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Physical Chemistry

Super Short Tricky Chemistry
By
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✎ **Contents :** Basic Concept, Atomic Structure, States of matter, Solid State, Equilibrium, Thermodynamics, Solution, Chemical Kinetics, Electrochemistry, Surface Chemistry, Redox, Coordination Compounds, Metallurgy

for

Pre-Medical (NEET) & Pre-Engineering (IIT-JEE/PET) Examinations
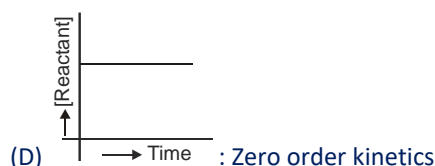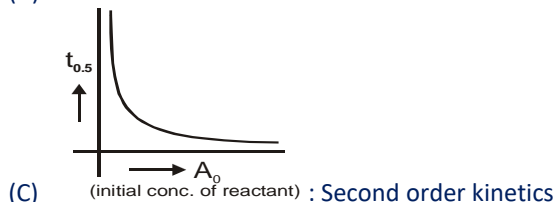## ❖ 202_ ❖

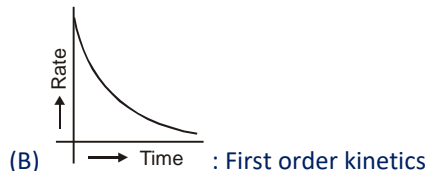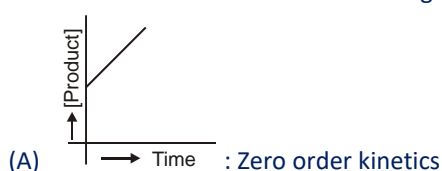Name of Students : ....

Roll No. : ....

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☎ आपका परिश्रम + हमारा मार्गदर्शन = निश्चित सफलता ☎

1. The pair of species having identical shape is-
   (A) CF_4, SF_4 (B) PCl_3, BF_3 (C) XeF_2, CO_2 (D) PF_5, IF_5

2. The value of Vander Waal's constant 'a' for gases O_2, N_2, NH_3 and CH_4 are 1.360, 1.390, 4.170 and 2.253 litre^2 atm mol^{-2} respectively. The gas which can most easily be liquefied is -
   (A) O_2 (B) N_2 (C) NH_3 (D) CH_4

3. One mole of $N_2O_4(g)$ at 300 K is kept in a closed container under one atmosphere. It is heated to 600 K when N_2O_4 (g) decomposes to $NO_2(g)$. If the resultant pressure is 2.4 atm, the percentage dissociation by mass of N_2O_4 (g) is
   (A) 10%   (B) 20%   (C) 30%   (D) 40%

4. Which of the following statement (s) is (are) correct?
   (A) The pH of 1.0×10^{-8} M HCl solution is 8
   (B) The conjugate base of $H_2PO_4^-$ is HPO_4^-
   (C) Auto protolysis constant of water increases with temperature
   (D) When a solution of a weak monoprotic acid is titrated against a strong base at half neutralization point, pH = ½ pK_a

5. Which of the following statements are correct?
   (A) Half life is proportional to initial concentration for zero order.
   (B) Average life = $1.44 \times$ half life for first order reaction.
   (C) 99.9% reaction takes place in 100 minutes for the case when rate constant is 0.0693 min^{-1}.
   (D) For the first order reaction $t_{3/4} = 2t_{1/2}$ where $t_{1/2}$ and $t_{3/4}$ are half life and three – fourth life respectively.

