KEAM 2026 Pharmacy April 18

Question Paper with Solutions (Memory-Based)

Conducted by CEE Kerala

General Instructions

(i) **Duration:** The total duration of the examination is 1.5 hours (90 minutes).

(ii) **Total Marks:** The complete paper carries a maximum of 300 marks.

(iii) **Structure:** The paper has 2 Sections:

- **Section A:** 30 Multiple Choice Questions (Physics).
- **Section B:** 45 Multiple Choice Questions (Chemistry).

(iv) **Compulsory Questions:** All 75 questions are compulsory.

(v) Each question has four options. Only **one** option is correct.

(vi) Correct Answer: +4 marks.

(vii) **Incorrect Answer:** −1 (Negative marking).

(viii) **Unanswered/Marked for Review:** 0 marks.

Physics

1. The dimension of mutual inductance is (Denote dimension of current as A)

(A) $ML^2T^2A^{-2}$

(B) $ML^2T^{-2}A^{-2}$

(C) $ML^{-2}T^2A^{-2}$

(D) $ML^2T^{-3}A^{-3}$

(E) $ML^2T^{-3}A^{-2}$

Correct Answer: (B) $\mathrm{ML^2T^{-2}A^{-2}}$

Solution:

Step 1: Understanding the relation for mutual inductance.

The mutual inductance M is defined as the ratio of the induced emf (electromotive force) in a coil to the rate of change of current in another coil. The general relation is:

$$\mathcal{E} = M \cdot \frac{dI}{dt}$$

Where: - $\mathcal{E}$ is the induced emf, with the dimension of $[\mathcal{E}] = \mathrm{ML^2T^{-3}A^{-1}}$. - $\frac{dI}{dt}$ is the rate of change of current, which has the dimension $[\frac{dI}{dt}] = \mathrm{AT^{-1}}$.

Step 2: Deriving the dimension of M.

Using the formula $\mathcal{E} = M \cdot \frac{dI}{dt}$, we can rearrange to find the dimension of mutual inductance M:

$$[M] = \frac{[\mathcal{E}]}{[dI/dt]} = \frac{\mathrm{ML^2T^{-3}A^{-1}}}{\mathrm{AT^{-1}}} = \mathrm{ML^2T^{-2}A^{-2}}$$

Step 3: Conclusion.

Therefore, the correct dimension for mutual inductance is $\mathrm{ML^2T^{-2}A^{-2}}$, which corresponds to option (B).

Final Answer: (B) $\mathrm{ML^2T^{-2}A^{-2}}$

Quick Tip: The mutual inductance dimension can be derived by considering the dimensions of emf and the rate of change of current. Be sure to handle dimensions carefully, especially for terms involving time and current.

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2. A pure inductor of inductance $0.1\,\mathrm{H}$ is connected to an AC source (of rms voltage 220 V and angular frequency 300 Hz). The rms current is

(A) $\frac{3}{22}$ A
(B) $\frac{22}{3}$ A

(C) $\frac{11}{150}$ A

(D) $\frac{150}{11}$ A

(E) $\frac{22}{6\pi}$ A

Correct Answer: (E) $\frac{22}{6\pi}$ A

Solution:

Step 1: Using the formula for rms current.

The formula for the rms current I_{rms} in an AC circuit with a pure inductor is given by:

$$I_{\text{rms}} = \frac{V_{\text{rms}}}{X_L}$$

Where:

- $V_{\text{rms}} = 220\,\text{V}$ (rms voltage)
- $X_L = \omega L = 2\pi f L$ is the inductive reactance, where:
- $f = 300\,\text{Hz}$ (frequency)
- $L = 0.1\,\text{H}$ (inductance)
- $\omega = 2\pi f$ is the angular frequency.

Step 2: Calculate the inductive reactance X_L.

First, calculate the angular frequency:

$$\omega = 2\pi f = 2\pi \times 300 = 600\pi\,\text{rad/s}$$

Now, calculate the inductive reactance X_L:

$$X_L = \omega L = 600\pi \times 0.1 = 60\pi\,\Omega$$

Step 3: Calculate the rms current.

