

## CUET Biology Question Paper 2024 Set B with Solutions

1. The beetle used as a biocontrol agent for aphids and mosquitoes is:

- (1) *Trichoderma*
- (2) Dragonflies
- (3) Ladybird
- (4) Silver fish

**Answer: (3) Ladybird**

**Solution:**

Ladybird beetles are commonly used as biocontrol agents to control aphid populations, as they are natural predators of aphids and other insect pests.

**Quick Tip**

Ladybirds are often used in organic farming for pest control, especially against aphids.

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2. Downstream processing method involves:

- (1) Identification

- (2) Amplification
- (3) Fermentation
- (4) Purification

**Answer: (4) Purification**

**Solution:**

Downstream processing in biotechnology refers to the recovery and purification of biosynthetic products, particularly pharmaceuticals, from natural sources such as animal or plant tissue or fermentation broth.

**Quick Tip**

Downstream processing focuses on the purification of biotechnological products.

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**3. Smack is chemically:**

- (1) Diacetyl morphine
- (2) Cocaine
- (3) Benzodiazepine
- (4) Amphetamine

**Answer: (1) Diacetyl morphine**

**Solution:**

Smack, also known as heroin, is chemically diacetylmorphine, an opioid drug used for its analgesic and euphoric effects.

**Quick Tip**

Diacetylmorphine is a synthetic derivative of morphine, commonly known as heroin.

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**4. Antibiotics are secreted by:**

- (1) T-Cells
- (2) B-Cells
- (3)  $\alpha$ -Cells
- (4)  $\beta$ -Cells

**Answer: (2) B-Cells**

**Solution:**

B-Cells are a type of white blood cell that plays a vital role in the immune response by producing antibodies that neutralize pathogens like bacteria and viruses.

**Quick Tip**

B-Cells are responsible for the production of antibodies in the immune system.

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**5. In sewage treatment, flocs are:**

- (1) The solids that settle during sedimentation.
- (2) The supernatant that is formed above the primary sludge.
- (3) The masses of bacteria associated with fungal filaments.
- (4) The bacteria which grow anaerobically and are also called anaerobic sludge di-

gesters.

**Answer: (1) The solids that settle during sedimentation.**

**Solution:**

In sewage treatment, flocs refer to the settling of solids during the sedimentation process, forming the primary sludge.

**Quick Tip**

Primary sludge is formed by the settling of solids during sewage treatment sedimentation.

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**6. Match List-I with List-II:**

<b>List-I (Products)</b>	<b>List-II (Organisms)</b>
(A) Statin	(I) <i>Streptococcus</i>
(B) Clot buster	(II) <i>Trichoderma</i>
(C) Swiss cheese	(III) <i>Monascus</i>
(D) Cyclosporin-A	(IV) <i>Propionibacterium</i>

**Choose the correct answer from the options given below:**

- (1) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)
- (2) (A) - (II), (B) - (IV), (C) - (III), (D) - (I)
- (3) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
- (4) (A) - (IV), (B) - (I), (C) - (II), (D) - (III)

**Answer:** (1) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

**Solution:**

(A) Statin is produced by *Monascus*, (B) clot buster is produced by *Streptococcus*, (C) Swiss cheese is made using *Propionibacterium*, and (D) Cyclosporin-A is produced by *Trichoderma*.

**Quick Tip**

Know the products and organisms associated with biotechnology applications in medicine and food.

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**7. Which of the following is *not* the correctly matched pair of organism and its respective cell wall degrading enzyme?**

- (1) Fungi – Chitinase
- (2) Algae – Methylase
- (3) Plant cells – Cellulase
- (4) Bacteria – Lysozyme

**Answer:** (2) Algae – Methylase

**Solution:**

Methylase is not an enzyme involved in the degradation of algal cell walls. Algal cell walls are degraded by enzymes like cellulases or agarases, depending on the specific algae.

### Quick Tip

Algal cell walls are primarily degraded by enzymes like cellulase or agarase, not methylase.

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**8. Arrange the following steps involved in transformation of bacteria in a sequence from initiation to end:**

- (A) Incubation of rDNA with bacterial cells on ice
- (B) Treatment with divalent cations
- (C) Heat shock treatment
- (D) Selection on antibiotic containing agar plate
- (E) Placed them again on ice

**Choose the correct answer from the options given below:**

- (1) (A), (B), (D), (C), (E)
- (2) (B), (A), (C), (E), (D)
- (3) (B), (C), (D), (A), (E)
- (4) (A), (C), (B), (D), (E)

**Answer: (2) (B), (A), (C), (E), (D)**

### Solution:

The steps in bacterial transformation include: (B) treatment with divalent cations, (A) incubation of rDNA with bacterial cells on ice, (C) heat shock, (E) placed back on ice, and (D) selection on an antibiotic-containing agar plate.

