# CBSE Class 10 2025 Biology Compartment Question Paper with Solutions

| **Time Allowed :**3 hours | **Maximum Marks :**80 | **Total questions :**38 |
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## General Instructions

**Read the following instructions very carefully and strictly follow them:**

1. This question paper contains 38 questions. All questions are compulsory.
2. This question paper is divided into five Sections – A, B, C, D and E.
3. In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) andques-tions number 19 and 20 are Assertion-Reason based questions of 1 markeach.
4. In Section B, Questions no. 21 to 25 are very short answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Questions no. 26 to 31 are short answer (SA) type questions,carrying 3 marks each.
6. In Section D, Questions no. 32 to 35 are long answer (LA) type questions carrying 5 marks each.
7. In Section E, Questions no. 36 to 38 are case study based questions carrying 4 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 3 questions in Section C, 2 questions in Section D and 2 questions in Section E.
9. Use of calculators is not allowed.

## SECTION-A

**1. Long ribbon-like pollen grains are seen in some:**

(A) Aquatic plants

(B) Wind-pollinated grasses

(C) Gymnosperms

(D) Bird-pollinated flowers

**Correct Answer:** (A) Aquatic plants

**Solution:**

Step 1: Some aquatic plants undergo pollination through water, a process known as hydrophily.

Step 2: In such plants, pollen grains are modified for floating and travel.

Step 3: *Zostera*, an aquatic plant, produces long, ribbon-like pollen grains which help in floating in water and reaching the stigma.

Step 4: This structure is not found in wind or bird-pollinated flowers or gymnosperms.

$$\Rightarrow \text{Therefore, the correct answer is } \boxed{\text{(A) Aquatic plants}}.$$

**Quick Tip**

Hydrophily occurs in very few plants. Remember examples like *Zostera* and *Vallisneria* that show adaptations like ribbon-like pollen.

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**2. Estrogen is secreted by:**

(A) Corpus luteum

(B) Membrane granulosa of Graafian follicle

(C) Pituitary gland

(D) Germinal epithelium

**Correct Answer:** (B) Membrane granulosa of Graafian follicle

**Solution:**

Step 1: Estrogen is the primary female sex hormone responsible for secondary sexual characteristics and regulation of the menstrual cycle.

Step 2: During the follicular phase of the menstrual cycle, developing follicles grow and mature.

Step 3: The inner lining of the Graafian follicle, called the **membrane granulosa**, contains cells that secrete estrogen.

Step 4: These granulosa cells convert androgens (from the theca interna) to estrogen using the enzyme aromatase.

Step 5: The corpus luteum secretes progesterone after ovulation, not estrogen.

$\Rightarrow$ Hence, the correct answer is $\boxed{\text{(B) Membrane granulosa of Graafian follicle}}$.

**Quick Tip**

Remember: Graafian follicle (before ovulation) $\rightarrow$ Estrogen; Corpus luteum (after ovulation) $\rightarrow$ Progesterone.

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**3. Amniocentesis is a technique that is used to:**

(A) Determine any disease of the heart

(B) Determine any genetic disorder of the foetus

(C) Determine any disorder of the brain

(D) Detect any abnormality in the bone formation

**Correct Answer:** (B) Determine any genetic disorder of the foetus

**Solution:**

Step 1: Amniocentesis is a prenatal diagnostic procedure.

Step 2: In this process, a small quantity of amniotic fluid is drawn from the uterus of a pregnant woman.

Step 3: The fluid contains fetal cells and genetic material.

Step 4: It is analyzed to detect chromosomal abnormalities such as Down's syndrome or genetic disorders like thalassemia.

Step 5: It is not used to diagnose heart, brain, or bone disorders.

$\Rightarrow$ Hence, the correct answer is $\boxed{\text{(B) Determine any genetic disorder of the foetus}}$.

**Quick Tip**

Amniocentesis is legally regulated to prevent misuse for sex determination. Focus on its role in detecting fetal genetic disorders.

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**4. In humans, non-disjunction of the 21$^{st}$ pair of chromosomes leads to:**

(A) Acquired Immune Deficiency Syndrome

(B) Klinefelter's Syndrome

(C) Turner's Syndrome

(D) Down's Syndrome

**Correct Answer:** (D) Down's Syndrome

**Solution:**

Step 1: Non-disjunction refers to the failure of homologous chromosomes to separate during meiosis.

Step 2: When this occurs in the 21$^{st}$ chromosome pair, it results in an extra copy (trisomy 21).

Step 3: This leads to a total of 47 chromosomes in the zygote instead of the normal 46.

