

AIIMS Paramedical Biology

Sample Paper – 4

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. Unattempted questions carry **0** marks.
- 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. Which international code governs the scientific naming of animals, and which governs that of plants and algae, respectively?

- (A) Plants by ICZN; animals by ICBN (now ICN)
- (B) Both groups by a single combined code, the ICNB
- (C) Animals by ICZN; plants and algae by ICBN (now ICN)
- (D) Animals by ICN; plants by IBC

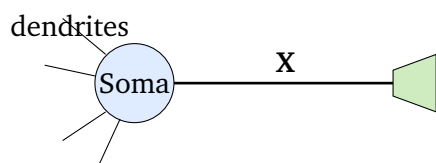
Q2. As one moves from species towards kingdom in the taxonomic hierarchy, the number of common characteristics shared by the members of a category

- (A) increases progressively
- (B) decreases progressively
- (C) remains exactly the same at every rank
- (D) first decreases and then increases



- Q3.** Whittaker's five-kingdom classification was based primarily on which set of criteria?
- (A) Cell structure, body organisation, mode of nutrition and phylogenetic relationships
 - (B) Only the colour of the organism and its habitat
 - (C) Only the presence or absence of a tail
 - (D) Geographical distribution and economic value alone
- Q4.** Which one of the following statements about gymnosperms is correct?
- (A) Their ovules are enclosed within an ovary wall
 - (B) They produce flowers with brightly coloured petals
 - (C) They form fruits that enclose the seeds
 - (D) Their ovules are naked, not enclosed within an ovary
- Q5.** The roundworms (phylum Aschelminthes/Nematoda) are characterised by
- (A) radial symmetry and a true coelom
 - (B) an open circulatory system and a segmented body
 - (C) bilateral symmetry, a pseudocoelom and a complete digestive tract
 - (D) the complete absence of any body cavity (acoelomate)
- Q6.** In a racemose inflorescence, the arrangement of flowers is such that
- (A) the main axis ends in a flower and growth is limited
 - (B) the main axis continues to grow and older flowers occur towards the base
 - (C) all flowers arise from a single point at the tip
 - (D) the youngest flower is always at the base of the axis
- Q7.** The diagram shows a typical neuron. The part labelled X carries impulses away from the cell body towards the next neuron.





- (A) Dendrite
- (B) Nissl granule
- (C) Cell body (cyton)
- (D) Axon

Q8. Within a chloroplast, the light-dependent reactions of photosynthesis occur on the

- (A) thylakoid membranes of the grana
- (B) fluid stroma surrounding the grana
- (C) outer chloroplast membrane only
- (D) ribosomes attached to the envelope

Q9. A non-protein metallic ion such as Zn^{2+} or Mg^{2+} that is tightly bound to an enzyme and required for its catalytic activity is best described as a

- (A) competitive inhibitor
- (B) cofactor (prosthetic group / metal-ion cofactor)
- (C) substrate analogue
- (D) product of the reaction

Q10. In the root nodules of leguminous plants, atmospheric nitrogen is reduced to ammonia. The enzyme responsible and the pigment that protects it from oxygen are, respectively

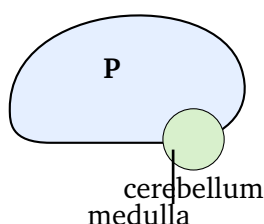
- (A) amylase and carotene
- (B) rubisco and chlorophyll
- (C) nitrogenase and leg-haemoglobin
- (D) catalase and anthocyanin



- Q11.** Which photosynthetic pigment shows maximum absorption in the blue and red regions of the visible spectrum and is the chief pigment trapping light energy?
- (A) Chlorophyll *a*
 - (B) Carotene (a carotenoid)
 - (C) Xanthophyll
 - (D) Phycoerythrin
- Q12.** The respiratory quotient (RQ) of a fat-rich seed undergoing aerobic respiration is
- (A) exactly equal to 1.0
 - (B) infinity
 - (C) greater than 1.0
 - (D) less than 1.0
- Q13.** The largest fraction of carbon dioxide transported in human blood from the tissues to the lungs is carried as
- (A) carbaminohaemoglobin bound to haemoglobin
 - (B) bicarbonate ions (HCO_3^-) dissolved in plasma
 - (C) physically dissolved CO_2 in plasma
 - (D) oxyhaemoglobin in red blood cells
- Q14.** The counter-current mechanism in the kidney, involving the loop of Henle and the vasa recta, mainly helps to
- (A) filter blood at the glomerulus
 - (B) add glucose back to the urine
 - (C) maintain a concentration gradient in the medulla for producing concentrated urine
 - (D) destroy old red blood cells



Q15. In the human brain shown schematically below, the region **P** controls thinking, voluntary actions and intelligence. Identify **P**.



