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398, Ramkrishnapur Road, Barasat
Kolkata, West Bengal-700125

BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – B.Tech.(CSE)-AIML-2024/B.Tech.(CSE)-DS-2024/B.Tech.(CSE)-CYS-2024/B.Tech.(CSE)-CYS-2025/B.Tech.(CSE)-DS-2025

Course Name – Engineering Chemistry

Course Code - BBS00010

(Semester II)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

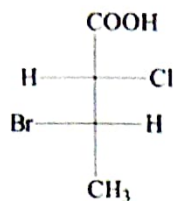
1. Choose the correct alternative from the following :

- (i) The wave function of a particle lie in which region of a 1-D box? (L = Length of the box)
- | | |
|----------------|------------|
| a) $X > 0$ | b) $X < 0$ |
| c) $0 < X < L$ | d) $X > L$ |
- (ii) Predict the number of unpaired electrons present in $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$.
- | | |
|------|------|
| a) 0 | b) 1 |
| c) 2 | d) 3 |
- (iii) The compounds cyclopropene, cyclopentadienyl cation and cyclohexatriene respectively are
- | | |
|---|--|
| a) aromatic, non-aromatic, anti-aromatic. | b) anti- aromatic, aromatic, non-aromatic. |
| c) non-aromatic, anti-aromatic, aromatic | d) non-aromatic, aromatic, anti-aromatic. |
- (iv) Conversion of benzene to phenol will give rise to which type of shifting of absorption maxima?
- | | |
|-----------------------|-----------------------|
| a) Bathochromic shift | b) Hypsochromic shift |
| c) Hypochromic shift | d) Hyperchromic shift |
- (v) Deviation of a real gas from its ideal behavior can be visualized by the term of
- | | |
|-----------------------|---------------------------|
| a) Volume factor | b) Pressure factor |
| c) Temperature factor | d) Compressibility factor |
- (vi) The unit of van der Waal constant 'b' is
- | | |
|-------------------------|-------------------------|
| a) mol/lit | b) lit/mol |
| c) mol/lit ² | d) lit/mol ² |
- (vii) The value of the potential energy of a particle in a 1-D box is.....
- | | |
|------------|-------------|
| a) Maximum | b) Minimum |
| c) Zero | d) Infinity |

- C

$$3 \times 5 = 15$$

-



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6. With an explanation, summarize the chemical equations involved in the rusting of iron. (3)

OR

For the reaction $M_2O(s) \rightarrow 2M(s) + \frac{1}{2}O_2(g)$; $\Delta H = 30 \text{ kJ mol}^{-1}$ and $\Delta S = 0.07 \text{ kJ mol}^{-1} \text{ K}^{-1}$ at 1 atm. Estimate up to which temperature, the reaction would not be spontaneous?

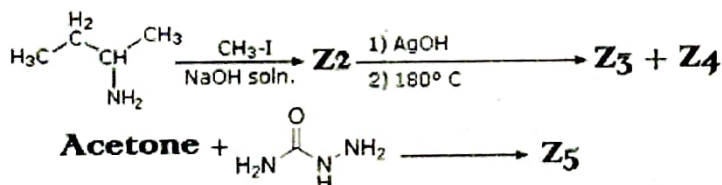
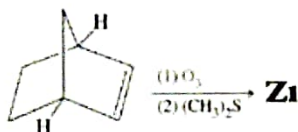
Group-C

(Long Answer Type Questions)

5 x 6=30

7. Predict the products for the following reactions:

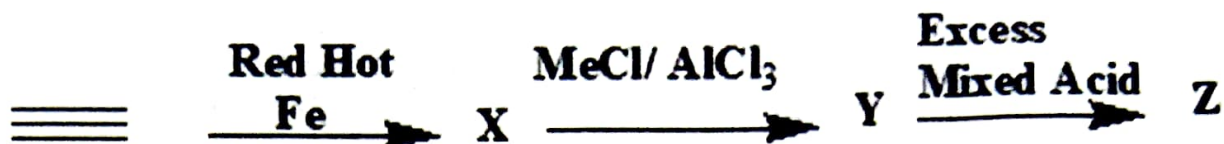
(5)



8. a. 1 mole of an ideal gas, at a temperature 100 K absorbs heat 4320 J. Evaluate the entropy change (5) in the expansion process.
- b. Calculate the entropy change when 2 g of hydrogen gas is mixed with 16 g of helium gas.
9. a. Write down the time-independent Schrödinger wave equation and clearly explain the significance of each term involved in the equation. (5)
- b. Define the significance of the term Ψ^2 , where Ψ denotes the wave function.
10. a. Explain why Carnot cycle is a completely imaginary cycle. (5)
- b. Write down the formula by which efficiency of a Carnot engine can be expressed.
- c. Explain why the efficiency of a Carnot Engine can never be 100%.

11. Predict the products formed in each step of the following reaction scheme.

(5)



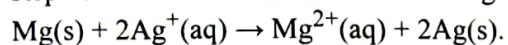
12. a. Prove that for an ideal gas under isothermal condition $\Delta G = \Delta A$. Where, 'G' is Gibbs Free energy and 'A' is Helmholtz Free energy. (5)

b. Determine the change in entropy when 2 moles of an ideal gas is compressed from 10 L to 1 L under isothermal condition.

OR

Represent the cell in which the following reaction takes place:

(5)



Also, determine the cell potential of that cell.

Given that: $E^0_{\text{Mg}^{2+}/\text{Mg}} = -2.37 \text{ V}$, $E^0_{\text{Ag}^+/\text{Ag}} = 0.80 \text{ V}$, $[\text{Ag}^+] = 0.02 \text{ M}$, and $[\text{Mg}^{2+}] = 0.001 \text{ M}$.

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