

# PGIMER BSc Nursing Biology

## Sample Paper – 10

Duration: 23 Minutes

Maximum Marks: 25

### Instructions

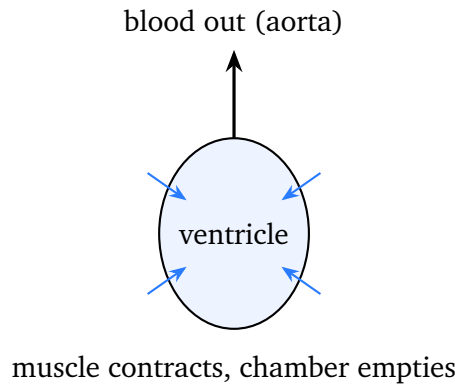
- This paper contains **25** Multiple Choice Questions (Single Correct Answer), modelled on the Biology portion of the **PGIMER BSc Nursing** entrance exam.
- Each correct answer carries **+1 mark**. **0.25 mark** is deducted for every incorrect answer. Unattempted questions carry **0 marks**.
- Only **one** option is correct. Choose carefully.
- Syllabus level: **Class 11 and 12 (NCERT) Biology**.
- The exam is conducted as a computer-based test. Personal calculators, mobile phones, and other electronic gadgets are strictly prohibited.

**Q1.** Proteins are broken down step by step in the alimentary canal. The final end products of protein digestion, which are absorbed into the blood through the wall of the small intestine, are:

- (A) Fatty acids and glycerol
- (B) Simple glucose molecules
- (C) Amino acids
- (D) Maltose units

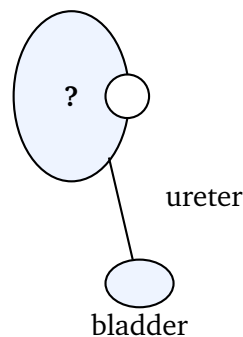
**Q2.** The figure shows the ventricle of the heart during one phase of the cardiac cycle. The heart muscle is contracting (arrows point inward) and blood is being forced out into the aorta. This phase of the cardiac cycle is called:





- (A) Diastole
- (B) Systole
- (C) Complete cardiac pause
- (D) Atrial filling

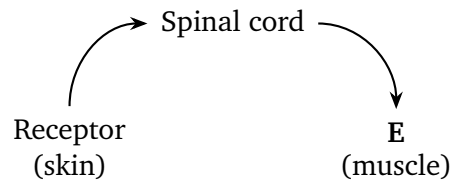
**Q3.** The figure shows an organ, together with the tube (ureter) that carries urine to the bladder. This bean-shaped organ is the chief regulator of the water and salt balance (osmoregulation) of the body. It is the:



- (A) Kidney
- (B) Liver
- (C) Lung
- (D) Spleen

**Q4.** The figure shows the pathway of a reflex action. A stimulus is picked up at the skin and, after passing through the spinal cord, an impulse reaches structure E, the muscle that carries out the response. Structure E is called the:





- (A) Receptor
  - (B) Effector
  - (C) Relay neuron
  - (D) Sensory neuron
- Q5.** The box-like structure at the upper end of the trachea that contains the vocal cords and is responsible for producing sound (the “voice box”) is the:
- (A) Pharynx
  - (B) Epiglottis
  - (C) Bronchus
  - (D) Larynx
- Q6.** The hormone secreted by the adrenal cortex that helps the body cope with long-term stress and raises blood glucose by influencing carbohydrate metabolism is:
- (A) Adrenaline
  - (B) Cortisol
  - (C) Insulin
  - (D) Thyroxine
- Q7.** A pea plant that is heterozygous for seed shape has the genotype Rr, where R is round and r is wrinkled. According to the law of segregation, the types of gametes this plant can produce are:
- (A) Only R gametes



- (B) Only r gametes
- (C) R gametes and r gametes in equal numbers
- (D) RR gametes and rr gametes

**Q8.** In a family pedigree chart, a trait appears in every generation, affects males and females in roughly equal numbers, and an affected child always has at least one affected parent. This pattern of inheritance is best described as:

- (A) Autosomal dominant
- (B) X-linked recessive
- (C) Y-linked
- (D) Autosomal recessive

**Q9.** The nitrogenous bases of DNA are grouped into purines and pyrimidines. Which of the following pairs consists of two purines?