### Quick Tip

Bacterial transformation often involves cation treatment followed by heat shock to facilitate DNA uptake.

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**9. Which of the following statements are *incorrect*?**

- (A) Fragments of DNA can be separated by ELISA.
- (B) Transformation is a procedure through which a piece of DNA is introduced in a host bacterium.
- (C) Recombinant DNA technology does not involve isolation of a desired DNA fragment.
- (D) DNA ligases are used for stitching DNA fragments into a vector.

**Choose the answer from the options given below:**

- (1) (A) and (C) only
- (2) (A) and (B) only
- (3) (B) and (C) only
- (4) (A), (C) and (D) only

**Answer: (1) (A) and (C) only**

**Solution:**

Fragments of DNA are not separated by ELISA but by techniques like gel electrophoresis. Recombinant DNA technology involves isolating a desired DNA fragment, making statement (C) incorrect as well.

**Quick Tip**

ELISA is used for detecting and quantifying proteins, not separating DNA fragments.

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**10. Which of the following statements are *true*?**

- (A) Milk obtained from 'Rosie' is nutritionally more balanced for human babies than natural human milk.
- (B) Biopiracy refers to the use of bioresources without proper authorisation from MNCs.
- (C) GEAC is the decisive body for safety and validity of GMOs and GM research respectively.
- (D) Transgenic animals help us to understand the contribution of genes in the development of disease.

**Choose the correct answer from the options given below:**

- (1) (A), (B), and (C) only
- (2) (B), (C), and (D) only
- (3) (A), (C), and (D) only
- (4) (A), (B), and (D) only

**Answer: (2) (B), (C), and (D) only**

**Solution:**

Statements (B), (C), and (D) are correct. Biopiracy refers to the use of bioresources without proper authorization, GEAC regulates GMOs in India, and transgenic animals are used to understand disease gene contributions.

**Quick Tip**

GEAC regulates GMOs in India, and transgenic animals play a crucial role in studying genetic diseases.

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**11. Match List-I with List-II:**

List-I (Transgene)	List-II (Used for/Products)
(A) $\alpha$ -1-antitrypsin	(I) <i>Meloidogyne incognitia</i>
(B) <i>cry1Ac</i>	(II) Corn borer
(C) Antisense RNA	(III) Treat emphysema
(D) <i>cry1Ab</i>	(IV) Cotton bollworms

**Choose the correct answer from the options given below:**

- (1) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
- (2) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
- (3) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)
- (4) (A) - (I), (B) - (IV), (C) - (III), (D) - (II)

**Answer:** (1) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

**Solution:**

(A)  $\alpha$ -1-antitrypsin is used to treat emphysema, (B) *cry1Ac* is used for cotton bollworms, (C) antisense RNA is used for *Meloidogyne incognitia*, and (D) *cry1Ab* is used for corn borer.

#### Quick Tip

Transgenic crops often contain genes like *cry* genes to confer resistance to specific pests, such as cotton bollworms and corn borers.

## 12. Expand "GEAC":

- (1) Genetic and Environmental Advisory Committee
- (2) Gene Establishment Approval Committee
- (3) Genetic Engineering Advisory Committee

(4) Genetic Engineering Approval Committee

**Answer: (4) Genetic Engineering Approval Committee**

**Solution:**

GEAC stands for Genetic Engineering Approval Committee, which is the authority in India for the approval and monitoring of genetically modified organisms (GMOs).

**Quick Tip**

GEAC is responsible for ensuring the safety and legality of GMOs in India.

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**13. When an insect feeds on the Bt plant, the insect dies due to the conversion of inactive protein to active protein in:**

- (1) Alkaline pH of the gut
- (2) Acidic pH of the gut
- (3) Acidic pH of saliva
- (4) Alkaline pH of saliva

**Answer: (1) Alkaline pH of the gut**

**Solution:**

In Bt crops, the Cry protein is ingested by insects, and in the alkaline environment of their gut, the inactive protein is converted into an active form, which causes cell lysis, leading to the death of the insect.

