Set A

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NEW GREEN FIELDS SCHOOL
HALF YEARLY EXAMINATION, 2015-16
CHEMISTRY

Time : 3 hrs.   Class – XII   M.M. : 100

*General Instructions—*

   (1)   *All questions are compulsory.*

   (2)   *Question number 1 to 5 are very short answer questions and carry 1 mark each.*

   (3)   *Question number 6 to 10 are short answer questions of 2 marks each.*

   (4)   *Question number 11 to 22 are also short answer questions of 3 marks each.*

   (5)   *Question number 23 carry 4 marks.*

   (6)   *Question numbers 24 to 26 are long answer.*

   (7)   *Use log tables if necessary.*

1   Why does $ZnO(s)$ becomes yellow upon heating ?

2   Write the electrode reactions taking place an lead storage battery.

3   What is shape selective catalyst ?

4   Draw the structure of a noble gas species which is isostructural with—

   (a) ICl_4^- (b) BrO_3^-

5   Which stoichiometric defect does not change the density of the crystal ?

6   A solution containing 15 g urea (molar mass 60 g mol^{-1}) per litre of solution in water

       has the same osmotic pressure (isotonic) as a solution of glucose (molar mass = 180 g

       mol^{-1}) in water. Calculate the mass of glucose present in one litre of its solution.

7   An element with density 2.8 g cm^{-3} forms a fcc unit cell with edge length of

       4×10^{-8} cm. Calculate the molar mass of the element.

[P.T.O.]

8   For a chemical reaction, variation in rate with concentration is shown below—

(a)   What is the order of the reaction ?

(b)   What are the units of rate constant K for the reaction ?

Rate ↑

Conc ⟶
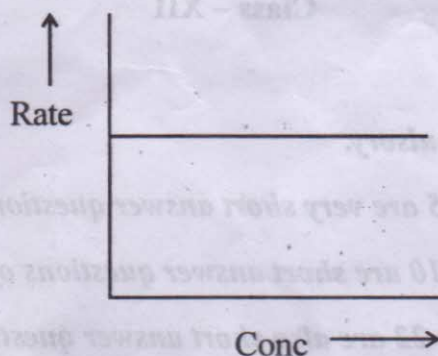
9   (a)   Describe the role of cryolite in extraction of aluminium.

(b)   Give the principle behind extraction of Silicon and Nickel.

10   (a)   Give the IUPAC name of—

(i) $[Co(H_2O)(CN)(en)_2]^{2+}$ (ii) $[PtCl_4]^{2-}$

(b)   Write the formula of the following—

(i)   Potassium tetrahydropalladate (II)

(ii) Penta ammine nitrito-N-cobalt (III)

OR

(a)   Discuss the nature of bonding in co-ordination compounds if metal is attached to carbonyl ligand.

(b)   Draw structure of $[Mn_2(CO)_{10}]$.

11   (a)   A sample of ferrous oxide has its actual formula as $Fe_{0.93}O_{1.00}$. In this sample what fraction of metal ions are Fe^{2+} ions ? What type of stoichiometric defect is present in this sample ?

(b)   What happens when silicon is doped with aluminium ?

12   Vaour pressure of pure water at 298 K is 23.8 mm Hg. 50 g of urea (H_2NCONH_2) is dissolved in 850 g of water. Calculate the vapour pressure of water for this solution.

13   (a)   The cell in which the following reaction occurs—

$2Fe^{3+}$(aq.) + $2I^-$(aq.) $\longrightarrow$ $2Fe^{2+}$ (aq.) + I_2(s) $E°_{cell}$ = 0.236 V

at 298 K. Calculate $\Delta G°$ and K_C of the cell reaction.

     (b)   The molar conductivity of strong electrolyte increases on dilution. Comment.

14   (a)   Give the packing efficiency in hcp structure.

     (b)   Give reason very old glass objects appear slightly milky instead of being transparent.

     (c)   Gold atomic radius = 0.144 nm crystallises in Body centred unit cell. What is the length of unit cell.

15   Assign reasons for the following—

     (a)   Helium finds wide application in diving system.

     (b)   Oxygen forms π bonds where as sulphur does not form π bonds.

     (c)   Nitrogen does not form NCl_5 but phosphorus forms PCl_5.

16   (a) $[Cr(NH_3)_6]^{3+}$ is paramagnetic while $[Ni(CN)_4]^{2-}$ is diamagnetic why ? Explain using VBT.

     (b)   Write all the geometrical isomers of $[Co(NH_3)(Cl)(F)(py)]$.

17   (a)   Give reactions for metallurgy of gold.

     (b)   What is Van Arkel method of refining ?

18   (a)   What happens when white phosphorus is heated with concentrated NaOH solution in an inert atmosphere of CO_2 ?

     (b)   Which gas emitted from exhaust systems of supersonic jet aeroplanes is depleting ozone layer ? Give reaction.

     (c)   Give the increasing order of reactivity towards acidic strength HCl, HBr, HI, HF.

19   (a)   Calculate emf of the following cell $Fe(s)/Fe^{2+}(0.001\ M) \parallel H^+ (1M) \mid H_2(g)$ 1 bar | Pt(s)

           $E^\circ_{Fe^{2+}/Fe} = -0.44$ V

    (b)   The molar conductivity of 0.025 mol^{-1} methanoic acid is 46.1 S $cm^2\ mol^{-1}$. Calculate its degree of dissociation and dissociation constant. Given $\lambda^\circ_{H^+} = 349.6$ S $cm^2\ mol^{-1}$ $\lambda^\circ_{HCOO^-}$ = 54.6 S $cm^2\ mol^{-1}$.

