JEECUP 2026 Group-E1 Pharmacy (Biology)

Question Paper (Memory-Based) with Solutions PDF

Conducted by Joint Entrance Examination Council, Uttar Pradesh (JEECUP).

General Instructions

(i) The examination is conducted in Computer-Based Test (CBT) mode.

(ii) Each question carries **+4 marks** for a correct answer and **-1 mark** for a wrong answer.

(iii) The total number of questions is **100**.

(iv) The total duration of the exam is **150 minutes** (2 hours and 30 minutes).

1. The value of the universal gravitational constant $G = 6.67 \times 10^{-11}$ N m^2/kg^2 in the CGS system is:

(A) 6.67×10^{11}
(B) 6.67×10^{-18}
(C) 6.67×10^{-8}
(D) 6.67×10^{8}

Correct Answer: (C) 6.67×10^{-8}

Solution:

Step 1: Understanding the Concept:
To convert a physical constant from the SI system to the CGS system, we replace the base units of force, length, and mass.
The SI units for G are Newton-meter squared per kilogram squared (N m^2/kg^2).
In CGS, the units become dyne-centimeter squared per gram squared (dyne cm^2/g^2).

Step 2: Key Formula or Approach:

We use the following standard conversion factors:

$$1\ \text{N} = 10^5\ \text{dyne}$$

$$1\ \text{m} = 10^2\ \text{cm} \implies 1\ \text{m}^2 = 10^4\ \text{cm}^2$$

$$1\ \text{kg} = 10^3\ \text{g} \implies 1\ \text{kg}^{-2} = (10^3)^{-2}\ \text{g}^{-2} = 10^{-6}\ \text{g}^{-2}$$

Step 3: Detailed Explanation:

Substitute the conversion factors into the SI value for G:

$$G = 6.67 \times 10^{-11} \times (10^5\ \text{dyne}) \times (10^4\ \text{cm}^2) \times (10^{-6}\ \text{g}^{-2})$$

$$G = 6.67 \times 10^{-11} \times 10^{(5+4-6)}\ \text{dyne cm}^2/\text{g}^2$$

$$G = 6.67 \times 10^{-11} \times 10^3\ \text{dyne cm}^2/\text{g}^2$$

$$G = 6.67 \times 10^{-8}\ \text{dyne cm}^2/\text{g}^2$$

Step 4: Final Answer:

The value of G in the CGS system is 6.67×10^{-8}.

Quick Tip: Remember the conversion factor powers: Newtons to dynes is 10^5, meters squared to cm squared is 10^4, and kg squared to g squared is 10^6. By combining them, you shift the decimal point in the exponent accordingly.

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2. A 2 kW air conditioner works for 8 hours per day. At the rate of Rs 6/kWh, the electricity bill for one day will be:

(A) Rs 12

(B) Rs 24

(C) Rs 48

(D) Rs 96

Correct Answer: (D) Rs 96

Solution:

Step 1: Understanding the Concept:
The cost of electricity is determined by the total energy consumed in kilowatt-hours (kWh). Energy consumption is the product of the power rating of the device and the total time it is operated.

Step 2: Key Formula or Approach:

$$\text{Total Energy (kWh)} = \text{Power (kW)} \times \text{Time (h)}$$

$$\text{Electricity Bill} = \text{Total Energy (kWh)} \times \text{Rate (Rs/kWh)}$$

Step 3: Detailed Explanation:
Given:
Power = 2 kW

Time = 8 hours

Rate = Rs 6/kWh

Calculation:

$$\text{Total Energy} = 2 \text{ kW} \times 8 \text{ h} = 16 \text{ kWh}$$

$$\text{Electricity Bill} = 16 \text{ kWh} \times \text{Rs } 6/\text{kWh} = \text{Rs } 96$$

Step 4: Final Answer:

The electricity bill for one day will be Rs 96.

