

MHT CET 2024 Solution

(April 22 - Shift 1)

Ques 1. Which of the following statements best describes the relationship between the hormones ANF and Angiotensin 2 in terms of their physiological effects on the body?

- A. ANF promotes sodium reabsorption, while Angiotensin 2 dilates blood vessels**
- B. ANF dilates blood vessels, while Angiotensin 2 promotes sodium reabsorption**
- C. Both ANF and Angiotensin 2 promote sodium reabsorption.**
- D. Both ANF and Angiotensin 2 dilate blood vessels**

Ans: ANF dilates blood vessels, while Angiotensin 2 promotes sodium reabsorption

Solu. The statement that best describes the relationship between ANF (Atrial Natriuretic Factor) and Angiotensin 2 is:

- ANF dilates blood vessels, while Angiotensin 2 promotes sodium reabsorption.

Here's why:

- ANF (Atrial Natriuretic Factor): This hormone acts as a vasodilator, meaning it widens blood vessels. Additionally, it promotes natriuresis (sodium excretion) and diuresis (increased urine production). So, it helps lower blood pressure by reducing blood volume and blood vessel resistance.
- Angiotensin 2: This hormone acts as a vasoconstrictor, causing blood vessels to narrow. It also stimulates the kidneys to reabsorb sodium and water back into the bloodstream, increasing blood volume and pressure.

Therefore, ANF and Angiotensin 2 have opposing effects on blood pressure regulation:

- ANF counteracts the actions of Angiotensin 2, promoting vasodilation and sodium excretion to lower blood pressure.
- Angiotensin 2 works in opposition to ANF, causing vasoconstriction and sodium reabsorption to raise blood pressure.

Ques 2. Which of the following factors ensures that coding for the same amino acid, such as methionine and valine, using identical anticodons remains non-ambiguous

- A. Redundancy of the genetic code**
- B. Degeneracy of the genetic code**
- C. Complementary base pairing between codons and anticodons**
- D. The presence of start and stop codons in the mRNA**

Ans: Degeneracy of the genetic code

Solu. The answer is (B) Degeneracy of the genetic code.

Here's why:

- Redundancy refers to the presence of multiple codons for the same amino acid. This characteristic of the genetic code is what allows for some level of mutation without affecting the final protein product. However, redundancy alone doesn't directly address the issue of identical anticodons for different amino acids.
- Degeneracy specifically refers to the situation where multiple codons can code for a single amino acid. This is crucial because it allows for some flexibility in the anticodon sequence without affecting the final amino acid incorporated into the protein. With degeneracy, even if two amino acids (like methionine and valine) have identical anticodons by chance, there will likely be other codons that code for those amino acids, preventing misincorporation.
- Complementary base pairing between codons and anticodons ensures proper tRNA binding during translation but doesn't directly

address the potential ambiguity arising from identical anticodons for different amino acids.

- Start and stop codons are important for translation initiation and termination, respectively, but they don't play a role in preventing ambiguity caused by identical anticodons for different amino acids.

Degeneracy, by allowing for some variation in codons for the same amino acid, provides a safety net in situations where anticodons might accidentally be identical for different amino acids. This redundancy in the code helps maintain fidelity during protein synthesis.

Ques 3. In males, the penis is analogous to which structure in females?

- A. Urethra**
- B. Labia majora**
- C. Clitoris**
- D. Vagina**

Ans: Clitoris

Solu. The clitoris is analogous to the penis in males.

Here's why:

- Both the penis and the clitoris are primarily erogenous zones, meaning they are the main organs for sexual pleasure.
- Both are derived from the same embryonic tissue during fetal development.
- Both contain erectile tissue that can become engorged with blood during sexual arousal.

However, there are some key differences:

- The penis is the male reproductive organ used for sexual intercourse and urination. The clitoris has no role in reproduction and only a minor role (if any) in urination.
- The penis is generally much larger than the clitoris.

Ques 4. Which of the following enzymes is secreted by the urinary bladder?

- A. Amylase**
- B. Urease**
- C. Renin**
- D. The urinary bladder does not typically secrete enzyme**

Ans: The urinary bladder does not typically secrete enzyme

Solu. The urinary bladder does not typically secrete enzymes.

The urinary bladder's primary function is to store urine until it can be eliminated from the body. It does not have a major role in enzymatic activity.

Here's a breakdown of the other answer choices:

- Amylase: This enzyme is found in saliva and pancreas and helps break down carbohydrates.
- Urease: This enzyme can be found in some bacteria and breaks down urea into ammonia and carbon dioxide. It's not produced by the bladder.
- Renin: This enzyme is produced by the kidneys and plays a role in regulating blood pressure.

While the urinary bladder might contain trace amounts of enzymes due to the presence of urine, it doesn't actively secrete them.

Ques 5. Which of the following statements about pollen grains is incorrect?

- A. Pollen grains develop from megaspores.**
- B. Pollen grains contain two cells: a generative cell and a tube cell.**
- C. Pollen grains are released from the stigma during pollination.**
- D. Pollen grains play a crucial role in the reproductive process of seed plants**

Ans: Pollen grains develop from megaspores.

Solu. The incorrect statement about pollen grains is:

- Pollen grains develop from megaspores.