**Quick Tip**

Bt crops are genetically engineered to produce the Cry protein, which activates in the insect's gut under alkaline conditions.

**14. Match List-I with List-II:**

<b>List-I (Interspecies Relationships)</b>	<b>List-II (Features)</b>
(A) Commensalism	(I) One species is benefitted at the expense of the other
(B) Mutualism	(II) One species is harmed and the other is unaffected
(C) Amensalism	(III) Both species are benefitted
(D) Parasitism	(IV) One species benefits and other remains unaffected

**Choose the correct answer from the options given below:**

- (1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
- (2) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
- (3) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
- (4) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

**Answer: (2) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)**

**Solution:**

(A) Commensalism means one species benefits and the other remains unaffected. (B) Mutualism involves both species benefiting. (C) Amensalism is when one species is harmed and the other is unaffected. (D) Parasitism is when one species benefits at the expense of the other.

**Quick Tip**

Understand the different interspecies relationships, as they explain how organisms interact in ecosystems.

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**15. In a country, at any time, the population has the same number of young and mature ones. What type of growth does it reflect?**

- (1) Expanding
- (2) Declining
- (3) Stable
- (4) S-shaped

**Answer: (3) Stable**

**Solution:**

When a population has equal numbers of young and mature individuals, it is in a stable growth phase, meaning there is no significant increase or decrease in population size.

**Quick Tip**

A stable population indicates a balanced birth and death rate, often seen in well-developed countries.

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**16. Two closely related species can co-exist indefinitely and violate the Gause's '*Competitive Exclusion Principle*' by:**

- (1) Eliminating the inferior species.
- (2) Resource partitioning.
- (3) Interacting with each other symbiotically.
- (4) Changing the area of grazing.

**Answer: (2) Resource partitioning**

**Solution:**

Resource partitioning allows two species to coexist by utilizing different resources or different aspects of the same resource, thus avoiding direct competition.

**Quick Tip**

Species can avoid competition and coexist through resource partitioning.

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**17. The process of mineralisation by microorganisms helps in the release of:**

- (1) Inorganic nutrients from detritus and formation of humus.
- (2) Organic nutrients from humus.
- (3) Inorganic nutrients from humus.
- (4) Organic and inorganic nutrients from detritus.

**Answer: (1) Inorganic nutrients from detritus and formation of humus**

**Solution:**

Mineralisation is the process by which microorganisms break down organic matter in detritus and release inorganic nutrients, contributing to soil fertility.

### Quick Tip

Mineralisation plays a crucial role in nutrient cycling, making inorganic nutrients available to plants.

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**18. In which ecosystem is the biomass of primary consumers greater than producers?**

- (1) Forests
- (2) Grassland
- (3) Desert
- (4) Sea

**Answer: (4) Sea**

### **Solution:**

In marine ecosystems, the biomass of primary consumers (such as zooplankton) often exceeds the biomass of producers (such as phytoplankton) because primary consumers reproduce and grow faster.

### Quick Tip

In marine ecosystems, the fast reproduction rate of consumers can lead to a higher biomass compared to producers.

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**19. Choose the correct statements with respect to decomposition from the following:**

- (A) Decomposition is an anaerobic process.
- (B) Decomposition rate of detritus depends upon the chemical nature of it.
- (C) Water-soluble organic nutrients go into the soil and get precipitated in the process of leaching.
- (D) Humification follows mineralisation.

**Choose the correct answer from the options given below:**

- (1) (B) and (D) only
- (2) (A) and (C) only
- (3) (B) and (C) only
- (4) (A) and (D) only

**Answer: (1) (B) and (D) only**

**Solution:**

The rate of decomposition depends on the chemical composition of the detritus, and humification (formation of humus) follows mineralisation.

**Quick Tip**

Decomposition processes play a key role in nutrient cycling and soil fertility.

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**20. Match List-I with List-II:**

<b>List-I (Concepts)</b>	<b>List-II (Explanation)</b>
(A) Standing state	(I) Available biomass for the consumption of heterotrophs
(B) Secondary productivity	(II) Rate of formation of organic matter by consumers
(C) Standing crop	(III) Mass of living matter in a trophic level at a given time
(D) Net primary productivity	(IV) Amount of mineral nutrients in the soil at a given time

**Choose the correct answer from the options given below:**

- (1) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
- (2) (A) - (IV), (B) - (II), (C) - (III), (D) - (I)
- (3) (A) - (IV), (B) - (II), (C) - (I), (D) - (III)
- (4) (A) - (I), (B) - (IV), (C) - (III), (D) - (II)

**Answer: (2) (A) - (IV), (B) - (II), (C) - (III), (D) - (I)**

**Solution:**

(A) Standing state refers to the amount of mineral nutrients present in the soil, (B) secondary productivity is the rate at which consumers form organic matter, (C) standing crop is the mass of living organisms in a trophic level, and (D) net primary productivity is the biomass available for consumption by heterotrophs.