Quick Tip: Always ensure your power unit is in kilowatts (kW). If the device power is given in Watts, divide by 1000 first before calculating the energy consumption.

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3. Two forces of 4 N and 3 N act on a particle. For maximum resultant force, the angle between them should be:

(A) 180°

(B) 120°

(C) 90°

(D) 0°

Correct Answer: (D) 0°

Solution:

Step 1: Understanding the Concept:

The resultant of two vectors (forces) $\vec{A}$ and $\vec{B}$ is given by the formula $R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$, where θ is the angle between them.

To obtain the maximum resultant force, the cosine of the angle must be at its maximum value.

Step 2: Key Formula or Approach:

The maximum value of $\cos\theta$ is 1, which occurs when $\theta = 0°$.

At $\theta = 0°$, the forces are acting in the same direction, and the resultant is simply the algebraic sum of the magnitudes.

Step 3: Detailed Explanation:

When $\theta = 0°$:

$$R = \sqrt{A^2 + B^2 + 2AB(1)}$$

$$R = \sqrt{(A+B)^2} = A + B$$

Substituting the values:

$$R = 4\text{ N} + 3\text{ N} = 7\text{ N}$$

This is the highest possible value for the resultant force.

Step 4: Final Answer:

The angle between the forces for the maximum resultant should be 0°.

Quick Tip: For maximum resultant force, align the vectors in the same direction ($\theta = 0°$). For the minimum resultant force, point them in opposite directions ($\theta = 180°$).

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4. During short circuiting, the electric current in the circuit-

(A) Becomes very small

(B) Remains unchanged

(C) Increases greatly

(D) Changes continuously

Correct Answer: (C) Increases greatly

Solution:

Concept:

A short circuit occurs when a very low resistance path is created between two points of different potential. This bypasses the normal load and allows a huge amount of current to flow.

According to Ohm's law,

$$I = \frac{V}{R}$$

where

$$I = \text{Current}$$

$$V = \text{Potential Difference}$$

$$R = \text{Resistance}$$

Step 1: Understand what happens during a short circuit.

During short circuiting, the resistance becomes extremely small.

$$R \to 0$$

Step 2: Apply Ohm's law.

Since current is inversely proportional to resistance,

$$I = \frac{V}{R}$$

a very small value of R results in a very large value of I.

Step 3: State the consequence.

The excessive current generates a large amount of heat which may:

- Damage electrical appliances
- Melt wires
- Cause electrical fires

Therefore, during short circuiting the current increases greatly.

Quick Tip: Fuse wires and circuit breakers are safety devices designed to protect circuits from the excessive current produced during short circuits.

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5. The order (characteristic) of 0.99 is-

(A) -1
(B) 0
(C) 1
(D) 2

Correct Answer: (A) -1

Solution:

Concept:
For common logarithms, the characteristic depends upon the position of the decimal point.
Rules:

- For numbers greater than 1, characteristic is one less than the number of digits before the decimal point.
- For numbers less than 1, characteristic is negative and equals one more than the number of zeros immediately after the decimal point.

Given number:

$$0.99$$

Step 1: Observe the position of the decimal point.

The number is less than 1.

Also, there are no zeros immediately after the decimal point before the first significant digit.

$$0.\underline{9}9$$

Hence,

$$n = 0$$

Step 2: Apply the logarithm rule.

$$\text{Characteristic} = -(n+1)$$

$$= -(0+1)$$

$$= -1$$

Thus,

$$\log(0.99)$$

has characteristic

$$\bar{1}$$

or equivalently

$$-1$$

Quick Tip: Any number between 0.1 and 1 has characteristic $\bar{1}$. Any number between 0.01 and 0.1 has characteristic $\bar{2}$.

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6. What is the chemical formula of rust?