- (A) Adenine and Guanine
- (B) Cytosine and Thymine
- (C) Adenine and Thymine
- (D) Guanine and Cytosine

**Q10.** The fossil *Archaeopteryx* had feathers and wings like a bird but also teeth, a long bony tail and clawed digits like a reptile. It is therefore regarded as a connecting link between:

- (A) Fishes and amphibians
- (B) Amphibians and reptiles
- (C) Birds and mammals
- (D) Reptiles and birds

**Q11.** In a dividing animal cell, the organelle that organises the microtubules to form the spindle apparatus is the:

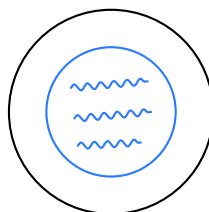


- (A) Ribosome
- (B) Centriole
- (C) Lysosome
- (D) Golgi apparatus

**Q12.** The movement of a substance such as glucose across the plasma membrane down its concentration gradient, with the help of specific carrier proteins but without spending ATP, is called:

- (A) Active transport
- (B) Osmosis
- (C) Facilitated diffusion
- (D) Simple diffusion through the lipid layer

**Q13.** The figure shows a cell whose nuclear envelope is intact and whose genetic material is present as diffuse, uncondensed chromatin threads while its DNA is being copied. This stage of the cell cycle, which precedes actual division, is the:



nuclear envelope intact, chromatin diffuse

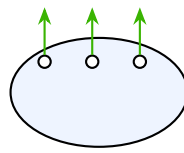
- (A) Prophase
- (B) Metaphase
- (C) Interphase
- (D) Anaphase

**Q14.** Meiosis involves one round of DNA replication followed by two successive divisions. Starting from a single diploid mother cell, meiosis produces:



- (A) Two diploid daughter cells
- (B) Two haploid daughter cells
- (C) Four diploid daughter cells
- (D) Four haploid daughter cells

**Q15.** The figure shows a potato reproducing through its underground stem tuber, whose “eyes” (buds) sprout into new plants. Since a new plant arises from a vegetative part of the parent without seeds or gametes, this method of reproduction is:



potato tuber with sprouting “eyes”

- (A) Vegetative propagation (asexual)
- (B) Sexual reproduction
- (C) Binary fission
- (D) Pollination

**Q16.** A sperm count that is well below the normal value in a man’s semen, and which is a common cause of male infertility, is medically termed:

- (A) Polyspermy
- (B) Oligospermia
- (C) Azoospermia
- (D) Normospermia

**Q17.** Twins that develop when a single fertilised egg (zygote) splits into two, so that both are of the same sex and are genetically identical, are called:

- (A) Fraternal twins
- (B) Dizygotic twins



- (C) Monozygotic (identical) twins
- (D) Conjoined twins

**Q18.** Inside the chloroplast the light reactions of photosynthesis, which trap light energy and split water, take place on the:

- (A) Stroma (the ground substance)
- (B) Grana, made of stacked thylakoid membranes
- (C) Outer chloroplast membrane
- (D) Cytoplasm surrounding the chloroplast

**Q19.** When dry pea seeds are placed in water they swell up and increase in size, because water is absorbed and held by their colloidal contents (proteins and starch). This absorption of water by dry solids is called:

- (A) Osmosis
- (B) Transpiration
- (C) Simple diffusion
- (D) Imbibition

**Q20.** A lichen, often the first organism to colonise bare rock, is a close symbiotic partnership between:

- (A) An alga and a fungus
- (B) A fungus and a bacterium
- (C) A moss and a fern
- (D) Two different fungi