Step 4: The child exhibits symptoms of Down's Syndrome: mental retardation, flattened facial profile, and short stature.

Step 5: Other syndromes result from different chromosomal abnormalities (e.g., XXY for Klinefelter's, XO for Turner's).

$$\Rightarrow \text{Correct answer is } \boxed{\text{(D) Down's Syndrome}}.$$

**Quick Tip**

Trisomy 21 $\rightarrow$ Down's Syndrome, Trisomy 18 $\rightarrow$ Edward's Syndrome, XO $\rightarrow$ Turner's, XXY $\rightarrow$ Klinefelter's.

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**5. Which one of the following codons has dual function?**

(A) AUG

(B) AUC

(C) ACU

(D) ACA

**Correct Answer:** (A) AUG

**Solution:**

Step 1: Codons are sequences of three nucleotides in mRNA that specify amino acids.

Step 2: AUG is unique because it acts as a **start codon**—it signals the beginning of translation.

Step 3: In addition, AUG also codes for the amino acid **methionine**.

Step 4: No other codon has both roles—initiation and amino acid coding.

$$\Rightarrow \text{Thus, the correct answer is } \boxed{\text{(A) AUG}}.$$

**Quick Tip**

AUG = Start codon + Methionine. UAA, UAG, UGA are stop codons. Remember the unique dual role of AUG.

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**6. Which one of the following options gives the correct temperature condition and the mixture of the gaseous components that were used by S.L. Miller in 1953 to prove abiogenesis of life?**

(A) $CH_4$, $H_2$, $NO_2$ and water vapour at 1800°C

(B) $CH_4$, $H_2$, $NH_3$ and water vapour at 1800°C

(C) $CO_2$, $H_2$, $NH_3$ and water vapour at 800°C

(D) $CH_4$, $H_2$, $NH_3$ and water vapour at 800°C

**Correct Answer:** (B) $CH_4$, $H_2$, $NH_3$ and water vapour at 1800°C

**Solution:**

Step 1: S.L. Miller conducted an experiment in 1953 to demonstrate the chemical origin of life.

Step 2: He used a closed flask with gases resembling early Earth's atmosphere: methane ($CH_4$), ammonia ($NH_3$), hydrogen ($H_2$), and water vapour.

Step 3: These gases were heated and subjected to electric sparks to simulate lightning.

Step 4: The temperature used was around 800°C (not 1800°C as mentioned in option B, so

technically none are fully correct, but B has the correct gas mixture).

Step 5: Organic compounds like amino acids were formed.

$$\Rightarrow \boxed{\text{Correct mixture: } CH_4, H_2, NH_3, \text{and } H_2O.}$$

**Quick Tip**

Remember the gas combination $CH_4$, $H_2$, $NH_3$, and water vapour to recall Miller's experiment on origin of life.

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**7. The mosquito-borne disease in humans causing chronic inflammation of the lymphatic vessels is:**

(A) Elephantiasis

(B) Ascariasis

(C) Ringworm

(D) Amoebiasis

**Correct Answer:** (A) Elephantiasis

**Solution:**

Step 1: Elephantiasis is a parasitic infection caused by filarial worms, mainly *Wuchereria bancrofti*.

Step 2: It is transmitted through the bite of infected female mosquitoes.

Step 3: The larvae block lymphatic vessels causing swelling and thickening of body parts, especially legs.

$$\Rightarrow \boxed{\text{Correct answer: (A) Elephantiasis}}$$

**Quick Tip**

Elephantiasis = Filarial worms + Lymph blockage + Mosquito vector.

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**8. In plants, which one of the following helps in the absorption of phosphorus from soil?**

(A) *Glomus*

(B) *Rhizobium*

(C) *Frankia*

(D) *Anabaena*

**Correct Answer:** (A) *Glomus*

**Solution:**

Step 1: *Glomus* is a genus of arbuscular mycorrhizal (AM) fungi.

Step 2: These fungi form symbiotic associations with the roots of higher plants.

Step 3: They help in the absorption of **phosphorus** and other minerals from the soil.

Step 4: *Rhizobium*, *Frankia*, and *Anabaena* are nitrogen-fixing organisms.

$$\Rightarrow \boxed{\text{Correct answer: (A) Glomus}}$$

**Quick Tip**

Mycorrhiza = Phosphorus absorption; Rhizobium = Nitrogen fixation in legumes.

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**9. The most primitive ancestor of humans is:**

(A) *Homo habilis*

(B) *Australopithecus*

(C) *Ramapithecus*

(D) *Homo neanderthalensis*

**Correct Answer:** (C) *Ramapithecus*

**Solution:**

Step 1: *Ramapithecus* is considered one of the earliest ancestors in the human evolutionary tree.

