

Question Paper

Exam Date & Time: 21-Jun-2024 (10:00 AM - 12:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER BSc HEALTH SCIENCES DEGREE EXAMINATION - JUNE 2024

SUBJECT: BHS-1202 - CHEMISTRY II

(NEW SCHEME)

Marks: 60

Duration: 150 mins.

Answer all the questions.

Answer the following in 2 or 3 sentences

- 2A) Define ion-induced dipole type of interaction. Give one example. (2)
- 2B) Identify the conjugate acid-base pairs for the following equations. (2)
- i) $ClO^-(aq) + H_2O(l) \rightleftharpoons HClO(l) + OH^-(aq)$
- ii) $HSO_4^-(aq) + CN^-(aq) \rightleftharpoons SO_4^{2-}(aq) + HCN(aq)$
- 2C) Explain how the following increases the rate of a reaction? (2)
- i) Concentration ii) Temperature
- 2D) The combustion of 5.00 grams of $C_2H_6(g)$, at constant pressure releases 259 kJ of heat. (2)
- What is ΔH for the reaction: $2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(l)$?
- 2E) Arrange the following bases in the increasing order of their base strength. Give reason. (2)
- $(CH_3)_2NH$, NH_3 , CH_3NH_2
- 2F) Consider the reaction: $CH_3Cl(aq) + OH^-(aq) \leftrightarrow CH_3OH(aq) + Cl^-(aq)$ (2)
- When the reaction is started with 0.10 moles of CH_3Cl and 0.20 moles of OH^- , 0.030 moles of CH_3OH are obtained at equilibrium. Calculate the equilibrium constant.

Write a short note on the following questions

- 3A) i) Mention the limitation of first law of thermodynamics. (3)
ii) The rate constant of a first-order reaction is $3.68 \times 10^{-2} \text{ s}^{-1}$ at 150°C , and the activation energy is 71 kJ/mol . What is the value of the rate constant at 170°C ?
- 3B) Determine the heat of reaction, ΔH° , for the reaction, $\text{Fe}_2\text{O}_3(\text{s}) + \text{FeO}(\text{s}) \rightarrow \text{Fe}_3\text{O}_4(\text{s})$ using the data given below. (3)
Data:
 $2\text{Fe}(\text{s}) + \text{O}_2(\text{g}) \rightarrow 2\text{FeO}(\text{s}) \Delta H^\circ = -544.0 \text{ kJ}$
 $4\text{Fe}(\text{s}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{Fe}_2\text{O}_3(\text{s}) \Delta H^\circ = -1648.4 \text{ kJ}$
 $\text{Fe}_3\text{O}_4(\text{s}) \rightarrow 3\text{Fe}(\text{s}) + 2\text{O}_2(\text{g}) \Delta H^\circ = +1118.4 \text{ kJ}$
- 3C) Explain phase diagram for water. (3)
- 3D) Describe construction and working of Zn-Cu voltaic cell with reactions (Note: Zn is anode and Cu is cathode). (3)
- 3E) Lead can displace silver from solution as follows: (3)
 $\text{Pb}(\text{s}) + 2\text{Ag}^+(\text{aq}) \rightarrow \text{Pb}^{2+}(\text{aq}) + 2\text{Ag}(\text{s})$
Calculate K and ΔG° at 298.15 K for this reaction.
- 3F) Predict which solvent will dissolve more of the given solute? (3)
i) NaCl in methanol (CH_3OH) or in 1-propanol ($\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$)
ii) Diethyl ether ($\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$) in water or in ethanol

Answer the following questions

- 4A) i) A research chemist adds a measured amount of HCl gas to pure water at 25°C and obtains a solution with $[\text{H}_3\text{O}^+] = 3.0 \times 10^{-4} \text{ M}$. Calculate $[\text{OH}^-]$. Is the solution neutral, acidic, or basic? (5)
ii) Define system, surrounding and entropy for a reaction.
- 4B) i) Calculate the vapor pressure lowering, ΔP , when 10.0 mL of glycerol ($\text{C}_3\text{H}_8\text{O}_3$) is added to $500. \text{ mL}$ of water at 50°C . At this temperature, the vapor pressure of pure water is 92.5 torr and its density is 0.988 g/mL . The density of glycerol is 1.26 g/mL . (5)
ii) Salts from strong bases and weak acids give basic solutions. Give reason.

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