MODEL PAPER "CHEMISTRY"

Intermediate Part-I Examination

OBJECTIVE

Time: 20 Minutes   Marks: 17

Q.No.1 Note:Write answers to the questions on the objective answer sheet provided. You have four choices for each objective type question as A, B, C, and D. The choice which you think is correct; fill the circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling to or more circles will result in zero mark in that question. Attempt as many question as given in objective-type question paper and leave others blank.

(i) Which of the following has least mass?

    (a) 1 mole of S   (b) 7.0 g of Ag

    (c) 2 g atom of nitrogen   (d) 3×10^{23} atoms of C

(ii) The rate at which the solute moves in paper chromatography depends upon:

    (a) the distribution coefficient   (b) the distribution law

    (c) the boiling point of the solvent   (d) Low partial pressures

(iii) The formula for density of a gas at a given temperature and pressure is:

    (a) $d = \dfrac{P}{RT}$ (b) $d = \dfrac{PM}{RT}$

    (c) $d = nP/RT$ (d) $d = \dfrac{M}{V}$

(iv) In order to maintain the boiling point of water at 110°C, the external pressure should be:

    (a) 550 torr   (b) between 500 and 760 torr

    (c) between 760 and 1500 torr   (d) any pressure can be maintained

(v) The $Cl^{\ominus}$ ion present at the corner of the unit cell is NaCl crystal, contributes:

    (a) 1/8 th   (b) 1/4 th

    (c) 1/2 th   (d) 1

(vi) Splitting of spectral lines when atoms are subjected to strong electric field is called:

    (a) Zeeman effect   (b) Stark effect

    (c) Photoelectric effect   (d) Compton effect

(vii) Quantum number values for 2p orbitals are:

    (a) $n = 2$ $l = 1$ (b) $n = 1$ $l = 2$

    (c) $n = 1$ $l = 0$ (d) $n = 2$ $l = 0$

(viii) The paramagnetic behaviour of O_2 molecules is best explained by:

    (a) V.B. Theory   (b) M.O.T.

    (c) four lone pairs on two oxygen atoms

    (d) VSEPR theory

(ix) The dipole moment of $CHCl_3$ is 1.05 D, while that of CCl_4 is zero Debye, because in CCl_4:

    (a) bond lengths are unequal

    (b) the structure is planar

    (c) the structure is perfectly tetrahedral

    (d) every bond is non-polar

(x) During an exothermic or endothermic reaction, which one of the following formula is used to calculate the amount of heat evolved or absorbed?

    (a) $\Delta H = \Delta E + P\Delta V$ (b) $\Delta E = q + W$

    (c) $Q = m \times S \times \Delta T$ (d) $Q_p = \Delta H$

(xi) K_p and K_n of a gaseous chemical reaction are related as,

$$K_p = K_n (P)^{\Delta n},$$ it shows that:

    (a) K_p is always greater than K_n

    (b) K_n is always greater then K_p

    (c) It depends upon the nature of reaction

    (d) It depends upon the nature of reaction, pressure and the system at equilibrium stage

(xii) Which of the following solutions have highest pH:

    (a) 0.1 M H_2SO_4 (b) 0.01 M NaOH

    (c) 0.02 M CH_3COONa (d) 0.01 M $NaHCO_3$

(xiii) In azeotropic mixture showing positive deviation from Raoult's law, the volume of the mixture is:

    (a) slightly more than the total volume of the components

    (b) slightly less than the total volume of the components

    (c) equal to the total volume of the components

    (d) none of these

(xiv) The cryoscopic constant of water is $1.86°C$. The elevation of B.P. for a 0.1 m solution of a solute in water is:

    (a) $18.6\ °C$ (b) $1.86°C$

    (c) $0.186\ °C$ (d) sufficient data not given

(xv) The oxidation number of carbon in $C_{12}H_{22}O_{11}$ is :

    (a) 0 (b) -6

    (c) $+6$ (d) $+2$

(xvi) In calculators and digital watches, the battery which is mostly used is:

    (a) alkaline battery   (b) silver oxide battery

    (c) Ni-Cd battery   (d) Pb-storage battery

(xvii) A catalyst increases the rate of reaction by:

    (a) reacting with reactants   (b) reacting with products

    (c) decreasing the activation energy   (d) increasing the activation energy

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SUBJECTIVE

SECTION-1

Time: 2:40 Minutes.   Marks: 68

Note: Out of Questions Nos.2,3, and 4 write any 22 (Twenty two) short answers. While writing answer write question No. carefully.

Q.No.2. Write short answers. $(22 \times 2) = 44$

(i)   NaCl has 58.5 amu as formula mass and not the molecular mass. Justify it.

