

Canadian National Institute of Health (CNIH) Entrance Practice Exam (Sample)

Study Guide



Everything you need from our exam experts!

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SAMPLE

Questions

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- 1. Which process is responsible for producing energy in cells?**
 - A. External respiration**
 - B. Internal respiration**
 - C. Breathing**
 - D. Gas exchange**
- 2. How do strepto bacteria typically form?**
 - A. As single cells**
 - B. In clusters**
 - C. In chains**
 - D. In biofilms**
- 3. Cocci bacteria have what shape?**
 - A. Square shaped**
 - B. Round shaped**
 - C. Rod shaped**
 - D. Spindle shaped**
- 4. Which component primarily comprises the transport medium of blood?**
 - A. Cells**
 - B. Proteins**
 - C. Plasma**
 - D. Salts**
- 5. Which enzyme is responsible for breaking down lipids?**
 - A. Amylase**
 - B. Trypsin**
 - C. Pepsin**
 - D. Lipase**
- 6. During which phase do sister chromatids separate?**
 - A. Prophase**
 - B. Metaphase**
 - C. Anaphase**
 - D. Telophase**

- 7. What is the function of spindle fibers during mitosis?**
- A. To disassemble the nuclear membrane**
 - B. To assist in the separation of sister chromatids**
 - C. To aid in the coiling of chromatin**
 - D. To reform the nucleolus**
- 8. During which phase of the cell cycle does the cell duplicate its contents except for chromosomes?**
- A. G1 phase**
 - B. G2 phase**
 - C. S phase**
 - D. G0 phase**
- 9. What does homeostasis refer to in biological terms?**
- A. Production of energy in cells**
 - B. Internal equilibrium maintained by the body**
 - C. Absorption of nutrients from food**
 - D. Regulation of blood flow in the body**
- 10. Which component is a major part of feces?**
- A. Protein**
 - B. Fat**
 - C. Cellulose**
 - D. Carbohydrates**

Answers

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1. B
2. C
3. B
4. C
5. D
6. C
7. B
8. A
9. B
10. C

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Explanations

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1. Which process is responsible for producing energy in cells?

- A. External respiration**
- B. Internal respiration**
- C. Breathing**
- D. Gas exchange**

The process responsible for producing energy in cells is internal respiration. This involves cellular respiration, a biochemical process that takes place within the mitochondria of cells. During this process, glucose and oxygen are converted into ATP (adenosine triphosphate), which is the primary energy currency of the cell. This process also generates carbon dioxide and water as byproducts. While external respiration, breathing, and gas exchange are all related to the intake of oxygen and the removal of carbon dioxide from the body, they mainly pertain to the physiological process of obtaining oxygen for the body and expelling carbon dioxide. They do not directly create energy at the cellular level like internal respiration does. Thus, internal respiration is central to energy production within cells.

2. How do strepto bacteria typically form?

- A. As single cells**
- B. In clusters**
- C. In chains**
- D. In biofilms**

Streptobacteria are known for their characteristic arrangement when they reproduce and grow. They typically divide by binary fission, a process where a single cell splits into two identical cells. Unlike other types of bacteria that may cluster together or form irregular shapes, streptobacteria tend to remain connected after division, leading to a chain-like formation. This chain structure is a hallmark of the genus and is a fundamental characteristic that differentiates them from other bacterial arrangements. Understanding this chain formation is crucial in microbiology, as the morphology of bacteria can influence their identification, classification, and the type of infections they may cause. Recognizing this characteristic helps in both laboratory settings and clinical diagnoses. The other arrangements, such as clusters or single cells, do not accurately represent how streptobacteria organize themselves after division.

3. Cocci bacteria have what shape?

- A. Square shaped
- B. Round shaped**
- C. Rod shaped
- D. Spindle shaped

Cocci bacteria are characterized by their spherical shape, which is accurately described as round. This classification is important in microbiology because the shape of bacteria can influence their behavior, growth, and even the diseases they may cause.

Understanding bacterial shapes is crucial for identification and diagnosis in clinical settings, as different shapes can be associated with different types of bacteria. For instance, cocci can be seen as single units, or they may group together in specific arrangements like chains or clusters, which can provide additional information about the bacterium's identity. The other options describe shapes that are not representative of cocci bacteria. Square-shaped, rod-shaped, and spindle-shaped are used for different types of bacteria, such as bacilli (rod-shaped) or spirochetes (spiral-shaped), but do not apply to cocci. Recognizing the round shape of cocci helps in both laboratory identification and understanding their biological roles.

4. Which component primarily comprises the transport medium of blood?

- A. Cells
- B. Proteins
- C. Plasma**
- D. Salts

The correct answer is plasma, as it acts as the main transport medium of blood, serving several crucial functions. Plasma is a yellowish liquid component that makes up about 55% of total blood volume. It is primarily composed of water, which constitutes about 90% of its content, along with various dissolved substances such as electrolytes, nutrients, hormones, proteins, and waste products. The role of plasma is vital; it carries red and white blood cells, platelets, nutrients from digestion, metabolic waste for excretion, and hormones to different parts of the body. It helps maintain blood pressure and volume and plays a key role in immune responses and thermoregulation. While cells, proteins, and salts play important roles in blood function, they do not act as the main transport medium. Red and white blood cells are responsible for oxygen transport and immune function, proteins such as albumin contribute to osmotic balance and transport, and salts help maintain electrolyte balance, but it is the plasma that serves as the fluid matrix allowing for the movement and transportation of these elements throughout the body.

