12-12-15_Sr.IPLCO_Jee-Main_RPTM-14_ Syllabus

MATHS:

Complete Properties of Triangles and Inverse Trigonometric Functions

PHYSICS

Geometrical & Wave Optics

Experiments:

1. Focal length of (i) Convex mirror

(ii) Concave mirror, and (iii) convex lens using parallax method.

2. Plot of angle of deviation vs angle of incidence for a triangular prism.

3. Refractive index of a glass slab using a travelling microscope.

CHEMISTRY

States of Matter, Solid State, Chemical Kinetics

CHEMISTRY

31. 10^{23} molecules each having a mass of 10^{-25} kg placed in a 1 lit container, move with a RMS velocity of 10^5 cm/s. Then their total kinetic energy and pressure exerted by them respectively are

    1) 10kJ & 3.33×10^6 Pa   2) 5kJ & 3.33×10^6 Pa

    3) 10kJ & 3.33×10^7 Pa   4) 5kJ & 3.33×10^7 Pa

32. From the following values of the critical constants, find out '*b*' of the vander Waal's equation for $H_2 : P_c = 12.4\,atm., Tc = 33.7°C$.

    1) 0.0253 *lit / mol*   2) 0.0212 *lit / mol*

    3) 0.0174 *lit / mol*   4) 0.0192 *lit / mol*

33. Identify the correct combination of ideal gas

	P(atm)	V(lit)	T	weight	Gas
1)	10.0	4.48	273K	32g	CH_4
2)	1.0	12.30	300K	16g	CH_4
3)	0.5	11.20	546K	4g	H_2
4)	1.0	22.40	273K	2g	He

34. Two glass bulbs 'A' and 'B' are connected by a very small tube having a stop cock. Bulb 'A' has a volume of 100 c.c. and contains a gas at 1 atm. While bulb 'B' is empty and its volume is 160 c.c. On opening the stop cock, the pressure in bulb 'A' gets reduced to 60% of the initial pressure, then it is closed. The pressure in bulb 'B' is

    1) 0.4 atm.   2) 0.25 atm.   3) 0.50 atm.   4) 0.75 atm.

35. A sample containing C_2H_4 and C_4H_8 gaseous has a density of 1.67 g / L at STP. Find the weight percentage of C_2H_4 and mole percentage of C_4H_8 in the sample.

    1) 50 % & 66.7 %   2) 33.3 % & 50 %

    3) 50 % & 33.3 %   4) 66.7% & 50%

36 A vessel of volume 22.4 lit contains 6 moles of H_2 and 1.0 mole of N_2 at 546K initially. Nitrogen present is totally converted into $NH_3 (N_2 + 3H_2 \rightarrow 2NH_3)$.

    In the final mixture (i) Partial pressure of NH_3 is 6 atm. (ii) Partial pressure of N_2 is 6 atm. (iii) Total pressure is 10 atm.
    (iv) Partial pressure of NH_3 is 4 atm.

    1) i, ii & iv are correct   2) iii and iv are correct

    3) i and ii are correct   4) ii, iii and iv are correct

37. At the top of a mountain peak having an altitude of 2,000 m above the sea level the atmospheric pressure is 50 cm of Hg in contrast to the sea level pressure of 75 cm of Hg . If you assume that you need as many O_2 molecules to live on the top of the peak as at the sea level and inhale the same volume of air per breath at both the levels, how much faster will you breath on the top of the peak?

    1) 1.5 times   2) 2 times   3) 4 times   4) cannot be predicted

38. Which of the following statements are true or false (T/F)?

    a) In the expansion of an ideal gas no cooling effect is observed

    b) Rate of diffusion of a gas is directly proportional to its pressure at constant temperature.

    c) The order of velocities of a gas at a given temperature is $\overline{C} < C_p < C$.

    d) At high temperature the fraction of total no of molecules possessing low velocities is less

    1) a–T, b–F, c–T, d–F   2) a–T, b–T, c–F, d–T

    3) a–T, b–F, c–F, d–T   4) a–F, b–F, c–T, d–F

39. For the reaction $2NO + Br_2 \longrightarrow 2NOBr$, the following mechanism has been suggested. $NO + Br_2 \xrightleftharpoons{K_1} NOBr_2 \, (fast)$ $NOBr_2 + NO \xrightarrow{K_2} 2NOBr \, (slow)$

[Given that $K_1 \times K_2 = K$, $K_1 = Eq.const$, $K_2 = Rate \, const$]