**Q21.** The frog is placed in the class Amphibia mainly because members of this class:

- (A) Have dry scaly skin and lay eggs on land
- (B) Have hair and feed their young on milk



- (C) Are warm-blooded and covered with feathers
- (D) Can live both on land and in water and have a moist, glandular skin

**Q22.** The figure shows a food chain that begins with a green plant (producer) and passes to a herbivore and then to carnivores. Because it starts from a living autotroph rather than from dead organic matter, this type of food chain is called a:

Grass ← Grasshopper → Frog → Snake  
(producer)

- (A) Detritus food chain
  - (B) Grazing food chain
  - (C) Parasitic food chain
  - (D) Decomposer food chain
- Q23.** Organisms such as bacteria and fungi that break down the dead bodies and wastes of plants and animals, returning simple nutrients to the soil, are called:
- (A) Producers
  - (B) Primary consumers
  - (C) Decomposers
  - (D) Top carnivores
- Q24.** Dengue fever is caused by a virus. The vector that transmits this virus from an infected person to a healthy person through its bite is the:
- (A) Female *Anopheles* mosquito
  - (B) *Culex* mosquito
  - (C) Common housefly
  - (D) *Aedes* mosquito



**Q25.** The technique of treating a genetic disorder by inserting a normal, functional gene into a patient's cells to correct or replace a defective gene is called:

- (A) Gene therapy
- (B) Gene cloning
- (C) DNA fingerprinting
- (D) Tissue culture



**Detailed Solutions**

Q1.

**Solution**

**Concept — End products of protein digestion:** Each class of food is digested into small, absorbable units, and proteins have their own final product.

**Step 1 — Trace protein digestion:** Proteins are first attacked by pepsin in the stomach, then by trypsin and chymotrypsin from the pancreas, and finally by peptidases in the small intestine.

**Step 2 — Identify the end product:** These enzymes break proteins down completely into amino acids, the simplest units, which are absorbed into the blood through the intestinal villi.

**Why other options are wrong:**

- Option A (Fatty acids and glycerol): these are the end products of fat (lipid) digestion, not protein.
- Option B (Glucose): glucose is the end product of carbohydrate digestion.
- Option D (Maltose): maltose is only an intermediate product of starch digestion, not of protein.

**Final Answer:** Proteins are finally digested to amino acids and absorbed ⇒

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

Q2.

**Solution**

**Concept — The cardiac cycle:** One heartbeat is a cardiac cycle, made of alternating phases of contraction and relaxation of the heart muscle.

**Step 1 — Read the figure:** The arrows point inward on the ventricle wall and blood is being pushed out into the aorta, so the muscle is contracting and the chamber is emptying.

**Step 2 — Name the phase:** The phase in which the heart muscle contracts and pumps blood out of its chambers is called systole. (The relaxation and filling phase is diastole.)

**Why other options are wrong:**

- Option A (Diastole): this is the relaxation phase, when the chambers fill with



blood, the opposite of what the figure shows.

- Option C (Complete cardiac pause): there is a brief joint pause, but during it the muscle relaxes and does not eject blood.
- Option D (Atrial filling): this describes blood entering the atria during diastole, not the ejection shown.

**Final Answer:** The contraction (ejection) phase of the cardiac cycle is systole ⇒

**B**

**Answer: (B)** [Go Back to Q2](#)

Q3.

### Solution

**Concept — Osmoregulation:** Keeping the water and salt content of body fluids constant is called osmoregulation, and one organ is chiefly responsible for it.

**Step 1 — Read the figure:** The bean-shaped organ drains through a ureter into the urinary bladder, which identifies it as part of the excretory system.

**Step 2 — Identify the organ:** The kidney filters the blood and adjusts how much water and salt is kept or removed as urine, making it the chief osmoregulatory (homeostatic) organ of the body.

**Why other options are wrong:**

- Option B (Liver): it detoxifies substances and makes urea, but it does not regulate water and salt balance or connect to a ureter.
- Option C (Lung): it exchanges oxygen and carbon dioxide; it is not linked to the ureter or bladder.
- Option D (Spleen): it stores and filters blood cells; it plays no role in urine formation.

