

Assignment

- Q.1 Viscosity of glycerol is much more than that of ether. Explain.
- Q.2 It is not possible to liquefy an ideal gas. Explain.
- Q.3 Write short notes on:
- Zero order reactions
 - Arrhenius equation.
 - Difference between order and molecularity of a reaction
- Q.4 Explain the factors which led vander Waal to modify the ideal gas equation $PV = nRT$ and hence derive the vander Waals equation of state.
- Q.5 Calculate the angles at which first and second order are obtained from the planes 500 pm apart, using X-rays of wavelength of 100 pm.
- Q.6 Molybdenum forms body-centred cubic crystal whose density is 10.3 g cm^{-3} . Calculate:
- edge length of unit cube.
 - distance between (111) planes. Molar mass of Molybdenum = 95.94 g mol^{-1} .
- Q.7 What are miller indices? Calculate Miller Indices for planes having Weiss indices:
- $2a, 3b, c$
 - $2a, -3b, -3c$

Q.8 Roughly sketch the Maxwell distribution curve for the gas molecules in terms of molecular speeds. Label both axes and explain the effect of temperature on the distribution curve.

Q.9 Why do the crystals of NaCl appear ~~just~~ colored (yellow in colour) on heating in sodium vapour?

Q.10 (a) Derive the Bragg's equation ($n\lambda = 2d \sin \theta$) for diffraction of X-ray by crystal. Define each of the terms in it

(b) X-ray of wavelength equal to 0.154 nm gives 2nd order diffraction from the surface of a crystal when value of θ is 10.5° . Calculate the distance between the planes in the crystal parallel to the surface examined ($\sin 10.5^\circ = 0.182$)

Q.11 Explain law of crystallography.

Q.12 The rate constant for a second order reaction is $5.7 \times 10^{-5} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ at 25°C and $1.64 \times 10^{-4} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ at 40°C . Calculate the activation energy of the reaction.

Q.13 Define the terms collision diameter (σ) and mean free path (λ) of a molecule of a gas.

- Q.14 Calculate the most probable velocity, average velocity and root mean ~~square~~ square velocity of O_2 at 300K.
- Q.15 Define mean free path. Explain the effect of temp and pressure on it.
- Q.16 (a) Describe Ostwald method for measuring the viscosity of liquid.
- (b) In a surface tension experiment using a stalagmometer, equal volumes of two liquids A and B give 55 and 25 drops respectively. Their densities are 0.80 and 0.99 g cm^{-3} respectively. Determine the surface tension of liquid A if the surface tension of liquid B is $72.6 \text{ dynes cm}^{-1}$.
- Q.17 Explain
- (a) The effect of temperature on viscosity of liquid
- (b) Frankel and Schottky defect in crystals.
- (c) Postulates of kinetic theory of gases.
- Q.18 Express the Maxwell's ~~dis~~ distribution of velocities and write three important features of Maxwell's distribution curve.

Q19. At what temperature the root mean square velocity of O_2 gas is same as that of SO_2 at NTP?

Q20. Explain why small drops of liquid are spherical.

Q21. Derive the expression for the critical temperature, pressure and volume of gas in terms of van der Waal's constants a and b .

Q22. Calculate the Miller Indices of the faces having the following intercepts with three axes perpendicular to each other.

(i) $\frac{a}{2}, 2b, \infty c$

(ii) $2a, 3b, 4c$.

Q23. Derive expressions to determine order of reaction using half-life method and van't Hoff differential method.

Q24. Explain the concept of activation energy of reaction. Derive expression for its calculation from Arrhenius equation.

Q25. Calculate the collision number Z , and mean free path λ of oxygen gas at 1 atm pressure and $27^\circ C$. The collision cross-section is 0.27 (nm)^2 .

Q.26. The density of Li metal is 0.53 g cm^{-3} and the separation of (100) planes is 350 pm . Determine whether the lattice is fcc or bcc.

$$M(\text{Li}) = 6.941 \text{ g mol}^{-1}$$

Q.27 Write a short note on collision theory of reaction rates.

Q.28. The chemical reaction;



is a first order reaction with respect of A and zero order with respect to B. Write down its differential rate law and deduce from it with the integrated rate law. What is the unit of rate constant of the above equation.

Q.29. Explain the dependence of surface tension on temperature.

Q.30 If the hard sphere of O_2 gas has molecular diameter 290 pm , what will be the mean free path of O_2 at 500 K and 100 Pa ?