

VITEEE 2020 Question Paper with Solutions for Biology

Time Allowed :90 Minutes	Maximum Marks :80	Total Questions :80
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. The question paper contains a total of 80 questions divided into four parts:
 - Part I: Physics (Questions 1 to 25)
 - Part II: Chemistry (Questions 26 to 50)
 - Part III: Mathematics (Questions 51 to 75)
 - Part IV: English & Logical Reasoning (Questions 76 to 80)
2. All questions are multiple-choice with four options, and only one of them is correct.
3. For each correct answer, the candidate will earn 1 mark.
4. There is no negative marking for incorrect answers.
5. The test duration is 12 hours.

“**1. Which of the following does not show segmented body plan?**

- (A) Arthropods
- (B) Annelids
- (C) Echinoderms
- (D) Chordates

Correct Answer: (C) Echinoderms

Solution:

Segmentation (metamerism) is a body plan characteristic found in Arthropods (A), Annelids (B), and Chordates (D).

Echinoderms (C), such as starfishes, exhibit pentaradial symmetry in their adult form.

They lack true metamerism segmentation.

Therefore, Echinoderms do not show a segmented body plan.

💡 Quick Tip

Metamerism is defined as the serial repetition of body parts. It is highly prominent in segmented worms (Annelids) and insects (Arthropods).

2. Synapsis occurs between

- (A) mRNA and ribosomes
- (B) spindle fibre and centromere
- (C) two homologous chromosomes
- (D) two heterologous chromosomes

Correct Answer: (C) two homologous chromosomes

Solution:

Synapsis is the physical pairing of chromosomes during Prophase I of meiosis.

This process involves the precise alignment of two homologous chromosomes.

The paired structure is called a bivalent or tetrad, forming the basis for crossing over.

💡 Quick Tip

Homologous chromosomes are pairs of chromosomes (one inherited from each parent) that contain the same genes in the same order. Synapsis ensures their correct separation in Meiosis I.

3. Gastrula has a pore which is known as

- (A) zoospore
- (B) oospore
- (C) blastopore
- (D) gonophore

Correct Answer: (C) blastopore

Solution:

The gastrula stage in embryogenesis follows the blastula stage.

During gastrulation, cell migration creates an internal cavity called the archenteron (primitive gut).

The opening of the archenteron to the exterior of the embryo is called the blastopore.

💡 Quick Tip

The blastopore is the defining feature of the gastrula stage, and its eventual fate determines the developmental lineage (Protostome vs. Deuterostome).

4. The human genetic disorder caused by the presence of an extra X chromosome is called

- (A) Klinefelter syndrome
- (B) Down syndrome
- (C) Turner syndrome
- (D) Marfan syndrome

Correct Answer: (A) Klinefelter syndrome

Solution:

Klinefelter syndrome is a sex chromosome aneuploidy characterized by the presence of an extra X chromosome.

The resulting karyotype is typically 47,XXY.

Turner syndrome (C) is 45,XO (missing X).

Down syndrome (B) is Trisomy 21 (extra autosome).

Quick Tip
Sex chromosome aneuploidies like Klinefelter and Turner syndromes occur due to non-disjunction of sex chromosomes during meiosis.

5. Interferon is a

- (A) fat
- (B) protein
- (C) carbohydrate
- (D) nucleic acid

Correct Answer: (B) protein

Solution:

Interferons (IFNs) are signaling molecules classified as cytokines.

Chemically, cytokines are low molecular weight regulatory glycoproteins or proteins.

Interferons are released by virus-infected cells to protect nearby non-infected cells from infection.

💡 Quick Tip

Interferons are crucial components of the innate immune system, functioning primarily as antiviral agents by inhibiting viral protein synthesis in neighboring cells.

6. The protein moiety of an enzyme is called as

- (A) apoenzyme
- (B) coenzyme
- (C) cofactor
- (D) holoenzyme

Correct Answer: (A) apoenzyme

Solution:

Many enzymes require a non-protein component (cofactor) to function.