5. Which enzyme is responsible for breaking down lipids?

- A. Amylase
- B. Trypsin
- C. Pepsin
- D. Lipase**

Lipase is the enzyme specifically responsible for breaking down lipids, which include fats and oils. This enzyme facilitates the hydrolysis of triglycerides into glycerol and free fatty acids, allowing the body to utilize fats as a source of energy. Lipase is primarily produced in the pancreas and secreted into the small intestine, where it acts in conjunction with bile salts to efficiently emulsify fats, making them more accessible for digestion. This process is crucial for the absorption of fat-soluble vitamins and fatty acids, directly impacting nutritional health and metabolism. Other enzymes listed have distinct functions in the digestive process. For example, amylase breaks down carbohydrates into simple sugars, trypsin is responsible for proteins, and pepsin also acts on proteins in the acidic environment of the stomach. Thus, lipase's role in lipid digestion is specialized and vital for proper nutrient absorption.

6. During which phase do sister chromatids separate?

- A. Prophase
- B. Metaphase
- C. Anaphase**
- D. Telophase

Sister chromatids separate during anaphase, which is a critical phase of cell division (whether in mitosis or meiosis). During this stage, the proteins that hold the sister chromatids together are cleaved, allowing them to move towards opposite poles of the cell. This separation is essential for ensuring that each new daughter cell receives an identical set of chromosomes. The process begins with the alignment of chromosomes at the cell's equatorial plane during metaphase, but it is in anaphase that the actual splitting and movement occurs. This movement is facilitated by the spindle fibers, which contract and pull the chromatids apart. As a result, the number of chromosomes effectively doubles, ensuring that the genetic material is accurately distributed between the dividing cells. In contrast, prophase is characterized by the condensation of chromatin into visible chromosomes and the formation of the mitotic spindle, while telophase marks the reformation of the nuclear envelope around separated chromosomes. Therefore, the phase where sister chromatids separate so that each daughter cell will receive the correct number of chromosomes is distinctly anaphase.

7. What is the function of spindle fibers during mitosis?

- A. To disassemble the nuclear membrane
- B. To assist in the separation of sister chromatids**
- C. To aid in the coiling of chromatin
- D. To reform the nucleolus

The function of spindle fibers during mitosis is primarily to assist in the separation of sister chromatids. Spindle fibers are crucial components of the mitotic spindle, which forms during cell division. They are composed of microtubules that grow out from the centrosomes at the poles of the cell. As the cell progresses through the phases of mitosis, specifically during metaphase, these fibers attach to the kinetochores of each sister chromatid, aligning the chromosomes at the cell's equatorial plane. During anaphase, the spindle fibers shorten, pulling the sister chromatids apart toward opposite poles of the cell. This ensures that each daughter cell receives an identical set of chromosomes. The other functions mentioned in the options do not pertain to spindle fibers. While the nuclear membrane disassembles during prophase and does reform at the end of telophase, this process is not related to spindle fiber function. The coiling of chromatin is related to the organization of DNA for cell division, but it does not involve spindle fibers. The reforming of the nucleolus occurs after mitosis concludes, and is similarly not associated with spindle fiber activity. Thus, the role of spindle fibers specifically centers on the separation and movement of sister chromatids.

8. During which phase of the cell cycle does the cell duplicate its contents except for chromosomes?

- A. G1 phase**
- B. G2 phase
- C. S phase
- D. G0 phase

The G1 phase, or the first gap phase of the cell cycle, is characterized by the growth and preparation of the cell for DNA replication. During this phase, the cell increases in size and synthesizes various proteins and organelles that are necessary for the next phase, which is the synthesis phase (S phase) where the actual duplication of the chromosomes occurs. It is during G1 that the cell ensures it has enough resources and energy to duplicate its contents effectively. This phase sets the stage for successful DNA synthesis by providing the necessary foundation. In contrast, the S phase is specifically when DNA is replicated, marking the duplication of chromosomes. The G2 phase follows S and involves further preparation for mitosis, including the duplication of certain organelles and additional synthesis, but it is not primarily focused on contents other than the chromosomes. The G0 phase represents a quiescent state where cells are metabolically active but not actively dividing, and thus does not involve content duplication as G1 does.

9. What does homeostasis refer to in biological terms?

- A. Production of energy in cells**
- B. Internal equilibrium maintained by the body**
- C. Absorption of nutrients from food**
- D. Regulation of blood flow in the body**

Homeostasis refers to the internal equilibrium maintained by the body, ensuring that various physiological parameters remain stable despite changes in the external environment. This concept is crucial for survival, as it involves the regulation of temperature, pH levels, hydration, and other vital functions. The body employs multiple systems, such as the nervous and endocrine systems, to continuously monitor and adjust these parameters. For instance, when you exercise, your body temperature rises. To maintain homeostasis, mechanisms like sweating and increased blood flow to the skin kick in to dissipate excess heat. Similarly, if blood sugar levels increase after a meal, the body releases insulin to help lower them back to a normal range. Thus, the focus of homeostasis is to preserve a balanced internal state that enables optimal functioning of biological processes.

10. Which component is a major part of feces?

- A. Protein**
- B. Fat**
- C. Cellulose**
- D. Carbohydrates**

Cellulose is a major component of feces because it is a form of dietary fiber that is not fully digested by humans. It primarily comes from plant cell walls and contributes significantly to the bulk of stool. While fats, proteins, and carbohydrates are indeed present in various amounts in the diet, they undergo digestion and absorption in the intestines. In contrast, cellulose passes through the digestive system largely intact and helps to organize fecal matter, promoting healthy bowel movements and preventing constipation. This role of cellulose in adding bulk and facilitating the passage of feces underscores its significance in gastrointestinal health.