MODEL EXAMINATION (2020-21)

STD XII   **CHEMISTRY (CODE-043)**   Marks: 70
                                             Time: 3 Hrs

General Instructions.

Read the following instructions carefully.

a) There are 33 questions in this question paper. All questions are compulsory.

b) Section A: Q. No. 1 to 2 are case-based questions having four MCQs or Reason Assertion type based on given passage each carrying 1 mark.

c) Section A: Question 3 to 16 are MCQs and Reason Assertion type questions carrying 1 mark each

d) Section B: Q. No. 17 to 25 are short answer questions and carry 2 marks each.

e) Section C: Q. No. 26 to 30 are short answer questions and carry 3 marks each.

f) Section D: Q. No. 31 to 33 are long answer questions carrying 5 marks each.

g) There is no overall choice. However, internal choices have been provided.

h) Use of calculators and log tables is not permitted.

SECTION A (OBJECTIVE TYPE)

1. Read the passage given below and answer the following questions: **(1x4=4)**

In phenols, the reaction that takes place on the aromatic ring are electrophilic substitution reactions. The -OH group attached to benzene rings activates it towards electrophilic substitution and directs the incoming groups to ortho- and para- positions in the ring. Nitration, halogenation and oxidation etc. are some common reactions that the phenols undergo.

The following questions are multiple choice questions. Choose the most appropriate answer:

(i) The –OH group attached to the benzene ring makes the ortho- and para- positions   (1)

electron rich due to

    a) Nucleophilic attack
    b) Electrophilic substitution
    c) Resonance effect
    d) Lone pair of electrons

(ii) What happen when the reaction of phenol with Bromine water gives ----------   (1)

    a) Monobromophenol
    b) 2,4,6-Tribromophenol

c) Bromobenzene

d) 2,4-Dibromo phenol

OR

The product formed during the Kolbe's reaction is ------------
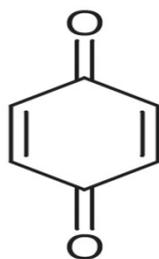
a) Salicylic acid
b) 2-Hydrobenzaldehyde
c) Benzaldehyde
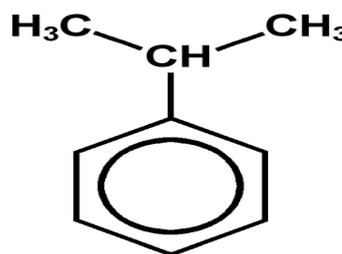d) Resorcinol

(iii) The IUPAC name of picric acid is ---------- (1)

a) 2-Hydroxy benzoic acid
b) 2,4,6- Trichlorophenol
c) Benzene sulphonic acid
d) 2,4,6-Trinitrophenol

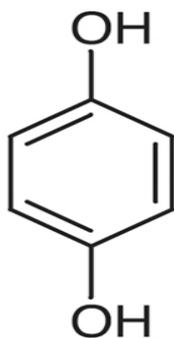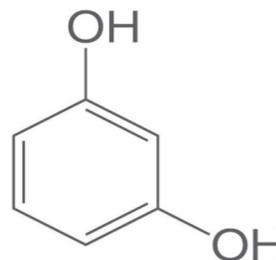(iv) Select the product obtained by oxidation of phenol with chromic acid-------- (1)

a)

b)

c)

d)

2. Read the passage given below and answer the following questions: **(1x4=4)**

Adsorption occurs due to unbalanced residual force on surface which allows to hold the adsorbate particle. These forces are generally chemical forces or physical van der Waal's forces.

Adsorption occurs by decreasing ΔG^0, ΔS^0, and ΔH^0 with condition ΔH has more –ve value in comparison to $T\Delta S$. $\Delta G<0$, $\Delta H<0$, $\Delta S<0$. Pressure on the gas that is adsorbed, generally magnitude of adsorption of an adsorbate gas is expressed as x/m. Extent of adsorption is directly proportional to surface area. Charcoal on heating at low pressure show increased power of adsorption. Colloid is a heterogeneous system. In which one substance is called dispersion medium which contain very small particles.

2. In these questions a statement of assertion followed by a statement of reason is given.

   Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

    (i)   Assertion: According to Freundlich adsorption isotherm, $x/m = K P^{1/n}$ (1)

            Reason: Isotherm shows that proportion of adsorbed gas on adsorbent is depends upon temperature.

