NEST Biology Sample Paper – 1

Duration: 45 Minutes **Maximum Marks: 60**

Instructions

- This paper contains **20 Multiple Choice Questions (single correct answer)**, modelled on the Biology section of **NEST 2026**.
- Each correct answer carries **+3 marks**. There is a deduction of -1 **mark** for each incorrect answer; **no marks** are deducted for an unattempted question.
- Every question has exactly **four options**, of which only **one** is correct. Choose carefully.
- Personal calculators, log tables, mobile phones, and other electronic gadgets are strictly prohibited in the examination hall.
- A simple on-screen (virtual) calculator is provided in the computer-based test interface and may be used; blank sheets for rough work are supplied at the exam centre.

Q1. In Whittaker's five-kingdom system, an organism is found to be a eukaryote with a cell wall made of chitin, a heterotroph that absorbs nutrients from dead organic matter, and a body made of thread-like filaments. To which kingdom does this organism belong?

(A) Monera

(B) Fungi

(C) Plantae

(D) Protista

Q2. An adult animal shows radial symmetry, a body organised into a water-vascular system with tube feet, an endoskeleton of calcareous ossicles, and lives exclusively in the sea (e.g. the starfish, *Asterias*). To which phylum does it belong?

(A) Coelenterata (Cnidaria)

(B) Mollusca

(C) Arthropoda

(D) Echinodermata

Q3. The fleshy, edible part of a potato that we eat is a swollen underground structure bearing "eyes" (nodes with axillary buds) and a covering of scale leaves. This structure is best described as a modification of the

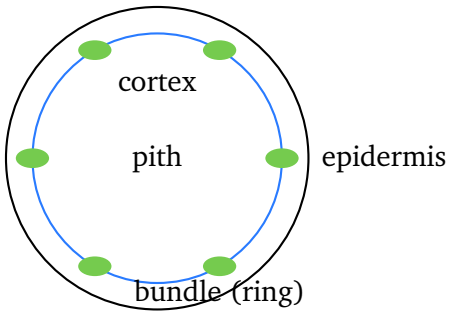
(A) tap root, for storage

(B) adventitious root, for support

(C) stem (tuber), for storage and perennation

(D) leaf base, for storage

Q4. The transverse section of a young stem shown below has vascular bundles arranged in a definite ring around a central pith, with phloem lying external to the xylem. This arrangement is characteristic of



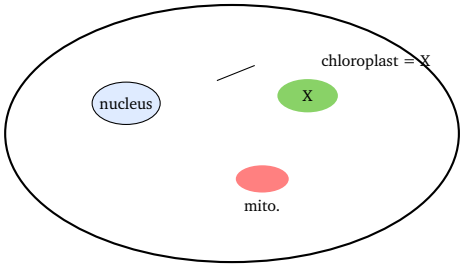
(A) a dicot stem

(B) a monocot stem

(C) a dicot root

(D) a monocot leaf

Q5. In the schematic cell below, organelle **X** is a double-membrane structure containing stacked thylakoids and is the site at which light energy is captured and used to fix carbon. Organelle **X** is the



(A) mitochondrion

(B) chloroplast

(C) Golgi apparatus

(D) rough endoplasmic reticulum

Q6. Two amino acids are joined together to form a dipeptide. The covalent bond that links the carboxyl group of one amino acid to the amino group of the next, with the elimination of a water molecule, is called a

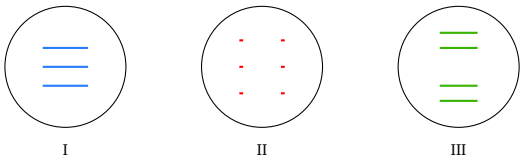
(A) glycosidic bond

(B) phosphodiester bond

(C) peptide bond

(D) hydrogen bond

Q7. The diagram shows three stages of mitosis. In the stage labelled **II**, the sister chromatids of each chromosome separate and move toward opposite poles of the cell. Stage **II** is



