KEAM 2026 Pharmacy April 18

Question Paper with Solution PDF

Conducted by CEE Kerala

General Instructions

(i) **Duration:** The total duration of the examination is 3 hours (180 minutes).

(ii) **Total Marks:** The complete paper carries a maximum of 600 marks.

(iii) **Structure:** The paper has 3 Sections:

- **Section A:** 45 Multiple Choice Questions (Physics).
- **Section B:** 30 Multiple Choice Questions (Chemistry).
- **Section B:** 75 Multiple Choice Questions (Mathematics).

(iv) **Compulsory Questions:** All 150 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) $ML^2T^{-2}A^{-2}$

Solution:

Step 1: Understanding the Concept:

Mutual inductance is the property of two coils where a changing current in one induces an electromotive force in the other.

It shares the exact same dimensional formula as self-inductance.

Step 2: Key Formula or Approach:

The dimension can be derived from the energy stored in an inductor, given by $U = \frac{1}{2}MI^2$.

Rearranging this formula gives $M = \frac{2U}{I^2}$.

Step 3: Detailed Explanation:

The dimensional formula for energy (or work), U, is $[M^1L^2T^{-2}]$.

The dimension for current, I, is given as $[A]$.

Substituting these into the rearranged equation yields:

$$[M] = \frac{[M^1L^2T^{-2}]}{[A]^2}$$

$$[M] = [M^1L^2T^{-2}A^{-2}]$$

This matches the second option provided in the choices.

Step 4: Final Answer:

The dimension of mutual inductance is $ML^2T^{-2}A^{-2}$.

Quick Tip: To avoid complex derivations during the exam, remember that inductance (both self and mutual) can always be quickly linked to energy via $E = \frac{1}{2}LI^2$.

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2. A pure inductor of inductance 0.1H 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: (B) $\frac{22}{3}$ A

Solution:

Step 1: Understanding the Concept:

In an AC circuit with a pure inductor, the opposition to the current flow is called inductive reactance (X_L).

The root mean square (rms) current can be calculated using Ohm's law applied to AC circuits.

Step 2: Key Formula or Approach:

The inductive reactance is found using the formula $X_L = \omega L$, where ω is the angular frequency.

The rms current is then calculated using the relation $I_{\text{rms}} = \frac{V_{\text{rms}}}{X_L}$.

Step 3: Detailed Explanation:

We are given the inductance $L = 0.1$ H, and the rms voltage $V_{\text{rms}} = 220$ V.

The problem states the angular frequency is 300 Hz, which indicates $\omega = 300$ rad/s based on standard problem conventions despite the unit.

First, we find the inductive reactance:

$$X_L = \omega L = 300 \times 0.1 = 30\,\Omega$$

Next, we substitute this into the current formula:

$$I_{\text{rms}} = \frac{220}{30}$$

$$I_{\text{rms}} = \frac{22}{3}\text{ A}$$

Step 4: Final Answer:

The rms current flowing through the circuit is $\frac{22}{3}$ A.

Quick Tip: When angular frequency (ω) is given but labeled with Hz instead of rad/s, always test the direct multiplication $\omega = 300$ first to see if it matches the given options.

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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 Concept:

This problem involves an object undergoing uniform linear acceleration.

We need to calculate the total displacement given the initial conditions and the acceleration period.

Step 2: Key Formula or Approach:

The distance travelled can be found using the second kinematic equation of motion.

The formula is $s = ut + \frac{1}{2}at^2$, where u is initial velocity, a is acceleration, and t is time.

Step 3: Detailed Explanation:

The given values from the problem are:

Initial velocity, $u = 5$ m/s.

Acceleration, $a = 2 \text{ m/s}^2$.

Time interval, $t = 6$ s.

Now, we substitute these parameters into the formula:

$$s = (5)(6) + \frac{1}{2}(2)(6)^2$$

$$s = 30 + (1)(36)$$

$$s = 30 + 36 = 66 \text{ m}$$

Step 4: Final Answer:

The distance travelled by the object during this period is 66 m.

Quick Tip: Always ensure your units are consistent (meters and seconds) before directly plugging them into the standard kinematic equations.

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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 N

(B) 2×10^4 N

(C) 3×10^4 N

(D) 5×10^3 N

(E) 10^3 N

Correct Answer: (B) 2×10^4 N

Solution:

Step 1: Understanding the Concept:

The vehicle is brought to a complete halt, meaning its final velocity is zero.