Now we can calculate the rms current:

$$I_{\text{rms}} = \frac{V_{\text{rms}}}{X_L} = \frac{220}{60\pi}$$

Step 4: Final calculation.

Simplifying the above expression:

$$I_{\text{rms}} = \frac{220}{60\pi} = \frac{22}{6\pi}\,\text{A}$$

Final Answer: (E) $\frac{22}{6\pi}$ A

Quick Tip: For an AC circuit with a pure inductor, the rms current depends on the voltage and the inductive reactance X_L, which is related to the frequency and inductance of the circuit.

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3. An object having a velocity of 5 m/s is accelerated at the rate 2 m/s^2 for 6s. Find the distance travelled during the period of acceleration.

(A) 60 m

(B) 25 m

(C) 36 m

(D) 66 m

(E) 45 m

Correct Answer: (D) 66 m

Solution:

Step 1: Understanding the equation for distance.

The equation to calculate the distance travelled under uniform acceleration is:

$$S = ut + \frac{1}{2}at^2$$

Where:

- $u = 5\,\text{m/s}$ (initial velocity)
- $a = 2\,\text{m/s}^2$ (acceleration)
- $t = 6\,\text{s}$ (time)

Step 2: Substituting values in the equation.

Substitute the values of u, a, and t into the formula:

$$S = 5 \times 6 + \frac{1}{2} \times 2 \times 6^2$$

Step 3: Simplifying the equation.

Simplifying the terms:

$$S = 30 + \frac{1}{2} \times 2 \times 36 = 30 + 36 = 66\,\text{m}$$

Final Answer: 66 m

Quick Tip: The formula $S = ut + \frac{1}{2}at^2$ is crucial for calculating the distance travelled under uniform acceleration. Remember to substitute the correct values for initial velocity, acceleration, and time.

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4. A vehicle moving at 36 km/hr is to be stopped by applying brakes in the next 5 m. If the vehicle weighs 2000 kg, determine the average force that must be applied on it.

(A) $10^4\,\text{N}$

(B) $2 \times 10^4\,\text{N}$

(C) $3 \times 10^4\,\text{N}$

(D) $5 \times 10^3\,\text{N}$

(E) $10^3\,\text{N}$

Correct Answer: (B) $2 \times 10^4\,\text{N}$

Solution:

Step 1: Given information.

- Initial velocity $u = 36\,\text{km/hr} = \frac{36\times1000}{3600} = 10\,\text{m/s}$
- Distance $s = 5\,\text{m}$
- Mass of the vehicle $m = 2000\,\text{kg}$

Step 2: Applying the equation of motion.

We can use the following equation of motion to find the acceleration a:

$$v^2 = u^2 + 2as$$

Since the vehicle is coming to rest, $v = 0$. Substituting the values:

$$0 = u^2 + 2as \quad \Rightarrow \quad a = -\frac{u^2}{2s}$$

Substituting $u = 10\,\text{m/s}$ and $s = 5\,\text{m}$:

$$a = -\frac{(10)^2}{2 \times 5} = -10\,\text{m/s}^2$$

Step 3: Finding the force.

The average force F can be calculated using Newton's second law:

$$F = ma$$

Substituting $m = 2000\,\text{kg}$ and $a = -10\,\text{m/s}^2$:

$$F = 2000 \times (-10) = -20000\,\text{N}$$

The magnitude of the force is $20000\,\text{N}$, which corresponds to $2 \times 10^4\,\text{N}$.

Final Answer: (B) $2 \times 10^4\,\text{N}$

Quick Tip: To calculate the force required to stop a vehicle, use the equation of motion $v^2 = u^2 + 2as$, where u is the initial velocity, a is the acceleration, and s is the stopping distance. Then apply $F = ma$ to find the force.