#### Quick Tip

Understanding concepts like standing state, productivity, and standing crop is essential for analyzing ecosystems.

**Read the passage carefully and give the answer to the next five questions:**

India was among the first countries in the world to initiate action plans and pro-

grammes at a national level to attain total reproductive health as a social goal. These programmes called 'family planning' were initiated in 1951 and were periodically assessed over the past decades. Improved programmes covering wider reproduction-related areas are currently in operation. Creating awareness among the people about various reproduction-related aspects and providing facilities and support for building up a reproductively healthy society are the major tasks under these programmes.

**21. Which of the following is *not* a Sexually Transmitted Disease?**

- (1) Chlamydia
- (2) Filariasis
- (3) Genital herpes
- (4) Trichomoniasis

**Answer: (2) Filariasis**

**Solution:**

Filariasis is a parasitic disease transmitted through mosquitoes and is not sexually transmitted. The other options listed are all sexually transmitted diseases.

**Quick Tip**

Filariasis is a mosquito-borne disease, while Chlamydia, herpes, and Trichomoniasis are all sexually transmitted infections.

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**22. Which of the following statements is *incorrect* with respect to Medical Termination of Pregnancy?**

- (1) They are considered safe during the first trimester.
- (2) It is legalised in India from 1971.

(3) MTPs can be performed even after 24 weeks, but with the opinion of 2 registered medical practitioners on specified grounds.

(4) About 20% of the total number of conceived pregnancies undergo MTP in a year globally.

**Answer: (4) About 20% of the total number of conceived pregnancies undergo MTP in a year globally.**

**Solution:**

The claim that about 20% of all conceived pregnancies undergo MTP globally is incorrect. The percentage is much lower. The other statements regarding MTP are correct.

**Quick Tip**

MTPs (Medical Termination of Pregnancy) are legal and considered safe during the first trimester, with legal guidelines established in 1971.

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**23. Match List-I with List-II:**

List-I (Various Assisted Reproductive Technologies)	List-II (Process Involved)
(A) ZIFT	(I) Formation of embryo <i>in vitro</i> by injecting sperm directly into ovum
(B) ICSI	(II) Transferring of embryo with more than 8 blastomeres into the uterus
(C) IUI	(III) Transferring of fertilised egg up to 8 blastomeres into fallopian tube
(D) IUT	(IV) Transfer of semen from a healthy donor into the uterus artificially

**Choose the correct answer from the options given below:**

- (1) (A) - (III), (B) - (I), (C) - (II), (D) - (IV)
- (2) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
- (3) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
- (4) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

**Answer: (1) (A) - (III), (B) - (I), (C) - (II), (D) - (IV)**

**Solution:**

(A) ZIFT is associated with transferring the fertilized egg with up to 8 blastomeres into the fallopian tube.

(B) ICSI involves forming an embryo *in vitro* by directly injecting sperm into an ovum.

(C) IUI is the process of transferring embryos with more than 8 blastomeres into the uterus.

(D) IUT involves the transfer of semen from a healthy donor into the uterus artificially.

### Quick Tip

Assisted reproductive technologies like ICSI, IUI, and ZIFT have different applications in fertility treatments.

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**24. Which of the following methods of contraception is *not* meant for females?**

- (1) IUDs
- (2) Lactational amenorrhea
- (3) Vasectomy
- (4) Condoms

**Answer: (3) Vasectomy**

### Solution:

A vasectomy is a male sterilization procedure and is not used as a contraceptive method for females. IUDs, lactational amenorrhea, and condoms are methods of contraception that can be used by females.

### Quick Tip

Vasectomy is a surgical procedure for male sterilization, whereas IUDs and lactational amenorrhea are contraceptive methods for females.

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**25. ‘Saheli’ – an oral contraceptive pill, also known as the ‘Once a week’ pill, was developed by:**

- (1) AIIMS
- (2) NBRI
- (3) CDRI
- (4) NBPGR

**Answer: (3) CDRI**

**Solution:**

The Central Drug Research Institute (CDRI) developed 'Saheli', a non-hormonal, once-a-week oral contraceptive pill.