    (ii)   Assertion: NH_3 is more adsorbed on charcoal than CO_2.   (1)

            Reason: NH_3 is polar.

    (iii)   Assertion: Physical adsorption is not possible on surface.   (1)

            Reason: In this process bonds of adsorbed molecules are broken.

    (iv)   Assertion: Lyophilic colloid is reversible sol.   (1)

            Reason: Lyophilic sol is hydrophilic.

OR

Assertion: Colloid particle shows Brownian movement.

Reason: Brownian movement are produced because of collision between colloid

Particle and particle in dispersion medium.

Following questions (No. 3 -11) are multiple choice questions carrying 1 mark each:

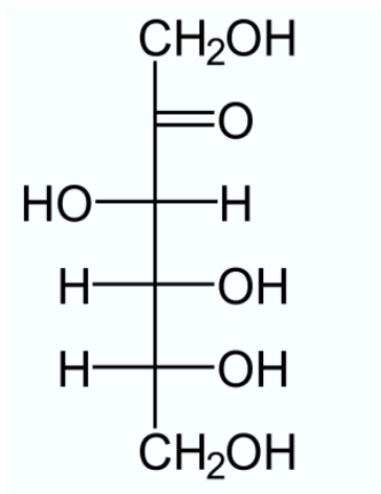3. Which Nernst equation is correct for a cell: $Co|Co^{2+} \, || \, Ag^+ \, | \, Ag$?   (1)

a) $E^0{}_{cell} = E_{cell} + RT/2F.\ln [Ag^+]^2 / [Co^{2+}]$

b) $E^0{}_{cell} = E_{cell} + RT/F.\ln [Co^{2+}]^{1/2} / [Ag^+]$

c) $E^0{}_{cell} = E_{cell} - RT/2F.\ln [Co^{2+}]/ [Ag^+]^2$

d) $E^0{}_{cell} = E_{cell} + RT/F. \ln [Co^{2+}]/ [Ag^+]^2$

4.

Which is configuration of fructose?   (1)

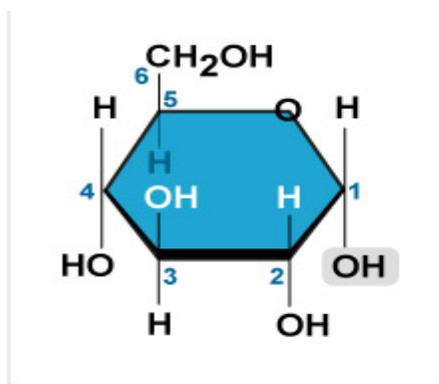   a) d   b) L   c) D   d) l

<center>**OR**</center>
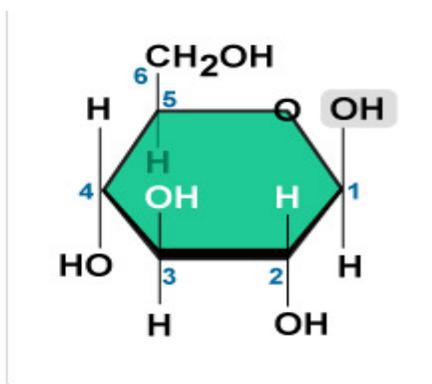
Which is true for structure (i) and (ii)?

                   (i)   (ii)

    a) (i) is β-D-(+) glucose and (ii) is α-D-(+) glucose.
    b) They are anomers of glucose
    c) They are enantiomers of glucose
    d) It is a mixture of D and L glucose

5. Which of the following mixture shows positive deviation of Raoult's law? (1)

   a) $CHCl_3 + (CH_3)_2CO$

   b) $(CH_3)_2CO + C_6H_5NH_2$

   c) $CHCl_3 + C_6H_6$

   d) $(CH_3)_2CO + CS_2$

6. Which of the following pair of transition ions show $3d^2$ electronic configuration? (1)

   a) Ti^{3+}, V^{2+}, Cr^{3+}, Mn^{4+}

   b) Ti^+, V^{4+}, Cr^{6+}, Mn^{7+}

   c) Ti^{4+}, V^{3+}, Cr^{3+}, Mn^{3+}

   d) Ti^{2+}, V^{3+}, Cr^{4+}, Mn^{3+}

OR

What is the colour of aqueous solution of $[Ni\,(H_2O)_6]^{2+}$?