(A) prophase

(B) metaphase

(C) telophase

(D) anaphase

Q8. During the non-cyclic photophosphorylation (Z-scheme) of the light reactions of photosynthesis, electrons that leave Photosystem II are ultimately replaced by electrons obtained from

(A) the splitting (photolysis) of water

(B) the reduction of $NADP^+$

(C) the oxidation of glucose

(D) carbon dioxide fixation in the stroma

Q9. Glycolysis converts one molecule of glucose into two molecules of pyruvate in the cytoplasm. The net gain of ATP and the number of NADH molecules produced per glucose molecule in glycolysis are, respectively

(A) 4 ATP and 2 NADH

(B) 2 ATP and 2 NADH

(C) 2 ATP and 4 NADH

(D) 8 ATP and 2 NADH

Q10. For a healthy adult the tidal volume (TV) is 500 mL, the inspiratory reserve volume (IRV) is 3000 mL, the expiratory reserve volume (ERV) is 1100 mL and the residual volume (RV) is 1200 mL. The vital capacity (VC) of this individual is

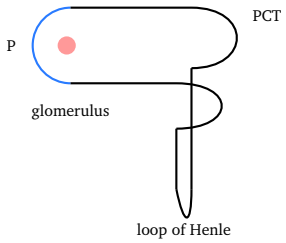
(A) 3500 mL

(B) 4100 mL

(C) 4600 mL

(D) 5800 mL

Q11. In the nephron shown, the cup-shaped structure **P** encloses a tuft of capillaries and is the site where blood plasma is filtered under pressure to form the initial filtrate. Structure **P** is the



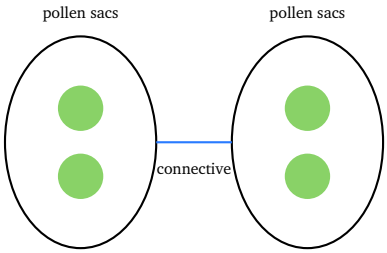
(A) Bowman's capsule

(B) proximal convoluted tubule

(C) collecting duct

(D) loop of Henle

Q12. The transverse section of a mature anther shown below contains four pollen sacs (microsporangia). Within each sac, the diploid microspore mother cells undergo meiosis to give rise to haploid microspores. This process is called



(A) megasporogenesis

(B) microsporogenesis

(C) fertilisation

(D) pollination

Q13. In the human male, the formation of sperm (spermatogenesis) takes place inside the testes. The specific structures within the testis where the germ cells divide and differentiate into spermatozoa are the

(A) Leydig (interstitial) cells

(B) epididymis

(C) vas deferens

(D) seminiferous tubules

Q14. In a monohybrid cross, two heterozygous tall pea plants (Tt $\times$ Tt) are crossed, where T (tall) is completely dominant over t (dwarf). From the Punnett square below, the expected phenotypic ratio of tall to dwarf plants in the F_2 generation is

	T	t
T	TT	Tt
t	Tt	tt

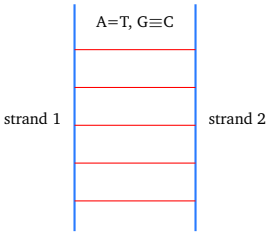
(A) 1 : 1

(B) 9 : 7

(C) 3 : 1

(D) 1 : 2 : 1

Q15. In a double-stranded DNA molecule (shown schematically below), the bases pair specifically: adenine (A) with thymine (T) and guanine (G) with cytosine (C). If 30% of the bases in this DNA are adenine, then the percentage of guanine is



(A) 30%

(B) 60%

(C) 20%

(D) 40%

Q16. According to Darwin's theory of evolution by natural selection, the chief reason that some individuals leave more offspring than others in a population is that those individuals

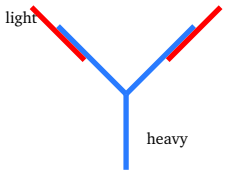
(A) possess heritable variations that make them better suited to the prevailing environment

(B) consciously try to adapt to their surroundings during their lifetime

(C) acquire useful characters through use of organs and pass them on

(D) are produced in larger numbers by their parents from birth

Q17. The antibody molecule shown below is Y-shaped and is built from a total of four polypeptide chains. The number and type of polypeptide chains making up one antibody molecule are



