



## SECTION – D

Answer **any two** questions. **Each** carries a weightage of **4**.

19. i) Briefly explain mean free path of a gas molecule and show how it varies with temperature and pressure.  
 ii) Vander Waal's constants for hydrogen chloride gas are  $a = 3.67 \text{ atm Lit}^{-2}$  and  $b = 40.8 \text{ m/mol}^{-1}$ . Find the critical temperature and critical pressure of the gas.
20. Explain different types of liquid crystals with examples. Write any four of its applications.
21. Derive integrated form of Clausius- Clapeyron equation. Write any two applications. (2×4=8)

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Reg. No. : .....

Name : .....

**V Semester B.Sc. Degree (CCSS – Reg./Supple./Imp.)**  
**Examination, November 2015**  
**CORE COURSE IN CHEMISTRY**  
**5B 07CHE : Physical Chemistry – 1**

Time : 3 Hours

Max. Weightage : 25

## SECTION – A

1. Answer **all** questions. Choose the correct answer. **Each** bunch of **four** questions carries a weightage of **1**.
- i) If the pressure and absolute temperature of 3 lit. of a gas are doubled, its volume would be  
 a) 2 lit.                      b) 4 lit.                      c) 3 lit.                      d) 12 lit.
- ii) Which of the following is incorrect ?  
 a)  $T_c = \frac{8}{27Rb}$                       b)  $P_c = \frac{a}{27b^2}$   
 c)  $T_c = \frac{8a}{27Rb}$                       d) all of these
- iii) The SI unit of coefficient of viscosity is  
 a)  $\text{kgm}^2\text{sec}$                       b)  $\text{kgm}^{-1}\text{sec}^{-1}$   
 c)  $\text{kgmsec}^{-1}$                       d)  $\text{kgm}^{-1}\text{sec}$
- iv) Which is incorrect for a hexagonal crystal system ?  
 a)  $a=b \neq c$                       b)  $\alpha = \beta = 90^\circ \gamma = 120^\circ$   
 c)  $a=b=c$                       d) none of these
2. i) In Bragg's equation,  $n\lambda = 2d\sin\theta$ ,  $n$  represents  
 a) The number of moles                      b) The principal quantum number  
 c) The Avogadro's no.                      d) The order of reflection
- ii) For an ionic crystal of type AX, the radius ratio lies between 0.732 and 0.414. Its co-ordination number is  
 a) 4                      b) 6                      c) 8                      d) 12



- iii) The number of atoms per unit cell in a simple cubic, fcc and bcc are  
 a) 1, 2, 4      b) 2, 4, 1      c) 1, 4, 2      d) 4, 2, 1
- iv) \_\_\_\_\_ is not an intensive property.  
 a) Pressure      b) Concentration      c) Density      d) Volume
3. i) For the reaction  $\text{CaCO}_{3(s)} \rightarrow \text{CaO}_{(s)} + \text{CO}_{2(g)}$ . Which of the following is true ?  
 a)  $\Delta H > \Delta E$       b)  $\Delta H = \Delta E$       c)  $\Delta H < \Delta E$       d)  $\Delta H = \frac{\Delta E}{2}$
- ii) Which is the correct unit for entropy ?  
 a)  $\text{KJmol}$       b)  $\text{JK}^{-1}\text{mol}^{-1}$       c)  $\text{JKmol}^{-1}$       d)  $\text{JK}^{-1}\text{mol}$
- iii) For the reaction  $2\text{NO}_2 + \text{O}_3 \rightarrow \text{N}_2\text{O}_5 + \text{O}_2$ , the following observations are made. Doubling the concentration of  $\text{NO}_2$  doubles the rate and doubling the concentration of  $\text{O}_3$  doubles the rate. What is the rate law for the reaction ?  
 a)  $r = K [\text{NO}_2]^2$       b)  $r = K [\text{NO}_2]^2 (\text{O}_3)$   
 c)  $r = K [\text{NO}_2]^2 (\text{O}_3)^2$       d)  $r = K [\text{NO}_2] (\text{O}_3)$
- iv) For a first order reaction, a plot of  $\log(a-x)$  versus time will be a straight line having slope  
 a)  $\frac{-2.303}{k_1}$       b)  $\frac{2.303}{k_1}$       c)  $\frac{2.303}{t}$       d)  $\frac{-2.303}{t}$
4. i) Which of the following is correct unit of reaction rate if concentrations are measured in molarity and time in seconds ?  
 a)  $\text{mol Lit}^{-1}$       b)  $\text{mol Lit}^{-1} \text{sec}^{-1}$   
 c)  $\text{mol}^{-1} \text{Lit sec}^{-1}$       d)  $\text{mol Lit}^{-1} \text{sec}$
- ii) The quantity K in the rate law expression is  
 a) Independent of concentration      b) Dimensionless  
 c) Independent of temperature      d) Arrhenius constant
- iii) The Joule Thomson coefficient of an ideal gas will be  
 a) -ve      b) +ve      c) zero      d) none of these
- iv) Which of the following is not a state function ?  
 a) Pressure      b) Volume      c) Temperature      d) Work      (4×1=4)



## SECTION - B

Answer **any five** questions. **Each** carries a weightage of 1.

5. A gas A diffuses at a rate of one half as fast as oxygen. Find the molecular mass of gas A.
6. What are the factors affecting the optical activity of any substance ?
7. What are surface active agents ? Give an example.
8. Determine the Miller indices for a plane when the intercepts along the axes are at unit distances  $\frac{3}{2}$ , 2 and 1 respectively.
9. 2 moles of an ideal gas are allowed to expand reversibly and isothermally at 300 K from a pressure of 1 atm. to a pressure of 0.1 atm. What is the change in Gibb's free energy ?
10. What is the effect of temperature in the following reaction ?  
 $\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)} \quad \Delta H = -92.38 \text{ KJ.}$
11. Differentiate rate constant from equilibrium constant.
12. Mention the causes of drawback of Collision theory.      (5×1=5)

## SECTION - C

Answer **any four** questions. **Each** carries a weightage of 2.

13. Explain the determination of optical activity using polarimeter.
14. Derive the variation of heat of reaction with temperature.
15. Discuss the theory of heterogeneous catalysis.
16. Derive Van't Hoff equation. Showing the variation of equilibrium constant with temperature.
17. For the photochemical reaction  $\text{B} \rightarrow \text{C}$ ,  $1.0 \times 10^{-5}$  mole of B was formed on absorption of  $6.62 \times 10^7$  ergs at  $3600 \text{ \AA}$ . Calculate the quantum yield.
18. The heat of reaction  $\text{Y}_2\text{H}_2 + \text{Y}_2\text{Cl}_2 \rightarrow \text{HCl}$  at  $27^\circ\text{C}$  is  $-22.1 \text{ kcal}$ . Calculate the heat of reaction at  $77^\circ\text{C}$ . The molar heat capacities at constant pressure at  $27^\circ\text{C}$  for  $\text{H}_2$ ,  $\text{Cl}_2$  and  $\text{HCl}$  are 6.82, 7.70 and 6.80 cal/mol respectively.      (4×2=8)