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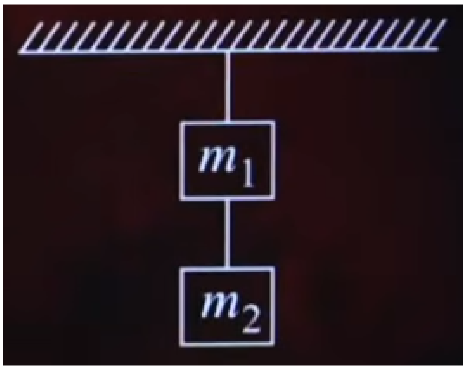
5. Two masses connected in series with two massless strings are hanging from a support as shown in the figure. Find the tension in the upper string.



(A) $m_1 g$

(B) $(m_1 - m_2)g$

(C) $m_2 g$

(D) $(m_1 + m_2)g$

(E) $(m_1 \times m_2)g$

Correct Answer: (D) $(m_1 + m_2)g$

Solution:

Step 1: Understanding the system setup.

We have two masses, m_1 and m_2, connected by massless strings. Both masses are hanging from a common support. The tension in the upper string T_1 must support the weight of both masses, as the entire system is in equilibrium. The force due to gravity acting on each mass is given by:
- The weight of the first mass m_1 is $W_1 = m_1 g$, where g is the acceleration due to gravity.
- The weight of the second mass m_2 is $W_2 = m_2 g$.

Step 2: Analyzing the forces.

In the vertical direction, since the system is in equilibrium, the total force acting on the upper string must be equal to the sum of the weights of both masses. The tension in the upper string must support both m_1 and m_2, so the tension T_1 is the sum of their weights:

$$T_1 = W_1 + W_2 = m_1 g + m_2 g$$

Step 3: Simplifying the expression for the tension.

Factor out the common term g from the equation:

$$T_1 = (m_1 + m_2)g$$

Thus, the tension in the upper string is $T_1 = (m_1 + m_2)g$.

Step 4: Conclusion.

The tension in the upper string is the sum of the weights of both masses, which is given by $(m_1 + m_2)g$. Therefore, the correct answer is option (D).

Final Answer: (D) $(m_1 + m_2)g$

Quick Tip: When two masses are connected in series with massless strings, the tension in the upper string is the sum of the weights of both masses. This principle is applicable when the system is in equilibrium.

Chemistry

6. The elemental analysis of an organic compound gave:
C: 38.71%, H: 9.67%, O: 51.67%. What is the empirical formula of the compound?

(A) CH_2O
(B) CH_3O
(C) CH_4O
(D) CHO
(E) CH_5O

Correct Answer: (B) CH_3O

Solution:

Step 1: Calculate moles of each element.

We are given the mass percentages of carbon (C), hydrogen (H), and oxygen (O). To determine the empirical formula, we need to convert the mass percentages to moles. The molecular weights of carbon, hydrogen, and oxygen are as follows:
- C: 12 g/mol
- H: 1 g/mol
- O: 16 g/mol

Now, calculate the moles for each element:

$$\text{Moles of C} = \frac{38.71}{12} = 3.2258\,\text{mol}$$
$$\text{Moles of H} = \frac{9.67}{1} = 9.67\,\text{mol}$$
$$\text{Moles of O} = \frac{51.67}{16} = 3.2294\,\text{mol}$$

Step 2: Determine the mole ratio.

Now, divide each number of moles by the smallest number of moles (which is 3.2258) to find the simplest ratio:

$$\frac{\text{Moles of C}}{3.2258} = \frac{3.2258}{3.2258} = 1$$
$$\frac{\text{Moles of H}}{3.2258} = \frac{9.67}{3.2258} = 3$$
$$\frac{\text{Moles of O}}{3.2258} = \frac{3.2294}{3.2258} = 1$$

Step 3: Write the empirical formula.

The mole ratio is approximately 1:3:1 for C:H:O. Therefore, the empirical formula is CH_3O.

Final Answer: (B) CH_3O

Quick Tip: To determine the empirical formula from elemental analysis data, first calculate the moles of each element, then find the smallest mole ratio and simplify it to get the empirical formula.

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7. Which of the following statement is incorrect about Bohr's model of atom?

(A) It fails to account for the finer details of the hydrogen atom spectrum.

(B) Unable to explain the splitting of spectral lines in the presence of magnetic field.

(C) The angular momentum of electron is quantised.