We must calculate the deceleration required to stop it within the specified distance, and then apply Newton's second law.

Step 2: Key Formula or Approach:

Use the third equation of motion to find the acceleration: $v^2 = u^2 + 2as$.

Then, determine the required force using Newton's second law: $F = ma$.

Step 3: Detailed Explanation:

First, we must convert the initial velocity from km/hr to m/s:

$$u = 36 \text{ km/hr} = 36 \times \frac{5}{18} \text{ m/s} = 10 \text{ m/s}$$

The final velocity is $v = 0$ m/s.

The stopping distance is $s = 5$ m.

Using the kinematic equation:

$$0^2 = (10)^2 + 2(a)(5)$$

$$0 = 100 + 10a$$

$$10a = -100 \implies a = -10 \text{ m/s}^2$$

The negative sign indicates that it is a retarding force.

Now, calculate the magnitude of the average force:

Mass, $m = 2000$ kg.

$$F = |ma| = 2000 \times 10 = 20000 \text{ N}$$

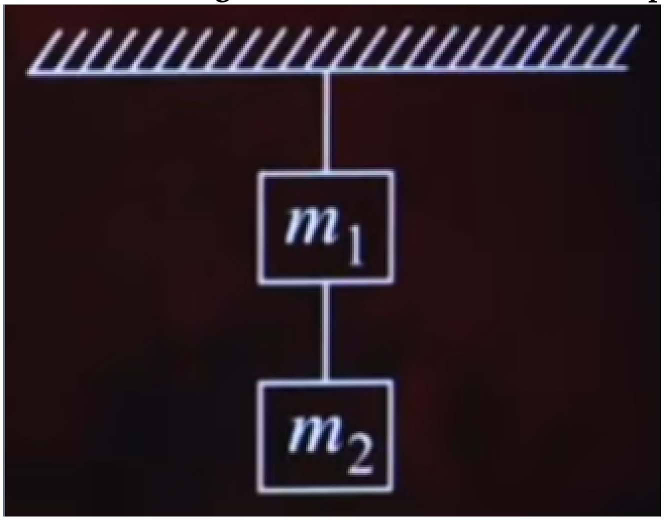
This can be written in scientific notation as 2×10^4 N.

Step 4: Final Answer:

The average stopping force required is 2×10^4 N.

Quick Tip: To save time during calculations, memorize the conversion factor: multiply by $\frac{5}{18}$ to convert km/hr to m/s instantly.

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 Concept:

In a vertically hanging system in equilibrium, each segment of the string must support the entire weight of all the masses located below it.

The net force acting on any part of the system is zero.

Step 2: Key Formula or Approach:

The tension T in the string supporting a mass system is balanced by the gravitational force: $T = \sum(m) \times g$.

We simply sum the masses below the specific string segment.

Step 3: Detailed Explanation:

Let us break down the forces in the system.

The lower string only carries the weight of the lower mass, m_2.

Therefore, the tension in the lower string is $T_{\text{lower}} = m_2 g$.

The upper string, however, connects the support to both mass m_1 and mass m_2.

It must support the combined weight of the entire system hanging below it.

Summing the forces vertically for the upper string gives:

$$T_{\text{upper}} = (m_1 + m_2)g$$

Step 4: Final Answer:

The tension in the upper string is equal to $(m_1 + m_2)g$.

Quick Tip: For static equilibrium problems with hanging masses, you can imagine all masses below the point of interest as a single combined mass object.

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: Understanding the Concept:

The empirical formula shows the simplest whole-number ratio of the different atoms present in a chemical compound.
We determine this ratio by converting mass percentages into relative moles for each element.

Step 2: Key Formula or Approach:
The number of moles for each element is calculated as $\frac{\text{Percentage by mass}}{\text{Atomic mass}}$.
Then, we divide each mole value by the smallest calculated mole value to find the simplest ratio.

Step 3: Detailed Explanation:
Let us assume we have a 100 g sample, which means the percentages translate directly to grams.
Mass of C $= 38.71$ g.
Mass of H $= 9.67$ g.
Mass of O $= 51.67$ g.
We calculate the moles using standard atomic masses (C $= 12$ g/mol, H $= 1$ g/mol, O $= 16$ g/mol):
Moles of C $= \frac{38.71}{12} \approx 3.22$ mol.
Moles of H $= \frac{9.67}{1} = 9.67$ mol.
Moles of O $= \frac{51.67}{16} \approx 3.22$ mol.
Next, we divide each by the smallest mole value (3.22) to get the atomic ratio:
C ratio $= \frac{3.22}{3.22} = 1$.
H ratio $= \frac{9.67}{3.22} \approx 3$.
O ratio $= \frac{3.22}{3.22} = 1$.
This results in a simple whole-number ratio of 1:3:1 for C:H:O.