(A) Hydrated ferrous oxide

(B) Only ferric oxide

(C) Hydrated ferric oxide

(D) None of these

Correct Answer: (C) Hydrated ferric oxide

Solution:

Concept:

Rusting is a slow chemical process in which iron reacts with oxygen and moisture present in the atmosphere. This process is a type of corrosion that gradually destroys iron objects.

The simplified chemical reaction for rusting is:

$$4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3 \cdot xH_2O$$

The reddish-brown substance formed is known as rust.

Step 1: Understand the composition of rust.

Rust is not pure iron oxide. It contains water molecules trapped within the iron oxide structure.

Therefore, rust is called a hydrated oxide.

Step 2: Identify the type of iron oxide.

The iron present in rust is in the ferric state (Fe^{3+}).

Hence the compound formed is ferric oxide:

$$Fe_2O_3$$

Since water molecules are attached, the complete formula becomes

$$Fe_2O_3 \cdot xH_2O$$

which is known as hydrated ferric oxide.

Step 3: Select the correct option.

Therefore, rust is chemically represented as:

$$Fe_2O_3 \cdot xH_2O$$

and is called hydrated ferric oxide.

Hydrated ferric oxide

Quick Tip: Rusting requires both oxygen and moisture. Iron does not rust in completely dry air or in water without dissolved oxygen.

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7. What does the pH value indicate in water?

(A) Temperature

(B) Acidity or alkalinity

(C) Turbidity

(D) Conductivity

Correct Answer: (B) Acidity or alkalinity

Solution:

Step 1: Understanding the Concept:

The pH scale is a measure of the concentration of hydrogen ions (H^+) in a solution. It is used to determine how acidic or basic (alkaline) a liquid is.

Step 2: Key Formula or Approach:

The pH is defined by the negative logarithm of the hydrogen ion concentration:

$$\text{pH} = -\log_{10}[H^+]$$

- A pH of 7 is neutral (like pure water).
- A pH below 7 indicates an acidic solution.
- A pH above 7 indicates an alkaline (basic) solution.

Step 3: Detailed Explanation:

Water chemistry relies heavily on this value because it influences the solubility of minerals and the survival of aquatic life. It does not measure physical properties like temperature, cloudiness (turbidity), or the ability to conduct electricity (conductivity), though these can be related to the chemical composition of water.

Step 4: Final Answer:

The pH value indicates the acidity or alkalinity of water.

Quick Tip: Remember: pH stands for "potential of hydrogen." A lower number means more free hydrogen ions (higher acidity), while a higher number means fewer free hydrogen ions (higher alkalinity).

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8. Which type of radiation consists of high-energy photons with no mass or charge?

(A) Alpha radiation
(B) Beta radiation
(C) Gamma radiation
(D) Neutron radiation

Correct Answer: (C) Gamma radiation

Solution:

Step 1: Understanding the Concept:

Radioactive decay releases different types of particles or electromagnetic energy. Alpha and beta radiations consist of particles with mass and charge, whereas gamma radiation is electromagnetic energy.

Step 2: Key Formula or Approach:

- Alpha particles: Helium nuclei (2 protons, 2 neutrons, mass 4, charge +2).

- Beta particles: High-energy electrons or positrons (small mass, charge -1 or $+1$).
- Gamma radiation: High-energy photons (no mass, no charge).

Step 3: Detailed Explanation:

Gamma rays are essentially a form of high-frequency electromagnetic radiation emitted from the nucleus of an atom. Because they are photons, they travel at the speed of light and lack the physical mass and electrical charge of alpha or beta particles, allowing them to have high penetrating power.

Step 4: Final Answer:
Gamma radiation consists of high-energy photons with no mass or charge.

Quick Tip: Think of the spectrum: Alpha is a heavy "cannonball," Beta is a "bullet," and Gamma is a "ray of light." Only the light (Gamma) has no mass or charge.

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9. Which element is always present in organic compounds?