(A) one heavy and one light chain

(B) four identical chains

(C) three heavy and one light chain

(D) two identical heavy chains and two identical light chains

Q18. The microorganism chiefly responsible for converting milk into curd (dahi), by producing acids that coagulate milk proteins and partly enrich it with vitamin B_{12}, is

(A) baker's yeast (*Saccharomyces cerevisiae*)

(B) lactic acid bacteria (*Lactobacillus*)

(C) the mould *Penicillium*

(D) the bacterium *Clostridium*

Q19. In recombinant DNA technology, the enzyme that cuts double-stranded DNA at specific recognition sequences to produce fragments with complementary "sticky ends" is

(A) DNA ligase

(B) DNA polymerase

(C) DNA helicase

(D) a restriction endonuclease

Q20. The relationship in which one species benefits while the other species is neither benefited nor harmed (for example, an orchid growing as an epiphyte on the branch of a mango tree) is termed

(A) commensalism

(B) mutualism

(C) parasitism

(D) competition

Detailed Solutions

Q1.

Solution

Concept — Kingdom Fungi: Fungi are eukaryotic, mostly multicellular heterotrophs with a cell wall of chitin. Their body (mycelium) is made of thread-like hyphae, and saprophytic forms absorb nutrients from dead organic matter.

Step 1 — Match the clues: Eukaryote (rules out Monera), chitin cell wall, absorptive heterotroph, filamentous body — every feature points uniquely to Fungi.

Why other options are wrong:

- (A) Monera are prokaryotes, never eukaryotic with a true nucleus.
- (C) Plantae are autotrophs with cellulose (not chitin) cell walls.
- (D) Protista are largely unicellular eukaryotes and lack a chitinous filamentous body.

Final Answer: The organism is a fungus $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q1

Q2.

Solution

Concept — Phylum Echinodermata: Echinoderms are exclusively marine, show radial symmetry (pentamerous) in the adult, possess a unique water-vascular system with tube feet, and have an endoskeleton of calcareous ossicles.

Step 1 — Identify diagnostic features: The water-vascular system with tube feet is found in no other phylum, and the calcareous endoskeleton plus radial symmetry confirm Echinodermata (e.g. *Asterias*).

Why other options are wrong:

- (A) Cnidarians are radially symmetrical but have a diploblastic body and stinging cnidoblasts, no tube feet.
- (B) Molluscs are bilaterally symmetrical, soft-bodied, often with a calcareous shell.
- (C) Arthropods are bilaterally symmetrical with a chitinous exoskeleton and jointed appendages.

Final Answer: The animal belongs to Echinodermata $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q2

Q3.

Solution

Concept — Stem modifications: Underground stems can be modified for storage and perennation. A potato is a stem tuber; its "eyes" are nodes bearing axillary buds, and scale leaves cover them, both proving its stem nature.

Step 1 — Use the diagnostic feature: Only stems bear nodes, internodes, axillary buds and scale leaves. The presence of buds in the "eyes" shows the potato is a modified stem, not a root.

Why other options are wrong:

- (A) A tap root (e.g. carrot) lacks nodes and axillary buds.
- (B) Adventitious roots provide support (e.g. prop roots) and bear no buds.
- (D) A leaf base modification (e.g. onion) does not bear nodal "eyes" with buds.

Final Answer: Potato is a modified stem (tuber) $\Rightarrow$ C

Answer: (C) Go Back to Q3

Q4.

Solution

Concept — Dicot vs monocot stem anatomy: In a dicot stem the vascular bundles are conjoint, open (with cambium) and arranged in a definite ring around a central pith. In a monocot stem they are scattered throughout the ground tissue and closed.

Step 1 — Read the figure: A ring of bundles around a central pith with phloem external to xylem is the hallmark of a dicot stem.