20   (a)   A reaction is third order with respect to a reactant. How is the rate of reaction affected if the concentration of the reactants is—

          (i)   doubled   (ii)   reduced to ½

    (b)   The rate constant for the decompostion of hydrocarbons is $2.418 \times 10^{-5}\ s^{-1}$ at 546 K. If the energy of activation is 179.9 KJ mol^{-1}. What will be the value of pre-exponential factor ?

21   (a)   Give crystal field splitting diagram for octahedral complexes. What will be the electronic configuration of d^6 species according to CFT if a strong field ligand is attached.

    (b)   A solution of $[Ni(H_2O)_6]^{2+}$ is green but a solution of $[Ni(CN)_4]^{2-}$ is colourless explain.

    (c)   Give the magnetic moment of $[Ni(H_2O)_6]^{2+}$.

22   (a)   Calculate the number of coulombs required to deposited 40.5 g of Al when electrode reation is—

          $Al^{3+}(aq.) + 3e^- \longrightarrow Al(s)$.

    (b)   How many grams of silver could be plated out of a shield by electrolysis of a solution containing Ag^+ ions for a period of 4 hours at a current of 8.5 A ?

<center>OR</center>

    (a)   Can you store $CuSO_4$ solution in a zinc pot ?
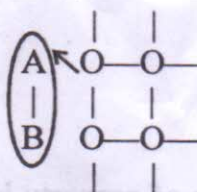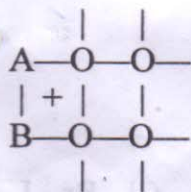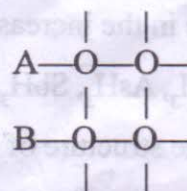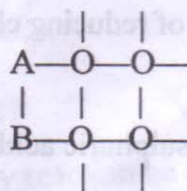
(b) Calculate the emf of the cell—

$$Mg(s) + 2Ag^+(aq.) \longrightarrow Mg^{2+}(aq.) + 2Ag(s)$$
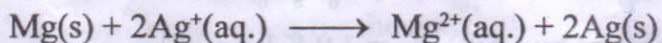
$[Mg^{2+}] = 0.130 \text{ M and } [Ag^+] = 1 \times 10^{-4} \text{ M}$

$E°_{Mg^{2+}/Mg} = -2.37 \text{ V} \qquad E°_{Ag^+/Ag} = +0.80 \text{ V}$

23　　Teacher was explaining modern adsorption theory of catalysis in a slide based lecture. By chance he could not place numbering on slides. She was asked to help to place the slides in the order of steps involved—

$$A + B \longrightarrow A - B$$
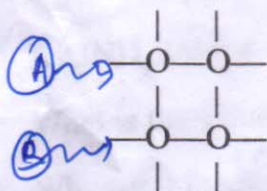
Based on the above figures—

(a) Arrange the slides I to V in accordance with correct steps. Mention the process.

(b) Give one example of industrial application involving this theory.

(c) What values are associated with the teacher ?

24 (a) Calculate the boiling point of a solution containing 0.61 g of benzoic acid in 5 g of CS_2. Assuming 84% dimerisation of acid. The boiling point and K_b of CS_2 are 46.2°C and 2.3 K kg mol^{-1} respectively.

(b) State Henry's law and give its one application.

OR

(a) Calculate the mass of ascosbing acid (Vitamin C, $C_6H_8O_6$) to be dissolved in 75 g of acetic acid to lower its melting point by 1.5°C. $K_b = 3.9$ K kg mol^{-1}

(b) What is reverse osmosis ? Explain.

(c) Why acetone and chloroform mixed together forms non-ideal solutions ?

25   Give reasons for the following—

(a) Sugar gets charged on addition of concentrated sulphuric acid.

(b) The negative value of electron gain enthalpy of fluorine is less than that of chlorine.

(c) SF_6 is less reactive than SF_4.

(d) Arrange in the increasing order of reducing character—

NH_3, PH_3, AsH_3, SbH_3, BiH_3

(e) Draw the structure of peroxodi sulphuric acid.

OR

(a) Complete the following reactions—

$NH_3 + 3Cl_2 \longrightarrow$

        excess

$XeF_6 + 2H_2O \longrightarrow$

(b) Arrange the following in order of property indicated F_2, Cl_2, Br_2, I_2 (increasing bond dissociation enthalpy)

(c) Give reason—

(i) Why are halogens coloured ?

(ii) Why does $R_3P = 0$ exist but $R_3N = 0$ does not (R = alkyl group) ?

26   (a) For the decomposition of azoisopropane to hexane and nitrogen at 543 K, the following data is obtained—

t (sec)	0	360	720
P (atm)	35	54	63

Calculate rate constant.
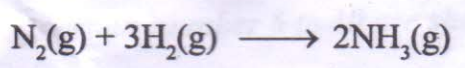
(b) The slope of a line in the graph of log K versus 1/T for a reaction is –5841 K. Calculate energy of activation for the reaction.

OR

(a) A certain reaction is 50% complete in 20 minutes at 300 K and the same reaction is again 50% complete at 350 K in 5 minutes. Calculate the activation energy if the reaction is first order.

(b) For the reaction—

$N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$

If $\Delta[NH_3]/\Delta t = 4 \times 10^{-8}$ mol L^{-1} s^{-1}

What is the value of $\Delta[H_2]/\Delta t$?

(c) Why can't moecularity of any reaction be equal to zero ?