**Quick Tip**

'Saheli' is a non-hormonal contraceptive developed by CDRI and is taken once a week.

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**Read the passage carefully and give the answers to the next five questions:**

Does the number of species in a community really matter to the functioning of the ecosystem? This is a question for which ecologists have not been able to give a definitive answer. For many decades, ecologists believed that communities with more species, generally, tend to be more stable than those with less species. According to the International Union for Conservation of Nature and Natural Resources (IUCN) (2004), the total number of plant and animal species described so far is more than 1.5 million.

**26. Which of the following is *not* a characteristic of a stable biological community?**

- (1) It must be resistant to invasions by alien species.
- (2) It should not show too much variation in productivity from year to year.
- (3) All the species are equally important in a stable community and absence of any one leads to its unsustainability.
- (4) It is resilient to occasional disturbances, whether natural or man-made.

**Answer: (3) All the species are equally important in a stable community and absence of any one leads to its unsustainability.**

**Solution:**

In a stable community, not all species are equally important for sustainability. Some species, such as keystone species, play a more significant role, and the loss of such species can lead to instability.

**Quick Tip**

Keystone species have a disproportionately large effect on their ecosystem relative to their abundance.

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**27. In 'rivet popper hypothesis' the 'rivet' signifies:**

- (1) Key species
- (2) Endemic species
- (3) Community
- (4) Species

**Answer: (1) Key species**

**Solution:**

In the 'rivet popper hypothesis', the 'rivet' represents key species, and the hypothesis compares species to rivets in an airplane, where the loss of key species could lead to the failure of the ecosystem.

**Quick Tip**

The 'rivet popper hypothesis' emphasizes the importance of key species in maintaining the integrity of ecosystems.

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**28. The scientist who proved that species richness directly correlates with the stability of a community, was:**

- (1) Paul Ehrlich
- (2) David Tilman
- (3) Robert May
- (4) Edward Wilson

**Answer: (2) David Tilman**

**Solution:**

David Tilman, an ecologist, demonstrated that ecosystems with higher species richness are more stable and resistant to disturbances.

**Quick Tip**

Species richness refers to the number of species in a community, and Tilman's research showed that higher species diversity leads to ecosystem stability.

**29. Among the vertebrates, which of the following is the most species-rich group?**

- (1) Reptiles
- (2) Fishes
- (3) Insects
- (4) Mammals

**Answer: (2) Fishes**

**Solution:**

Fishes represent the largest group of vertebrates in terms of species richness, with more species than any other group.

Quick Tip

Fishes have the highest number of species among all vertebrate groups.

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**30. The following are the various hypotheses proposed in explaining the greatest biological diversity in tropics *except*:**

- (1) Temperate regions are subjected to glaciations, but tropical latitudes have remained relatively undisturbed.
- (2) Tropical environments have more humidity/moisture which helps the diversity to flourish.
- (3) Tropical environments are less seasonal and more constant.
- (4) There is more solar energy available in the tropics which contributes to higher productivity and hence, biodiversity.

**Answer: (1) Temperate regions are subjected to glaciations, but tropical**

latitudes have remained relatively undisturbed.

**Solution:**

The statement about glaciation refers to temperate regions, not tropical regions, which have had a relatively stable climate, allowing them to support high biodiversity.

**Quick Tip**

Tropical regions have higher biodiversity due to factors like higher solar energy, humidity, and less seasonality.

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**31. Cells present in the mature pollen grains are:**

- (1) Central cell and generative cell
- (2) Antipodal cell and vegetative cell
- (3) Vegetative cell and generative cell
- (4) Filiform cell and micropylar cell

**Answer: (3) Vegetative cell and generative cell**

**Solution:**

Mature pollen grains contain two types of cells: a larger vegetative cell and a smaller generative cell, which divides to form two sperm cells.

**Quick Tip**

Pollen grains contain a vegetative cell responsible for pollen tube growth and a generative cell that divides to form sperm cells.

