Chemistry

MODEL QUESTION

Grade: XII **Times: 3 hours**

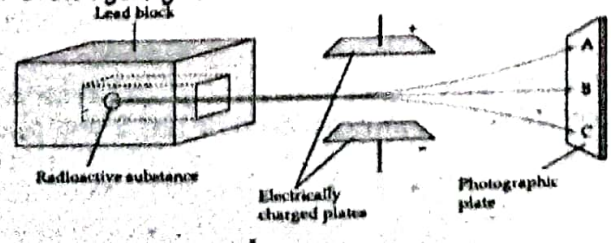
Full Marks 75 (11 marks obj. + 64 marks sub.)

1

Group A: Multiple Choice Questions

Tick the correct answer. **[11×1=11]**

1. What is the equivalent weight of H_3PO_3 in the reaction; $2NaOH + H_3PO_3 \longrightarrow Na_2HPO_3 + 2H_2O$
   a. 2M b. M/1
   c. M/2 d. M/3
2. The solubility product of chalk is 9.3×10^{-8}. What is its solubility in gram per liter?
   a. 3.04×10^{-1} b. 3.04×10^{-2}
   c. 3.04×10^{-3} d. 3.04×10^{-4}
3. What is the concentration of N_2O_5 in the following first order reaction in which the rate is 2.4×10^{-5} mol/L and rate constant is 3.0×10^{-5} S^{-1}? $2N_2O_5 \longrightarrow 4NO_2 + O_2$
   a. 0.04 b. 0.8
   c. 1.2 d. 1.4
4. What happens when the lead storage bettery is discharged?
   a. SO_2 is evolved b. $PbSO_4$ is consumed
   c. Lead is formed d. H_2SO_4 is consumed
5. What is the general electronic configuration of transition metal?
   a. $(n-1)s^2p^6d^{1-10}ns^{0-2}$ b. $(n-1)s^2p^6ns^2np^1$
   c. $(n-1)s^2p^6d^5ns^1$ d. $ns^{(0-2)}(n-1)d^{(1-10)}$
6. Which of the following ore is concentrated by forth-flotation process?
   a. Hematite b. Siderite
   c. Galena d. Malachite
7. Which of the following products is obtained when nitrobenzene is electrolytically reduced?
   a. p-aminophenol b. azobenzene
   c. azoxybenzene d. hydrozobenzene
8. Which of the following compounds is pi-bonded organo-metallic compound which has ethane as one of its component and is the first synthesized organometallic compound?
   a. Zeise's salt b. Ferrocene
   c. Dibenzene chromium d. Tetraethyl tin
9. What effect does calcium sulphate have on cement?
   a. Retards setting action b. Acts as flux
   c. Imparts color d. Reduces strength
10. Removal of which of the following leads to higher fiber-fiber bonding strength is paper?
    a. Softwood b. Hardwood
    c. Lignin d. Pulp
11. In the figure given below which one is correct?



   a. Alpha rays deviate towards A, beta rays deviate towards C and gamma rays direct towards B.
   b. Alpha rays direct towards B, beta rays deviate towards C and gamma rays towards A.
   c. Alpha rays deviate towards C, beta rays direct towards B and gamma rays towards A.
   d. Alpha rays deviate towards C, beta rays deviate towards A and gamma rays direct towards B.

Group B: Short Answer Questions

Attempt all the questions. **[8×5=40]**

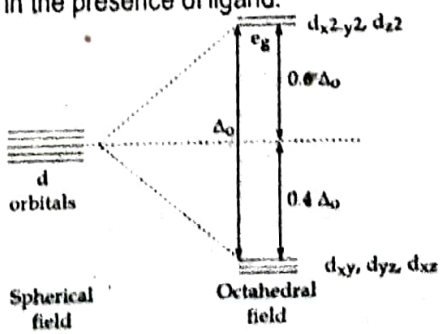
1. Standard solution of Na_2CO_3 is used to determine the strength of H_2SO_4 during titration.
   a. How is the completion of the reaction in this titration detected? Is the solution prepared from Na_2CO_3 primary standard? Why? [1+1]
   b. 2.16 g of pure Na_2CO_3 is added to 400 mL deci-normal solution of H_2SO_4. How many grams of H_2SO_4 is further required to neutralize the resultant solution completely? [3]

   OR

   a. Derive the relation $k = \log \frac{2.303}{t} \log \frac{a}{a-x}$. Show that for the first order reaction the time required for half the change (half life period) is independent of the initial concentration. [2+1]
   b. A first order reaction is 50% completed in 10 min. How much time would it take for 90% completion? [2]
2. Study the following data for the thermodynamic process $H_2O\ (l) \longrightarrow H_2O\ (s)$ at different temperatures and at 1 atmospheric pressure.

