CHEMISTRY CLASS XII SURE SHOT(LONG ANSWER QUESTONS)

1. Give reasons for the following:
   (i) p-nitro phenol is more acidic than p-methyl phenol.
   (ii) Bond length of C – O bond in phenol is shorter than that in methanol.
   (iii) $(CH_3)_3C$ – Br on reaction with sodium methoxide (Na+ OCH_3) gives alkene as the main product and not ether.
   (iv) Alcohols are more soluble in water than corresponding hydrocarbons.
   (v) Why are ethers insoluble in water?

2. (i) Which one of the following is a disaccharide :
        Starch, maltose, fructose, glucose
   (ii) What is the difference between acidic amino acid and basic amino acid?
   (iii) Write the name of the linkage joining two nucleotides.
   (iv) What do you mean by denaturation of protein?
   (v) Explain why vitamin c cannot be stored in body?

3. (i)Calculate emf of the following cell at 25 $^\square$C :

   Zn | Zn^{2+}(1 M) || Cu $^{2+}$ / Cu
   $E^\square$(Zn^{2+} |Zn) = –0.76 V $E^\square$(Cu^{2+}| Cu) = 0.34 V
 (ii) What do you mean by a fuel cell? State any two advantages Fuel cell over ordinary cell.

4. Write the equations involved in the following reactions:
   (i) Cannizaro reaction
   (ii) Wolff-Kishner reduction
   (iii) Clemmensen reduction
   (iv) Aldol Condensation
   (v) Etard reaction

5.Write the equations involved in the following reactions:
   (i) Hoffmann bromamide reaction
   (ii) Carbylamine reaction
   (iii) Gabriel phthalimide synthesis
   (iv) Coupling reaction of diazonium salt
   (v) Sandmeyers Reaction.

6. Seeing the growing cases of diabetes and depression among children, Mr. Chopra, the principal of one reputed school organized a seminar in which he invited parents and principals. They all resolved this issue by strictly banning the junk food in schools and by introducing healthy snacks and drinks like soup, lassi, milk etc. in school canteens. They also decided to make compulsory half an hour physical activities for the students in the morning assembly daily. After six months, Mr. Chopra conducted the health survey in most of the schools and discovered a tremendous improvement in the health of students.
After reading the above passage, answer the following questions:
(i) What are the values (at least two) displayed by Mr. Chopra?
(ii) As a student, how can you spread awareness about this issue?
(iii) Why should antidepressant drugs not be taken without consulting a doctor?

7. (a) Account for the following :
        (i) Bond angle in is higher than NH_3. NH_4^+
        (ii) H_2S has lower boiling point than H_2O.
        (iii) Reducing character decreases from SO_2 to TeO_2.

(b) Draw the structures of the following :
   (i) $H_4P_2O_7$ (Pyrophosphoric acid)
   (ii) XeF_2

8.(a) Draw the structures of the following :
   (i) XeF_4
   (ii) $H_2S_2O_7$
  (b) Account for the following :
  (i) Iron on reaction with HCl forms $FeCl_2$ and not $FeCl_3$.
  (ii) $HClO_4$ is a stronger acid than HClO.
  (iii) BiH_3 is the strongest reducing agent amongst all the hydrides of group 15.

9. (a) Illustrate the following reactions giving suitable example in each case :
   (i) Ammonolysis
   (ii) Coupling reaction
   (iii) Acetylation of amines
  (b) Describe Hinsberg method for the identification of primary, secondary and tertiary amines.Write
       the chemical equations of the reactions involved

 10. (a) Write the structures of the main products when aniline reacts with the following reagents:
     (i) Br_2 water
     (ii) HCl
     (iii) $(CH_3CO)_2O$ / pyridine
    (b) Arrange the following in the increasing order of their boiling point:
        $C_2H_5NH_2$, C_2H_5OH, $(CH_3)_3N$
    (c) Give a simple chemical test to distinguish between the following pair of compounds:
        $(CH_3)_2$ -NH and $(CH_3)_3N$

11 (a) Define the following terms
       (i) Activation energy
       (ii) Rate constant
  (b) A first order reaction takes 10 minutes for 25% decomposition. Calculate t1/2 for the reaction.