Step 2: It lived around 12–14 million years ago.

Step 3: Fossils show primitive jaw and teeth structure similar to hominids.

Step 4: It predates *Australopithecus* and *Homo habilis*.

$$\Rightarrow \boxed{\text{Correct answer: (C) Ramapithecus}}$$

Quick Tip

Human evolution starts with Ramapithecus → Australopithecus → Homo habilis → Homo erectus → Homo sapiens.

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**10. The sequence that controls the copy number of linked DNA in the vector is termed:**

(A) Selectable marker

(B) Ori site

(C) Palindromic sequence

(D) Recognition site

**Correct Answer:** (B) Ori site

**Solution:**

Step 1: Ori (origin of replication) is a DNA sequence where replication starts.

Step 2: In genetic engineering, Ori determines how many copies of the inserted DNA will be made inside the host cell.

Step 3: Selectable marker identifies transformed cells, not replication.

$$\Rightarrow \boxed{\text{Correct answer: (B) Ori site}}$$

Quick Tip

Ori = Copy number control; Marker = Selection; Recognition = Cutting.

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**11. Crystals of Bt toxin produced by some bacteria do not kill the bacteria producing them because:**

(A) Bacteria are resistant to the toxin

(B) Toxin is immature

(C) Toxin is inactive

(D) Bacteria encloses 'toxin' in a special capsule

**Correct Answer:** (C) Toxin is inactive

**Solution:**

Step 1: *Bacillus thuringiensis* produces a crystalline protein toxin called Bt toxin.

Step 2: The toxin is produced in an inactive form called protoxin.

Step 3: It becomes active only in the alkaline pH of the insect gut.

Step 4: Since the bacteria's own cytoplasm doesn't activate the toxin, it is not harmed.

$\Rightarrow$ Correct answer: (C) Toxin is inactive

**Quick Tip**

Bt toxin becomes active only in alkaline pH, which is found in insect guts, not inside bacteria.

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**12. The population interaction where one species is harmed and the other is unaffected is:**

(A) Amensalism

(B) Commensalism

(C) Parasitism

(D) Predation

**Correct Answer:** (A) Amensalism

**Solution:**

Step 1: In amensalism, one species is inhibited or harmed while the other remains unaffected.

Step 2: A classic example is Penicillium secreting penicillin that inhibits bacterial growth.

Step 3: The fungus remains unaffected while the bacteria is harmed.

$\Rightarrow$ Correct answer: (A) Amensalism

**Quick Tip**

Amensalism = 0 / –, Commensalism = + / 0, Parasitism = + / –, Predation = + / –.

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**13. Assertion (A):** Periodic abstinence is a method in which couples avoid coitus from day 10 to 17 of menstrual cycle.

**Reason (R):** Periodic abstinence has limited effectiveness because menstrual cycles are not always regular.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

**Correct Answer:** (A)

**Solution:**

Step 1: Periodic abstinence is a natural method of birth control where couples avoid intercourse during the fertile window (days 10 to 17).

Step 2: This period is considered the ovulation window when chances of conception are highest.

Step 3: However, this method is not fully reliable as menstrual cycles can vary and ovulation days may shift.

Step 4: Hence, both Assertion and Reason are true, and Reason correctly explains Assertion.

Quick Tip

Periodic abstinence is a safe but less reliable method due to irregular menstrual cycles.

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**14. Assertion (A):** *Streptococcus pneumoniae* and *Haemophilus influenzae* are responsible for causing infectious diseases in human beings.

**Reason (R):** A healthy person acquires the infection by inhaling the droplets/aerosols released by an infected person.

**Correct Answer:** (A)

**Solution:**

Step 1: Both *Streptococcus pneumoniae* and *Haemophilus influenzae* are known to cause pneumonia and other respiratory infections.

Step 2: These bacteria spread through droplets and aerosols from coughing or sneezing.

Step 3: Hence, both the assertion and reason are true, and the reason explains the assertion correctly.

Quick Tip

Airborne transmission is a key route for respiratory infections like pneumonia and flu.

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**15. Assertion (A):** Biotechnology produces transgenic micro-organisms that act as microfactories for proteins.

**Reason (R):** To produce proteins for human use like insulin, transgenic microorganisms can be developed.

**Correct Answer:** (A)

**Solution:**

Step 1: Transgenic microorganisms are genetically engineered to express foreign genes.

Step 2: These microbes act as miniature factories that produce proteins such as insulin, growth hormone, etc.

Step 3: Both assertion and reason are true and closely linked—reason supports assertion directly.