**Final Answer:** The main osmoregulatory organ shown, draining by a ureter, is the kidney ⇒ **A**

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



Q4.

**Solution**

**Concept — The reflex arc:** A reflex action follows a fixed pathway: receptor → sensory neuron → spinal cord → motor neuron → effector.

**Step 1 — Follow the pathway in the figure:** The stimulus is detected at the skin (receptor), an impulse travels to the spinal cord, and from there an impulse is sent out to structure E, the muscle.

**Step 2 — Name structure E:** The organ (here a muscle) that receives the motor impulse and carries out the response is called the effector.

**Why other options are wrong:**

- Option A (Receptor): the receptor is the part at the skin that detects the stimulus, at the start of the arc, not the end.
- Option C (Relay neuron): this is a connecting neuron inside the spinal cord, not the responding muscle.
- Option D (Sensory neuron): this carries the impulse from the receptor to the spinal cord; it does not produce the response.

**Final Answer:** The responding muscle at the end of a reflex arc is the effector ⇒

**B**

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

Q5.

**Solution**

**Concept — The respiratory passage:** Air passes through the nose, pharynx, larynx, trachea and bronchi before reaching the lungs, and one of these produces sound.

**Step 1 — Locate the voice box:** At the upper end of the trachea lies a cartilaginous box that houses the vocal cords.

**Step 2 — Identify it:** This structure is the larynx; when air passes over the vocal cords they vibrate and produce sound, so the larynx is called the voice box.

**Why other options are wrong:**

- Option A (Pharynx): a common passage for air and food behind the mouth; it does not contain vocal cords.
- Option B (Epiglottis): a flap of cartilage that covers the larynx during swal-



lowing; it does not produce sound.

- Option C (Bronchus): a branch of the trachea that carries air into a lung; it has no vocal cords.

**Final Answer:** The voice box at the top of the trachea is the larynx ⇒

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

Q6.

### Solution

**Concept — Hormones of the adrenal gland:** The adrenal gland has two parts, the medulla and the cortex, each releasing different hormones.

**Step 1 — Focus on the cortex:** The adrenal cortex secretes steroid hormones called corticoids, one of which manages long-term stress and metabolism.

**Step 2 — Identify the hormone:** Cortisol (a glucocorticoid) raises blood glucose by promoting the breakdown of proteins and fats and helps the body withstand prolonged stress.

**Why other options are wrong:**

- Option A (Adrenaline): this is from the adrenal medulla and handles short-term “fight or flight” emergencies, not long-term stress.
- Option C (Insulin): this is from the pancreas and lowers blood glucose, the opposite effect.
- Option D (Thyroxine): this is from the thyroid gland and controls the overall metabolic rate.

**Final Answer:** The adrenal-cortex stress hormone regulating metabolism is cortisol ⇒

**Answer: (B)** [Go Back to Q6](#)



Q7.

**Solution**

**Concept — Law of segregation and gametes:** During gamete formation the two alleles of a gene separate, so each gamete carries only one allele of a pair.

**Step 1 — Write the genotype:** The heterozygous plant is Rr, carrying one round allele (R) and one wrinkled allele (r).

**Step 2 — Apply segregation:** When gametes form, R and r separate into different gametes. So half the gametes carry R and half carry r, that is, R and r in equal numbers.

**Why other options are wrong:**

- Option A (Only R): this would be true only for a homozygous RR plant.
- Option B (Only r): this would be true only for a homozygous rr plant.
- Option D (RR and rr): gametes are haploid and carry only one allele each, never a pair like RR or rr.

**Final Answer:** A heterozygote Rr forms R and r gametes in equal numbers  $\Rightarrow$

[Go Back to Q7](#)

Q8.

**Solution**

**Concept — Reading a pedigree:** The pattern in which a trait appears across generations reveals whether it is dominant or recessive and whether it is autosomal or sex-linked.