12. (a) For a reaction A + B ---- P, the rate is given by
           Rate = k $[A]^2$ [B]
        (i) How is the rate of reaction affected if the concentration of A is doubled?
        (ii) What is the overall order of reaction if B is present in larg
 (b) A first order reaction takes 23.1 minutes for 50% completion. Calculate the time required for 75%
Completion of this reaction.

13.(a) Calculate the freezing point of solution when 1.9 g of $MgCl_2$(M=95 g mol–1) was dissolved in
50 g of water, assuming $MgCl_2$ undergoes complete ionization.
                (K_f for water = 1.86 K kg mol–1)
    (b) (i) Out of 1 M glucose and 2 M glucose, which one has a higher boiling point and why
        (ii) What happens when the external pressure applied becomes more than the osmotic pressure
        of solution ?

14. (a) When 2.56 g of sulphur was dissolved in 100 g of CS_2, the freezing point lowered by   0.383 K.
Calculate the formula of sulphur (Sx).
  (K_f for CS_2 = 3.83 K kg mol–1, Atomic mass of Sulphur = 32 g mol–1]

(b) Blood cells are isotonic with 0.9% sodium chloride solution. What happens if we Place blood cells in a solution containing

(i) 1.2% sodium chloride solution?

(ii) 0.4% sodium chloride solution?

15.(a) Account for the following :

(i) Ozone is thermodynamically unstable.

(ii) Solid PCl_5 is ionic in nature.

(iii) Fluorine forms only one oxoacid HOF.

(b) Draw the structure of

(i) BrF_5

(ii) XeF_4

16. (i) Compare the oxidizing action of F_2 and Cl_2 by considering parameters such as bond dissociation enthalpy, electron gain enthalpy and hydration enthalpy.

(ii) Write the conditions to maximize the yield of H_2SO_4 by contact process.

(iii) Arrange the following in the increasing order of property mentioned:

(a) H_3PO_3, H_3PO_4, H_3PO_2 (Reducing character)

(b) NH_3, PH_3, AsH_3, SbH_3, BiH_3 (Base strength)

17. (i) What is the role of t-butyl peroxide in the polymerization of ethene ?

(ii) Identify the monomers in the following polymer :

$-[NH - (CH_2)_6 - NH - CO - (CH_2)_4 - CO -]n$
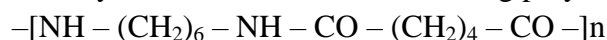
(iii) Arrange the following polymers in the increasing order of their intermolecular forces :

Polystyrene, Terylene, Buna-S

(iv) Discuss the main purpose of vulcanization of rubber.

(v) What is copolymer?

18. Due to hectic and busy schedule, Mr. Angad made his life full of tensions and anxiety. He started taking sleeping pills to overcome the depression without consulting the doctor. Mr. Deepak, a close friend of Mr. Angad, advised him to stop taking sleeping pills and suggested to change his lifestyle by doing Yoga, meditation and some physical exercise. Mr. Angad followed his friend's advice and after few days he started feeling better.

After reading the above passage, answer the following :

(i) What are the values (at least two) displayed by Mr. Deepak ?

(ii) Why is it not advisable to take sleeping pills without consulting doctor ?

(iii) What are tanquilizers ? Give two examples.

19. (a) Write the chemical equation for the reaction involved in Cannizzaro reaction.

(b) Draw the structure of the semicarbazone of ethanal.

(c) Why pKa of F-CH_2-COOH is lower than that of Cl – CH_2 – COOH ?

(d) Name the aldehyde which does not give Fehlings solution test.

(e) How can you distinguish between propanal and propanone ?

20.(i) Show that in a first order reaction, time required for completion of 99.9% is 10 times that of half-life ($t\frac{1}{2}$) of the reaction.

(ii) Derive integrated rate equation for rate constant for a first order reaction.