Quick Tip

Example: *E. coli* used in production of recombinant human insulin.

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**16. Assertion (A):** Gross primary productivity is always less than net primary productivity.

**Reason (R):** Rate of synthesis of organic matter by consumers is known as secondary productivity.

**Correct Answer:** (C) Assertion (A) is true, but Reason (R) is false.

**Solution:**

Step 1: Gross primary productivity (GPP) is the total energy fixed by autotrophs.

Step 2: Net primary productivity (NPP) = GPP - Respiration (R). So, NPP is always less than GPP.

Step 3: Reason talks about consumers, but Assertion is about producers.

Step 4: While Reason is a correct definition, it does not support or explain the Assertion—it refers to a different concept.

$\Rightarrow$ Assertion is true, but Reason is unrelated. $\Rightarrow$ Correct answer: (C)

**Quick Tip**

Remember: GPP ¿ NPP and secondary productivity refers to consumers, not producers.

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**17. The mosquito-borne disease in humans causing chronic inflammation of the lymphatic vessels is:**

(A) Elephantiasis

(B) Ascariasis

(C) Ringworm

(D) Amoebiasis

**Correct Answer:** (A) Elephantiasis

**Solution:**

Elephantiasis is a disease caused by filarial worms like *Wuchereria bancrofti*, which are transmitted by mosquitoes.

These worms reside in the lymphatic system and cause chronic inflammation leading to enlargement of body parts, especially the legs.

Thus, it is a mosquito-borne disease that affects the lymphatic vessels.

**Quick Tip**

Diseases caused by vector-borne parasitic worms often affect specific organ systems like lymphatic or digestive—identify based on symptoms.

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**18. In which of the following plants are both male and female flowers born on the same plant and the mode of pollination can be geitonogamy or xenogamy?**

(A) Papaya

(B) Date Palm

(C) Maize

(D) Spinach

**Correct Answer:** (C) Maize

**Solution:**

In maize, both male (tassel) and female (ear) flowers are found on the same plant — making it monoecious.

Pollination can occur between flowers of the same plant (geitonogamy) or between different plants (xenogamy).

Therefore, maize fits the criteria given.

**Quick Tip**

Monoecious plants like maize can exhibit both self-pollination (geitonogamy) and cross-pollination (xenogamy).

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**19. Which one of the following hormones is secreted by the human placenta that helps in the maintenance of pregnancy?**

(A) Relaxin

(B) Human Chorionic Gonadotropin

(C) Oxytocin

(D) Human Placental Lactogen

**Correct Answer:** (D) Human Placental Lactogen

**Solution:**

Human Placental Lactogen (hPL) is secreted by the placenta and plays an important role in maintaining pregnancy.

It helps in preparing the mammary glands for lactation and modifies the metabolic state of the mother to support fetal growth.

**Quick Tip**

hPL is also called human chorionic somatomammotropin — remember it supports both mother and fetus.

**20. The periodic abstinence by a couple for family planning should be from:**

(A) Day 5 to 10 of menstrual cycle

(B) Day 13 to 15 of menstrual cycle

(C) Day 10 to 17 of menstrual cycle

(D) Day 16 to 20 of menstrual cycle

**Correct Answer:** (C) Day 10 to 17 of menstrual cycle

**Solution:**

Ovulation typically occurs around day 14 of a 28-day cycle.

The fertile window spans a few days before and after ovulation, i.e., roughly days 10 to 17.

Avoiding intercourse during this period is known as periodic abstinence, a natural method of contraception.

Quick Tip

The fertile period is calculated around ovulation — periodic abstinence relies on understanding the menstrual calendar.

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**21.** Select the *incorrect* match from the following:

(A) 45 + XX — Broad palm with characteristic palm crease

(B) 44 + XXY — Overall feminine development

(C) 44 + XO — Sterile females as ovaries are rudimentary

(D) 44 + XY — Normal male

**Correct Answer:** (A) 45 + XX — Broad palm with characteristic palm crease

**Solution:**

Let's analyze the human karyotype and character combinations one by one:

**(A) 45 + XX** indicates a missing chromosome but shows a normal female sex chromosome pattern (XX).

However, the total chromosome number 45 (instead of the normal 46) does not typically describe any known syndrome with the given symptom — *broad palm with characteristic palm crease*.

This symptom is typically associated with Down syndrome, which has the karyotype 47 + XY or 47 + XX (trisomy 21), not 45 + XX.

Hence, this match is **incorrect**.

**(B) 44 + XXY** refers to Klinefelter syndrome, which indeed presents overall feminine development due to the presence of an extra X chromosome in a genetically male individual.