(D) The ability of atoms to form molecule by chemical bonds.

(E) Unable to explain the splitting of spectral lines in the presence of magnetic field.

Correct Answer: (D) The ability of atoms to form molecule by chemical bonds.

Solution:

Bohr's model of the atom was a significant advancement in understanding atomic structure. However, it had limitations. Let's examine the given statements:

Step 1: Analyze each statement.

(A) It fails to account for the finer details of the hydrogen atom spectrum.
This is correct. Bohr's model cannot explain the fine structure or hyperfine splitting in the hydrogen spectrum. These fine details were later explained by the quantum mechanical model of the atom.

(B) Unable to explain the splitting of spectral lines in the presence of magnetic field.
This is also correct. Bohr's model cannot explain the Zeeman effect, which is the splitting of spectral lines in the presence of a magnetic field. This phenomenon requires quantum mechanics for a proper explanation.

(C) The angular momentum of electron is quantised.
This statement is correct. One of the key features of Bohr's model is that the angular momentum of an electron is quantised. Bohr proposed that the angular momentum of electrons in certain

orbits is restricted to discrete values.

Step 2: Identify the incorrect statement.

(D) The ability of atoms to form molecule by chemical bonds.

This statement is incorrect in the context of Bohr's model. Bohr's model does not address the ability of atoms to form molecules or the nature of chemical bonding. This concept is better explained by quantum mechanics and the molecular orbital theory.

(E) Unable to explain the splitting of spectral lines in the presence of magnetic field.

This is a repeat of statement (B), and it is correct. Bohr's model does not explain the splitting of spectral lines in the presence of a magnetic field (the Zeeman effect).

Final Answer: (D) The ability of atoms to form molecule by chemical bonds.

Quick Tip: Bohr's model is effective in explaining the hydrogen atom spectrum, but it fails to explain phenomena like fine structure and Zeeman effect, which require quantum mechanical models.

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8. The number of electrons in one mole of methane (CH_4) is:

(A) 6.023×10^{23}

(B) 60.23×10^{23}

(C) 0.6023×10^{23}

(D) 602.3×10^{23}

(E) 6023×10^{23}

Correct Answer: (B) 60.23×10^{23}

Solution:

Step 1: Number of electrons in methane.

In methane (CH_4), carbon (C) has 6 electrons, and hydrogen (H) has 1 electron. Since there are 4 hydrogen atoms, the total number of electrons in one molecule of methane is:

$$\text{Total electrons} = 6(\text{from C}) + 4 \times 1(\text{from H}) = 10\,\text{electrons per molecule of } CH_4$$

Step 2: Number of electrons in one mole of methane.

One mole of methane (CH_4) contains 6.023×10^{23} molecules (Avogadro's number). Therefore, the total number of electrons in one mole of methane is:

$$\text{Total electrons} = 10 \times 6.023 \times 10^{23} = 60.23 \times 10^{23}$$

Step 3: Conclusion.

Thus, the number of electrons in one mole of methane is 60.23×10^{23}.

Final Answer: (B) 60.23×10^{23}

Quick Tip: To calculate the total number of electrons in one mole of a compound, multiply the number of electrons in one molecule by Avogadro's number, 6.023×10^{23}.

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9. No two electrons in an atom can have the same set of quantum numbers. This is known as:

(A) Hund's rule
(B) Pauli's exclusion principle
(C) Aufbau principle
(D) Heisenberg's principle
(E) Fajan's rule

Correct Answer: (B) Pauli's exclusion principle

Solution:

The Pauli's exclusion principle states that no two electrons in an atom can have the same set of quantum numbers. This principle is crucial in explaining the electron configuration of atoms and the arrangement of electrons in orbitals.

Step 1: Understanding quantum numbers.

Each electron in an atom is described by a set of four quantum numbers: 1. Principal quantum number (n) - defines the energy level. 2. Azimuthal quantum number (l) - defines the orbital shape. 3. Magnetic quantum number (m_l) - defines the orientation of the orbital. 4. Spin quantum number (m_s) - defines the electron's spin direction.