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**32. Match List-I with List-II:**

<b>List-I (Structures)</b>	<b>List-II (Functions)</b>
(A) Filiform apparatus	(I) Made up of sporopollenin
(B) Tapetum	(II) Attachment of ovule to the placenta
(C) Exine	(III) Guides pollen tube into the synergid
(D) Funicle	(IV) Nourishes the pollen grain

**Choose the correct answer from the options given below:**

- (1) (A) - (IV), (B) - (I), (C) - (III), (D) - (II)
- (2) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
- (3) (A) - (II), (B) - (I), (C) - (III), (D) - (IV)
- (4) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

**Answer: (2) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)**

**Solution:**

(A) Filiform apparatus helps in guiding the pollen tube, (B) tapetum nourishes the pollen grain, (C) exine is made up of sporopollenin, and (D) funicle connects the ovule to the placenta.

**Quick Tip**

Know the functions of different parts of the pollen grain, as these are important in reproduction in plants.

**33. Primary Endosperm Nucleus is the product of:**

- (1) Double fusion
- (2) Triple fusion
- (3) Parthenogenesis
- (4) Apomixis

**Answer: (2) Triple fusion**

**Solution:**

The primary endosperm nucleus is formed as a result of triple fusion, which involves the fusion of one sperm nucleus with two polar nuclei in the embryo sac.

**Quick Tip**

Triple fusion occurs during double fertilization in angiosperms, leading to the formation of the endosperm.

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**34. In humans, mammary gland is divided into \_\_\_\_\_ lobes.**

- (1) 10 – 12
- (2) 25 – 30
- (3) 30 – 35
- (4) 15 – 20

**Answer: (4) 15 – 20**

**Solution:**

The mammary glands in humans are composed of 15 to 20 lobes, each containing

clusters of alveoli that produce milk.

**Quick Tip**

Each lobe in the mammary gland has ducts that lead to the nipple and plays a role in milk secretion.

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**35. Sex in human embryo is determined by:**

- (1) 'X' chromosome of egg
- (2) 'X' or 'Y' chromosome of sperm
- (3) Only 'Y' chromosome of sperm
- (4) Health of mother

**Answer: (2) 'X' or 'Y' chromosome of sperm**

**Solution:**

The sex of the human embryo is determined by the sperm cell, which can carry either an 'X' or 'Y' chromosome. The egg always contributes an 'X' chromosome.

**Quick Tip**

Sperm cells determine the sex of the embryo because they carry either an X or a Y chromosome.

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**36. Arrange the following stages of oogenesis in order of their occurrence:**

- (A) Ovum

- (B) Oogonia
- (C) Primary oocyte
- (D) Secondary oocyte

**Choose the correct answer from the options given below:**

- (1) (C), (B), (D), (A)
- (2) (B), (C), (D), (A)
- (3) (D), (C), (A), (B)
- (4) (A), (D), (C), (B)

**Answer: (2) (B), (C), (D), (A)**

**Solution:**

The stages of oogenesis proceed as follows: Oogonia (germ cells) give rise to primary oocytes, which then become secondary oocytes. Finally, the ovum is formed after meiosis.

**Quick Tip**

Oogenesis starts with oogonia, proceeds to primary oocyte, then secondary oocyte, and finally forms the ovum.

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**37. Which of the following pair of contrasting traits was *not* studied by Mendel?**

- (1) Pink and white flowers
- (2) Inflated and constricted pods
- (3) Axial and terminal flowers
- (4) Green and yellow pods

**Answer: (1) Pink and white flowers**

**Solution:**

Mendel studied traits such as flower position, seed color, and pod shape, but he did not study pink and white flower colors.

**Quick Tip**

Mendel's experiments focused on seven contrasting traits, none of which involved pink and white flowers.

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**38. Failure of chromatids to segregate during cell division cycle results in:**

- (1) Polyploidy
- (2) Euploidy
- (3) Aneuploidy
- (4) Autopolyploidy

**Answer: (3) Aneuploidy**

**Solution:**

Aneuploidy occurs when there is an abnormal number of chromosomes due to the failure of chromatids to segregate properly during cell division.

**Quick Tip**

Aneuploidy can result in genetic disorders due to the gain or loss of chromosomes.

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**39. Select the correctly matched pair about sickle cell anaemia:**

Genotype : Phenotype

- (A) Hb<sup>A</sup> Hb<sup>A</sup> : Diseased phenotype
- (B) Hb<sup>A</sup> Hb<sup>S</sup> : Diseased phenotype
- (C) Hb<sup>S</sup> Hb<sup>S</sup> : Diseased phenotype
- (D) Hb<sup>S</sup> Hb<sup>A</sup> : Carrier of disease

**Choose the correct answer from the options given below:**

- (1) (C) and (D) only
- (2) (A) and (C) only
- (3) (B), (C) and (D) only
- (4) (A), (B), and (C) only

**Answer: (1) (C) and (D) only**

**Solution:**

Hb<sup>S</sup> Hb<sup>S</sup> results in the diseased phenotype, while Hb<sup>S</sup> Hb<sup>A</sup> individuals are carriers of the sickle cell trait. Hb<sup>A</sup> Hb<sup>A</sup> individuals are normal and do not exhibit the disease.