**(C) 44 + XO** is Turner syndrome, a condition where females are sterile due to rudimentary ovaries. This is a correct match.

**(D) 44 + XY** is the normal male karyotype (autosomes 44 + XY sex chromosomes), hence correct.

**Quick Tip**

Down syndrome involves an extra chromosome 21 (47 chromosomes), not 45. A total of 45 chromosomes with XX doesn't indicate Down syndrome traits. Always match chromosome count with phenotype clues.

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**22.** You know that there are twenty different types of naturally occurring amino acids and four different types of bases in the DNA. A combination of 3 such bases code for a specific amino acid. If instead there are 96 different amino acids and 12 different bases in the DNA, then the minimum number of combination of bases required to form a codon is:

(A) 6

(B) 8

(C) 2

(D) 4

**Correct Answer:** (D) 4

**Solution:**

We are given:

Number of amino acids = 96

Number of DNA bases = 12

We need minimum number of bases per codon, i.e., smallest value of $x$ such that:

$$12^x \geq 96$$

**Trial:**

$12^1 = 12$

$12^2 = 144$

So, $x = 2 \Rightarrow 144 \geq 96$

Thus, using **2 bases**, we can get 144 codons, which is sufficient.

But the question asks for the **minimum number of combinations of bases** required — i.e., not number of bases per codon, but **minimum codon length (x)**.

Let's test smaller values:

$$12^1 = 12 < 96$$

$12^2 = 144 > 96$

So, **2 bases per codon** are enough, hence the codon length is 2. But since the options given are mismatched, and the question might have misworded "number of combinations" instead of "number of bases," we consider the actual requirement:

We are looking for the smallest $x$ such that:

$$12^x \geq 96 \Rightarrow x = 2 \text{ is sufficient}$$

**However,** the correct interpretation based on options provided is:

Find smallest $x$ such that $12^x \geq 96 \Rightarrow x = 2$

**Therefore, correct codon length = 2 bases  Answer = (C)**

**Quick Tip**

Codon combinations follow the formula $n^r$, where $n$ is the number of bases and $r$ is the number of bases per codon. Calculate the smallest $r$ such that $n^r$  number of amino acids.

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**23.** The type of bond represented by the dotted line '——' in a schematic polynucleotide chain is:

(A) Hydrogen bond

(B) Peptide bond

(C) N-glycosidic linkage

(D) Phosphodiester bond

**Correct Answer:** (C) N-glycosidic linkage

**Solution:**

In a polynucleotide structure, each nucleotide consists of a phosphate group (P), a sugar (S), and a nitrogenous base (B).

The dotted line in the figure represents the connection between the sugar (S) and the base (B). This bond is known as the **N-glycosidic linkage**, which connects the 1' carbon of sugar to the nitrogen atom of the base.

Let's briefly compare with other options:

- **Hydrogen bond** – forms between complementary nitrogen bases of two DNA strands.
- **Peptide bond** – links amino acids in proteins.
- **Phosphodiester bond** – links the phosphate of one nucleotide to the sugar of another nucleotide (in the DNA backbone).

Since the question highlights the bond between sugar and base, the answer is **N-glycosidic linkage**.

Quick Tip

Sugar and base are connected via N-glycosidic linkage; phosphate-sugar backbone is formed via phosphodiester bonds.

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**24.** In which of the following conditions/diseases is there a substantial increase in the activity of mast cells observed in the human body?

(A) Typhoid

(B) Allergy

(C) Ascariasis

(D) AIDS

**Correct Answer:** (B) Allergy

**Solution:**

Mast cells are immune cells found in connective tissues and play a critical role in allergic reactions.

They contain granules rich in histamine and other chemicals.

During allergic responses, allergens bind to IgE antibodies on mast cells, causing them to degranulate and release histamine.

This leads to symptoms like sneezing, itching, swelling, and mucous secretion.

Other options:

- Typhoid is a bacterial infection caused by *Salmonella typhi*; mast cells are not directly involved.

- Ascariasis is caused by a parasitic roundworm (*Ascaris lumbricoides*) and may activate eosinophils rather than mast cells.

- AIDS is caused by HIV which destroys helper T-cells, not primarily involving mast cells.

**Quick Tip**

Mast cells are key players in allergic reactions, releasing histamine upon allergen exposure.

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**25.** *Lactobacillus* that sets milk into curd is categorised as:

(A) Cyanobacteria

(B) Archaebacteria

(C) Chemosynthetic bacteria

(D) Heterotrophic bacteria

**Correct Answer:** (D) Heterotrophic bacteria

**Solution:**

*Lactobacillus* is a genus of bacteria that plays a major role in the curdling of milk by converting lactose (milk sugar) into lactic acid.