6. $Zn \mid Zn^{+2}$ (C_2) $\mid\mid Zn^{+2}$ (C_1) $\mid$ Zn   ;   For this cell ΔG is negative if-
   (A) $C_1 = C_2$ (B) $C_1 > C_2$ (C) $C_2 > C_1$ (D) Both (A) and (C)

7. A saturated solution of silver benzoate, $C_6H_5CO_2Ag$ has a pH of 8.63. K_a for benzoic acid is 6.5×10^{-5}. Estimate the value of K_{sp} of silver benzoate.
   (A) 1.49×10^{-3} (B) 1.399×10^{-2} (C) 1.287×10^{-2} (D) None of these

8. The reduction potential of hydrogen half-cell will be negative if-
   (A) $p(H_2)$ =1 atm and $[H^+]$ = 1 M   (B) $p(H_2)$ = 1 atm and $[H^+]$ = 2M
   (C) $p(H_2)$ = 2 atm and $[H^+]$ =1 M   (D) $p(H_2)$ = 2 atm and $[H^+]$ = 2M

9. Price of radioactive substance is directly proportional to the activity of radioactive sample. If initial price of radioactive sample ($t_{1/2}$ = 6 months) is 4096 Rs then price of radioactive sample after 5 years will be
   (A) 4 Rs.   (B) 8 Rs   (C) 16 Rs   (D) 4096 Rs

10. The coefficient of Br_2 in the balanced reaction $Br_2 + OH^- \rightleftharpoons Br^- + BrO_3^- + H_2O$ is-
    (A) 1   (B) 2   (C) 3   (D) 4

11. Which of the following samples of oxygen has the greatest entropy?
    (A) 1 mole of $O_2(s)$ at 15 K   (B) 1 mole of $O_2(g)$ at 0.5 atm and 273 K
    (C) 1 mole of $O_2(g)$ at 2.0 atm and 273 K   (D) 1 mole of $O_2(g)$ at 2.0 atm and 200 K

12. A complex containing K^+, Pt (IV) and Cl^- is 100% ionised giving i = 3. Thus, complex is:
    (A) $K_2[PtCl_4]$ (B) $K_2[PtCl_6]$ (C) $K_3[PtCl_5]$ (D) $K[PtCl_3]$

13. The solubility of AgCl in water, 0.01 M $CaCl_2$, 0.02 M NaCl and 0.05 M $AgNO_3$ are denoted by S_1, S_2, S_3 and S_4 respectively. Which of the following relationship is correct?
    (A) $S_1 > S_2 > S_3 > S_4$ (B) $S_1 = S_2 = S_3 = S_4$ (C) $S_1 > S_3 > S_2 > S_1$ (D) $S_1 > S_2 > S_3 > S_4$

14. Equal volumes of 1.0 M KCl and 1.0 M $AgNO_3$ are mixed. The depression of freezing point of the resulting solution will be ($K_f(H_2O)$ = 1.86 K kg mol^{-1}, 1 M = 1m)
    (A) 3.72 K   (B) 1.86 K   (C) 0.93 K   (D) none of these

15. Which is not correct match in following

    (A)   : Zero order kinetics
    (B)   : First order kinetics
    (C)   : Second order kinetics
    (D)   : Zero order kinetics

16. The uncertainly in the position of an electron is equal to its de-broglie wavelength. The minimum percent error in measurement of its velocity under this circumstance will be :
    (A) $1/4\pi$ (B) $10/4\pi$ (C) $100/4\pi$ (D) None of these

17. Determine the quantum number of Bohr orbit of Li^{2+} ion in which electron is moving at speed equal to the speed of electron in the 3rd excited state of H-atom ?

(A) 3   (B) 6   (C) 9   (D) 12

18. Which of the following has been arranged in the increasing order of freezing point?

(A) 0.025 M KNO_3 < 0.1 M NH_2CSNH_2 < 0.05 M $BaCl_2$ < 0.1 M NaCl

(B) 0.1 M NaCl < 0.05 M $BaCl_2$ < 0.1 M $NH_2 CSNH_2$ < 0.025 M KNO_3

(C) 0.1 M $NH_2 CSNH_2$ < 0.1 M NaCl < 0.05 M $BaCl_2$ < 0.025 M KNO_3

(D) 0.025 M KNO_3 < 0.05 M $BaCl_2$ < 0.1 M NaCl < 0.1 M $NH_2 CSNH_2$

19. pH of 0.01 M $(NH_4)_2SO_4$ and 0.02 M NH_4OH buffer solution (pK_a of NH_4^+ = 9.26) is

