

15U218

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Name:.....

Reg No:.....

**SECOND SEMESTER BSc DEGREE EXAMINATION, JUNE 2016
(CUCBCSS – UG)**

**Complementary Course: Chemistry
CC15U CHE2 C02 – Physical Chemistry
(2015 Admission)**

Time: 3 Hrs

Maximum: 64 Marks

Section -A

(Answer all questions. Each question carries 1 mark)

1. Among energy, enthalpy, viscosity and surface area, an intensive property of a system is.....
2. A process in which..... of the system is kept constant is called an isochoric process.
3. The average velocity of oxygen is..... that of carbon dioxide at the same temperature.
4. A larger value of vanderwaal's constant 'b' indicates a.....size for the molecules of gas.
5. An amorphous solid possess.....range order.
6. Viscosity of a liquid.....with increase in temperature.
7. Among water, ethanol and diethyl ether,is the most volatile one.
8. pH of 0.1 N sodium hydroxide solution is.....
9. The specific conductance of an electrolyte solution.....with dilution.
10. Cell reaction is spontaneous when ΔG is..... **(10 x 1 = 10 Marks)**

Section -B

(Answer any seven questions. Each question carries 2 marks)

11. Give the statement of the First Law of thermodynamics and its mathematical formulation.
12. Define entropy of vapourisation. How is it related to enthalpy of vapourisation?
13. Calculate the Gibb's free energy change and predict whether the reaction is spontaneous at 500 K for the reaction $2\text{NO}(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 2\text{NO}_2(\text{g})$.
Given that $\Delta H = -109 \text{ KJ}$ and $\Delta S = -130 \text{ JK}^{-1}$ at 500 K.
14. Calculate the ratio of the RMS velocities of Helium and Neon gases at 25°C .
15. Define a) space lattice b) Weiss indices
16. State and explain Henry's law
17. Explain why water wets glass, while mercury does not.

18. Zinc wire is dipped in silver nitrate solution taken in beaker A and a silver wire is dipped in zinc sulphate solution taken in beaker B. Predict in which beaker the ions present will get reduced. Given that the standard reduction potential of zinc and silver are -0.76 V and 0.80 V respectively.
19. Write three advantages of hydrogen-oxygen fuel cell.
20. State and explain Kohlrausch's law. (7 x 2 = 14 Marks)

Section -C

(Answer any four questions. Each question carries 5 marks)

21. State and explain the Third Law of thermodynamics.
22. What are the features that distinguish a reversible process from an irreversible process?
23. Show that the ratio, most probable velocity: average velocity: rms velocity is $1:1.128:1.224$.
24. The first order Bragg's reflection from the (100) plane of a cubic crystal with $d_{100} = 0.251\text{ nm}$ occurs at a glancing angle of $27^\circ 8'$. Calculate the wavelength of the X-rays used.
25. Explain why an aqueous solution of potassium acetate is basic while that of ammonium nitrate is acidic.
26. a). Define the term cell constant
 b) The specific conductivity of a 0.3N KCl solution at 25°C is 0.0285 cm^{-1} . Resistance of the cell containing this solution is 300 ohms . Determine cell constant. (5 x 4 = 20 Marks)

Section -D

(Answer any two questions. Each question carries 10 marks)

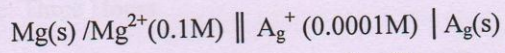
27. (a). Give the physical significance of Gibb's free energy. Derive the necessary relationships. Explain the effect of temperature in the spontaneity of a reaction.
 (b) For the decomposition reaction of H_2O_2 , $\text{H}_2\text{O}_2 \longrightarrow \text{H}_2\text{O} + \frac{1}{2}\text{O}_2$. Given $\Delta H = -212\text{ KJ mol}^{-1}$, $\Delta S = -132\text{ Jmol}^{-1}$. Predict feasibility of the process at 27°C . (6+4= 10marks)
28. (a) What are liquid crystals? Name the different types of liquid crystals. Mention any four applications of liquid crystals.
 (b) Explain the different types of stoichiometric defects in crystals. (6+4 = 10 marks)
29. (a) State the laws of osmotic pressure proposed by Vant Hoff and derive Vant Hoff osmotic pressure equation.

(b) A solution containing 20 g of a non-volatile organic solvent in 800 ml, exerts an osmotic pressure of $8 \times 10^5 \text{ Nm}^{-2}$ at 20°C . Calculate molar mass of the solute.

(5 + 5 = 10 Marks)

(a). What is meant by single electrode potential? How is it measured?

(b). Calculate the EMF at 298 K of the following cell.



Given that $E^\circ_{\text{Ag}^+/\text{Ag}} = 0.80\text{V}$, $E^\circ_{\text{Mg}^{2+}/\text{Mg}} = -2.37\text{V}$.

(5 + 5 = 10 Marks)