(A) Hydrogen
(B) Carbon
(C) Oxygen
(D) Nitrogen

Correct Answer: (B) Carbon

Solution:

Step 1: Understanding the Concept:
Organic chemistry is defined as the scientific study of carbon-based compounds. Carbon's unique ability to form stable, long-chain covalent bonds with itself and other elements is what makes life possible.

Step 2: Key Formula or Approach:

The definition of an organic compound is a chemical compound containing carbon-hydrogen bonds. While hydrogen, oxygen, and nitrogen are very common in organic molecules, carbon is the essential, defining element for the entire field.

Step 3: Detailed Explanation:

Without carbon, a compound is generally classified as "inorganic." Examples like carbon dioxide or carbonates are sometimes considered exceptions in traditional classifications, but in the context of general organic chemistry, carbon is the central pillar.

Step 4: Final Answer:

Carbon is the element that is always present in organic compounds.

Quick Tip: When you see the word "organic," automatically think "Carbon." Organic chemistry is essentially the chemistry of carbon atoms bonded to each other and atoms of hydrogen, oxygen, nitrogen, and other non-metals.

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10. The main function of enzymes in organic reactions is to:

(A) Increase reaction temperature
(B) Increase reaction rate
(C) Change reaction mechanism
(D) Inhibit reaction progress

Correct Answer: (B) Increase reaction rate

Solution:

Concept:

Enzymes are biological catalysts produced by living organisms. They speed up chemical reactions without being consumed during the reaction.

A catalyst works by lowering the activation energy required for a reaction.

Step 1: Understand activation energy.

For a chemical reaction to occur, reactant molecules must possess a minimum amount of energy called activation energy.

Without a catalyst, many reactions occur very slowly.

Step 2: Understand the role of enzymes.

Enzymes provide an alternative reaction pathway with lower activation energy.

As a result:

- More molecules can react successfully.
- The reaction proceeds faster.
- The enzyme itself remains chemically unchanged.

Step 3: Analyze the options.

Enzymes do not:

- Increase temperature.
- Stop reactions.
- Get consumed permanently.

Their primary role is to increase the reaction rate.

Therefore, the correct answer is:

Increase reaction rate

Quick Tip: A small quantity of enzyme can catalyze thousands of reactions because enzymes are regenerated at the end of the reaction.

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11. Ribosomes are the sites for the synthesis of which of the following?

(A) Lipids

(B) Proteins

(C) Carbohydrates

(D) Nucleic acids

Correct Answer: (B) Proteins

Solution:

Concept:

Ribosomes are small, non-membranous cell organelles found in both prokaryotic and eukaryotic cells. They are often referred to as the "protein factories" of the cell because their primary function is protein synthesis.

Proteins are essential biomolecules that perform structural, enzymatic, transport, and regulatory functions in living organisms.

Step 1: Understand the role of ribosomes.

Ribosomes read the genetic information carried by messenger RNA (mRNA).

During the process of translation, amino acids are joined together in a specific sequence to form proteins.

$$\text{mRNA} \xrightarrow{\text{Ribosome}} \text{Protein}$$

Step 2: Location of ribosomes.

Ribosomes may occur:

- Freely suspended in the cytoplasm.
- Attached to the rough endoplasmic reticulum.

Both types participate in protein synthesis.

Step 3: Analyze the options.

- Lipids are synthesized mainly in the smooth endoplasmic reticulum.
- Carbohydrates are synthesized through various metabolic pathways.
- Nucleic acids are synthesized in the nucleus.
- Proteins are synthesized on ribosomes.

Hence, ribosomes are the sites of protein synthesis.

Quick Tip: The greater the number of ribosomes in a cell, the greater its capacity to synthesize proteins.

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12. Which of the following nitrogenous bases is NOT found in DNA?

(A) Adenine

(B) Cytosine

(C) Thymine

(D) Uracil

Correct Answer: (D) Uracil

Solution:

Concept:

DNA (Deoxyribonucleic Acid) is the genetic material responsible for storing and transmitting hereditary information.