(A) 9.26   (B) 4.74   (C) 4.74 + log 2   (D) none

20. In ground state of an element, the last electron has quantum numbers n = 3, l = 0, m = 0, s = + 1/2. If the atom is diamagnetic in nature then the number of electrons having m = 0 and s = − 1/2 in the atom, will be:

(A) 8   (B) 4   (C) 3   (D) 6

21. A complex of iron and cyanide ions is 100% ionised at 1 m (molal). if its elevation in b.p. is 2.08° (K_b = 0.52° mol^{-1} kg) then the complex is:

(A) $K_3[Fe(CN)_6]$ (B) $Fe(CN)_2$ (C) $K_4[Fe(CN)_6]$ (D) $Fe(CN)_4$

22. Which of the following statement is/are correct for the formation of ammonia gas

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$; $\Delta H_r = -22.4$ kcal

(A) Concentration of reactant decreases on addition of inert gas at constant pressure

(B) On increasing volume of vessel equilibrium constant K_c decreases

(C) On decreasing temperature equilibrium shifts in the forward direction

(D) On addition of inert gas at constant volume equilibrium shifts in the forward direction

23. Which of the following sets of quantum number is/are not permitted?

(I) n = 3, ℓ = 3, m = 0, s = $\frac{1}{2}$ (II) n = 3, ℓ = 2, m = 2, s = $-\frac{1}{2}$ (III) n = 3, ℓ = 1, m = 2, s = $-\frac{1}{2}$ (IV) n = 3, ℓ = 0, m = 0, s = $+\frac{1}{2}$

(A) I and II   (B) I and III   (C) II and III   (D) III and IV

24. Boyle's law may be expressed as-

(A) $\left(\frac{dP}{dV}\right)_T = \frac{K}{V}$ (B) $\left(\frac{dP}{dV}\right)_T = -\frac{K}{V^2}$ (C) $\left(\frac{dP}{dV}\right)_T = -\frac{K}{V}$ (D) none

25. In the following first order competing reactions $A \longrightarrow B$, $C \longrightarrow D$, the ratio of $\frac{k_1}{k_2}$, if only 50% of A have been reacted whereas 94% of C has been reacted, is

(A) 4.06   (B) 0.246   (C) 2.06   (D) 0.06

26. What will be the molality of H_2SO_4 in which mole fraction of water is 0.85?

(A) 10.43 m   (B) 9.8 m   (C) 8.9 m   (D) 43.1 m

27. Two separate bulbs contains ideal gases A and B. Density of gas A is twice that of gas B while mol. wt. of gas A is half that of gas B at the same temp. The pressure ratio P_A/P_B will be?

(A) ½   (B) ¼   (C) 1   (D) 4/1

28. What volume of 3 M HNO_3 is needed to oxidize 8 g of Fe^{2+} to Fe^{3+}, HNO_3 gets converted to NO?

(A) 8 ml   (B) 16 ml   (C) 32 ml   (D) 64 ml

29. The mass of an electron is m. Its charge is e and it is accelerated from rest through a potential difference V. The velocity acquired by the electron will be?

(A) $\sqrt{V/m}$ (B) $\sqrt{eV/m}$ (C) $\sqrt{2eV/m}$ (D) None of the above

30. Which of the following groups contains only salts that are expected to be slightly soluble or insoluble in water?

(A) NaCl, KNO_3, ZnS, $PbCrO_4$ (B) NaCl, KNO_3, $Zn(NO_3)_2$, Na_2S.