- (A) Cerebrum
 - (B) Medulla oblongata
 - (C) Cerebellum
 - (D) Pons
- Q16.** In angiosperms, during double fertilisation the second male gamete fuses with the two polar nuclei (or the secondary nucleus) to form the
- (A) diploid zygote
 - (B) triploid primary endosperm nucleus
 - (C) haploid synergid
 - (D) diploid integument
- Q17.** During human oogenesis, the secondary oocyte is released at ovulation but completes its second meiotic division only
- (A) before birth, in the foetal ovary
 - (B) at the onset of puberty for all oocytes together
 - (C) immediately after the first meiotic division
 - (D) after the entry of a sperm (at fertilisation)
- Q18.** Medical termination of pregnancy (MTP) is considered relatively safe during the
- (A) last trimester only
 - (B) period after 20 weeks of gestation



- (C) first trimester (up to about 12 weeks) of pregnancy
- (D) entire nine months without any time limit

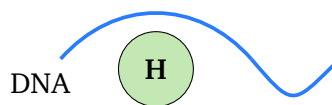
Q19. In the human ABO blood-group system, the AB blood group results because the alleles I^A and I^B are

- (A) codominant, so both A and B antigens are expressed together
- (B) completely dominant over each other in turn
- (C) both recessive to allele i
- (D) lethal in combination

Q20. In humans, the sex of the child is determined by the father because

- (A) the mother produces both X and Y eggs
- (B) the father always passes a Y chromosome
- (C) only the mother's chromosomes decide the sex
- (D) the father is heterogametic (produces X-bearing and Y-bearing sperm)

Q21. In the diagram of DNA packaging, the negatively charged DNA is wrapped around a core of positively charged proteins labelled **H** to form the repeating unit shown. The protein core is made of



- (A) ribosomal RNA molecules
- (B) eight histone proteins (a histone octamer)
- (C) cellulose fibres
- (D) lipid bilayer units

Q22. DNA fingerprinting is based on the analysis of regions of the genome that show high variability between individuals. These regions are known as

- (A) exons coding for haemoglobin



- (B) ribosomal binding sites
- (C) VNTRs (variable number tandem repeats / satellite DNA)
- (D) promoter sequences of housekeeping genes

Q23. According to Darwin's theory of natural selection, the chief driving force behind the evolution of adaptations is

- (A) differential reproduction of individuals best suited to the environment
- (B) the inheritance of characters acquired during an individual's lifetime
- (C) a sudden, directed change willed by the organism
- (D) the constancy of all species over time

Q24. Which of the following correctly pairs a disease with its causative organism?

- (A) Common cold — a protozoan
- (B) Amoebiasis — a rhinovirus
- (C) Common cold — a bacterium
- (D) Amoebiasis — *Entamoeba histolytica*; common cold — rhinoviruses

Q25. Vaccination provides protection against a disease mainly by

- (A) supplying ready-made antibiotics to the body
- (B) generating memory B and T cells so a faster, stronger response occurs on later exposure
- (C) directly killing all pathogens already inside the body within minutes
- (D) permanently raising the body temperature

Q26. The microorganisms chiefly responsible for producing methane-rich biogas from cattle dung in a go-bar-gas plant are

- (A) green algae of the genus *Chlorella*



- (B) baker's yeast, *Saccharomyces cerevisiae*
- (C) methanogens such as *Methanobacterium*
- (D) lactic acid bacteria, *Lactobacillus*

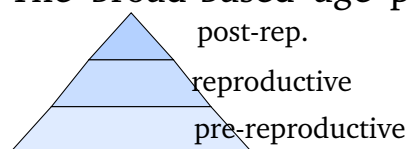
Q27. In agarose gel electrophoresis, DNA fragments are separated according to their

- (A) base sequence read letter by letter
- (B) content of nitrogen alone
- (C) ability to fluoresce in daylight
- (D) size, with smaller fragments moving farther towards the anode

Q28. Tobacco plants have been made resistant to the nematode *Meloidogyne incognita* using RNA interference (RNAi). The technique works by