Step 4: Final Answer:
The empirical formula of the given compound is CH_3O.

Quick Tip: To speed up calculations in chemistry exams, look for rough multiples; for instance, recognizing that 9.67 is roughly three times 3.22 avoids tedious division.

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:

Step 1: Understanding the Concept:

The question requires us to identify the incorrect statement regarding the features and limitations of Niels Bohr's atomic model.

Bohr's theory effectively explained the discrete energy levels of a hydrogen atom but had several significant shortcomings.

Step 2: Key Formula or Approach:

The approach is to evaluate each statement against the known postulates and recognized limitations of Bohr's atomic theory.

No mathematical formula is needed; conceptual verification is sufficient.

Step 3: Detailed Explanation:

Let's analyze the options individually.

Option (A): Bohr's model could not explain the finer details (such as doublets) of the hydrogen spectrum observed with advanced spectroscopes. This statement is true.

Option (B) and (E): The model failed to explain the Zeeman effect, which is the splitting of spectral lines in a magnetic field. This statement is true.

Option (C): A primary postulate of Bohr's model is that the angular momentum of an electron is quantized ($mvr = \frac{nh}{2\pi}$). This statement is true.

Option (D): The statement implies Bohr's model explains "The ability of atoms to form molecule by chemical bonds." This is entirely false.

Bohr's model provided no insight into chemical bonding, molecular formation, or the shapes of molecules.

Step 4: Final Answer:

The statement claiming the model explains the ability of atoms to form molecules by chemical bonds is incorrect.

Quick Tip: Remember that Bohr's model was strictly successful for single-electron species (like H, He^+, Li^{2+}) and could not explain molecular bonding or multi-electron systems.

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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: Understanding the Concept:

To find the total number of electrons in a mole of a substance, we must determine the number of electrons in a single molecule first.
Then, we multiply that count by the total number of molecules in a mole (Avogadro's number).

Step 2: Key Formula or Approach:

The formula is: Total electrons = (Electrons per molecule) × (Number of moles) × (Avogadro's number, N_A).
Avogadro's number is approximately 6.023×10^{23} mol^{-1}.

Step 3: Detailed Explanation:

First, we count the electrons in one molecule of methane (CH_4).

A carbon atom (C) has an atomic number of 6, meaning it contains 6 electrons.

A hydrogen atom (H) has an atomic number of 1, meaning it contains 1 electron.

The total number of electrons in one CH_4 molecule is $6 + 4(1) = 10$ electrons.

Since one mole of methane contains 6.023×10^{23} molecules, we multiply this by the electron count per molecule.

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

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

Step 4: Final Answer:

There are 60.23×10^{23} electrons in one mole of methane.

Quick Tip: Always be careful to distinguish between the number of moles of molecules and the number of specific subatomic particles (electrons, protons) requested.

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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:

Step 1: Understanding the Concept:

Quantum numbers act as a unique address for an electron within an atom, defined by principal

(n), azimuthal (l), magnetic (m_l), and spin (m_s) numbers.
We need to identify the specific scientific principle that forbids two electrons from sharing all four numbers.

Step 2: Key Formula or Approach:
The approach involves identifying the standard definition of the quantum mechanical principles provided in the options.
No calculation is required.

Step 3: Detailed Explanation:
Let us review the definitions of the principles given.
Hund's rule dictates that electrons fill degenerate orbitals singly before pairing up.
The Aufbau principle states that electrons fill lower-energy atomic orbitals first.
Heisenberg's principle states that the exact position and momentum of an electron cannot be simultaneously determined.
Pauli's exclusion principle strictly states that no two electrons in a single atom can have an identical set of all four quantum numbers.
If two electrons occupy the exact same orbital (sharing n, l, and m_l), they must have opposite spins (different m_s).

Step 4: Final Answer:
The statement perfectly describes Pauli's exclusion principle.