(C) ZnS, $PbCrO_4$, $Ca_3(PO_4)_2$, $Cr(OH)_3$ (D) ZnS, KNO_3, $PbCrO_4$, CoS.

31. Baking powder contains

(A) $NaHCO_3$, $Ca(H_2PO_4)_2$ and starch   (B) $NaHCO_3$ and $Ca(H_2PO_4)_2$

(C) $Ca(H_2PO_4)_2$ and starch   (D) $NaHCO_3$ and starch

Comprehension-Type: Read the following paragraph and answer the question (32 – 34) given below:

Homogeneous mixing and compressibility both result from fact that the molecules are far apart in gases. Mixing occurs because individual gaseous molecules have little interaction with their neighbours and assuming that no reaction takes place, the chemical identities of those neighbours are irrelevant. Compressibility is possible in gases because only about 0.1% of the volume of a typical gas is taken up by the molecules themselves under circumstances; the remaining 99.9% is empty space.

32. Compressibility factor of a gas in given by-

(A) $\frac{PV}{R}$ (B) $\frac{PV}{R^2}$ (C) $\frac{R}{PV}$ (D) $\frac{PV}{nRT}$

33. Assume molecules are spherical of radius 1 Å, volume occupied by molecules in one mole of gas at NTP is

(A) 2.52 m^3 (B) 2.52 × 10^{-4} m^3 (C) 2.52 × 10^{-6} m^3 (D) 2.52 × 10^{-2} m^3

34. For H_2 and He, force of attraction is negligible, hence compressibility factor is

(A) $\dfrac{PV}{RT}$ (B) $\left(1 + \dfrac{Pb}{RT}\right)$ (C) $\left(1 - \dfrac{a}{RTV}\right)$ (D) $\left(1 + \dfrac{RT}{Pb}\right)$

Question No. 35 - 37 :

Properties whose values depend only on the concentration of solute particles in solution and not on the identify of the solute are called colligative properties.

35. Acetic acid in benzene solution forms dimer due to intermolecular H-bonding. For this case van't Hoff factor is:

(A) i = 1   (B) i > 1   (C) i < 1   (D) None of these

36. An aq. solution of 0.01 M CH_3COOH has van't Hoff factor of 1.01. If pH = – log $[H^+]$, pH of 0.01 M CH_3COOH sol^n would be

(A) 2   (B) 3   (C) 4   (D) 5

37. In which case van't Hoff factor is maximum?

(A) KCl, 50% ionised   (B) K_2SO_4 40% ionised   (C) $SnCl_4$, 20% ionised   (D) $FeCl_3$, 30% ionised

38. In which of the following equilibrium, the value of K_p is less than K_c?

(A) $N_2O_4 \rightleftharpoons 2NO_2$ (B) $N_2 + O_2 \rightleftharpoons 2NO$ (C) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (D) $2SO_2 + O_2 \rightleftharpoons 2SO_3$

39. Which is/are correct statements?

(A) A solute will dissolve in water if hydration energy is greater than lattice energy.

(B) If the anion is large compared to the cation, the lattice energy will remain almost constant.

(C) Solubility of IIA hydroxide is in order: $Be(OH)_2 < Mg(OH)_2 < Ca(OH)_2 < Sr(OH)_2$

(D) None is correct

40. If Hund's rule is not followed, magnetic moment of Fe^{2+}, Mn^{2+} and Cr all having 24 electrons will be in the order:

(A) $Fe^{2+} < Mn^+ < Cr$ (B) $Fe^{2+} = Cr < Mn^+$ (C) $Fe^{2+} = Mn^+ < Cr$ (D) $Mn^{2+} = Cr < Fe^{2+}$

41. A compound ClF_n shows the following reaction at 75°C $ClF_n + U(s) \longrightarrow UF_6 + ClF(g)$

UF_6 produced is 3.53 g and ClF produced is 343 ml at 75°C and 2.5 atm. Hybridization of Cl in ClF_n is

(A) sp^3 hybridized   (B) sp^3d hybridized   (C) sp^2 hybridized   (D) sp^3d^2 hybridized

42. A 10 ml sample of H_2SO_4 required 45 ml of 0.85 M NaOH for its complete reaction. This same acid was used to fill a lead storage battery which would effectively operate at acid conc. between 4.0 M to 5.0 M. Which of the following is true?