- (A) introducing dsRNA that silences a specific nematode mRNA, killing the parasite
- (B) adding extra chlorophyll to the plant leaves
- (C) making the plant produce a thick waxy cuticle
- (D) increasing the number of chromosomes in the plant

Q29. The broad-based age pyramid shown represents a population that is



- (A) declining, with very few young individuals
- (B) expanding (growing), with a large fraction of young individuals
- (C) stable, with equal numbers in all age groups
- (D) entirely post-reproductive

Q30. The orderly, sequential change in the species composition of a community over time, ultimately leading to a stable climax community, is called



- (A) eutrophication
- (B) biomagnification
- (C) ecological succession
- (D) nitrogen fixation



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

Concept — Codes of nomenclature: Each major group of living organisms has its own internationally agreed set of rules for scientific naming so that names are stable and universal.

Step 1 — Animals: The naming of animals is governed by the International Code of Zoological Nomenclature (ICZN).

Step 2 — Plants and algae: The naming of plants and algae is governed by the International Code of Botanical Nomenclature (ICBN), now renamed the International Code of Nomenclature for algae, fungi and plants (ICN).

Why other options are wrong:

- Options (A) and (D) swap or invent the codes.
- Option (B): there is no single combined code named ICNB for both groups.

Final Answer: Animals by ICZN; plants and algae by ICBN/ICN ⇒ **C**

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

Q2.**Solution**

Concept — Taxonomic hierarchy: The categories run species → genus → family → order → class → phylum → kingdom, from the most specific to the most general.

Step 1 — Lower categories: A species contains organisms that are very similar, so they share the maximum number of common characters.

Step 2 — Higher categories: As we ascend towards the kingdom, the category becomes broader and includes more diverse organisms, so the number of shared characters falls.

Why other options are wrong:

- Option (A): characters do not increase upward.
- Option (C): they clearly change with rank.
- Option (D): the trend is a steady decrease, not a dip and rise.

Final Answer: The shared characters decrease progressively ⇒ **B**



Answer: (B) Go Back to Q2

Q3.

Solution

Concept — Five-kingdom system: R. H. Whittaker (1969) divided living organisms into Monera, Protista, Fungi, Plantae and Animalia.

Step 1 — Main criteria: The classification used cell structure (prokaryotic vs eukaryotic), body organisation (unicellular vs multicellular), and mode of nutrition (autotrophic vs heterotrophic).

Step 2 — Additional consideration: Reproduction and phylogenetic (evolutionary) relationships were also taken into account.

Why other options are wrong:

- Options (B), (C) and (D) list superficial features such as colour, tail or habitat that are not used as primary criteria.

Final Answer: Cell structure, organisation, nutrition and phylogeny ⇒ **A**

Answer: (A) Go Back to Q3

Q4.

Solution

Concept — Gymnosperms: The word gymnosperm literally means “naked seed”.

Step 1 — Key feature: In gymnosperms the ovules are not enclosed within an ovary wall; they sit exposed on the surface of megasporophylls.

Step 2 — Consequence: Because there is no ovary, the seeds that develop are also naked, and true fruits are not formed.

Why other options are wrong:

- Options (A) and (C): enclosed ovules and fruits are features of angiosperms.
- Option (B): showy petalled flowers are absent in gymnosperms.

Final Answer: Ovules are naked, not enclosed in an ovary ⇒ **D**

Answer: (D) Go Back to Q4



Q5.

Solution

Concept — Aschelminthes (roundworms): These are the nematodes, an important pseudocoelomate phylum.

Step 1 — Symmetry and cavity: They show bilateral symmetry and organ-system level of organisation, and possess a body cavity that is a pseudocoelom (not lined entirely by mesoderm).

Step 2 — Digestive tract: Their alimentary canal is complete, having both a mouth and an anus.

Why other options are wrong:

- Option (A): they are bilateral, not radial; the coelom is false.
- Option (B): they are not segmented and lack such a circulatory system.
- Option (D): they are pseudocoelomate, not acoelomate.

Final Answer: Bilateral, pseudocoelomate, complete gut ⇒ **C**

Answer: (C) **Go Back to Q5**

Q6.

Solution

Concept — Inflorescence: The arrangement of flowers on the floral axis defines the inflorescence type.

Step 1 — Racemose type: In a racemose inflorescence the main axis shows unlimited (indeterminate) growth and does not end in a flower.