Why other options are wrong:

- (B) A monocot stem has scattered (not ringed) bundles and no distinct pith.
- (C) A dicot root has radial bundles with xylem and phloem on separate radii (exarch), not a ring.
- (D) A monocot leaf shows parallel venation, not a ring of bundles around pith.

Final Answer: The section is a dicot stem $\Rightarrow$ A

Answer: (A) Go Back to Q4

Q5.

Solution

Concept — Chloroplast: The chloroplast is a double-membrane plastid containing stacked thylakoids (grana). It captures light energy in the light reactions and fixes carbon dioxide in the stroma (Calvin cycle).

Step 1 — Match the description: "Double membrane + stacked thylakoids + light capture + carbon fixation" is unique to the chloroplast (organelle X).

Why other options are wrong:

- (A) Mitochondria have cristae (not thylakoids) and carry out respiration, not light capture.
- (C) The Golgi apparatus packages and modifies secretory products.
- (D) Rough ER, studded with ribosomes, synthesises and transports proteins.

Final Answer: Organelle X is the chloroplast $\Rightarrow$ B

Answer: (B) Go Back to Q5

Q6.

Solution

Concept — Peptide bond: Amino acids polymerise into proteins by peptide bonds. A peptide bond forms between the carboxyl ($-COOH$) group of one amino acid and the amino ($-NH_2$) group of the next, releasing a water molecule (dehydration/condensation).

Step 1 — Apply the definition: The carboxyl-to-amino linkage with loss of water is, by definition, a peptide bond.

Why other options are wrong:

- (A) Glycosidic bonds join sugar (monosaccharide) units in carbohydrates.
- (B) Phosphodiester bonds link nucleotides in nucleic acids.
- (D) Hydrogen bonds are weak interactions that stabilise secondary/tertiary structure, not the primary covalent backbone.

Final Answer: The linkage is a peptide bond $\Rightarrow$ C

Answer: (C) Go Back to Q6

Q7.

Solution

Concept — Phases of mitosis: In anaphase the centromeres split so that the two sister chromatids of each chromosome separate and the daughter chromosomes are pulled to opposite poles by spindle fibres.

Step 1 — Match the event: "Sister chromatids separate and move to opposite poles" is the defining event of anaphase (stage II in the figure).

Why other options are wrong:

- (A) In prophase chromosomes condense; chromatids are still joined.
- (B) In metaphase chromosomes align at the equatorial plate; chromatids are not yet separated.
- (C) In telophase the separated chromosomes reach the poles and nuclear envelopes re-form.

Final Answer: Stage II is anaphase $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q7

Q8.

Solution

Concept — Non-cyclic photophosphorylation: In the Z-scheme, Photosystem II loses electrons to the electron transport chain. These lost electrons are replaced by electrons released when water is split (photolysis): $2H_2O \rightarrow 4H^+ + 4e^- + O_2$.

Step 1 — Trace the electrons: Water donates electrons to PS II, which is why oxygen is evolved as a by-product of the light reaction.

Why other options are wrong:

- (B) $NADP^+$ is the final *acceptor* of electrons (forming NADPH), not the donor to PS II.
- (C) Glucose oxidation belongs to respiration, not the light reaction.
- (D) Carbon fixation is part of the dark (Calvin) reactions and does not supply electrons to PS II.

Final Answer: Electrons come from the splitting of water $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q8

Q9.

Solution

Concept — Net yield of glycolysis: Glycolysis uses 2 ATP in the preparatory phase and produces 4 ATP in the payoff phase, giving a *net* gain of 2 ATP. It also reduces 2 NAD^+ to 2 NADH per glucose.

Step 1 — Balance: Net ATP $= 4 - 2 = 2$ ATP; NADH $= 2$.

Why other options are wrong:

- (A) 4 ATP is the gross (not net) ATP yield.
- (C) 4 NADH overcounts; only 2 NADH form in glycolysis.
- (D) 8 ATP wrongly adds yields from later respiratory stages.

Final Answer: Net 2 ATP and 2 NADH $\Rightarrow$ B

Answer: (B) Go Back to Q9

Q10.