These bacteria are dependent on external organic substances for nutrition, making them heterotrophic.

Let's eliminate other options:

- **Cyanobacteria** are autotrophic and photosynthetic, not involved in curd formation.

- **Archaebacteria** are ancient extremophiles found in harsh conditions like hot springs, not in curd.
- **Chemosynthetic bacteria** obtain energy from inorganic chemical reactions, not involved in dairy fermentation.

Hence, *Lactobacillus* is correctly classified as **heterotrophic bacteria**.

**Quick Tip**

Bacteria like *Lactobacillus* help in fermentation and curd formation by anaerobic breakdown of lactose — a heterotrophic process.

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**26.** Which one of the following transgenic animals is being used to test the safety of the polio vaccine?

(A) Sheep

(B) Goat

(C) Pig

(D) Mice

**Correct Answer:** (D) Mice

**Solution:**

Transgenic animals are those that have had a foreign gene deliberately inserted into their genome.

Transgenic **mice** are widely used for testing the safety of vaccines, including the polio vaccine.

These mice help assess the toxicity and immunogenicity of a vaccine before it's used in humans.

Other animals like sheep and goats may be used for producing recombinant proteins, but not for vaccine safety testing.

**Quick Tip**

Transgenic mice are preferred for vaccine testing due to their genetic manipulability and physiological similarity in immune response.

**27.** Restriction Endonuclease – Hind II always cuts DNA molecules at a particular point by recognising a specific sequence of:

(A) Six base pairs

(B) Four base pairs

(C) Seven base pairs

(D) Three base pairs

**Correct Answer:** (A) Six base pairs

**Solution:**

Restriction endonucleases are enzymes that cut DNA at specific recognition sites.

Hind II was the first restriction enzyme discovered that cuts DNA at a specific recognition sequence.

It recognizes a sequence of exactly **six base pairs** and cuts DNA at that site.

Hence, the correct answer is six base pairs.

Quick Tip

Most restriction enzymes recognize palindromic sequences of 4–8 base pairs; Hind II specifically recognizes 6 bp.

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**28.** Which scientist proposed that ”embryo never pass through the adult stages of other animals”?

(A) Alfred Wallace

(B) Thomas Malthus

(C) Karl Ernst von Baer

(D) Ernst Haeckel

**Correct Answer:** (C) Karl Ernst von Baer

**Solution:**

Karl Ernst von Baer, a pioneer in embryology, formulated **Baer's Law**.

He proposed that the embryo of a species does not pass through the adult stages of other species, contradicting Haeckel's theory of recapitulation.

Baer emphasized that embryos of different species resemble each other in early development but diverge as they grow.

**Quick Tip**

Von Baer's Law opposes the outdated "ontogeny recapitulates phylogeny" theory by Haeckel.

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**29.** The flows of genetic information in central dogma are in which direction?

(A) Protein $\rightarrow$ RNA $\rightarrow$ DNA

(B) RNA $\rightarrow$ DNA $\rightarrow$ Protein

(C) DNA $\rightarrow$ Protein $\rightarrow$ RNA

(D) DNA $\rightarrow$ RNA $\rightarrow$ Protein

**Correct Answer:** (D) DNA $\rightarrow$ RNA $\rightarrow$ Protein

**Solution:**

The **Central Dogma** of molecular biology explains the flow of genetic information within a biological system.

It was proposed by **Francis Crick** and follows this sequence:

$$\text{DNA} \xrightarrow{\text{Transcription}} \text{RNA} \xrightarrow{\text{Translation}} \text{Protein}$$

- DNA is transcribed to form mRNA.

- mRNA is translated into a polypeptide chain (protein).

This is the universal pathway of gene expression in most organisms.

**Quick Tip**

Central dogma = DNA $\rightarrow$ RNA $\rightarrow$ Protein. Reverse transcription (RNA $\rightarrow$ DNA) occurs in retroviruses, but is not the standard pathway.

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**30.** Which scientist proposed that "embryo never pass through the adult stages of other animals"?

(A) Alfred Wallace

(B) Thomas Malthus

(C) Karl Ernst von Baer

(D) Ernst Haeckel

**Correct Answer:** (C) Karl Ernst von Baer

**Solution:**

Karl Ernst von Baer, a German scientist, proposed that:

**"The embryo of a higher form never resembles any other form, but only its own embryonic form."**

This was in direct contradiction to Ernst Haeckel's idea of "ontogeny recapitulates phylogeny."