Step 2 — Order of opening: Flowers are borne laterally in an acropetal succession, so the older, mature flowers are towards the base and the younger ones towards the tip.

Why other options are wrong:

- Option (A): a terminal flower limiting growth is the cymose pattern.
- Option (C): flowers from a single point describe an umbel detail, not the general rule.
- Option (D): the youngest flower is at the tip, not the base.

Final Answer: Axis keeps growing; older flowers towards the base ⇒ **B**

Answer: (B) **Go Back to Q6**



Q7.

Solution

Concept — Neuron structure: A neuron has a cell body (cyton), several short dendrites, and a single long axon.

Step 1 — Identify X: The long process leaving the cell body and ending in synaptic terminals (the green knob) is the axon.

Step 2 — Function: The axon carries nerve impulses *away* from the cell body towards the next neuron or effector.

Why other options are wrong:

- Option (A): dendrites carry impulses *towards* the cell body.
- Option (B): Nissl granules are granular bodies inside the cyton, not a process.
- Option (C): the cell body is the soma, not the labelled fibre.

Final Answer: X is the axon $\Rightarrow$

Answer: (D) **Go Back to Q7**

Q8.

Solution

Concept — Chloroplast: The chloroplast has a double envelope, a fluid stroma, and stacked thylakoids forming grana.

Step 1 — Light reactions: The light-dependent reactions need the pigment systems and electron-transport chain that are embedded in the thylakoid membranes of the grana.

Step 2 — Dark reactions: The light-independent (Calvin) reactions occur separately in the stroma.

Why other options are wrong:

- Option (B): the stroma hosts the dark reactions, not the light reactions.
- Options (C) and (D): the outer membrane and envelope ribosomes are not the sites of the light reactions.

Final Answer: Thylakoid membranes of the grana $\Rightarrow$

Answer: (A) **Go Back to Q8**



Q9.

Solution

Concept — Enzyme cofactors: Many enzymes are active only when a non-protein component is attached to the protein (apoenzyme).

Step 1 — Definition: A cofactor is a non-protein component required for catalysis; when it is a metal ion tightly bound to the enzyme it forms part of the active enzyme.

Step 2 — Example: Ions such as Zn^{2+} and Mg^{2+} act as metal-ion cofactors that stabilise the structure or participate in catalysis.

Why other options are wrong:

- Options (A) and (C): inhibitors and substrate analogues block the enzyme rather than activate it.
- Option (D): a cofactor is not a reaction product.

Final Answer: It is a cofactor $\Rightarrow$ **B**

Answer: (B) **Go Back to Q9**

Q10.

Solution

Concept — Biological nitrogen fixation: *Rhizobium* in legume root nodules converts atmospheric N_2 to ammonia.

Step 1 — Enzyme: The reduction of N_2 to NH_3 is catalysed by the enzyme nitrogenase.

Step 2 — Oxygen protection: Nitrogenase is extremely sensitive to oxygen, so the pink pigment leg-haemoglobin scavenges free oxygen and protects the enzyme.

Why other options are wrong:

- Options (A), (B) and (D) name enzymes and pigments (amylase, rubisco, catalase, carotene, chlorophyll, anthocyanin) that have no role in this protection.

Final Answer: Nitrogenase and leg-haemoglobin $\Rightarrow$ **C**

Answer: (C) **Go Back to Q10**



Q11.

Solution

Concept — Photosynthetic pigments: Leaves contain chlorophylls and accessory carotenoids, each with a characteristic absorption spectrum.

Step 1 — Main pigment: Chlorophyll *a* is the chief pigment that traps light and drives the photochemical reactions.

Step 2 — Absorption: Chlorophyll *a* absorbs most strongly in the blue-violet and red regions of the visible spectrum, reflecting green light.

Why other options are wrong:

- Options (B) and (C): carotene and xanthophyll are accessory pigments.
- Option (D): phycoerythrin is found in red algae, not the chief pigment here.

Final Answer: Chlorophyll *a* $\Rightarrow$ **A**

Answer: (A) **Go Back to Q11**

Q12.

Solution

Concept — Respiratory quotient (RQ):

$$RQ = \frac{\text{volume of CO}_2 \text{ evolved}}{\text{volume of O}_2 \text{ consumed}}$$

Step 1 — Fats need more oxygen: Fats are highly reduced and require a large amount of oxygen for their complete oxidation.

Step 2 — Effect on the ratio: Because O₂ consumed exceeds CO₂ evolved, the ratio falls below one, so the RQ of fats is less than 1.0 (about 0.7).