**Step 1 — Note the clues:** The trait appears in every generation, affects both sexes about equally, and each affected child has an affected parent.

**Step 2 — Interpret the pattern:** Appearance in every generation without skipping points to a dominant allele; equal effect on both sexes points to an autosome. Together this is an autosomal dominant pattern.

**Why other options are wrong:**

- Option B (X-linked recessive): this typically skips generations and affects far more males than females.
- Option C (Y-linked): a Y-linked trait passes only from father to all sons and never affects females.
- Option D (Autosomal recessive): a recessive trait usually skips generations



and can appear in children of unaffected (carrier) parents.

**Final Answer:** A trait in every generation affecting both sexes with an affected parent is autosomal dominant  $\Rightarrow$

**Answer: (A)** [Go Back to Q8](#)

Q9.

### Solution

**Concept — Purines and pyrimidines:** The nitrogenous bases of DNA fall into two groups based on their ring structure.

**Step 1 — Recall the two groups:** Purines have a double-ring structure and include adenine (A) and guanine (G). Pyrimidines have a single ring and include cytosine (C) and thymine (T).

**Step 2 — Pick the purine pair:** The pair made of two purines is adenine and guanine.

**Why other options are wrong:**

- Option B (Cytosine and Thymine): both of these are pyrimidines, not purines.
- Option C (Adenine and Thymine): this mixes one purine (A) with one pyrimidine (T).
- Option D (Guanine and Cytosine): this again mixes one purine (G) with one pyrimidine (C).

**Final Answer:** The two purines are adenine and guanine  $\Rightarrow$

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

Q10.

### Solution

**Concept — Connecting links:** A fossil that shows features of two different groups is called a connecting link and is strong evidence for evolution.

**Step 1 — List the features of *Archaeopteryx*:** It had feathers, wings and a beak like a bird, but also teeth, a long bony tail and clawed fingers like a reptile.

**Step 2 — Interpret the mix:** Because it combines bird features with reptile features, *Archaeopteryx* is a connecting link between reptiles and birds, showing that



birds evolved from reptiles.

**Why other options are wrong:**

- Option A (Fishes and amphibians): this link is illustrated by lungfishes, not *Archaeopteryx*.
- Option B (Amphibians and reptiles): *Archaeopteryx* shows no amphibian features such as moist skin.
- Option C (Birds and mammals): it has no mammalian features such as hair or mammary glands.

**Final Answer:** *Archaeopteryx* is a connecting link between reptiles and birds ⇒

**D**

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

Q11.

### Solution

**Concept — Organelles in cell division:** During division the chromosomes are moved by a spindle, and in animal cells a particular organelle organises this spindle.

**Step 1 — Identify the organiser:** Animal cells contain a pair of centrioles (the centrosome) near the nucleus.

**Step 2 — State its role:** At the start of division the centrioles move to opposite poles and organise the microtubules into the spindle fibres that pull the chromosomes apart.

**Why other options are wrong:**

- Option A (Ribosome): this is the site of protein synthesis and has no role in forming the spindle.
- Option C (Lysosome): this holds digestive enzymes for breaking down waste, unrelated to the spindle.
- Option D (Golgi apparatus): this packages and secretes materials; it does not build the spindle.

**Final Answer:** The spindle-organising organelle of an animal cell is the centriole

⇒ **B**

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



Q12.

**Solution**

**Concept — Membrane transport:** Substances cross the membrane by passive processes (no ATP) or by active transport (using ATP).

**Step 1 — Note the key features:** The movement is down the concentration gradient (so it is passive) but it needs carrier proteins to help the substance across.

**Step 2 — Name the process:** Passive movement down a gradient with the help of carrier or channel proteins, and without ATP, is called facilitated diffusion.

**Why other options are wrong:**

- Option A (Active transport): this moves substances against the gradient and requires ATP, unlike the process described.
- Option B (Osmosis): this is the passive movement of water, not of glucose through carrier proteins.
- Option D (Simple diffusion through the lipid layer): this needs no carrier protein, whereas glucose here uses a carrier.

