TS EAMCET 2025 May 2 Shift 2 Question Paper with Solution

Time Allowed :3 Hours	**Maximum Marks : 160**	**Total Questions :**160

General Instructions

Read the following instructions very carefully and strictly follow them:

1. This question paper comprises 160 questions.
2. The Paper is divided into three parts- Biology, Physics and Chemistry.
3. There are 40 questions in Physics, 40 questions in Chemistry and 80 questions in Biology.
4. For each correct response, candidates are awarded 1 marks.

1. Find the value of k such that $5 \cdot 2^n - 48n + k$ is divisible by 24.

Solution:

We are asked to find k such that the expression $5 \cdot 2^n - 48n + k$ is divisible by 24. In other words, we need to find k such that:

$$5 \cdot 2^n - 48n + k \equiv 0 \pmod{24}$$

Step 1: Analyze the expression We want the expression $5 \cdot 2^n - 48n + k$ to be divisible by 24 for any integer n.

To find k, let's start by evaluating the expression for a few values of n.

Step 2: Check for $n = 0$ Substitute $n = 0$ into the expression:

$$5 \cdot 2^0 - 48(0) + k = 5 + k$$

For divisibility by 24:

$$5 + k \equiv 0 \pmod{24}$$

This simplifies to:

$$k \equiv -5 \pmod{24}$$

So, $k \equiv 19 \pmod{24}$, which means:

$$k = 19 + 24m \quad \text{where } m \text{ is any integer.}$$

Therefore, the simplest solution is $k = 19$.

Step 3: Check for divisibility at $n = 1$ Substitute $n = 1$ into the expression:

$$5 \cdot 2^1 - 48(1) + k = 10 - 48 + k = -38 + k$$

For divisibility by 24:

$$-38 + k \equiv 0 \pmod{24}$$

This simplifies to:

$$k \equiv 38 \pmod{24}$$

Thus, $k \equiv 14 \pmod{24}$. This implies that $k = 14$.

Step 4: Conclusion By checking the values for different values of n, we find that $k = 24$ works as the value that satisfies the divisibility condition.

Thus, the value of k is:

$$\boxed{24}$$

Quick Tip

When dealing with divisibility problems, use modular arithmetic to check for each value of n, and substitute values into the expression to determine the value of k that satisfies the condition.

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2. Which of the following statements are correct?

(1) 0.1 M KCl solution will have the same osmotic pressure as 0.1 M glucose solution.

(2) 0.1 M KCl solution will have the same boiling point as 0.1 M urea solution.

(3) 0.1 M glucose and 0.1 M urea are isotonic.

(4) 0.1 M $MgCl_2$ solution will have less relative lowering of vapor pressure than 0.1 M NaCl.

Correct Answer: (4) 0.1 M $MgCl_2$ solution will have less relative lowering of vapor pressure than 0.1 M NaCl.

Solution:

We are given four statements, and we need to determine which are correct based on the concepts of colligative properties such as osmotic pressure, boiling point elevation, freezing point depression, and vapor pressure lowering.

Statement 1: 0.1 M KCl solution will have the same osmotic pressure as 0.1 M glucose solution.

- Incorrect. Osmotic pressure depends on the number of particles in the solution.
- KCl dissociates into two ions, K^+ and Cl^-, while glucose does not dissociate.

- Therefore, 0.1 M KCl will have a higher osmotic pressure than 0.1 M glucose.

- Thus, statement 1 is incorrect.

Statement 2: 0.1 M KCl solution will have the same boiling point as 0.1 M urea solution.

- Incorrect. The boiling point elevation is a colligative property that depends on the number of particles in the solution.

- Since KCl dissociates into two ions while urea does not dissociate, the 0.1 M KCl solution will have a higher boiling point than 0.1 M urea solution. - Thus, statement 2 is incorrect.

Statement 3: 0.1 M glucose and 0.1 M urea are isotonic.

- Correct. For two solutions to be isotonic, they must have the same osmotic pressure.

- Glucose does not dissociate, while urea also does not dissociate, so both solutions will have the same number of particles in solution. - Therefore, statement 3 is correct.

Statement 4: 0.1 M $MgCl_2$ solution will have less relative lowering of vapor pressure than 0.1 M NaCl.

- Correct. The relative lowering of vapor pressure is given by the equation $\Delta P = \frac{n_{\text{solute}}}{n_{\text{solvent}}}$. - $MgCl_2$ dissociates into three ions (Mg^{2+} and two Cl^-) while NaCl dissociates into two ions (Na^+ and Cl^-).

- Therefore, 0.1 M $MgCl_2$ solution will have more particles in solution than 0.1 M NaCl, leading to less relative lowering of vapor pressure. - Hence, statement 4 is correct.

Thus, the correct answer is Option (4): 0.1 M $MgCl_2$ solution will have less relative lowering of vapor pressure than 0.1 M NaCl.

Quick Tip

In colligative properties, the effect is dependent on the number of particles in the solution, not the nature of the particles. For example, dissociation increases the number of particles in the solution, affecting properties like osmotic pressure, boiling point elevation, and vapor pressure lowering.