The complete, active enzyme structure is called the holoenzyme (D).

The protein part of this active enzyme is specifically referred to as the apoenzyme (A).

💡 Quick Tip

Cofactors and coenzymes are non-protein parts. The apoenzyme is inactive alone; it becomes functional only when bound to the required cofactor, forming the holoenzyme.

7. Which one of the following is not correct with C4 plants?

- (A) The primary acceptor of CO₂ is a 3 carbon compound
- (B) The first stable product is a 4-carbon compound
- (C) Two different cell types are involved
- (D) Photorespiration occurs frequently

Correct Answer: (D) Photorespiration occurs frequently

Solution:

In C4 plants, the primary CO₂ acceptor is PEP (Phosphoenolpyruvate), a 3-carbon compound (A).

The first stable product is Oxaloacetic Acid (OAA), a 4-carbon compound (B).

The process involves two cell types: mesophyll and bundle sheath cells (C).

The main advantage of the C₄ pathway is concentrating CO₂ in bundle sheath cells, thereby minimizing RuBisCO's oxygenase activity.

This mechanism significantly reduces or suppresses photorespiration.

Therefore, the statement that photorespiration occurs frequently (D) is incorrect.

 Quick Tip

C₄ plants show Kranz anatomy and spatial separation of the initial CO₂ fixation (in mesophyll) and the Calvin cycle (in bundle sheath).

8. Oxygen binding affinity to the haemoglobin is

- (A) decreased by increase in pH
- (B) increased by increase in pCO₂
- (C) increased by increase in pO₂
- (D) not affected by change in pH, pO₂ and pCO₂

Correct Answer: (C) increased by increase in pO₂

Solution:

The O₂-Hb dissociation curve shifts based on metabolic factors.

A high partial pressure of oxygen (pO₂) maximizes the saturation of Hb, thus increasing its apparent affinity for O₂ (C).

An increase in pH (alkaline condition) increases affinity (A is incorrect, as it says decreased).

An increase in pCO₂ leads to lower pH (Bohr effect), decreasing affinity (B is incorrect).

Affinity is highly regulated by these factors (D is incorrect).

 Quick Tip

Factors that shift the O₂-Hb curve to the right (decreasing affinity and favoring O₂ release in tissues) are increased pCO₂, increased temperature, increased H⁺ (decreased pH), and increased 2,3-BPG.

9. Which one of the following techniques cannot be used for the measurement of organic matter in sewage?

- (A) Chemical oxygen demand (COD)
 - (B) Biochemical oxygen demand (BOD)
 - (C) Total organic carbon (TOC)
 - (D) Membrane filtration technique (MFT)
- Correct Answer:** (D) Membrane filtration technique (MFT)

Solution:

COD (A), BOD (B), and TOC (C) are all standard analytical methods used to quantify the amount of organic material or its oxygen demand in wastewater.

COD measures total oxidizable matter; BOD measures biodegradable organic matter; TOC measures total carbon content.

Membrane filtration technique (MFT) (D) is a procedure used primarily in microbiology.

MFT is used to isolate and enumerate specific microorganisms, such as indicator bacteria (coliforms), in water samples.

It does not provide a direct measure of the bulk concentration of organic matter.

 Quick Tip

In environmental engineering, BOD and COD are primary metrics for pollution load. MFT focuses on the biological safety and microbial concentration, not organic mass.

10. Study of population ecology is called

- (A) autecology
 - (B) demecology
 - (C) demography
 - (D) ethology
- Correct Answer:** (B) demecology

Solution:

Ecology concerning individuals or single species is autecology (A).

Demecology (B) is the specific branch of ecology dealing with populations, including population size, density, distribution, and growth dynamics.

Demography (C) is the statistical study of human populations, especially concerning size and structure.

Ethology (D) is the scientific study of animal behavior.

 Quick Tip

Ecology is broadly classified into autecology (individual/species level) and synecology (community/ecosystem level). Demecology is the specialized term for population-level study.