**Quick Tip**

Sickle cell anaemia is caused by the Hb<sup>S</sup> allele. Carriers (Hb<sup>S</sup> Hb<sup>A</sup>) do not show symptoms but can pass on the trait.

**40. Match List-I with List-II:**

<b>List-I (Scientists)</b>	<b>List-II (Discovery)</b>
(A) Sutton and Boveri	(I) X-Body
(B) Sturtevant	(II) Chromosomal Theory of Inheritance
(C) Henking	(III) Transformation in bacteria
(D) Griffith	(IV) Genetic maps

**Choose the correct answer from the options given below:**

- (1) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)
- (2) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
- (3) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
- (4) (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

**Answer:** (1) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

**Solution:**

(A) Sutton and Boveri proposed the Chromosomal Theory of Inheritance, (B) Sturtevant developed genetic maps, (C) Henking discovered the X-body, and (D) Griffith demonstrated transformation in bacteria.

**Quick Tip**

Griffith's experiment demonstrated bacterial transformation, leading to the discovery of DNA as the genetic material.

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**41. Which of the following statements are *incorrect* with respect to nucleotides?**

- (A) Purines and pyrimidines are nitrogenous bases.
- (B) Nucleotides are non-enzymatic molecules.
- (C) Phosphate group is linked to  $\text{-OH}$  of 5' C of a nucleoside through phosphoester linkage.
- (D) In RNA, every nucleotide residue has an additional  $\text{-OH}$  group present at 2' position in the ribose.
- (E) Thymine is an example of Pyrimidine.

**Choose the correct answer from the options given below:**

- (1) (A), (B) and (E) only
- (2) (D) and (E) only
- (3) (B) and (D) only
- (4) (B) and (E) only

**Answer: (3) (B) and (D) only**

**Solution:**

Statement (B) is incorrect because nucleotides are enzymatic molecules. Statement (D) is incorrect because RNA nucleotides have a hydroxyl group at the 2' position of ribose, which is true, but this does not necessarily make it a distinctive feature for error correction.

**Quick Tip**

Nucleotides are the building blocks of nucleic acids like DNA and RNA and play enzymatic roles in cellular functions.

**42. Arrange the given steps of DNA fingerprinting in the sequence from initiation to end:**

- (A) Digestion of DNA by restriction endonuclease
- (B) Isolation of DNA
- (C) Hybridisation using labelled VNTR probe
- (D) Transferring (blotting) of separated DNA fragments to synthetic membrane

**Choose the correct answer from the options given below:**

- (1) (A), (B), (C), (D)
- (2) (A), (D), (C), (B)
- (3) (B), (A), (D), (C)
- (4) (C), (A), (B), (D)

**Answer: (3) (B), (A), (D), (C)**

**Solution:**

The correct sequence for DNA fingerprinting begins with isolation of DNA, followed by digestion with restriction enzymes, transferring to a membrane, and hybridisation with a labelled probe.

**Quick Tip**

DNA fingerprinting is a powerful tool for identifying individuals based on their unique DNA profiles.

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**43. Nucleosome is associated with \_\_\_\_\_ molecules of histones.**

- (1) Four
- (2) Nine
- (3) Two
- (4) Eight

**Answer: (4) Eight**

**Solution:**

A nucleosome consists of eight histone proteins, forming the core around which DNA is wrapped. The histones are H2A, H2B, H3, and H4 (two copies of each).

**Quick Tip**

Histone proteins help to package DNA into chromatin, making it more compact and fitting inside the nucleus.

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**44. Select the observations drawn from the human genome project which are correct:**

- (A) The human genome contains 3164.7 million bp.
- (B) The average gene consists of 3000 bases.
- (C) Total number of genes is estimated at 30,000.
- (D) The functions are unknown for over 50% of discovered genes.
- (E) Less than 2% of the genome codes for proteins.