Von Baer's laws emphasize that embryos develop from general to specific features and never pass through the adult forms of other species.

Quick Tip

Von Baer's laws laid the foundation of modern embryology by stating that embryonic stages are unique to each species.

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**31.** They are useful to get rid of aphids.

(A) Lady bird

(B) Baculovirus

(C) Dragonfly

(D) Trichoderma

**Correct Answer:** (A) Lady bird

**Solution:**

Lady birds (ladybugs) are beneficial insects that prey on aphids, which are crop-damaging pests.

They are widely used in biological control programs in agriculture.

Other options:

- **Baculovirus**: used to control insect pests, especially caterpillars, not aphids.

- **Dragonfly**: predates mosquitoes and small insects, but not specialized for aphids.

- **Trichoderma**: a fungal biocontrol agent, useful against plant pathogens but not aphids.

Quick Tip

Lady bird beetles (Coccinellidae) are natural enemies of aphids and are used in pest management.

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**32.** What is the correct name of AI technique in assisted reproductive technologies?

(A) Artificial Injection

(B) Assisted Insemination

(C) Artificial Insemination

(D) Artificial Intelligence

**Correct Answer:** (C) Artificial Insemination

**Solution:**

In assisted reproductive technology (ART), **Artificial Insemination (AI)** refers to the technique of introducing sperm into the reproductive tract of a female by artificial means. It is commonly used in both humans and animal husbandry for fertility treatments.

Quick Tip

AI in reproduction refers to Artificial Insemination, not Artificial Intelligence.

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**33.** Genes which control $\alpha$-Thalassemia and $\beta$-Thalassemia are present on which number of chromosomes?

(A) On 16 & on 21

(B) On 21 & on 11

(C) On 16 & on 11

(D) On 11 & on 16

**Correct Answer:** (C) On 16 & on 11

**Solution:**

- $\alpha$-Thalassemia is caused by mutations/deletions in genes located on chromosome **16**.
- $\beta$-Thalassemia is caused by mutations in the $\beta$-globin gene located on chromosome **11**.

Therefore, both 16 and 11 are involved in respective forms of thalassemia.

**Quick Tip**

Remember: $\alpha$ = Chromosome 16, $\beta$ = Chromosome 11 in thalassemia genetics.

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**34.** Distance between two consecutive base pairs of DNA is _____

(A) 34 nm

(B) 0.34 nm

(C) $0.34 \times 10^{-9}$ m

(D) both B & C

**Correct Answer:** (D) both B & C

**Solution:**

In the DNA double helix, the distance between two consecutive base pairs is approximately **0.34 nanometers (nm)**.

This is equal to $0.34 \times 10^{-9}$ m.

Hence, both options (B) and (C) are correct.

**Quick Tip**

DNA has 10 base pairs per helical turn, spanning 3.4 nm, so each base pair is 0.34 nm apart.

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**35.** In a family tree of dinosaurs, which dinosaur was about 20 feet in height & had huge fearsome dagger-like teeth?

(A) Triceratops

(B) Tyrannosaurus

(C) Pteranodon

(D) Stegosaurus

**Correct Answer:** (B) Tyrannosaurus

**Solution:**

The **Tyrannosaurus rex (T. rex)** was a large carnivorous dinosaur known for its massive

size (up to 20 feet tall) and fearsome dagger-like teeth.

It was a top predator in its ecosystem.

Other options:

- **Triceratops** – herbivorous with three horns.

- **Pteranodon** – flying reptile, not a dinosaur.

- **Stegosaurus** – herbivore with bony plates.

Quick Tip

Tyrannosaurus was a bipedal predator known for its size, strength, and sharp teeth.

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**36.** If a person is positive in Widal test, then that person is infected by which pathogen?

(A) Streptococcus pneumoniae

(B) Plasmodium falciparum

(C) Salmonella typhi

(D) Entamoeba histolytica

**Correct Answer:** (C) Salmonella typhi

**Solution:**

The **Widal test** is a serological test used to detect the presence of antibodies against **Salmonella typhi**, the causative agent of typhoid fever.

Hence, a positive Widal test indicates infection with **typhoid**.

Quick Tip

Widal test = Typhoid = Salmonella typhi. It's a classic diagnostic test for enteric fever.

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**37.** Which chemical is obtained from microorganism *Aspergillus niger*?

(A) Lactic acid

(B) Acetic acid

(C) Butyric acid

(D) Citric acid

**Correct Answer:** (D) Citric acid

**Solution:**

**Aspergillus niger** is a fungus widely used in the industrial production of **citric acid**.

Citric acid is used in food preservation, pharmaceuticals, and beverages.

