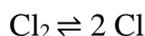


Model Question Bank

B.Sc. (Life/ Physical Science) Sem-VI SEC- IT Skills for Chemists

Q.1) Express van der Waal's equation in terms of pressure (P).

Q.2) The equilibrium constant K for dissociation of chlorine



is given by $K = \frac{[\text{Cl}]^2}{[\text{Cl}_2]}$. Derive an expression for K in terms of [Cl].

Q.3) Express the following quantities in standard (scientific) form:

a.) avogadro's number = $6023000000000000000000 \text{ mol}^{-1}$

b.) $1 \text{ eV} = 0.000000000000000000160219 \text{ J}$

Q.4) Express the following quantities in their SI units (exact value):

(a.) energy of 1 calorie (b.) energy of 1 erg

Q.5) The Dietrici equation of state is $P e^{a/V_m RT} (V_m - b) = RT$ where P is pressure, T is temperature, V_m is molar volume, R is gas constant, a and b are constants. A fairly good approximation we, can say $e^{a/V_m RT} \approx 1 + \frac{a}{V_m RT}$. Using this approximation into the original equation of state simplify the above equation into quadratic equation of V_m .

Q.6) From the van der Waal's equation of state find units of van der Waal's constants 'a' and 'b'.

Q.7) Expand the expression $\sum_{i=1}^4 a_i x^i$.

Q.8) What is the relation between exponential (e) and natural log (ln)?

Q.9) The second order rate constant is given by $k = \frac{1}{t} \left(\frac{1}{c} - \frac{1}{c_0} \right)$ where c_0 is initial concentration of reactant and c is concentration of reactant at time t. Express the above equation in terms of equation of straight line by taking t as independent variable and $\frac{1}{c}$ as dependent variable. From there find slope and intercept of the line.

Q.10) Solve the simultaneous equations $2x - 3y = 14$ and $4x - 6y = 15$.

Q.11) Differentiate the following:

(a.) Accuracy and Precision (b.) Absolute and relative error.

Q.12) Assuming that ideal gas law holds, find the amount in moles of nitrogen gas in container if: $P = 129.6 \pm 0.005 \text{ Pa}$, $V = 0.02541 \pm 0.00005 \text{ mol}$, $T = 297.56 \pm 0.1 \text{ K}$ and $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$. Find expected error in amount of nitrogen.

Q.13) If $P = \frac{nRT}{V}$ then find $\left(\frac{\partial P}{\partial V} \right)_T$ and $\left(\frac{\partial P}{\partial T} \right)_V$.

Q.14) What is the role of significant figures in experimental measurement. Explain taking example of potentiometric titrations.

Q.15) Identify the number of significant figures in the following:

(a.) 91600 (b.) 0.005601

Q.16) By rounding off the last digit express the result of following quantities up to two decimal place: (a.) 2.745 (b.) 2.735

Q.17) Convert the following:

(a.) 1 litre in terms of meter cubed (m^3)

(b.) value of gas constant $R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$ in terms of $\text{dm}^3\text{atm K}^{-1}\text{mol}^{-1}$.

Q.18) Write the following quantities to (i) 3 significant figures and (ii) 2 decimal places :

(a.) a rate constant of $1.0846 \text{ dm}^3\text{mol}^{-1}\text{s}^{-1}$ (b.) gas constant $0.0820578 \text{ dm}^3\text{atm K}^{-1}\text{mol}^{-1}$.

Q.19) What is uncertainty in measurement? How many types of uncertainty are there?

Q.20) Calculate the arithmetic mean, median, mode, variance and standard deviation of the following values of ionization energy of sodium (in kJ mol^{-1}) 495, 497, 493, 493, 496, 492.

Q.21) What is method of least square curve fitting? Calculate the slope 'm' and intercept 'b' for least square line for data given below:

x	3.4	3.3	3.2	3.2	3.1	3.1	3.1	3.0	3.0
y	4.02	4.25	4.54	4.77	5.04	5.25	5.49	5.72	5.93

Q.22) Using binary bisection method to find x for the equation:

$$x^2 - 2 = 0.$$

Q.23) In the reaction between nitrogen and hydrogen to give ammonia, the fraction amount of nitrogen reacted x can be related to equilibrium constant K , which has value 977. This gives quadratic equation $81.2 x^2 - 163.4x + 81.2 = 0$. What is value of x .

Q.24) Write the formula for finding integral by Trapezoidal rule and Simpson's rule. What is the condition for applying Simpson's rule? Why Simpson's rule is also known as Simpson's 1/3rd rule? Out of above two rules which one is more accurate?

Q.25) Use Trapezoidal approximation with five panels, calculate the value of integral

$$\int_{10}^{20} 2x^2 dx$$