**Choose the correct answer from the options given below:**

- (1) (A), (B), (C) and (D) only
- (2) (A), (C), (D) and (E) only
- (3) (A), (C) and (E) only
- (4) (A), (B), (C), (D) and (E)

**Answer: (4) (A), (B), (C), (D) and (E)**

**Solution:**

All the statements provided are accurate findings from the Human Genome Project, which mapped the human genome and revealed various important aspects of gene functionality.

**Quick Tip**

The Human Genome Project has provided vital insights into genetics, but many genes still have unknown functions.

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**45. Analogous structures are a result of:**

- (1) Convergent evolution
- (2) Divergent evolution
- (3) Parallel evolution
- (4) Retrogressive evolution

**Answer: (1) Convergent evolution**

**Solution:**

Analogous structures arise due to convergent evolution, where unrelated species evolve similar traits because they face similar environmental pressures.

**Quick Tip**

Analogous structures serve similar functions but do not share a common evolutionary origin.

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**46. Which of the following does *not* affect the Hardy-Weinberg equilibrium?**

- (1) Natural selection
- (2) Genetic drift
- (3) Gene pool
- (4) Gene migration

**Answer: (3) Gene pool**

**Solution:**

The gene pool refers to the total genetic diversity within a population, and does not affect the Hardy-Weinberg equilibrium by itself.

**Quick Tip**

Factors like mutation, migration, and selection disrupt the Hardy-Weinberg equilibrium, but the gene pool is neutral in this context.

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**47. Which of the following primates was more like an ape?**

- (1) *Homo erectus*
- (2) *Dryopithecus*
- (3) *Australopithecines*
- (4) *Ramapithecus*

**Answer: (2) *Dryopithecus***

**Solution:**

*Dryopithecus* was an extinct genus of apes and is considered to have been more like modern apes. It lived during the Miocene and is believed to be an ancestor of modern great apes and humans.

**Quick Tip**

*Dryopithecus* is closely related to apes, while *Australopithecines* and *Homo erectus* are more closely linked to human ancestors.

**48. Match List-I with List-II:**

List-I (Placental mammals)	List-II (Counterpart Marsupials)
(A) Anteater	(I) Spotted cuscus
(B) Bobcat	(II) Numbat
(C) Lemur	(III) Flying Phalanger
(D) Flying squirrel	(IV) Tasmanian tiger cat

**Choose the correct answer from the options given below:**

- (1) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)
- (2) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
- (3) (A) - (IV), (B) - (I), (C) - (III), (D) - (II)
- (4) (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

**Answer:** (4) (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

**Solution:**

The correct matches are: (A) Anteater - Tasmanian tiger cat, (B) Bobcat - Spotted cuscus, (C) Lemur - Flying Phalanger, and (D) Flying squirrel - Numbat.

Quick Tip

Placental mammals and marsupials often evolved similar traits independently, a process called convergent evolution.

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**49. Identify the *incorrect* statement/s:**

- (A) Intestinal perforation and death may occur in severe cases of typhoid infection.
- (B) Common cold is caused by Rhinoviruses.
- (C) Lips and fingernails may turn grey to bluish colour in severe cases of pneumonia.
- (D) Pneumonia is caused by *Salmonella*.
- (E) Typhoid fever could be confirmed by Widal test.

**Choose the answer from the options given below:**

- (1) (A), (C) and (D) only
- (2) (B) and (E) only
- (3) (D) only
- (4) (A) and (D) only

**Answer: (3) (D) only**

**Solution:**

Pneumonia is caused by bacteria such as *Streptococcus pneumoniae*, not by *Salmonella*, which causes typhoid.

Quick Tip

*Salmonella* causes typhoid, while pneumonia is caused by *Streptococcus pneumoniae*.

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**50. Match List-I with List-II:**

<b>List-I (Types of barriers)</b>	<b>List-II (Examples)</b>
(A) Cytokine barriers	(I) Mucus coating
(B) Physical barriers	(II) Tears from eyes
(C) Cellular barriers	(III) Phagocytosis
(D) Physiological barriers	(IV) Interferons

**Choose the correct answer from the options given below:**

- (1) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)
- (2) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
- (3) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)
- (4) (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

**Answer:** (4) (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

**Solution:**

(A) Cytokine barriers (Interferons), (B) Physical barriers (Mucus coating), (C) Cellular barriers (Phagocytosis), and (D) Physiological barriers (Tears from eyes) are matched correctly.

**Quick Tip**

Barriers in the immune system can be categorized as physical, chemical, cellular, and cytokine-related for effective protection against pathogens.