**Final Answer:** Carrier-assisted passive transport without ATP is facilitated diffusion ⇒

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

Q13.

**Solution**

**Concept — Interphase:** The cell cycle has a long preparatory stage (interphase) followed by the actual division (M phase).

**Step 1 — Read the figure:** The nuclear envelope is intact and the genetic material is spread out as thin, uncondensed chromatin threads, not as distinct chromosomes.

**Step 2 — Match the stage:** DNA replication and growth, with chromatin still diffuse and the nuclear envelope present, are the hallmarks of interphase, the stage before division begins.

**Why other options are wrong:**

- Option A (Prophase): here chromatin condenses into visible chromosomes and the nuclear envelope starts to break down.
- Option B (Metaphase): chromosomes are fully condensed and lined up at



the equator, not diffuse.

- Option D (Anaphase): sister chromatids have separated and are moving to the poles, again not diffuse chromatin.

**Final Answer:** Diffuse chromatin with DNA replicating and an intact nucleus is interphase ⇒

**Answer: (C)** [Go Back to Q13](#)

Q14.

### Solution

**Concept — Outcome of meiosis:** Meiosis is a reduction division used to make gametes, and the number and type of cells it produces are fixed.

**Step 1 — Count the divisions:** There is one round of DNA replication followed by two divisions, meiosis I and meiosis II.

**Step 2 — Work out the product:** One diploid cell first gives two cells at meiosis I, and each divides again at meiosis II, giving four cells; because the chromosome number was halved, all four are haploid.

**Why other options are wrong:**

- Option A (Two diploid cells): this describes the result of mitosis, not meiosis.
- Option B (Two haploid cells): only two cells form after meiosis I; the second division makes four.
- Option C (Four diploid cells): the number four is right, but meiosis halves the chromosome number, so the cells are haploid, not diploid.

**Final Answer:** Meiosis produces four haploid daughter cells ⇒

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

Q15.

### Solution

**Concept — Asexual reproduction in plants:** Plants can reproduce without seeds or gametes when a new plant grows from a vegetative part of the parent.

**Step 1 — Read the figure:** The potato is an underground stem tuber, and its “eyes” are buds that sprout into new shoots and roots.

**Step 2 — Name the method:** A new plant arising from a vegetative part (here a



stem tuber), without fusion of gametes, is produced by vegetative propagation, a form of asexual reproduction.

**Why other options are wrong:**

- Option B (Sexual reproduction): this needs the fusion of male and female gametes, which does not happen here.
- Option C (Binary fission): this is the splitting of a single-celled organism such as *Amoeba* into two, not the sprouting of a tuber.
- Option D (Pollination): this is the transfer of pollen in flowering, a step of sexual reproduction, not tuber sprouting.

**Final Answer:** A potato reproducing through its stem tuber shows vegetative propagation (asexual) ⇒

**Answer: (A)** [Go Back to Q15](#)

Q16.

### Solution

**Concept — Sperm count and infertility:** A healthy man's semen contains a large number of sperm, and changes in this count have specific medical names.

**Step 1 — Recall the normal range:** A normal sperm count is very high, of the order of tens of millions of sperm per millilitre of semen.

**Step 2 — Name the low-count condition:** When the sperm count falls well below normal but sperm are still present, the condition is called oligospermia, a common cause of male infertility.

**Why other options are wrong:**

- Option A (Polyspermy): this refers to more than one sperm entering an egg during fertilisation, not to sperm count.
- Option C (Azoospermia): this means a complete absence of sperm in the semen, not merely a low count.
- Option D (Normospermia): this describes a normal sperm count, the opposite of the low count asked about.

**Final Answer:** A sperm count well below normal is oligospermia ⇒

**Answer: (B)** [Go Back to Q16](#)



Q17.