Why other options are wrong:

- Option (A): RQ = 1 is for carbohydrates.
- Option (B): infinity applies to anaerobic respiration with no O₂ used.
- Option (C): RQ > 1 occurs in organic acids, not fats.

Final Answer: RQ of fats is less than 1.0 $\Rightarrow$ **D**

Answer: (D) **Go Back to Q12**



Q13.

Solution

Concept — Transport of CO_2 : Carbon dioxide travels in blood in three forms: dissolved, as carbaminohaemoglobin, and as bicarbonate.

Step 1 — Bicarbonate route: About 70% of the CO_2 is converted to bicarbonate ions (HCO_3^-) with the help of carbonic anhydrase and is carried in the plasma.

Step 2 — Minor forms: Roughly 20–25% is carried as carbaminohaemoglobin and only about 7% stays physically dissolved.

Why other options are wrong:

- Options (A) and (C): these are the minor fractions.
- Option (D): oxyhaemoglobin carries oxygen, not CO_2 .

Final Answer: As bicarbonate ions in plasma $\Rightarrow$ **B**

Answer: (B) **Go Back to Q13**

Q14.

Solution

Concept — Counter-current mechanism: The loop of Henle and the surrounding vasa recta run in opposite directions, acting as a counter-current pair.

Step 1 — Gradient build-up: Their counter-current flow sets up and maintains an increasing osmolarity gradient from the cortex towards the inner medulla.

Step 2 — Outcome: This medullary gradient allows water to be reabsorbed from the collecting duct, producing concentrated (hypertonic) urine.

Why other options are wrong:

- Option (A): filtration happens at the glomerulus, a different step.
- Option (B): glucose is normally fully reabsorbed, not added back.
- Option (D): destroying RBCs is a function of the spleen and liver.

Final Answer: Maintains the medullary gradient for concentrated urine $\Rightarrow$ **C**

Answer: (C) **Go Back to Q14**



Q15.

Solution

Concept — Human brain: The brain has three main parts: forebrain (cerebrum), midbrain, and hindbrain (cerebellum, pons, medulla).

Step 1 — Identify P: The large, folded region forming the bulk of the brain is the cerebrum (part of the forebrain).

Step 2 — Function: The cerebrum is the seat of thinking, intelligence, memory and the control of voluntary actions.

Why other options are wrong:

- Option (B): the medulla controls involuntary actions such as heartbeat.
- Option (C): the cerebellum coordinates muscular activity and balance.
- Option (D): the pons relays signals between brain regions.

Final Answer: P is the cerebrum $\Rightarrow$ **A**

Answer: (A) **Go Back to Q15**

Q16.

Solution

Concept — Double fertilisation: In angiosperms two male gametes are involved, leading to two fusion events.

Step 1 — Syngamy: One male gamete fuses with the egg to form the diploid zygote.

Step 2 — Triple fusion: The second male gamete fuses with the two polar nuclei (secondary nucleus) to form the triploid ($3n$) primary endosperm nucleus, which develops into nutritive endosperm.

Why other options are wrong:

- Option (A): the zygote forms by the other fusion event.
- Option (C): synergids are cells of the embryo sac, not a fusion product.
- Option (D): integuments form the seed coat and are not a fertilisation product.

Final Answer: Triploid primary endosperm nucleus $\Rightarrow$ **B**

Answer: (B) **Go Back to Q16**



Q17.

Solution

Concept — Oogenesis: Egg formation in humans is arrested at specific stages and resumes later.

Step 1 — Arrest at ovulation: The first meiotic division finishes just before ovulation, releasing a secondary oocyte that is then arrested in metaphase of meiosis II.

Step 2 — Completion: The secondary oocyte completes the second meiotic division only after a sperm enters it, that is, at fertilisation.

Why other options are wrong:

- Option (A): before birth the oocyte is arrested in prophase I.
- Option (B): not all oocytes complete meiosis at puberty.
- Option (C): meiosis II does not follow immediately; it waits for fertilisation.

Final Answer: Only after sperm entry (fertilisation) ⇒ **D**

Answer: (D) **Go Back to Q17**

Q18.

Solution

Concept — Medical termination of pregnancy (MTP): MTP is the intentional, legal termination of a pregnancy before full term.

Step 1 — Safe period: MTPs are relatively safe during the first trimester, that is up to about 12 weeks of gestation.