Step 2: Applying the exclusion principle.

The Pauli exclusion principle asserts that no two electrons in an atom can have the same set of these four quantum numbers. This means that every electron in an atom has a unique set of quantum numbers.

Step 3: Conclusion.

Therefore, the correct answer is (B) Pauli's exclusion principle.

Final Answer: (B) Pauli's exclusion principle

Quick Tip: Pauli's exclusion principle is fundamental in determining the electron configuration in atoms. It ensures that each electron in an atom has a unique quantum state.

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10. Uncertainty principle is valid for:

(A) Proton
(B) Methane
(C) Both (A) and (B)
(D) 1 μm sized platinum particles
(E) 1 μm sized NaCl particles

Correct Answer: (A) Proton

Solution:

The uncertainty principle, also known as Heisenberg's uncertainty principle, is a fundamental concept in quantum mechanics. It states that there is a limit to how precisely we can know both the position and the momentum of a particle simultaneously.

Step 1: Applicability of the uncertainty principle.

The uncertainty principle is significant for very small particles, such as subatomic particles (e.g., protons, electrons, etc.). For larger objects, such as molecules like methane or larger particles like platinum or NaCl crystals, the uncertainty in position and momentum is so small that it becomes negligible.

Step 2: Why proton is valid for the uncertainty principle.

The uncertainty principle is most relevant to elementary particles like protons, which are tiny and exhibit quantum mechanical effects. In such small particles, the uncertainty in the position and momentum is significant.

Step 3: Conclusion.

Therefore, the uncertainty principle is valid for protons, and the correct answer is (A) Proton.

Final Answer: (A) Proton

Quick Tip: The uncertainty principle primarily applies to subatomic particles, where quantum effects are significant. For macroscopic objects like molecules or large particles, the uncertainty is negligible.

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11. Which of the following has the least atomic radius?

(A) B

(B) C

(C) N

(D) O

(E) F

Correct Answer: (E) F

Solution:

The atomic radius generally decreases as we move across a period from left to right in the periodic table. This happens because, as we move across a period, the number of protons increases, leading to a greater nuclear charge. The increased nuclear charge pulls the electrons closer to the nucleus, reducing the size of the atom.

Step 1: Atomic radius across the period.

- In the case of the elements in the question, we are dealing with period 2 elements: B (Boron), C (Carbon), N (Nitrogen), O (Oxygen), and F (Fluorine).
- As we move from left to right across the period, the atomic radius decreases.

Step 2: Atomic radius of fluorine.

Fluorine (F) is the rightmost element in the period, and therefore, it has the least atomic radius. This is because it has the highest effective nuclear charge in this period, which pulls its electrons closer to the nucleus.

Step 3: Conclusion.

Therefore, the element with the least atomic radius is fluorine (F), which corresponds to option (E).

Final Answer: (E) F

Quick Tip: The atomic radius decreases across a period from left to right due to the increase in nuclear charge, which pulls the electrons closer to the nucleus.

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12. Which one of the following elements is represented as Eka-silicon in Mendeleev's periodic table?

(A) Gallium

(B) Germanium

(C) Aluminium

(D) Tin

(E) Arsenic

Correct Answer: (B) Germanium

Solution:

In Mendeleev's periodic table, Eka-silicon was the name given to an undiscovered element that was predicted by Mendeleev to have properties similar to silicon. This element was later discovered and named germanium.

Step 1: Eka-silicon prediction.

Mendeleev, while arranging the elements in his periodic table, left gaps for undiscovered elements. One such element was predicted to be similar to silicon, and Mendeleev called it "Eka-silicon."

Step 2: Discovery of germanium.

Later, germanium was discovered and found to have similar properties to silicon, confirming Mendeleev's prediction. Therefore, germanium is the element represented as Eka-silicon in Mendeleev's periodic table.

Step 3: Conclusion.

Thus, the element represented as Eka-silicon is germanium, which corresponds to option (B).

Final Answer: (B) Germanium

Quick Tip: Mendeleev's periodic table had gaps for undiscovered elements. Eka-silicon was one such gap, which was later filled by the discovery of germanium.