**Solution**

**Concept — Types of twins:** Twins arise in two ways, depending on whether one egg or two eggs are involved.

**Step 1 — Trace the origin:** When a single fertilised egg (one zygote) divides into two embryos, both share the same genetic material.

**Step 2 — Name the twins:** Twins from one zygote are called monozygotic or identical twins; they are always of the same sex and genetically identical.

**Why other options are wrong:**

- Option A (Fraternal twins): these form from two separate eggs and are only as alike as ordinary siblings.
- Option B (Dizygotic twins): “di” means two zygotes, so these are not from a single egg and are not identical.
- Option D (Conjoined twins): these are identical twins whose bodies fail to separate fully; the general term for same-egg twins is monozygotic.

**Final Answer:** Twins from a single split zygote are monozygotic (identical) twins  
⇒  C

**Answer: (C)** [Go Back to Q17](#)

Q18.

**Solution**

**Concept — Sites of the two reactions of photosynthesis:** The chloroplast is divided into grana (thylakoids) and stroma, and the two stages of photosynthesis occur in different places.

**Step 1 — Locate the light reaction:** The light reactions need chlorophyll to trap light and split water; the chlorophyll is held on the thylakoid membranes stacked as grana.

**Step 2 — Contrast with the dark reaction:** The light reactions therefore occur in the grana (thylakoids), while the dark reaction (Calvin cycle) takes place in the stroma.

**Why other options are wrong:**

- Option A (Stroma): the stroma is the site of the dark reaction (carbon fixation), not the light reaction.



- Option C (Outer chloroplast membrane): this is only a boundary layer and holds no photosynthetic pigments.
- Option D (Cytoplasm): photosynthesis occurs inside the chloroplast, not in the surrounding cytoplasm.

**Final Answer:** The light reactions occur on the grana (thylakoid membranes) ⇒

**B**

**Answer: (B)** [Go Back to Q18](#)

Q19.

### Solution

**Concept — Imbibition:** Dry hydrophilic solids can take up water and swell, a special kind of water absorption.

**Step 1 — Observe the effect:** Dry pea seeds swell and increase greatly in size when soaked, because water is drawn into their colloidal substances such as proteins and starch.

**Step 2 — Name the process:** This absorption of water by solid colloidal particles, causing them to swell, is called imbibition.

**Why other options are wrong:**

- Option A (Osmosis): osmosis needs a semipermeable membrane separating two solutions, not simply dry solids soaking up water.
- Option B (Transpiration): this is the loss of water vapour from a plant, the opposite of water uptake.
- Option C (Simple diffusion): diffusion is the spreading of particles from high to low concentration, not the swelling of solids by water absorption.

**Final Answer:** Swelling of dry seeds by water uptake is imbibition ⇒ **D**

**Answer: (D)** [Go Back to Q19](#)



Q20.

**Solution**

**Concept — Lichens:** A lichen is not a single organism but a partnership of two very different organisms living together for mutual benefit.

**Step 1 — Identify the partners:** A lichen is made of an alga and a fungus living in close symbiotic association.

**Step 2 — Explain the benefit:** The alga prepares food by photosynthesis, while the fungus provides shelter, water and minerals, so both benefit; this lets lichens grow even on bare rock.

**Why other options are wrong:**

- Option B (A fungus and a bacterium): a bacterium is not the photosynthetic partner of a lichen; the partner is an alga.
- Option C (A moss and a fern): mosses and ferns are separate plants and do not form a lichen.
- Option D (Two different fungi): a lichen needs a photosynthetic partner (the alga), so it cannot be two fungi.

**Final Answer:** A lichen is a symbiosis of an alga and a fungus ⇒

[Go Back to Q20](#)

Q21.

**Solution**

**Concept — Class Amphibia:** Vertebrates are classified into groups by features such as skin, breathing and habitat, and amphibians have a distinctive set.

**Step 1 — Recall the key features:** Amphibians such as frogs can live both in water and on land, and they have a moist, glandular skin used for breathing.

**Step 2 — Apply to the frog:** Because the frog leads this “dual life” and has a moist skin, it is placed in the class Amphibia.