Solution

Concept — Vital capacity: Vital capacity is the maximum volume of air a person can breathe out after a maximal inspiration. It equals the sum of tidal volume, inspiratory reserve volume and expiratory reserve volume: VC $=$ TV $+$ IRV $+$ ERV (residual volume is excluded).

Step 1 — Compute: VC $= 500 + 3000 + 1100 = 4600$ mL.

Why other options are wrong:

- (A) 3500 mL is the inspiratory capacity (TV + IRV).
- (B) 4100 mL leaves out the tidal volume.
- (D) 5800 mL wrongly adds the residual volume (that would be total lung capacity).

Final Answer: VC $= 4600$ mL $\Rightarrow$ C

Answer: (C) Go Back to Q10

Q11.

Solution

Concept — Bowman's capsule: The nephron begins with the renal corpuscle, a cup-shaped Bowman's capsule enclosing the glomerulus (a tuft of capillaries). Here blood plasma is filtered under pressure (ultrafiltration) to form the glomerular filtrate.

Step 1 — Match the structure: A double-walled cup enclosing the glomerulus, the site of filtration, is the Bowman's capsule (structure P).

Why other options are wrong:

- (B) The PCT reabsorbs most filtrate but is a coiled tubule, not the filtering cup.
- (C) The collecting duct concentrates urine; it lies far downstream.
- (D) The loop of Henle creates the medullary concentration gradient; it does not filter plasma.

Final Answer: Structure P is Bowman's capsule $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q11

Q12.

Solution

Concept — Microsporogenesis: Within the pollen sacs (microsporangia) of the anther, diploid microspore mother cells (pollen mother cells) undergo meiosis to form haploid microspores arranged in tetrads. This formation of microspores from a microspore mother cell is microsporogenesis.

Step 1 — Match the process: Meiosis of microspore mother cells $\rightarrow$ microspores $=$ microsporogenesis.

Why other options are wrong:

- (A) Megasporogenesis is the formation of megaspores in the ovule, not in the anther.
- (C) Fertilisation is the fusion of male and female gametes, a later event.
- (D) Pollination is the transfer of pollen grains to the stigma, not microspore formation.

Final Answer: The process is microsporogenesis $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q12

Q13.

Solution

Concept — Seminiferous tubules: Spermatogenesis occurs in the seminiferous tubules of the testis. Their walls contain spermatogonia (which divide and differentiate into sperm) and supporting Sertoli cells that nourish the developing germ cells.

Step 1 — Locate the site: Germ-cell division and differentiation into spermatozoa happen inside the seminiferous tubules.

Why other options are wrong:

- (A) Leydig (interstitial) cells lie outside the tubules and secrete testosterone; they do not form sperm.
- (B) The epididymis stores and matures sperm after they are formed.
- (C) The vas deferens merely conducts sperm toward the urethra.

Final Answer: Sperm form in the seminiferous tubules $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q13

Q14.

Solution

Concept — Law of segregation (monohybrid cross): A Tt $\times$ Tt cross gives F_2 genotypes in the ratio 1 TT : 2 Tt : 1 tt. Since T is completely dominant, TT and Tt are tall and only tt is dwarf.

Step 1 — Count phenotypes: Tall = 1 TT + 2 Tt = 3; dwarf = 1 tt. Phenotypic ratio = 3 : 1.

Why other options are wrong:

- (A) 1 : 1 is a test-cross (Tt $\times$ tt) result, not Tt $\times$ Tt.
- (B) 9 : 7 arises in certain dihybrid (gene-interaction) crosses, not a monohybrid.
- (D) 1 : 2 : 1 is the *genotypic* ratio, not the phenotypic ratio asked for.

Final Answer: Phenotypic ratio is 3 : 1 $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q14

Q15.

Solution

Concept — Chargaff's rule: In double-stranded DNA, A pairs with T and G with C, so $\%A = \%T$ and $\%G = \%C$. The four bases together total 100%.

Step 1 — Use the pairing: If $A = 30\%$, then $T = 30\%$ as well, so $A + T = 60\%$.