(iii) For the first order thermal decomposition reaction, following data were obtained :

$C_2H_5Cl(g) \rightarrow C_2H_4(g) + HCl(g)$

Time/sec	Total pressure / atm
0	0.30
300	0.50

Calculate the rate constant.

(Given log 2 = 0.301, log 3 = 0.4771, log 4 = 0.6021)

21. (a) Account for the following :

 (i) Mn_2O_7 is acidic whereas MnO is basic.

 (ii) Though copper has completely filled d-orbital (d^{10}) yet it is considered as a transition metal.

 (iii) Actinoids show wide range of oxidation states.

 (b) Write the preparation of potassium permanganate from pyrolusite ore (MnO_2).

22. (a) The elements of 3d transition series are given as :

    Sc Ti V Cr Mn Fe Co Ni Cu Zn

 Answer the following :

 (i) Which element has the highest m.p. and why ?

 (ii) Which element is a strong oxidizing agent in +3 oxidation state and why ?

 (iii) Which element is soft and why ?

 (b) Write the equations involved in the preparation of Potassium dichromate from Sodium chromate .

23. (a) What happens when

   (i) phenol reacts with Bromine water ?

   (ii) ethanol reacts with CH3COCl/pyridine ?

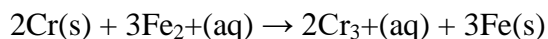   (iii) anisole reacts with HI ?

   Write the chemical equations involved in the above reactions.

 (b) Distinguish between :

 (i) Ethanol and phenol

 (ii) Propan-2-ol and 2-methylpropan-2-ol

24.(a) Calculate $\Delta G°$ and log Kc for the following reaction at 298 K :

      $2Cr(s) + 3Fe_2+(aq) \rightarrow 2Cr_3+(aq) + 3Fe(s)$

       Given : E° cell = 0.30 V

   (b) Using the E° values of A and B, predict which is better for coating the surface of iron

       [E° (Fe^{2+} | Fe) = –0.44 V] to prevent corrosion and why ?

       Given : $E°(A^{2+} | A)$ = –2.37 V : $E°(B^{2+}| B)$ = –0.14 V

25. (a) The conductivity of 0.001 mol L–1 solution of CH_3COOH is 3.905 × 10–5 S cm–1.
    Calculate its molar conductivity and degree of dissociation (α).
    Given : $\lambda°$ (H^+) = 349.6 S cm2 mol–1 and $\lambda°$ (CH_3COO–) = 40.9 S cm2 mol–1.

 (b) What type of battery is lead storage battery ? Write the overall reaction occurring in lead
    storage battery.

26. Write the role of

(i) I_2 in the van Arker method of refining.
(ii) Cryolite in the extraction of aluminium.
(iii) Dilute NaCN in the extraction of silver
(iv) Silica in the metallurgy of Copper
(v) Depressant in froth floatation process?

27. (a) Give reasons :
   (i) The α-hydrogen atoms of aldehydes and ketones are acidic in nature.
   (ii) Propanone is less reactive than ethanol toward addition of HCN.
   (iii) Benzoic acid does not give Friedal-Crafts reaction.
   (b) How can you convert ?
   (i) Toluene to Benzaldehyde
   (ii) Acetone to Propane

28. (a) When a co-ordination compound $CoCl_3 \cdot 4NH_3$ is mixed with $AgNO_3$, 1 mole of AgCl is precipitated per mole of the compound.
   Write (i) Structural formula of the complex
      (ii) IUPAC name of the complex
   (b) For the complex $[Fe(CO)_5]$, write the hybridization, magnetic character and spin of the complex.
      (At. number : Fe = 26)
   (c) Define crystal field splitting energy.

