are handed to **molecular oxygen**.

Step 2 — Product: Oxygen combines with electrons and protons (H⁺) to form water (H₂O).

Why other options are wrong:

- CO₂ is released earlier, in glycolysis/Krebs cycle, not at the ETS terminal.
- NAD⁺ is an intermediate electron carrier, not the final acceptor.
- Pyruvic acid is a substrate of respiration, not an electron acceptor here.

Final Answer: Molecular oxygen is the final electron acceptor ⇒ **C**

Answer: (C) [Go Back to Q12](#)



Q13.

Solution

Concept — Absorption of food: Different regions of the gut perform digestion and absorption.

Step 1 — Site of maximum absorption: The **small intestine** is the principal region for absorbing digested nutrients.

Step 2 — Reason: Its inner wall has villi and microvilli that hugely increase the surface area for absorption.

Why other options are wrong:

- The stomach mainly digests proteins; little nutrient absorption occurs there.
- The large intestine mainly absorbs water and some minerals.
- The oesophagus only conducts food; no absorption occurs.

Final Answer: Small intestine $\Rightarrow$

Answer: (A) [Go Back to Q13](#)

Q14.

Solution

Concept — ABO blood groups: Group is set by antigens on red cells and antibodies in plasma.

Step 1 — Group AB antigens: Group AB red cells carry both A and B antigens.

Step 2 — Plasma antibodies: Its plasma contains **neither anti-A nor anti-B antibodies**, so it does not agglutinate any donor red cells; hence “universal recipient”.

Why other options are wrong:

- Having both antibodies (A) would be group O, the universal donor.
- Anti-A only (B) is group B; anti-B only (C) is group A.

Final Answer: AB plasma has neither anti-A nor anti-B antibodies $\Rightarrow$

Answer: (D) [Go Back to Q14](#)



Q15.

Solution

Concept — Sliding filament theory: Muscle contraction results from thin and thick filaments sliding past one another, not from the filaments themselves shortening.

Step 1 — What slides: The **thin actin filaments slide over the thick myosin filaments** toward the centre of the sarcomere.

Step 2 — Result: The Z lines are pulled closer, so the sarcomere (and the muscle) shortens, while filament lengths stay the same.

Why other options are wrong:

- Filaments do not shorten or dissolve.
- Z lines move closer (not apart); the sarcomere shortens, it does not lengthen.

Final Answer: Thin filaments slide over thick filaments, shortening the sarcomere
⇒

Answer: (B) [Go Back to Q15](#)

Q16.

Solution

Concept — Types of pollination: Pollination is classified by the source of the pollen relative to the receiving flower.

Step 1 — Define xenogamy: **Xenogamy** is the transfer of pollen to the stigma of a flower on a *different* plant of the same species (true cross-pollination).

Step 2 — Compare the others: Autogamy = same flower; geitonogamy = different flower of the same plant; cleistogamy = self-pollination in unopened flowers.

Why other options are wrong: Options A, B and D all involve pollen from the same plant, so they are forms of self-pollination, not cross-pollination.

Final Answer: Xenogamy (cross-pollination) ⇒

Answer: (C) [Go Back to Q16](#)



Q17.

Solution

Concept — Spermatogenesis: It is the formation of sperms from spermatogonia, occurring inside the testes.

Step 1 — Site: The process takes place in the **seminiferous tubules** of the testes.

Step 2 — Support: Sertoli cells inside the tubules nourish the developing sperms.

Why other options are wrong:

- The epididymis stores and matures sperms but does not form them.
- The vas deferens conducts sperms.
- The prostate adds secretions to semen.

Final Answer: Seminiferous tubules of the testes $\Rightarrow$ A

Answer: (A) [Go Back to Q17](#)

Q18.

Solution

Concept — Assisted reproductive technologies: ARTs differ in whether fertilisation is in vitro or in vivo, and what is transferred.

Step 1 — Identify ZIFT: In **ZIFT (Zygote Intra Fallopian Transfer)**, the ovum is fertilised outside the body and the early embryo/zygote is transferred into the fallopian tube.

Step 2 — Contrast GIFT: In GIFT, an ovum (gamete), not a zygote, is transferred to the fallopian tube of another female.