(ii)   What is the number of covalent bonds in 8 g of CH_4?

(iii)   11 g of carbon is reacted with 32 g of oxygen to give CO_2. Which is the limiting reactant?

$$C + O_2 \longrightarrow CO_2$$

(iv)   How does a Gooch crucible increase the rate of filtration?

(v)   How the decolourization of undesirable colours is carried out for freshly prepared crystalline substances?

(vi)   Calculate the density of CH_4 at S.T.P.

(vii)   How do you explain that $-273°C$ is theoretical temperature and is not attainable?

(viii) Calculate the S.I. unit of general gas constant R.

(ix)   Why the vapour pressure of water, ethyl alcohol and diethyl ether are different from each other at $0°C$?

(x)   Why the things can be easily cooked in a pressure cooker?

(xi)   Sodium is a good conductor of electricity but sodium chloride in solid state is not. Give reason?

Q.No.3. Write answers to the short questions.

(i)   Justify that the distance gaps between different orbits go on increasing from the lower to the higher orbits.

(ii)   Why the photographic plate is dark and a few bright lines are there in the line emission spectra of a substance?

(iii)   According to de-Broglie's idea, only microscopic particles have the waves. Comment upon it.

(iv)   Why the ionization energies decrease down the group although the nuclear charges increase?

(v)   Why second I.P. of an element is always greater than its first I.P?

(vi)   Why $\ddot{N}H_3$ and $\ddot{P}H_3$ give coordinate covalent bonds with $H^{\oplus}$?

(vii)   How M.O.T. justifies that He atoms cannot make the He_2?

(viii) How do we determine the ΔH in the laboratory for food, fuel etc.?

(ix)   Specific heat of a substance depends upon the nature of substance. Comment.

(x)   Those gaseous reactions which happen with the increase of volume go to the backward direction, when the volume is decreased. Why?

(xi)   By diluting the solution of CH_3COOH, the % age ionization changes, but the dissociation constant of the acid remains the same at a constant temperature. How?

Q.No.4. Write answers to the short questions.

(i) The sum of mole fractions of all the components is always equal to unity for any solution. Justify it.

(ii) Why the relative lowering of vapour pressure is independent of temperature?

(iii) Why the NaCl and KNO_3 are used to lower the melting point of ice?

(iv) Why a salt like CH_3COONa produced from a weak acid and a strong base gives a basic aqueous solution?

(v) How is Al anodized in an electrolytic cell?

(vi) How can we say that a voltaic cell is reversible cell?

(vii) How does electrochemical series tell us the distinction between the oxidizing and reducing agents?

(viii) What are the electrode reactions of dry cell?

(ix) The reaction rate decreases every moment but the rate constant 'k' of the reaction is a constant quantity, under the given conditions. Justify it.

(x) Define activation energy and activated complex.

(xi) The reactions happen due to collisions among the molecules, but all the collisions are not fruitful. Justify it.

SECTION-II

Note: Attempt any THREE questions. $\qquad (8 \times 3) = 24$

Q.5 (a) How the mass spectrometer is employed to do the analysis of isotopes of an element. Mention the roles of electric and magnetic fields. 5

(b) A well-known ideal gas is enclosed in a container having volume 500 cm^3 at S.T.P. Its mass comes out to be 0.72g. What is the molar mass of this gas? 3

Q.6 (a) Define and give two examples of each of the properties of crystalline solids: 5
(i) Isomorphism. (ii) Polymorphism.
(iii) Transition temperature. (iv) Allotropy
(v) Anisotropy

(b) What is Born-Haber cycle? How lattice energy of a crystal can be determined by it. 3

Q.7 (a) Justify various spectral lines for hydrogen atom by using the formula of energy difference of Bohr's model of hydrogen atom. 4

(b) Discuss the structure of ethene ($CH_2 = CH_2$) on the basis of sp^2-hybridization of carbon atoms. 4

Q.8 (a) Give three definitions of 'Raoult's law. Derive the formula of this law when both the components are volatile and give its graphical explanation. 5

(b) Calculate the pH of a buffer solution in which 0.11 molar CH_3COONa and 0.09 molar CH_3COOH solutions are present. pKa for CH_3COOH is 4.78. 3

Q.9 (a) Give the rules for the balancing of redox reaction by ion-electron method and balance the following equation by this method. 4

$$MnO_4^{-1}{}_{(aq)} + C_2O_4^{-2}{}_{(aq)} + H_2O \longrightarrow MnO_{2(s)} + CO_{2(g)} + OH^-{}_{(aq)}$$

(b) How Arrhenius equation is employed to calculate the energy of activation of a reaction. 4