Step 2 — Find G: $G + C = 100 - 60 = 40\%$, and since G = C, each is $40/2 = 20\%$. So guanine $= 20\%$.

Why other options are wrong:

- (A) 30% wrongly sets G equal to A.
- (B) 60% is the combined A + T fraction, not G alone.
- (D) 40% is the combined G + C fraction, not G alone.

Final Answer: Guanine $= 20\% \Rightarrow$ C

Answer: (C) Go Back to Q15

Q16.

Solution

Concept — Darwinian natural selection: Darwin proposed that populations show heritable variation, and individuals whose variations make them better fitted to the environment survive and reproduce more ("survival of the fittest"). Such advantageous traits become more common over generations.

Step 1 — Identify the mechanism: Differential reproductive success arises from *heritable* variations that improve fitness in the prevailing environment.

Why other options are wrong:

- (B) Conscious "trying" to adapt is not a Darwinian mechanism.
- (C) Inheritance of acquired (use-and-disuse) characters is Lamarck's idea, not Darwin's.
- (D) Merely being born in larger numbers does not by itself confer a selective advantage.

Final Answer: Heritable adaptive variation drives selection $\Rightarrow$ A

Answer: (A) Go Back to Q16

Q17.

Solution

Concept — Antibody structure: An antibody (immunoglobulin) is a Y-shaped molecule made of four polypeptide chains: two identical long heavy chains and two identical short light chains, held together by disulphide bonds. It is written as H_2L_2.

Step 1 — Count and classify: Two heavy + two light = four chains in two identical pairs, matching the figure.

Why other options are wrong:

- (A) One heavy + one light gives only two chains, not the H_2L_2 structure.
- (B) The four chains are not all identical; heavy and light chains differ in size.
- (C) Three heavy and one light is not the antibody composition.

Final Answer: Two heavy and two light chains (H_2L_2) $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q17

Q18.

Solution

Concept — Microbes in household products: Lactic acid bacteria (LAB), such as *Lactobacillus*, convert milk into curd. They ferment lactose into lactic acid, which coagulates milk proteins and also increases vitamin B_{12} content.

Step 1 — Match microbe to product: Curd from milk $\rightarrow$ lactic acid bacteria (*Lactobacillus*).

Why other options are wrong:

- (A) Baker's yeast (*Saccharomyces cerevisiae*) leavens bread and ferments must into wine, not curd.
- (C) *Penicillium* is used in cheese ripening and antibiotic production, not curd setting.
- (D) *Clostridium* is associated with butyric-acid fermentation, not normal curd.

Final Answer: Curd is set by lactic acid bacteria $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q18

Q19.

Solution

Concept — Restriction endonucleases: These "molecular scissors" recognise specific palindromic DNA sequences and cut both strands. A staggered cut leaves single-stranded overhangs ("sticky ends") that allow complementary fragments to be joined.

Step 1 — Match function to enzyme: Sequence-specific cutting producing sticky ends is the role of a restriction endonuclease.

Why other options are wrong:

- (A) DNA ligase *joins* fragments; it does not cut them.
- (B) DNA polymerase synthesises new strands during replication.
- (C) DNA helicase unwinds the double helix but does not cleave the backbone at specific sites.

Final Answer: The cutting enzyme is a restriction endonuclease $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q19

Q20.

Solution

Concept — Commensalism: In commensalism one partner is benefited while the other is neither harmed nor benefited ($+/0$ interaction). An orchid growing as an epiphyte on a mango branch gains support and access to light; the tree is unaffected.

Step 1 — Match the $+/0$ pattern: One gains, the other is unaffected $\Rightarrow$ commensalism.

Why other options are wrong:

- (B) Mutualism benefits both species ($+/+$).
- (C) Parasitism benefits one and harms the other ($+/-$).
- (D) Competition harms both interacting species ($-/-$).

Final Answer: The interaction is commensalism $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q20

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	D	3	C	4	A	5	B
6	C	7	D	8	A	9	B	10	C
11	A	12	B	13	D	14	C	15	C
16	A	17	D	18	B	19	D	20	A