Why other options are wrong:

- GIFT transfers a gamete, not a zygote.
- ICSI injects a single sperm into an ovum.
- IUI introduces semen into the uterus; no in-vitro fertilisation.

Final Answer: ZIFT $\Rightarrow$ D

Answer: (D) [Go Back to Q18](#)



Q19.

Solution

Concept — Multiple alleles: When a gene exists in more than two allelic forms in a population, it shows multiple allelism.

Step 1 — ABO alleles: The gene I has three alleles: I^A , I^B and i .

Step 2 — Expression: I^A and I^B are codominant and both dominant over i , giving four blood groups (A, B, AB, O).

Why other options are wrong:

- It is not a single pair with simple complete dominance (option A).
- It is controlled by one gene, not many (so not polygenic, option C).
- The gene is autosomal, not sex-linked (option D).

Final Answer: Multiple alleles (I^A , I^B , i) $\Rightarrow$ B

Answer: (B) [Go Back to Q19](#)

Q20.

Solution

Concept — Linkage: Genes situated on the same chromosome tend to stay together during inheritance.

Step 1 — Define linkage: Linkage is the tendency of genes located close together on the same chromosome to be inherited together.

Step 2 — Recombination: The closer the genes, the lower the chance of crossing over separating them, so the stronger the linkage.

Why other options are wrong:

- Independent assortment applies to genes on different chromosomes.
- Codominance is an allele-expression pattern.
- Pleiotropy is one gene affecting many traits.

Final Answer: Linkage $\Rightarrow$ C

Answer: (C) [Go Back to Q20](#)



Q21.

Solution

Concept — Translation: Translation is the synthesis of a polypeptide using the codons of mRNA as a template.

Step 1 — Role of tRNA: Transfer RNA (tRNA) carries a specific amino acid and has an anticodon.

Step 2 — Codon–anticodon pairing: The tRNA anticodon base-pairs with the mRNA codon at the ribosome, delivering the correct amino acid.

Why other options are wrong:

- mRNA carries the code but does not bring amino acids.
- rRNA forms the structure of the ribosome.
- DNA polymerase works in DNA replication, not translation.

Final Answer: Transfer RNA (tRNA) $\Rightarrow$ A

Answer: (A) [Go Back to Q21](#)

Q22.

Solution

Concept — *lac* operon: The *lac* operon is an inducible system that is switched on when lactose is available.

Step 1 — The inducer: Allolactose, a derivative of lactose, acts as the inducer.

Step 2 — Mechanism: Allolactose binds the repressor, inactivating it, so RNA polymerase can transcribe the structural genes (*z*, *y*, *a*).

Why other options are wrong:

- Glucose causes catabolite repression; it does not induce the operon.
- The repressor switches the operon off, not on.
- RNA polymerase transcribes but is not the inducer.

Final Answer: Allolactose is the inducer $\Rightarrow$ B

Answer: (B) [Go Back to Q22](#)



Q23.

Solution

Concept — Hardy–Weinberg principle: In a non-evolving population, allele and genotype frequencies stay constant across generations.

Step 1 — Allele frequencies: If p is the frequency of one allele and q of the other, then $p + q = 1$.

Step 2 — Genotype frequencies: Squaring gives $(p + q)^2 = p^2 + 2pq + q^2 = 1$, where p^2 and q^2 are the homozygotes and $2pq$ the heterozygotes.

Why other options are wrong: Options A, B and D are not valid expansions of $(p + q)^2 = 1$.

Final Answer: $p^2 + 2pq + q^2 = 1 \Rightarrow \boxed{C}$

Answer: (C) [Go Back to Q23](#)

Q24.

Solution

Concept — Malaria transmission: Malaria is caused by *Plasmodium* and spread by a specific mosquito vector.

Step 1 — Identify the vector: The parasite is transmitted by the bite of the **female *Anopheles*** mosquito (as shown in the cycle).

Step 2 — Cycle outline: Sporozoites enter the liver, multiply, release merozoites that infect red blood cells; gametocytes are then taken up by another mosquito.

Why other options are wrong:

- It is the female, not the male, mosquito that bites and transmits.
- *Culex* spreads filariasis, *Aedes* spreads dengue.
- The housefly is not a malaria vector.