29. (a) State Henry's law. Write its one application.
   (b) What is the effect of temperature on solubility of gases in liquid
   (c) Calculate the freezing point of solution when 2 g of Na_2SO_4(M = 142 g mol^{-1}) was dissolved in 50 g of water, assuming Na_2SO_4 undergoes complete ionization.
      (K_f for water = 1.86 K kg mol^{-1})

30. Define the following terms :
 (i) Sorption
 (ii) Zeta potential
 (iii) Kraft temperature
 (iv) Zeolites
 (v) Peptization

31. (i) Draw the pyranose structure of glucose.
   (ii) What type of linkage is present in proteins?
   (iii) Give one example each for water-soluble vitamins and fat-soluble vitamins.
   (iv) What are reducing sugars?
   (v) What is effect of denaturation on the structure of protein?

32. An organic compound (A) has characteristic odour. On treatment with NaOH, it forms compounds (B) and (C). Compound (B) has molecular formula C_7H_8O which on oxidation gives back (A). The compound (C) is a sodium salt of an acid. When (C) is treated with soda-lime, it yields an aromatic compound (D). Deduce the structures of (A), (B), (C) and (D). Write the sequence of reactions involved.

33. (a) Exemplify the following reactions:
     (i) Rosenmund reduction reaction.
     (ii) Kolbe electrolysis reaction.
     (iii) Wolff Kishner reduction
   (b) Arrange the following compounds in increasing order of their reactivity towards HCN:
        Acetaldehyde, Acetone, Di-tert-butyl ketone.
   (C) Arrange the following compounds in increasing order of acid strength:
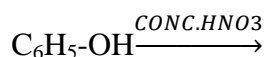   Benzoic acid, 4-Nitrobenzoic acid, 4-Methoxybenzoic acid.
34. (a) Write the mechanism of hydration of ethene to form ethanol.
    (b) How are the following conversions carried out?
       (i) Propanol to propan-2-ol.
       (ii) Propanol to 1-propoxypropane.
    (c) Give the structure and the IUPAC name of the major product obtained in the following
        reaction:

$$C_6H_5\text{-OH} \xrightarrow{CONC.HNO3}$$

35.(a) A blackish brown coloured solid (A) which is an oxide of manganese, when fused with alkali
metal hydroxide and an oxidizing agent like KNO_3, produces a dark green coloured compound (B).
Compound (B) on disproportionation in neutral and acidic solution gives a purple coloured compound
(C). Identify A, B and C and write the reaction involved when compound (C) is heated to 513 K.

(b)Write balanced equations to represent what happens when
   (i) Cu^{2+} is treated with KI.
  (ii) Acidified potassium dichromate solution is reacted with iron (II) solution.

36. John had gone with his mother to the doctor as he was down with fever. He then went to the
chemist shop with his mother to purchase medicines prescribed by the doctor. There he observed a
young man pleading with the chemist to give him medicines as he had nasal congestion. The chemist
gave him cimetidine. John advised and also explained to the young man that he should only take the
medicines prescribed by the doctor. Answer the following questions:
(a) Did the chemist give an appropriate medicine? Justify your answer.
(b) John's action was appreciated by his mother. List any two reasons.
(c) What value shown by John?

37. (i) Which of the following biomolecule is insoluble in water? Justify.
        Insulin, Haemoglobin, Keratin.
    (ii) Draw the Haworth structure for α-D-Glucopyranose.
    (iii) Write chemical reaction of glucose with HCN, Br_2 water and HNO_3.

38. (a) Give one chemical test to distinguish between the following pairs of compounds:
       (i) Methylamine and dimethylamine.
       (ii) Aniline and benzylamine
   (b) Write the structures of different isomers corresponding to the molecular formula C_3H_9N, which
        will liberate nitrogen gas on treatment with nitrous acid.
   (c) Ethylamine is soluble in water whereas aniline is not

39. (i) What type of deviation from Raoult's law is observed, when two volatile liquids A and B on mixing produce a warm solution? Explain with the help of a well labeled vapour pressure graph.

(ii) Consider separate solutions of 0.5 M CH_3OH, 0.250 M KCl (aq) and 0.125 M Na_3PO_4 (aq). Arrange the above solutions in the increasing order of their Van't Hoff factor

(iii) 0.5 g of KCl was dissolved in 100 g of water and the solution originally at 200 C, froze at -0.240 C. Calculate the percentage dissociation of the salt.