Step 2 — Reason: Beyond this period the foetus is more developed and the procedure carries much greater risk to the mother.

Why other options are wrong:

- Options (A) and (B): second- and third-trimester procedures are far riskier.
- Option (D): there is a legal and medical time limit; it is not unrestricted.

Final Answer: First trimester (up to about 12 weeks) ⇒ **C**

Answer: (C) **Go Back to Q18**



Q19.

Solution

Concept — Codominance: When both alleles of a gene express themselves fully and independently in a heterozygote, they are said to be codominant.

Step 1 — ABO alleles: The alleles I^A and I^B each direct the formation of a different surface antigen (A and B).

Step 2 — AB phenotype: In an $I^A I^B$ individual both antigens appear together, giving the AB blood group; neither allele masks the other.

Why other options are wrong:

- Option (B): one is not simply dominant over the other.
- Option (C): both are dominant over i , not recessive.
- Option (D): the combination is not lethal.

Final Answer: They are codominant $\Rightarrow$ A

Answer: (A) **Go Back to Q19**

Q20.

Solution

Concept — Sex determination in humans: Humans have an XX (female) / XY (male) system.

Step 1 — Gamete types: The mother (XX) is homogametic and produces only X-bearing eggs. The father (XY) is heterogametic and produces two kinds of sperm, X-bearing and Y-bearing.

Step 2 — Outcome: An X sperm gives an XX (girl) and a Y sperm gives an XY (boy), so the father's sperm decides the sex of the child.

Why other options are wrong:

- Option (A): the mother does not make Y eggs.
- Option (B): the father passes X-bearing sperm half the time, not always Y.
- Option (C): the mother always contributes an X, so she cannot decide the sex.

Final Answer: The father is heterogametic $\Rightarrow$ D

Answer: (D) **Go Back to Q20**



Q21.

Solution

Concept — DNA packaging: The long DNA double helix must be condensed to fit inside the nucleus, and histone proteins help do this.

Step 1 — Histone octamer: The positively charged histones H2A, H2B, H3 and H4 assemble in two copies each to give a unit of eight proteins, the histone octamer.

Step 2 — Nucleosome: The negatively charged DNA wraps around this octamer (the core H in the figure) to form a nucleosome, the repeating bead of chromatin.

Why other options are wrong:

- Option (A): rRNA is part of ribosomes, not the nucleosome core.
- Options (C) and (D): cellulose and lipids do not form the histone core.

Final Answer: A histone octamer (eight histones) $\Rightarrow$ **B**

Answer: (B) **Go Back to Q21**

Q22.

Solution

Concept — DNA fingerprinting: This technique identifies individuals from differences in their DNA.

Step 1 — Variable regions: It examines highly variable, repetitive stretches of non-coding DNA called VNTRs (variable number tandem repeats), a kind of satellite DNA.

Step 2 — Basis of uniqueness: The number of repeats at these loci differs from person to person, giving each individual a unique banding pattern (except identical twins).

Why other options are wrong:

- Options (A), (B) and (D): coding exons, ribosomal sites and housekeeping promoters are conserved and not useful for distinguishing individuals.

Final Answer: VNTRs / satellite DNA $\Rightarrow$ **C**

Answer: (C) **Go Back to Q22**



Q23.

Solution

Concept — Darwinian natural selection: Darwin proposed that nature selects favourable variations.

Step 1 — Struggle and variation: More offspring are produced than can survive, and individuals vary in heritable traits.

Step 2 — Differential reproduction: Individuals best suited to the environment survive and reproduce more, passing on their favourable traits; this differential reproductive success drives adaptation.

Why other options are wrong:

- Option (B): inheritance of acquired characters is Lamarck's idea.
- Option (C): variation is not a directed act of will.
- Option (D): Darwin's theory explains change, not constancy.

Final Answer: Differential reproduction of the fittest $\Rightarrow$ **A**

Answer: (A) **Go Back to Q23**

Q24.

Solution

Concept — Disease and causative agents: Each infectious disease is linked to a specific pathogen.

Step 1 — Common cold: The common cold is caused by rhinoviruses, which infect the upper respiratory tract.

Step 2 — Amoebiasis: Amoebiasis (amoebic dysentery) is caused by the protozoan *Entamoeba histolytica*, transmitted through contaminated food and water.

Why other options are wrong:

- Options (A), (B) and (C) wrongly assign a protozoan or bacterium to the cold, or a virus to amoebiasis.