Quick Tip: A simple memory trick: "Pauli Prevents Pairing of Perfect matches" – no two electrons can have perfectly matching quantum numbers.

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10. Uncertainty principle is valid for:

(A) Proton
(B) Methane
(C) Both (A) and (B)

(D) 1μm sized platinum particles

(E) 1μm sized NaCl particles

Correct Answer: (C) Both (A) and (B)

Solution:

Step 1: Understanding the Concept:

Heisenberg's Uncertainty Principle declares that it is fundamentally impossible to simultaneously determine both the exact position and momentum of a particle.

This principle is a core component of quantum mechanics and is significant primarily for microscopic objects.

Step 2: Key Formula or Approach:

The mathematical expression for Heisenberg's uncertainty principle is $\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$.

The mass of the object dictates how observable this uncertainty is.

Step 3: Detailed Explanation:

While the principle theoretically applies to all matter, its practical significance is inversely proportional to the mass of the object.

For macroscopic objects, the mass is so large that the uncertainty in position and velocity becomes infinitesimally small and completely unobservable.

A proton is a subatomic particle, meaning it has an extremely small mass and exhibits significant quantum uncertainty.

A methane molecule is also a microscopic entity on the atomic scale, making the uncertainty principle valid and significant for it.

Particles of size 1μm (like the platinum or NaCl particles) are considered macroscopic in the context of quantum mechanics, and their quantum uncertainties are negligible.

Therefore, the principle holds true measurable validity for both protons and methane.

Step 4: Final Answer:

The uncertainty principle is valid for both the proton and the methane molecule.

Quick Tip: Quantum effects like uncertainty and de Broglie wavelengths are only significant for objects on the atomic and subatomic scale, not for anything measurable in micrometers.

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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:

Step 1: Understanding the Concept:

Atomic radius is defined as the typical distance from the center of the nucleus to the boundary of the surrounding shells of electrons.

The size of an atom is governed by periodic trends across periods and groups in the periodic table.

Step 2: Key Formula or Approach:

The approach is to use periodic trends, specifically the variation of effective nuclear charge (Z_{eff}) across a period.

As Z_{eff} increases, the atomic radius decreases.

Step 3: Detailed Explanation:

All the elements provided in the options (Boron, Carbon, Nitrogen, Oxygen, Fluorine) belong to the second period of the periodic table.

As we move from left to right across a period, electrons are sequentially added to the same principal energy shell.

Simultaneously, protons are added to the nucleus, which increases the nuclear charge.

Because electrons in the same shell do not shield each other very effectively, the effective

nuclear charge (Z_{eff}) increases from left to right.
This stronger pull from the nucleus draws the electron cloud closer, leading to a decrease in atomic radius.
The order of elements from left to right is B, C, N, O, F.
Therefore, the atomic radius progressively decreases in the order: $\text{B} > \text{C} > \text{N} > \text{O} > \text{F}$.

Step 4: Final Answer:
Fluorine (F), being the rightmost element among the choices, has the least atomic radius.

Quick Tip: The general rule of thumb for atomic radius is: it decreases from left to right across a period and increases from top to bottom down a group.

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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:

Step 1: Understanding the Concept:
When Dmitri Mendeleev formulated his periodic table, he recognized that some elements were missing based on the periodic trends.
He left gaps for these undiscovered elements and predicted their chemical and physical properties based on their expected positions.

Step 2: Key Formula or Approach:

The approach is to recall the historical context of Mendeleev's periodic table and the specific names he assigned to undiscovered elements.

He used the Sanskrit prefix "Eka" (meaning one) to name the missing element after the known element directly above it.

Step 3: Detailed Explanation:

Mendeleev predicted the existence of an element that would fit below Silicon in Group 14.

He tentatively named it 'Eka-silicon', meaning it would be the first element under Silicon and share similar properties.

When the element Germanium (Ge) was eventually discovered in 1886 by Clemens Winkler, its properties perfectly matched Mendeleev's predictions for Eka-silicon.

For context with other options, 'Eka-aluminium' was the predicted name for Gallium, and 'Eka-boron' was the predicted name for Scandium.

Step 4: Final Answer:

Germanium is the element that was historically represented as Eka-silicon in Mendeleev's periodic table.

Quick Tip: Use simple acronyms to remember Mendeleev's major predictions: BoSc (Eka-Boron = Scandium), AlGa (Eka-Aluminium = Gallium), and SiGe (Eka-Silicon = Germanium).