(Given : K_f for water = 1.86 K kg /mol, Atomic mass: K = 39 u, Cl= 35.5 u)

40. i) Graphically explain the effect of temperature on the rate constant of reaction? How can this temperature effect on rate constant be represented quantitatively?

(ii) Rate constant for a first order reaction has been found to be 2.54 x 10-3s-1. Calculate its three-fourth life.

41. (i) Predict the number of unpaired electrons in the tetrahedral $[MnBr_4]^{2-}$ ion.

(ii) Draw structures of geometrical isomers of $[Co(NH_3)_4Cl_2]^+$.

(iii) Write the formula for the following coordinate compound:
Amminebromidochloridonitrito-N-platinate(II)

(iv) Why are low spin tetrahedral complexes not found?

(v) What are ambidentate ligands?

42. Explain what is observed when
(i) Silver nitrate solution is added to potassium iodide solution.
(ii) The size of the finest gold sol particles increases in the gold sol.
(iii) Two oppositely charged sols are mixed in almost equal proportions.
(iv) When a beam of light passed through colloidal solution
(v) An electric current pass through a colloidal solution.

43. (a) Draw the structures of the following :
(i) p-Methylbenzaldehyde
(ii) 4-Methylpent-3-en-2-one
(b) Give chemical tests to distinguish between the following pairs of compounds :
(i) Benzoic acid and Ethyl benzoate.
(ii) Benzaldehyde and Acetophenone.
(iii) Phenol and Benzoic acid.

44. (a) Draw the structures of the following derivatives :
(i) Propanone oxime
(ii) Semicarbazone of CH3CHO
(b) How will you convert ethanal into the following compounds? Give the chemical equations involved.
(i) $CH_3 – CH_3$
(ii) $CH_3 – CH =CH – CHO$
(iii) CH_3CH_2OH

45. (a) Elements of Gr. 16 generally show lower value of first ionization enthalpy compared to the corresponding periods of Gr. 15. Why ?
(b) What happens when
(i) concentrated H_2SO_4 is added to CaF_2 ?
(ii) sulphur dioxide reacts with chlorine in the presence of charcoal ?
(iii) ammonium chloride is treated with $Ca(OH)_2$?

46. Neeraj went to the departmental store to purchase groceries. On one of the shelves he
noticed sugar free tablets. He decided to buy them for his grandfather who was a
diabetic. There were three types of sugar free tablets. He decided to buy sucrolose
which was good for his grandfather's health.
(i) Name another sugar free tablet which Neeraj did not purchase.
(ii) Was it right to purchase such medicines without doctor's prescription ?
(iii) What quality of Neeraj is reflected above ?

47. (a) Define conductivity and molar conductivity for the solution of an electrolyte.
Discuss their variation with concentration.
(b) Calculate the standard cell potential of the galvanic cell in which the following
reaction takes place :
$$Fe^{2+}(aq) + Ag^+(aq) \rightarrow Fe^{3+}(aq) + Ag(s)$$
Calculate the $\Delta rG°$ and equilibrium constant of the reaction also.
($E°Ag^+/Ag = 0.80$ V; $E°Fe^{3+}/Fe^{2+} = 0.77$ V)

48. (a) Describe the following giving chemical equations :
(i) De-carboxylation reaction
(ii) Friedel-Crafts reaction
(b) How will you bring about the following conversions ?
(i) Benzoic acid to Benzaldehyde
(ii) Benzene to m-Nitroacetophenone
(iii) Ethanol to 3-Hydroxybutanal

49. (a) Write balanced equations for the following reactions :
(i) Chlorine reacts with dry slaked lime.
(ii) Carbon reacts with concentrated H_2SO_4.
(b) Describe the contact process for the manufacture of sulphuric acid with special reference to the
reaction conditions, catalysts used and the yield in the process.

50. (a) Define the following terms :
(i) Molar conductivity (^{m})
(ii) Secondary batteries
(iii) Fuel cell
(b) State the following laws :
(i) Faraday first law of electrolysis
(ii) Kohlrausch's law of independent migration of ions

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