Final Answer: Amoebiasis by *Entamoeba histolytica*; cold by rhinoviruses $\Rightarrow$ **D**

Answer: (D) **Go Back to Q24**



Q25.

Solution

Concept — Vaccination and immunological memory: A vaccine contains antigenic material from a pathogen.

Step 1 — Primary response: On vaccination the immune system mounts a primary response and generates antibodies along with memory B and T cells.

Step 2 — Protection: If the real pathogen is later encountered, these memory cells trigger a rapid, large secondary response that neutralises it before disease develops.

Why other options are wrong:

- Option (A): vaccines do not supply antibiotics.
- Option (C): they do not instantly kill pathogens already present.
- Option (D): they do not work by raising body temperature.

Final Answer: By generating memory cells for a faster secondary response ⇒ **B**

Answer: (B) **Go Back to Q25**

Q26.

Solution

Concept — Biogas production: Biogas is a mixture of gases (mainly methane) produced by microbial action on organic waste.

Step 1 — Key microbes: The methane is generated by a group of anaerobic archaeobacteria called methanogens, for example *Methanobacterium*.

Step 2 — Source: These methanogens are abundant in cattle dung (gobar) and in the rumen of cattle, so dung is the usual raw material for a biogas plant.

Why other options are wrong:

- Option (A): *Chlorella* is an alga, not a methane producer.
- Option (B): yeast carries out alcoholic fermentation.
- Option (D): *Lactobacillus* produces curd, not biogas.

Final Answer: Methanogens such as *Methanobacterium* ⇒ **C**

Answer: (C) **Go Back to Q26**



Q27.

Solution

Concept — Gel electrophoresis: This technique separates charged molecules in an electric field through a gel matrix.

Step 1 — Charge and movement: DNA is negatively charged, so it moves towards the positive electrode (anode) when current is applied.

Step 2 — Size sieving: The agarose gel acts as a molecular sieve, so smaller fragments move faster and travel farther, separating fragments by size.

Why other options are wrong:

- Option (A): the exact base sequence is read by sequencing, not by this gel.
- Option (B): separation is not based on nitrogen content.
- Option (C): plain DNA does not fluoresce in daylight; a dye is needed for visualisation.

Final Answer: By size; smaller fragments move farther ⇒ **D**

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

Q28.

Solution

Concept — RNA interference (RNAi): RNAi is a cellular defence that silences specific genes using complementary RNA.

Step 1 — Transgene introduction: A gene producing double-stranded RNA (dsRNA) complementary to a vital nematode mRNA is introduced into the tobacco plant using *Agrobacterium* vectors.

Step 2 — Silencing: When the nematode feeds on the plant, the dsRNA silences (degrades) its specific mRNA, so the parasite cannot survive and the plant becomes resistant.

Why other options are wrong:

- Options (B), (C) and (D): adding chlorophyll, a waxy cuticle or extra chromosomes is not how RNAi confers resistance.

Final Answer: dsRNA silences a specific nematode mRNA ⇒ **A**

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



Q29.

Solution

Concept — Age pyramids: The shape of an age pyramid reflects the proportions of pre-reproductive, reproductive and post-reproductive individuals and predicts how a population will change.

Step 1 — Read the shape: A broad base means a very large number of young (pre-reproductive) individuals compared with older age groups.

Step 2 — Interpretation: Such a triangular, broad-based pyramid indicates an expanding (growing) population, because the many young individuals will soon reproduce.

Why other options are wrong:

- Option (A): a declining population has a narrow base.
- Option (C): a stable population has more even age classes.
- Option (D): the base, not the top, is the largest, so it is not post-reproductive.

Final Answer: An expanding (growing) population $\Rightarrow$ **B**

Answer: (B) **Go Back to Q29**

Q30.

Solution

Concept — Ecological succession: Communities are not static; they change in a predictable way over time.

Step 1 — Definition: Ecological succession is the gradual and orderly replacement of one community by another at a site until a stable community is reached.

Step 2 — Climax: The final, stable, self-perpetuating community in equilibrium with the environment is called the climax community.

Why other options are wrong:

- Option (A): eutrophication is nutrient enrichment of water bodies.
- Option (B): biomagnification is the build-up of toxins along a food chain.
- Option (D): nitrogen fixation is conversion of N_2 to usable form.

Final Answer: Ecological succession $\Rightarrow$ **C**

Answer: (C) **Go Back to Q30**



Answer Key

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