Condition	Temperature	Entropy change in J/Kmol^{-1}	
		Entropy of system	Entropy of surrounding
1	−1°C	−25.68	+25.72
2	0°C	−26.55	+26.88
3	+1°C	−27.62	+27.42

   a. Calculate the total entropy of the universe at given condition 3. [1]
   b. Can we predict the spontaneity of the given reaction at 0°C? [1]
   c. Calculate the equilibrium constant for the fusion of ice at 1°C. What is the effect of temperature for the entropy change of reaction? [2+1]
3. The figure shows the octahedral distortion of d-block orbital in the presence of ligand.



a. Why does octahedral distortion occur in the presence of ligand? Explain on the basis of CFT. [2]
b. On the basis of the given distortion, how can you explain $[Cu(H_2O)_6]^{++}$ is blue colored complex. [1]
c. Out of Fe^{++} and Fe^{+++} which one is more stable? Explain on the basis of distortion seen in the above figure. [1]
d. Why do such elements which give such splitting show good catalytic properties? [1]

4. X is an ore of a metal M. X on calcination gives black precipitate (W) of metal oxide which belongs to group II of basic radical in qualitative analysis. X on roasting gives the metal (M) and a gas as major byproduct. The gas when passed through an acidified $K_2Cr_2O_7$ solution turns green.
a. Identify the metal ore X. [1]
b. Write the reaction involved during calcination of X. [1]
c. Write the action of the gas on acidified $K_2Cr_2O_7$. [1]
d. Convert metal M into it's vitriol. [2]

5. The given table shows the compounds and their molecular formula. How can you convert P to Q, where Q is a compound in which two methyl groups are substituted at adjacent carbons? How is P obtained from T, where T is secondary alcohol? Write the reactions involved in the conversion of P into R and S? [5x1=5]

Compounds	Molecular formula
P	C_3H_7Br
Q	C_6H_{14}
R	CH_2O
S	C_2H_4O
T	C_3H_8O

OR

An aromatic compound [A] in which one chlorine atom is substituted at benzene ring. When the compound [A] is heated with 2, 2, 2-trichloro ethanal in presence of conc. H_2SO_4 gives an insecticide [B]. The compound [A] when treated with an acid chloride containing two carbon atoms in the presence of anhydrous $AlCl_3$ gives [C].
a. Identify B and C. [1 +1]
b. Reaction of aq. NaOH on the compound [A] is more difficult than with chloroethane, justify with a suitable explanation. [2]
c. How would you obtain compound [A] from benzene diazonium chloride? [1]

6. A list of compounds are given as follows:
p-hydroxyazobenzene, $C_6H_5N_2Cl$, $C_6H_5NH_2$, $C_6H_5NO_2$, C_6H_6
From the above list of compounds, prepare a sequence of reaction chain with suitable conditions and reactions. [1+1+1+1+1]

7. Write down the isomeric alcohols of C_3H_8O and their IUPAC name. How would you apply Victor Meyer's test to distinguish these isomers? [2+3]

8. a. Define condensation polymerization. Write the molecular structures of monomers of Bakelite. [1+2]
b. Differentiate between OPC and PPC cement. [2]

Group C: Long Answer Questions **[3x8=24]**

9. a. What amount of $Zn(OH)_2$ will be precipitated out at 25°C if 100 mL of 0.22g NaOH is added to 1 liter of a saturated solution of $Zn(OH)_2$? Precipitate is obtained in this reaction, why? [Solubility product of $Zn(OH)_2$ at 25°C is 1.8×10^{-14}.] [4+1]
b. Potassium hydroxide having pH 8 is diluted 1000 times. Calculate the pH of the diluted base. [3]

OR

a. Calculate heat of formation of ethyl alcohol from the given data. [4]

Heat of combustion of ethyl alcohol	-330 kcal
Heat of formation of Carbondioxide	-94 kcal
Heat of formation of water	-68.5 kcal

b. The standard electrode potential for the following electrode reaction at standard state is given.
$Cu(s) \longrightarrow Cu^{++}(aq) + 2e^-$... $E^0_{Cu^{++}/Cu} = +0.34V$
$Ag^+(aq) + e^- \longrightarrow Ag(s)$ ... $E^0_{Ag^+/Ag} = +0.80V$
i. Write the cell notation indicating anode and cathode. [1]
ii. With 1M solution of ion at 25°C and 1atm. pressure, what will be the cell potential? [1]
iii. Calculate the free energy change in the reaction. [1]
iv. Can we store $AgNO_3$ solution in a copper vessel? [1]

10. a. A primary alcohol with molecular wt. 46 is boiled with sodium hydroxide and iodine. When the same alcohol is heated with ethanoic acid in presence of conc. H_2SO_4, one of the derivatives of carboxylic acid is obtained. Write the reactions involved in both conditions. What would be the product obtained when the same alcohol is heated with conc. H_2SO_4? How would you distinguish the above alcohol from methanol? [1+1+1+1+1=5]
b. An aromatic compound known as oil of mirabane is prepared from benzene.
i. What product would you obtain when the compound is electrolyzed in acidic medium? [1]
ii. Give the complete reaction for the conversion of the compound into yellow dye. [2]