Rate law consistent with their mechanism is

1) $K_2 [NO]^2 [Br_2]$

2) $K [NO]^2 [Br_2]$

3) $K_1 [NO][Br_2]$

4) $K_2 [NOBr_2][NO]^2$

40. For a certain reaction the activation energy is zero. If the value of its rate constant at 300 K is 1.6×10^6 sec^{-1}, the value of its rate constant at 280 K is

1) 1.6×10^6 sec^{-1}

2) Zero

3) ∞

4) 3.2×10^{12} sec^{-1}

41. A hydrogenation reaction is carried out at 500 K. If the same reaction is to be carried out in presence of catalyst at the same rate the temperature to be maintained is 400 K. If the activation energy is lowered by 20 kJ in catalysed path, the activation energy in uncatalysed path is

    1) 100 kJ   2) 200 kJ   3) 300 kJ   4) 400 kJ

42. The reaction A →B follows first order kinetics. When initial amount of A is 0.8 mole, the time taken for the production of 0.6 mole of B is 1 hour. What is the time taken for the production of 0.675 mole of B from 0.9 mol of A ?

    1) 1 Hour   2) 0.5 Hour   3) 0.25 Hour   4) 2 Hour

43. Two substances A and B are present such that [A] = 4[B] and half-life of A is 5 minute and that of B is 15 min. If they start decaying at the same time following first order, how much time later will the amounts of both the substances would be same ?

    1) 15 minutes   2) 10 minutes   3) 5 minute   4) 12 minutes

44. Two gases A and B present separately in two vessels X and Y at the same temperature with a molecular weights, M and 2M respectively are allowed to effuse out. The orifice in vessel 'X' is circular while that in Y is square. If the radius of the circular orifice is equal to that of the length of the square orifice, the ratio of rates of effusion of gas A to that of gas B is

1) $\sqrt{2}\pi$ 2) $\sqrt{\pi}/2$ 3) 2π 4) $)\sqrt{2}/\pi$

45. Select the rate law that corresponds to the data shown for the following reaction

$A+B \longrightarrow C$ [In the given table concentrations are in moles/lit and rate is moles/lit-sec⁻]

Experiment	[A]	[B]	Initial Rate
1	0.012	0.035	0.10
2	0.024	0.070	0.80
3	0.024	0.035	0.10
4	0.012	0.070	0.80

1) $Rate = k[B]^4$ 2) $Rate = k[A][B]^3$

3) $Rate = k[A]^2[B]^2$ 4) $Rate = k[B]^3[A]^0$

46. How may unit cells are present in a cube-shaped ideal crystal of NaCl of mass 1.00 g ?

1) 2.57×10^{21} unit cell   2) 5.14×10^{21} unitcells

3) 1.28×10^{21} unit cell   4) 1.71×10^{21} unit cells

47. If volume occupied by CO_2 molecules is negligible, then the pressure exerted by one mole of CO_2 gas in terms of temperature (T), assuming V to be single valued, is

1) $P = \dfrac{RT}{4a}$ 2) $P = \dfrac{RT}{4 \times a - b}$ 3) $P = \dfrac{R^2 T^2}{4a}$ 4) $\dfrac{R^2 T^2}{4ab}$

48. The density of CaO is 3.35 gm/cm^3. The oxide crystallises in one of the cubic systems with an edge of $4.80 \, A^0$. Total number of Ca^{2+} ions and O^{2-} ions per each unit cell are

1) 2   2) 4   3) 6   4) 8

49. A site in a closest-packed lattice can be generated by placing four spheres of radius R at alternate corners of a cube, such that the spheres are in contact. The site created is:

   1) Octahedral   2) Spherical

   3) Tetrahedral   4) None of these

50. Identify the wrong combination regarding the type of defect shown by them

   1) NaCl- Schottky defect   2) ZnO-non stoichiometric defect

   3) $Fe_{0.92}O$-dislocation defect   4) ZnS-Frenkel defect

51. A metal of atomic mass = 75 forms a cubic lattice of edge length 5 Å and density 2 g cm^{-3}. Calculate the radius of the atom. (Given Avogadro's number, $N_A = 6 \times 10^{23}$.)

   1) 176pm   2) 201pm   3)217pm   4) 420pm

52. The compressibility factor for N_2 at 330K and 800 atm is 1.90 and at 570k and 200 atm is 1.10. A certain mass of N_2 occupies a volume of $1dm^3$ at 330k and 800 atm. The volume occupied by same quantity of N_2 gas at 570K and 200 atm is

    1) 4 lit   2) 6 lit   3) 8 lit   4) 2lit

53. Which of the following is a false statement?

    1) GaAs (Gallium Arsinide) is a semiconductor

    2) ReO_3 is like metallic copper in its conductivity and appearance.

