

VITEEE 2019 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. Chlorophyceae, Phaeophyceae and Rhodophyceae belong to

- (A) algae
- (B) angiosperms
- (C) gymnosperms
- (D) pteridophytes

Correct Answer: (A) algae

Solution:

Chlorophyceae, Phaeophyceae, and Rhodophyceae are the three major classes of algae based on their pigments.

Chlorophyceae are known as Green Algae (pigments chlorophyll a and b).

Phaeophyceae are known as Brown Algae (pigments chlorophyll a, c, and fucoxanthin).

Rhodophyceae are known as Red Algae (pigments chlorophyll a, d, and r-phycoerythrin).

These groups are thallophytes and are distinct from embryophytes like angiosperms, gymnosperms, and pteridophytes.

💡 Quick Tip

The suffixes "-phyceae" usually denote algal classes. Remember the color coding: Chloro (Green), Phaeo (Brown), Rhodo (Red).

2. MTOC (Microtubule Organizing Centre) is not found in

- (A) centrosome
- (B) the poles of the mitotic spindle
- (C) the basal body of a cilium
- (D) the bacterial flagellum

Correct Answer: (D) the bacterial flagellum

Solution:

A Microtubule Organizing Centre (MTOC) is a structure in eukaryotic cells where microtubules originate.

The centrosome is the primary MTOC in animal cells.

The spindle poles act as MTOCs during cell division to organize the spindle fibers.

The basal body is the MTOC for cilia and flagella in eukaryotes.

However, the bacterial flagellum is a prokaryotic structure made of the protein flagellin, not microtubules.

Since bacteria lack microtubules and the associated organizing centers, MTOCs are not found in bacterial flagella.

💡 Quick Tip

Distinguish between Eukaryotic flagella (tubulin-based, 9+2 arrangement) and Prokaryotic flagella (flagellin-based, no microtubules).

3. Which one of the following is not a part of fallopian tube?

- (A) Isthmus
- (B) Fundus
- (C) Infundibulum
- (D) Ampulla

Correct Answer: (B) Fundus

Solution:

The fallopian tube (oviduct) is divided into three main anatomical regions.

The **Infundibulum** is the funnel-shaped opening near the ovary.

The **Ampulla** is the wider, middle portion where fertilization occurs.

The **Isthmus** is the narrow section connecting to the uterus.

The **Fundus** is the upper, rounded part of the uterus itself, not a part of the fallopian tube.

💡 Quick Tip

The Fundus is the "roof" of the uterus. The fallopian tubes are the "hallways" leading to the main room (uterus).

4. In garden peas, height is determined by a single gene with tall being dominant to short. If two heterozygous plants are crossed, what proportion of the tall progeny will be homozygous dominant?

(A) $3/4$

(B) $1/2$

(C) $2/3$

(D) $1/3$

Correct Answer: (D) $1/3$

Solution:

Let the dominant allele for Tall be T and the recessive allele for Short be t.

The cross between two heterozygotes is: $Tt \times Tt$.

The genotypic ratio of the offspring is: 1 TT : 2 Tt : 1 tt.

The phenotypic ratio is: 3 Tall (TT + 2 Tt) : 1 Short (tt).

The question asks for the proportion of the **tall progeny** (Total = 3) that are homozygous dominant (TT = 1).

Therefore, the proportion is $1/3$.

💡 Quick Tip

Read the question carefully: "proportion of the tall progeny" means the denominator is the number of tall offspring (3), not the total offspring (4).

5. Which pair is not correctly matched?

- (A) Dengue fever - Flavivirus
- (B) Plague - *Yersinia pestis*
- (C) Sleeping sickness - *Trypanosoma gambiense*
- (D) Syphilis - *Trichuris trichiura*

Correct Answer: (D) Syphilis - *Trichuris trichiura*

Solution:

Dengue fever is caused by the Dengue virus, a member of the Flavivirus genus. (Correct match).

Plague is caused by the bacterium *Yersinia pestis*. (Correct match).

African Sleeping Sickness is caused by the protozoan parasite *Trypanosoma brucei gambiense*. (Correct match).

Syphilis is caused by the spirochete bacterium *Treponema pallidum*.

Trichuris trichiura is a nematode (whipworm) that causes trichuriasis.

Therefore, pair (D) is incorrect.

💡 Quick Tip

Do not confuse *Treponema* (bacteria causing Syphilis) with *Trichuris* (worm causing Trichuriasis).