11. a. An organic compound is used in the given figure to preserve museum specimens and also to prepare urinary antiseptics.

i. Write the reaction when the compound is heated with concentrated sodium hydroxide. [1]
ii. Draw the structure of urinary antiseptic [1]
iii. Write the chemical reaction that would occur when the given preservative is treated with phenol in acidic medium. [2]
iv. How would you obtain the preservative from methanol? [1]
b. A carbonyl compound with molecular formula C_3H_6O (it does not give silver mirror test) has treated with a compound Y which gives Z. Z on hydrolysis in acidic medium gives 2- hydroxy-2-methyl propanoic acid. Identify the carbonyl compound, Y and Z with proper reactions. [1+1+1]

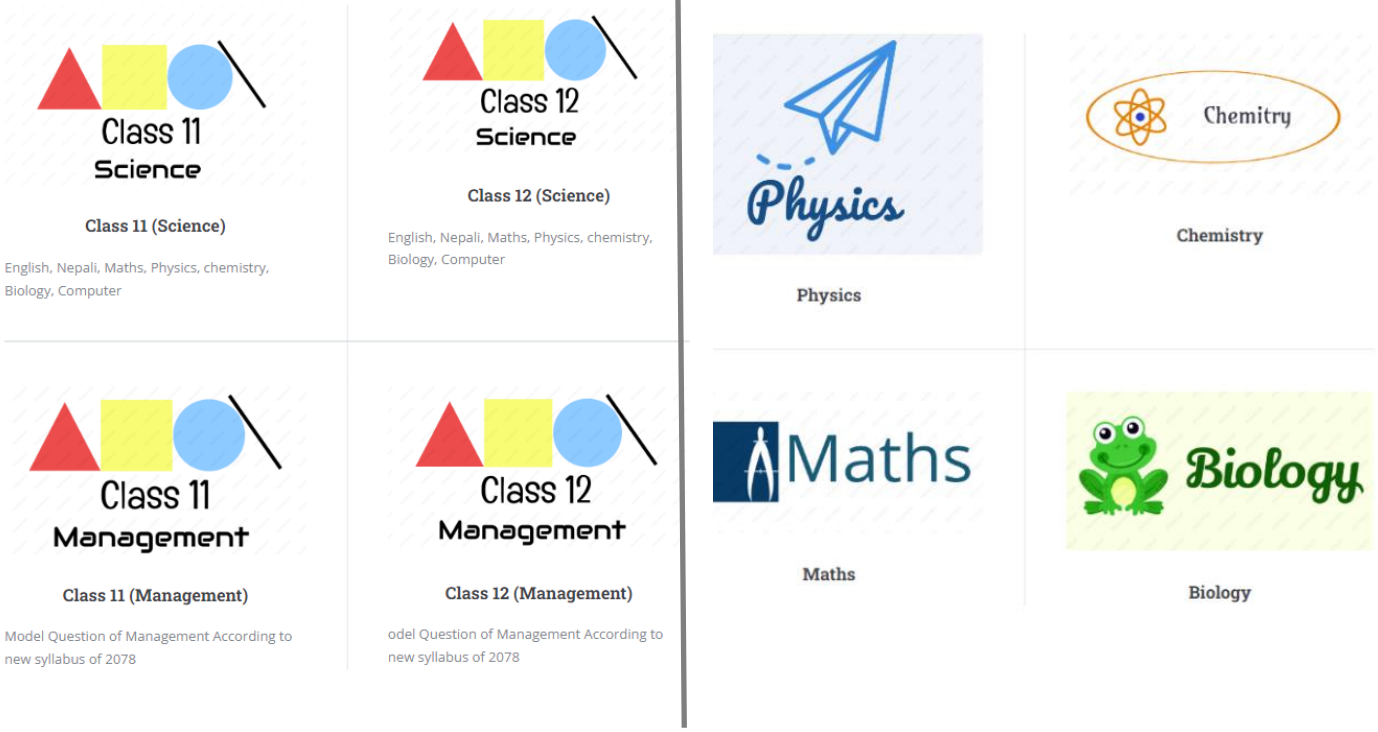
OR

a. Starting from compound P, how do the reactions proceed ahead to obtain T which gives benzene where R is aniline? Complete the reaction sequence with suitable conditions. [5x1=5]

b. Arrange the given compounds according to their ascending order of acidic strength and justify your order.
CH_3CH_2COOH, C_6H_5COOH, $ClCH_2CH_2COOH$

BIPO's notes

Class 12 complete notes and paper collection and solutions.



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