**Why other options are wrong:**

- Option A (Dry scaly skin, eggs on land): these are features of reptiles, not amphibians.
- Option B (Hair and milk): hair and mammary glands are features of mammals.
- Option C (Warm-blooded with feathers): warm blood and feathers are fea-



tures of birds.

**Final Answer:** The frog is an amphibian because it leads a dual life with moist skin ⇒  D

**Answer: (D)** [Go Back to Q21](#)

Q22.

### Solution

**Concept — Types of food chains:** A food chain can start either from living green plants or from dead organic matter, and each type has its own name.

**Step 1 — Read the figure:** The chain begins with grass, a living green plant (producer), and then passes to a grasshopper, a frog and a snake.

**Step 2 — Classify the chain:** A food chain that begins with a living autotroph (green plant) and moves on to grazing herbivores and carnivores is called a grazing food chain.

**Why other options are wrong:**

- Option A (Detritus food chain): this starts from dead organic matter (detritus) and decomposers, not from a living green plant.
- Option C (Parasitic food chain): here energy passes from a larger host to smaller parasites; that is not what the figure shows.
- Option D (Decomposer food chain): this is another name for a detritus chain based on dead matter, again not one starting with a living plant.

**Final Answer:** A food chain starting with a living green plant is a grazing food chain ⇒  B

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

Q23.

### Solution

**Concept — Decomposers in an ecosystem:** Every ecosystem needs organisms that break down dead material so that nutrients can be reused.

**Step 1 — Identify the role:** Bacteria and fungi feed on the dead remains and wastes of plants and animals and break them into simple substances.

**Step 2 — Name the group:** Such organisms are called decomposers; they return



minerals and nutrients to the soil, keeping nutrient cycles running.

**Why other options are wrong:**

- Option A (Producers): producers are green plants that make food by photosynthesis, not breakers of dead matter.
- Option B (Primary consumers): these are herbivores that eat living plants, not dead remains.
- Option D (Top carnivores): these feed on other animals at the top of the food chain, not on decaying matter.

**Final Answer:** Bacteria and fungi that break down dead matter are decomposers ⇒

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

Q24.

### Solution

**Concept — Vector-borne diseases:** Many diseases are spread by insect vectors, and each disease is linked to a particular vector.

**Step 1 — Identify the disease:** Dengue fever is caused by the dengue virus, which needs a mosquito to pass from person to person.

**Step 2 — Name the vector:** The dengue virus is transmitted by the bite of the *Aedes* mosquito (*Aedes aegypti*), which usually bites during the day.

**Why other options are wrong:**

- Option A (Female *Anopheles*): this mosquito transmits malaria (*Plasmodium*), not dengue.
- Option B (*Culex*): this mosquito spreads filariasis and some forms of encephalitis, not dengue.
- Option C (Housefly): the housefly spreads diseases like typhoid and cholera by contaminating food, not dengue.

**Final Answer:** Dengue virus is spread by the *Aedes* mosquito ⇒

**Answer: (D)** [Go Back to Q24](#)



Q25.

**Solution**

**Concept — Gene therapy:** Some genetic disorders arise from a defective gene, and biotechnology offers a way to correct such a fault.

**Step 1 — Understand the technique:** Gene therapy inserts a normal, functional copy of a gene into a patient's cells to replace or make up for the defective gene.

**Step 2 — State the aim:** By restoring the correct gene product, the technique corrects the disorder at its source; the first attempts treated a defect in the ADA enzyme.

**Why other options are wrong:**

- Option B (Gene cloning): this only makes many copies of a gene in the laboratory; it does not treat a patient's disorder.
- Option C (DNA fingerprinting): this is used to identify individuals from their DNA pattern, not to correct genes.
- Option D (Tissue culture): this grows plant or animal tissue on a nutrient medium; it does not repair defective genes.

**Final Answer:** Correcting a defective gene by inserting a normal gene is gene therapy ⇒

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## Answer Key

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