6. In oxidative phosphorylation which one of the following four complexes is not a part of the electron transport chain?

- (A) NADH : CoQ reductase
- (B) Succinate dehydrogenase
- (C) Cytochrome c oxidase
- (D) ATP synthase

Correct Answer: (D) ATP synthase

Solution:

The Electron Transport Chain (ETC) consists of four complexes that transfer electrons and pump protons:

Complex I: NADH: CoQ reductase.

Complex II: Succinate dehydrogenase.

Complex III: Cytochrome bc1 complex.

Complex IV: Cytochrome c oxidase.

Complex V is ATP synthase. While it acts in oxidative phosphorylation to generate ATP using the proton gradient, it does not transport electrons itself.

Therefore, ATP synthase is not considered a part of the electron transport chain proper.

💡 Quick Tip

The "Chain" refers to the flow of electrons. ATP synthase is the "Generator" that uses the energy from the chain but is not part of the electron flow itself.

7. What is the first electron acceptor in photosystem I?

- (A) Cytochrome
- (B) Iron-sulphur protein
- (C) Plastocyanin
- (D) Ferredoxin

Correct Answer: (B) Iron-sulphur protein

Solution:

In Photosystem I (PS I), the reaction center P700 is excited by light and expels an electron.

The primary electron acceptor is a modified chlorophyll molecule (A0), followed by phylloquinone (A1).

The electron is then passed to a series of Iron-Sulphur (Fe-S) centers (F_X , F_A , F_B) within the PS I complex.

From the Fe-S centers, the electron is transferred to Ferredoxin (Fd).

Among the given options, the Iron-sulphur protein is the first acceptor in the sequence before Ferredoxin.

💡 Quick Tip

The sequence in PS I is $P700 \rightarrow A0 \rightarrow A1 \rightarrow Fe-S \rightarrow Ferredoxin$. Fe-S comes before Ferredoxin.

8. In urinary system, blood plasma is filtered in

- (A) renal corpuscle
- (B) proximal convoluted tubule
- (C) loop of Henle
- (D) distal tubule

Correct Answer: (A) renal corpuscle

Solution:

Urine formation begins with the filtration of blood.

This process, known as ultrafiltration, occurs in the Renal Corpuscle (also called the Malpighian body).

The Renal Corpuscle consists of the Glomerulus (a tuft of capillaries) and Bowman's capsule.

Blood pressure forces plasma through the filtration membrane in the corpuscle into the lumen of Bowman's capsule.

The other parts (PCT, Loop of Henle, DCT) are involved in reabsorption and secretion, not the initial filtration.

💡 Quick Tip

Filtration = Glomerulus + Bowman's Capsule (Renal Corpuscle). Reabsorption/Secretion = Tubules.

9. Green Fluorescent Protein (GFP), an auto-fluorescent protein is commonly used as a tag in fusion proteins. Identify the amino acid sequence responsible for its auto-fluorescence property.

- (A) Ser-Tyr-Gly
- (B) Ser-Trp-Phe
- (C) Lys-Tyr-Gly
- (D) Lys-Trp-Phe

Correct Answer: (A) Ser-Tyr-Gly

Solution:

The Green Fluorescent Protein (GFP) contains a chromophore responsible for its light emission.

This chromophore is formed by an autocatalytic post-translational cyclization and oxidation reaction.

The specific tripeptide sequence involved is Serine-Tyrosine-Glycine (Ser-Tyr-Gly) at positions 65, 66, and 67 of the protein chain.

Therefore, the correct sequence is Ser-Tyr-Gly.

💡 Quick Tip

The magic trio for GFP fluorescence is Ser-Tyr-Gly (Sequence 65-67).

10. The two gases making highest relative contribution to the greenhouse effect are

- (A) CFC and N_2O
- (B) CO_2 and N_2O
- (C) CO_2 and CH_4
- (D) CH_4 and N_2O

Correct Answer: (C) CO_2 and CH_4

Solution:

The relative contribution of various greenhouse gases to total global warming is as follows:

Carbon dioxide (CO_2): approximately 60%

Methane (CH_4): approximately 20%

Chlorofluorocarbons (CFCs): approximately 14%

Nitrous oxide (N_2O): approximately 6%

The two gases with the highest contributions are CO_2 and CH_4 (Totaling approx 80%).

💡 Quick Tip

Remember the order of contribution: $\text{CO}_2 > \text{CH}_4 > \text{CFCs} > \text{N}_2\text{O}$.