Final Answer: Female *Anopheles* mosquito $\Rightarrow \boxed{A}$

Answer: (A) [Go Back to Q24](#)



Q25.

Solution

Concept — Bacterial diseases: Different bacteria cause specific human diseases.

Step 1 — Cause of typhoid: Typhoid fever is caused by the bacterium *Salmonella typhi*.

Step 2 — Spread: It spreads through contaminated food and water and affects the intestine.

Why other options are wrong:

- *Streptococcus pneumoniae* causes pneumonia.
- *Plasmodium vivax* causes malaria (a protozoan).
- *Wuchereria bancrofti* causes filariasis (a worm).

Final Answer: *Salmonella typhi* ⇒ D

Answer: (D) [Go Back to Q25](#)

Q26.

Solution

Concept — Sewage treatment: Secondary treatment uses microbes to break down organic matter in sewage.

Step 1 — Activated sludge: During biological treatment, aeration encourages the growth of **aerobic microbes** that form flocs (activated sludge).

Step 2 — Function: These microbes consume most of the organic matter, lowering the BOD of the effluent.

Why other options are wrong:

- The sludge is not pure mineral salts.
- It contains living microbes, not antibiotics.
- Heavy metals are pollutants to be removed, not added.

Final Answer: Aerobic microbes that consume the organic matter ⇒ A

Answer: (A) [Go Back to Q26](#)



Q27.

Solution

Concept — PCR: The polymerase chain reaction amplifies a DNA segment through repeated cycles of denaturation, annealing and extension at high temperatures.

Step 1 — The enzyme needed: A heat-stable polymerase is required because the cycle reaches about 90 °C.

Step 2 — Identify it: *Taq* DNA polymerase, from the thermophilic bacterium *Thermus aquaticus*, withstands these temperatures and extends the primers.

Why other options are wrong:

- Restriction endonucleases cut DNA, they do not synthesise it.
- DNA ligase joins fragments.
- Reverse transcriptase makes DNA from RNA, not used in standard PCR amplification.

Final Answer: *Taq* DNA polymerase ⇒

Answer: (B) [Go Back to Q27](#)

Q28.

Solution

Concept — Gene therapy: Gene therapy corrects a genetic defect by introducing a functional gene.

Step 1 — The first case: The first gene therapy (1990) was given to a girl with severe combined immunodeficiency caused by deficiency of **adenosine deaminase (ADA)**.

Step 2 — Approach: Functional ADA cDNA was introduced into her lymphocytes to restore enzyme activity.

Why other options are wrong:

- Insulin deficiency relates to diabetes, treated by hormone supply.
- Amylase and DNA polymerase deficiencies are not the ADA case.

Final Answer: Adenosine deaminase (ADA) ⇒

Answer: (C) [Go Back to Q28](#)



Q29.

Solution

Concept — Ecosystem structure: An ecosystem has producers, consumers and decomposers linked by energy flow.

Step 1 — Define producers: Green plants make their own food by photosynthesis, so they are **producers (autotrophs)**.

Step 2 — Energy entry: They trap solar energy and form the base of every food chain.

Why other options are wrong:

- Primary and tertiary consumers are heterotrophs that eat other organisms.
- Decomposers break down dead matter; they do not photosynthesise.

Final Answer: Producers (autotrophs) $\Rightarrow$ **A**

Answer: (A) [Go Back to Q29](#)

Q30.

Solution

Concept — Carbon cycle: Carbon moves between the atmosphere and living organisms through opposing processes.

Step 1 — Removal of CO₂: Photosynthesis fixes atmospheric CO₂ into organic compounds in plants.

Step 2 — Return of CO₂: Respiration (by plants and animals) releases CO₂ back into the atmosphere, as the diagram shows.

Why other options are wrong:

- Option A reverses the two roles.
- Combustion and decomposition also return CO₂, but the pair highlighted in the figure is photosynthesis/respiration.
- Both processes do not only remove CO₂.

Final Answer: Photosynthesis removes it; respiration returns it $\Rightarrow$ **D**

Answer: (D) [Go Back to Q30](#)



Answer Key

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