Other acids:

- **Lactic acid** – produced by *Lactobacillus*.

- **Acetic acid** – by *Acetobacter*.

- **Butyric acid** – by anaerobic bacteria like *Clostridium*.

Quick Tip

Citric acid production = Aspergillus niger. It's the most common commercial method.

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**38.** The first r-DNA was constructed in which microorganism?

(A) *E. coli*

(B) *Salmonella typhimurium*

(C) *Vibrio cholera*

(D) *Staphylococci*

**Correct Answer:** (A) *E. coli*

**Solution:**

The first recombinant DNA (r-DNA) was constructed in the bacterium ***Escherichia coli (E. coli)*** in 1972 by Paul Berg.

It was a significant step in genetic engineering and molecular biology.

Quick Tip

*E. coli* is a model organism used extensively in recombinant DNA technology due to its simple genetics and fast growth.

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**39.** Who proposed the competitive exclusion principle?

(A) G. F. Gause

(B) Von Humboldt

(C) Mac Arthur

(D) Verhulst - pearl

**Correct Answer:** (A) G. F. Gause

**Solution:**

G.F. Gause proposed the **competitive exclusion principle**, also known as *Gause's Law*.

It states that two species competing for the same limiting resources cannot coexist at constant population values. One will outcompete the other.

Quick Tip

Gause's experiment with *Paramecium* species demonstrated that no two species can occupy the same niche indefinitely.

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**40.** How many billion tons productivity of oceans?

(A) 55

(B) 70

(C) 155

(D) 170

**Correct Answer:** (A) 55

**Solution:**

The ocean's net primary productivity is approximately **55 billion tons (gigatons)** of organic matter annually.

Though oceans cover  70

Quick Tip

Despite low productivity per unit area, oceans contribute significantly due to their vast expanse — about 55 billion tons.

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**41.** How many number of biodiversity hotspots in the world right now?

(A) 9

(B) 14

(C) 25

(D) 34

**Correct Answer:** (D) 34

**Solution:**

According to Conservation International, there are currently **34 biodiversity hotspots** in the world.

These are regions with exceptional levels of species richness and endemism but are threatened by human activities.

Quick Tip

To qualify as a biodiversity hotspot, a region must have at least 1,500 endemic vascular plants and 70

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**42.** Assertion (A): Apple is false fruit.

Reason (R): Thalamus also contributes to fruit formation in apple.

(A) A & R both are correct. R is correct explanation of A.

(B) A is correct & R is wrong.

(C) A & R both are correct. R is not correct explanation of A.

(D) A is wrong & R is correct.

**Correct Answer:** (A) A & R both are correct. R is correct explanation of A.

**Solution:**

A **false fruit** is one where some parts other than the ovary contribute to fruit formation.

In apple, the **thalamus (receptacle)** becomes fleshy and forms the major part of the fruit.

So both assertion and reason are correct, and the reason explains the assertion.

Quick Tip

True fruit: only ovary contributes. False fruit: other floral parts (e.g., thalamus in apple) contribute.

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**43.** Which one is not determined in the developing foetus by using amniocentesis?

(A) Sex determination of foetus

(B) Hepatitis

(C) Survivability of the foetus

(D) Haemophilia

**Correct Answer:** (B) Hepatitis

**Solution:**

**Amniocentesis** is a prenatal diagnostic technique used to detect genetic disorders, sex of the fetus, and chromosomal abnormalities.

It cannot detect infections like hepatitis.

- (A), (C), and (D) are detectable via genetic screening.

- (B) Hepatitis is a viral infection — not diagnosable through amniotic fluid analysis.

**Quick Tip**

Amniocentesis analyzes fetal cells and DNA — not viral or bacterial infections like hepatitis.

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**44.** If a colour-blind woman marries a person whose mother is colour-blind, then what is the probability of colour blindness in their offspring?

(A) 50%

(B) 100%

(C) 25%

(D) 75%

**Correct Answer:** (B) 100%

**Solution:**

Colour blindness is an X-linked recessive trait.

- Colour-blind woman: $\mathbf{X^cX^c}$

- Husband: Son of a colour-blind mother must be $\mathbf{X^cY}$ (colour-blind male)

Cross: $\mathbf{X^cX^c \times X^cY}$

Offspring:

- Females: $X^cX^c$ (colour-blind), $X^cX^c$ (colour-blind)

- Males: $X^cY$ (colour-blind), $X^cY$ (colour-blind)

All offspring will be colour-blind **100%** probability.

**Quick Tip**

For X-linked recessive disorders, a homozygous recessive mother and affected male produce 100% affected children.

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