DNA contains four nitrogenous bases:

Adenine (A)

Thymine (T)

Guanine (G)

Cytosine (C)

Step 1: Recall the base pairing rule.

In DNA:

$$A \leftrightarrow T$$

$$G \longleftrightarrow C$$

These complementary pairs maintain the double-helical structure.

Step 2: Identify the role of uracil.

Uracil is not present in DNA.

Instead, it is present in RNA (Ribonucleic Acid), where it replaces thymine.

In RNA:

$$A \longleftrightarrow U$$

Step 3: Choose the correct option.

Since DNA contains thymine but not uracil, the base absent from DNA is:

Uracil

Quick Tip: Remember: DNA contains Thymine (T), whereas RNA contains Uracil (U) instead of Thymine.

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13. The Fluid Mosaic Model of the cell membrane was proposed by:

(A) Schleiden and Schwann

(B) Singer and Nicolson

(C) Watson and Crick

(D) Robert Brown

Correct Answer: (B) Singer and Nicolson

Solution:

Step 1: Understanding the Concept:

The Fluid Mosaic Model describes the cell membrane as a dynamic, flexible structure composed of a lipid bilayer with embedded proteins, cholesterol, and carbohydrates.

Step 2: Detailed Explanation:
In 1972, S.J. Singer and G.L. Nicolson proposed this model to explain the structure and function of cell membranes.

The "fluid" part refers to the phospholipid bilayer which allows lateral movement of components, while the "mosaic" part refers to the pattern of proteins scattered throughout the membrane like tiles in a mosaic.

Step 3: Final Answer:
The Fluid Mosaic Model was proposed by Singer and Nicolson.

Quick Tip: Remember: Singer and Nicolson are the "Fluid Mosaic" team! Schleiden and Schwann are associated with "Cell Theory," Watson and Crick with "DNA Structure," and Robert Brown with the discovery of the "Cell Nucleus."

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14. During which phase of the cell cycle does DNA replication occur?

(A) G1 phase
(B) S phase
(C) G2 phase
(D) M phase

Correct Answer: (B) S phase

Solution:

Step 1: Understanding the Concept:
The eukaryotic cell cycle consists of Interphase (G1, S, and G2 phases) and the M phase (mitosis/meiosis).

Step 2: Key Formula or Approach:

The S phase stands for "Synthesis" phase.

During this phase, the cell synthesizes a complete copy of the DNA in its nucleus.

Step 3: Detailed Explanation:

- G1 (Gap 1): Cell growth and metabolic activity.
- S (Synthesis): DNA replication occurs, doubling the amount of genetic material.
- G2 (Gap 2): Preparation for cell division.
- M (Mitotic) phase: The cell divides into two daughter cells.

Step 4: Final Answer:

DNA replication occurs during the S phase of the cell cycle.

Quick Tip: Think of the S in "S phase" as standing for "Synthesis." Since DNA replication is essentially the synthesis of a new DNA strand, it fits perfectly in this stage!

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15. Which organelle is known as the 'Suicidal Bag' of the cell?

(A) Mitochondria

(B) Lysosome

(C) Ribosome

(D) Golgi apparatus

Correct Answer: (B) Lysosome

Solution:

Step 1: Understanding the Concept:

Lysosomes are membrane-bound organelles containing powerful hydrolytic enzymes that break down waste materials and cellular debris.

Step 2: Detailed Explanation:

If a cell becomes damaged or dies, the lysosome membrane can rupture, releasing these

digestive enzymes into the cytoplasm. This process leads to the self-digestion of the cell, which is why they are colloquially termed "suicidal bags."

Step 3: Final Answer:

The lysosome is known as the "Suicidal Bag" of the cell.

Quick Tip: Lysosomes act like the "garbage disposal system" of the cell. When the disposal system itself breaks down and spills its acidic enzymes, it ends up destroying the very home (the cell) it was meant to clean!
