

1454

8

(e) Explain Resonance Energy

(5×3)

[This question paper contains 8 printed pages.]

Your Roll No.....

आपका अनुक्रमांक.....

Sr. No. of Question Paper : 1454

I

Unique Paper Code : 2172583501

Name of the Paper : DSC-A5: Physical Chemistry

Name of the Course : Agrochemical and Pest
Management

Semester : V

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt four questions in all.

(500)

P.T.O.

1. Answer the following questions in brief:

(a) Distinguish between state function and path function. Give one example for each

(b) Explain why specific properties like specific volume or specific heat capacity are intensive.

(c) Define specific heat capacity. Differentiate between specific heat capacity and heat capacity.

(d) 2.0 mole of an ideal gas expands isothermally and reversibly at 300 K from a volume of 10 dm³ to a final volume of 20 dm³. Calculate the work done, ΔE , ΔH , and δq . ($R=8.314 \text{ J mol}^{-1}\text{K}^{-1}$).

(e) Calculate the pH of 0.04 M solution of $\text{Mg}(\text{OH})_2$.
(2, 2, 4, 4, 3)

200 mL of $1.3 \times 10^{-3} \text{ M AgNO}_3$ is mixed with 100 mL of $4.5 \times 10^{-5} \text{ M Na}_2\text{S}$ solution. Will precipitation occur? ($K_{\text{sp}} = 1.6 \times 10^{-49}$).

(i) Define degree of ionization. What are the factors affecting the degree of ionization?

(ii) Calculate the pH of 0.1 M CH_3COOH . The dissociation constant of acetic acid is 1.8×10^{-5} .
(4, 5, 6)

6. Write short notes on the following:

(a) Common Ion Effect and its Applications

(b) Enthalpy of Combustion and its applications

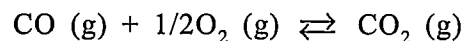
(c) Two statements of the Second Law of Thermodynamics

(d) Conductometric Titrations (only acid-base)

P.T.O.

(b) Define molar conductance and specific conductance. How are they related? Explain why the conductivity of a solution decreases with dilution, but molar conductance increases.

(c) The equilibrium constant (K_p) for the reaction



is 5.04×10^{17} at 25°C . Calculate the standard free energy change for the reaction.

(d) Calculate the pH of 10^{-8} M NaOH aqueous solution
(5, 4, 4, 2)

5. (a) Explain buffer action if small amount of HCl is added in basic buffer solution ($\text{NH}_4\text{OH}/\text{NH}_4\text{Cl}$).

(b) Write any two difference between ionic product and solubility product.

2. (a) State Kohlrausch's Law of independent migration of ions. If molar conductivities at infinite dilution of NaCl, HCl and CH_3COONa are 126.4, 426.1 and $91.0 \text{ ohm}^{-1}\text{cm}^2\text{mol}^{-1}$ respectively. What will be the molar conductivity of acetic acid at infinite dilution.

(b) The heat of combustion of ethyl alcohol ($\text{C}_2\text{H}_5\text{OH}$) is 1380.7 KJ/mol. If the heat of formation of CO_2 and H_2O are 394.5 and 286.6 KJ/mol respectively. Calculate the heat of formation of Ethyl alcohol.

(c) State second law of thermodynamics. Derive expression for the entropy calculation of any Substance.

(d) Define Integral and differential enthalpies of solution and dilution
(4, 4, 4, 3)

3. (a) Calculate the heat of formation of HCl at 348K from the following data:

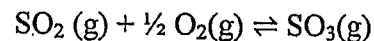
$\frac{1}{2} \text{N}_2(\text{g}) + \frac{3}{2} \text{H}_2(\text{g}) \rightarrow \text{NH}_3(\text{g})$. The heat of formation at 25°C at constant pressure is -72300J. The mean heat capacities over this temperature range are:

$$\text{N}_2(\text{g}); C_p = 28.53 \text{ J/K/mol}$$

$$\text{H}_2(\text{g}); C_p = 32.26 \text{ J/k/mol}$$

$$\text{NH}_3(\text{g}); C_p = 28.49 \text{ J/K/mol}$$

- (b) State Le Chatelier's principle. For the equilibrium:



Predict the direction of the shift of equilibrium if:

- (a) The pressure is increased.
- (b) The temperature is increased (endothermic reaction).
- (c) On addition of SO_2 .
- (c) Calculate the hydrolysis constant, degree of hydrolysis and pH of salt of weak acid and strong base.
- (d) Calculate the pH of a buffer solution containing 0.20 M CH_3COOH and 0.15M of CH_3COONa . (K_b for NH_4OH is 1.8×10^{-5}) (4, 4, 4, 3)

4. (a) Derive the relationship between K_p and K_c . Under what conditions are K_p and K_c equal? For the reaction $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$ $K_p = 0.1 \text{ atm}^{-1}$ at 300 K. Find K_c .