Here's the breakdown:

- **Megaspores:** These are female reproductive spores that develop into the female gametophyte (egg sac) in seed plants.
- **Pollen grains:** These are male reproductive spores that develop into the male gametophyte (pollen tube) in seed plants.

Therefore, pollen grains develop from microspores, not megaspores.

Ques 6. Which of the following statements is correct regarding the number of codons and their degeneracy?

- A. There are 20 codons, and all of them exhibit degeneracy**
- B. There are 64 codons, and none of them exhibit degeneracy**
- C. There are 64 codons, and some of them exhibit degeneracy**
- D. There are 20 codons, and none of them exhibit degeneracy**

Ans: There are 64 codons, and some of them exhibit degeneracy

Solu. The correct statement regarding the number of codons and their degeneracy is:

There are 64 codons, and some of them exhibit degeneracy.

Here's a breakdown of the concept:

- **Number of codons:** There are indeed 64 possible codons formed by combinations of the four nitrogenous bases (A, U, G, C) in mRNA. Each codon is a triplet (three nucleotides).
- **Degeneracy:** This refers to the situation where multiple codons can code for the same amino acid. Not all codons are degenerate, but a significant portion are. For example, the amino acid alanine can be coded for by four different codons (GCA, GCC, GCG, and GCU).

Ques 7. Which of the following is an emulsion?

- A. Butter**
- B. mist**
- C. Milk**

D. Jellies

Ans: C) Milk

Solu. Out of the given choices, Milk is an emulsion.

Here's why:

- **Emulsion:** An emulsion is a mixture of two or more immiscible (unblendable) liquids, where one liquid is dispersed in tiny droplets throughout the other. There's usually an emulsifier present to help stabilize the mixture and prevent separation.
- **Milk:** Milk is an emulsion where fat droplets (oil phase) are dispersed in a water-based solution (aqueous phase) containing lactose (sugar), proteins, and minerals. Casein, a protein in milk, acts as an emulsifier, helping to keep the fat droplets suspended.
- **Butter:** Butter is not an emulsion; it's primarily made of fat churned from cream. While there might be some leftover milk components in butter, the majority is fat.
- **Mist:** Mist is a suspension of tiny water droplets in air. Suspensions differ from emulsions because the dispersed phase (water) is a solid in the case of suspensions, not another liquid.
- **Jellies:** Jellies are typically classified as colloids, which are a broader category that includes emulsions but also encompasses gels and other mixtures. Jellies are formed when gelatin (a protein) disperses in water and forms a network that traps water molecules, giving it a gel-like consistency.

Ques 8. When a stem of a plant is cut a few inches above the soil and xylem sap is seen flowing out through the cut end, this exudation is considered evidence for the existence of root pressure. Who proposed the theory of root pressure ?

A Robert Hooke

B Stephen Hales

C Joseph Priestley

D Gregor Mendel

Ans. C

Solu. The answer is C) Joseph Priestley.

Explanation:

- Root pressure: This is the pressure exerted by the root system of a plant that pushes water and dissolved solutes up the xylem (vascular tissue) towards the leaves.
- Evidence of root pressure: Observing xylem sap flowing out from a cut stem can be an indication of root pressure. However, it's not the only definitive proof, as other mechanisms might contribute to some sap flow even after cutting.

Ques 9. What is the transforming principle in Griffith's experiment?

- A. A protein that transfers genetic information**
- B. A polysaccharide coat present in S-strain bacteria**
- C. A substance that can transfer genetic material from one bacterium to another**
- D. A lipid molecule responsible for bacterial transformation**

Ans. C

Solu. The transforming principle in Griffith's experiment is:

C) A substance that can transfer genetic material from one bacterium to another

Here's why:

- Griffith's experiment: This classic experiment, conducted in 1928 by Frederick Griffith, is a landmark discovery in bacterial transformation. It provided the first evidence that bacteria could acquire genetic information from other bacteria.
- The Experiment: Griffith used two strains of *Streptococcus pneumoniae* bacteria:
 - Smooth (S-strain) - Virulent (caused pneumonia in mice) and had a polysaccharide capsule.

- Rough (R-strain) - Non-virulent (did not cause pneumonia) and lacked the capsule.
- He injected mice with live S-strain bacteria (causing pneumonia) and live R-strain bacteria (no effect). Interestingly, when he injected mice with a mixture of heat-killed S-strain bacteria (inactive) and live R-strain bacteria, some mice died of pneumonia.
- The Transforming Principle: Griffith concluded that some "transforming principle" from the heat-killed S-strain bacteria must have transferred to the live R-strain bacteria, enabling them to become virulent and produce the capsule.
- Later Discovery: Further experiments revealed that the transforming principle was DNA.

Therefore, option (C) accurately describes the transforming principle's role in Griffith's experiment.

Ques 10. Who first identified the transforming principle ?

A Oswald Avery

B Frederick Griffith

C James Watson

D Rosalind Franklin

Ans. C

Solu. The answer is B) Frederick Griffith.

Explanation:

- Griffith's Experiment: As you mentioned earlier, Frederick Griffith conducted the classic experiment in 1928 that provided the first evidence of bacterial transformation. He observed that a "transforming principle" from heat-killed smooth (S) strain bacteria could transfer genetic information to live rough (R) strain bacteria, making them virulent.