    3) Quartz glass is a crystalline solid

    4) $ZnFe_2O_4$ is an example for Ferri magnetic substance.

54. Rate constant of a reaction [A $\rightarrow$ product] is $0.0693 \, Min^{-1}$, starting with 5 mol of reactant rate of reaction after 10 min is

    1) $17 \times 10^{-2} mol.\min^{-1}$ 2) $1.7 \times 10^{-2} mol.\min^{-1}$

    3) $0.17 \times 10^{-3} mol.\min^{-1}$ 4) $1.7 \times 10^{-3} mol.\min^{-1}$

55. Potassium crystallises in a body centred cubic unit cell. The mass of one unit cell is

    1) 1.29×10^{-23} gm   2) 1.29×10^{-22} gm   3) 6.2×10^{-23} gm   4) 1.29×10^{-24} gm

56. Which of the following pair has same crystalline systems?

    1) Graphite & Diamond   2) Calcite & Cinnabar

   3) $CaSO_4$ & $BaSO_4$ 4) $B(OH)_3$ & KNO_3

57. Aqueous tension of water as a function of temperature is given below

Temp(K)	273.15	283.15	293.15	303.15
Aq.tension (bar)	0.006	0.0121	0.0230	?

    Aqueous tension of water at 303.15K may be (in bar)

    1) 0.015   2) 0.035   3) 0.0418   4) 0.98

58.   The following graphs drawn for rate of the reaction on Y axis and concentration of reactants on X-axis. Which of the following is not correct?

1)

Zero Order

2)

First Order

3)

Second Order

4)

Zero Order
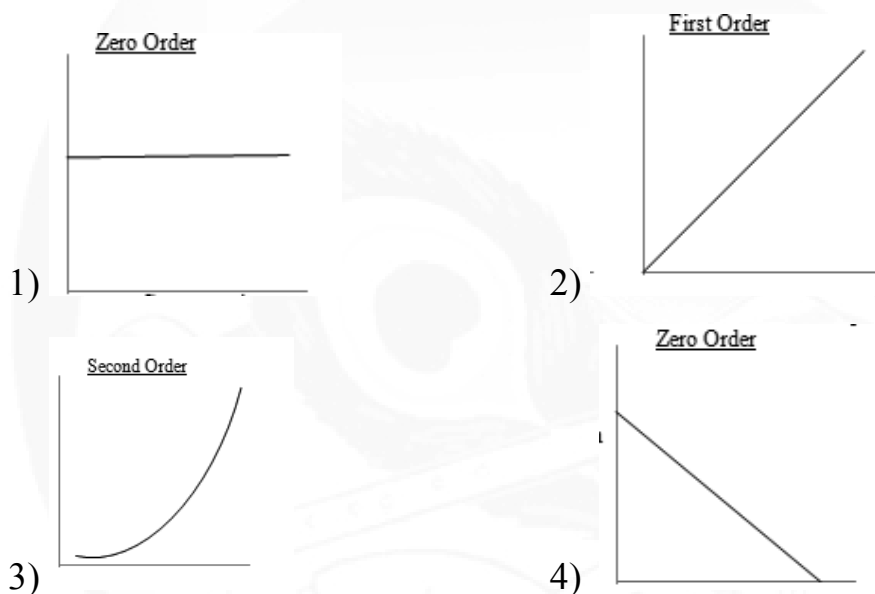
59.   Molar volume of a gas at STP (273.15K and 1 bar pressure) and at SATP (standard ambient temperature and pressure) are respectively in litres

1) 22.41 & 22.71   2) 22.41 & 22.789

3) 22.71 & 22.71   4) 22.71 & 22.789

60. 1.0 ml of $CH_3COOC_2H_5$ (ethyl acetate) was added to 20ml of $N/20HCl$. 2ml of the mixture were with drawn from time to time during the progress of the hydrolysis of ester and titrated against standard NaOH solution. The volume of NaOH solution required for titration of various intervals is given below:

Time (min):   0   75   119   183 $\propto$

NaOH (used in ml):   20.24   25.20   27.60   30.22   43.25

$$\left[\log \frac{22.79}{17.83} = 0.1065 \right]$$

The value of half-life of the reaction is: (in $\min$)

1) $\dfrac{0.693 \times 2.303}{0.00327}$ 2) $\dfrac{2.303}{0.00327}$ 3) $\dfrac{0.693}{0.00327}$ 4) $\dfrac{0.693}{0.0327}$