(A) The battery will work efficiently.   (B) The battery will not work effectively.

(C) The battery working has nothing to do with the concentration of acid.   (D) Both (A) and (C)

43. Which of the following statements is/are correct?

(A) Unlike order of reaction, molecularity must be an integer.

(B) If a single species must collide with solvent molecules, the reaction will appear to be unimolecular because solvent does not appear in rate equation.

(C) In multistep reaction, molecularity of a single step is likely not to be related to the rate equation.

(D) All the above

44. Oxidation number of S in $H_2S_2O_8$, H_2SO_5 , H_2SO_3 is-

(A) +6, 0, +4   (B) −6, +6, +4   (C) +8, 0, +4   (D) +4, 0, +6

45. 0.5 g of sample of MnO_2 was dissolved in 100 ml of 0.1 M $FeSO_4$ solution in the presence of acid. Excess $FeSO_4$ required 10 ml of 0.1 M $K_2Cr_2O_7$ for complete oxidation. The % purity of MnO_2 is

(A) 17.4%   (B) 34.8%   (C) 50%   (D) None of these

46. Which of the following electronic transitions from one orbit to another corresponds to the third line in the Balmer series of hydrogen spectrum?

(A) $1 \longrightarrow 2$ (B) $3 \longrightarrow 2$ (C) $5 \longrightarrow 2$ (D) $\infty \longrightarrow 2$

47. Which gas shows real behavior?

(A) 8 g O_2 at STP occupies 5.6 L   (B) 1 g H_2 in 0.5 L flask exerts a pressure of 24.63 atm at 300K

(C) 1 mole NH_3 at 300 K and 1 atm occupies volume 22.4 lt. (D) 5.6 L of CO_2 at STP is equal to 11 g.

48. The wavelength associated with a tennis ball weighing 200g moving at speed of 5 m/h is of the order

(A) 10^{-10} m   (B) 10^{-20} m   (C) 10^{-30} m   (D) 10^{-40} m

49. & 50. Match The Column :   (Given process does not include chemical reaction and phase change)

Column-I (Relation)	Column-II (Applicable to)	List - I	List - II
(A) dH = dU + d(PV) (B) dH = n.C_P. dT (C) q = ΔU	(P) Any matter undergoing any process (Q) Isochoric process involving any substance (R) Ideal gas, under any process (S) Ideal gas under isothermal process	(A) Root mean square velocity (B) Most probable velocity (C) Average velocity (D) K.E. of gas mol^{-1}	(1) $\dfrac{3}{2}RT$ (2) $\sqrt{\dfrac{8P}{\pi d}}$ (3) $\sqrt{\dfrac{3P}{d}}$ (4) $\sqrt{\dfrac{2RT}{M}}$

Answer Key

1.	C	2.	C	3.	B	4.	B,C	5.	A,B,C,D	6.	B	7.	B	8.	C	9.	A	10. C
11.	B	12.	B	13.	D	14.	B	15.	D	16.	C	17.	D	18.	B	19.	A	20. B
21.	A	22.	A,C	23.	B	24.	B	25.	A	26.	B	27.	D	28.	B	29.	C	30. C
31.	A	32.	D	33.	C	34.	B	35.	C	36.	C	37.	B,C,D	38.	C,D	39.	A,B,C	40. B
41.	B	42.	B	43.	D	44.	A	45.	B	46.	C	47.	C	48.	C				
49.	A → P,Q,R,S; B → R,S; C → Q					50.	A → 3, B → 4, C → 2, D → 1											

*** With Best Wishes ***