   a) Green
   b) Yellow
   c) Orange
   d) Colourless

7. Mention the hybridization of N-atom and spatial arrangement of methyl group around it in the Compound $(CH_3)_3N$. (1)
   a) sp^3, pyramidal
   b) sp^3, tetrahedral
   c) sp^2, trigonal planar
   d) sp^3, trigonal planar

OR

Which of the following is the structural formula of the Heisenberg's reagent?

   a) $C_6H_5SO_2Cl$
   b) $C_6H_5SO_3H$
   c) $C_6H_5NHCH_3$
   d) $C_6H_5COCH_3$

8. Which of the following complex is diamagnetic? (1)

   a) $[Fe\,(CN)_6]^{3-}$

b) $[FeF_6]^{3-}$
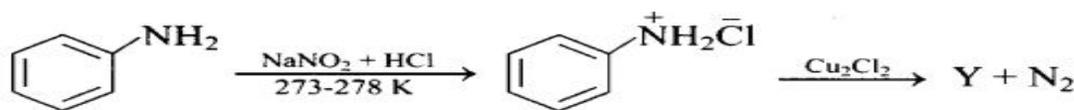
c) $[CoF_6]^{3-}$

d) $[Fe(CN)_6]^{4-}$

OR

Among the given ligand which one has highest number of co-ordination site?

a) en
b) Pn
c) Ptn
d) EDTA $^{4-}$

9. Which of the following pairs of ions have the same electronic configuration? (1)

(a) Cu^{2+}, Cr^{2+}

(b) Fe^{3+}, Mn^{2+}

(c) Co^{3+}, Ni^{3+}

(d) Sc^{3+}, Cr^{3+}

10. Identify the compound Y in the following reaction: (1)

11. Silver halides generally show: (1)

(a) Schottky defect

(b) Frenkel defect

(c) Both Frenkel and Schottky defects

(d) cation excess defect

In the following questions (Q. No. 12 - 16) a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for

assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

12. Assertion: Insulin is a globular protein. (1)

   Reason: Globular proteins are water soluble.

13. Assertion: Reactivity of fluorine is less. (1)

   Reason: Bond dissociation enthalpy of F-F is less than other halogen elements.

14. Assertion: For ideal solution ΔH_{mix} and ΔV_{mix} is zero. (1)

   Reason: In ideal solution intermolecular attraction A-B is equal to intermolecular

   attraction A-A and B-B.

OR

Assertion: Osmotic pressure of 0.1 M urea solution is less than that of 0.01 M NaCl solution.

Reason: Osmotic pressure is not a colligative property.

15. Assertion: Both Grignard reagent and dialkyl cadmium reacts with acid chloride and give (1) tertiary alcohol.

   Reason: Grignard reagent is active like dialkyl cadmium.

16. Assertion: Boiling point of alcohol is higher than ether having same molecular mass. (1)

   Reason: Alcohol and ether are isomers of each other.

SECTION B

The following questions, Q.No 17 – 25 are short answer type and carry 2 marks each.

17. Write the mechanism of the following reaction: (2)
    $$CH_3CH_2OH \xrightarrow{HBr} CH_3\,CH_2Br + H_2O$$

OR

Explain why:
 (i) Alkyl halides though polar, are immiscible with water?
 (ii) Grignard's reagent should be prepared under anhydrous conditions?

18. Henry's law constant for CO_2 in water is 1.67×10^8 Pa at 298 K. Calculate the quantity of   (2)
   CO_2 in 500 mL of soda water when packed under 2.5 atm CO_2 pressure at 298 K.

19. (i) Write the hybridization and shape of the following complexes.   (2)
       (a) $[CoF_6]^{3-}$ (b) $[Ni\,(CN)_4]^{2-}$

   OR

   Write down the IUPAC name for each of the following complexes:
   (i) $[Co\,(NH_3)_5Cl]\,Cl_2$
   (ii) $[CoBr_2\,(en)_2]^+$

20. The decomposition of N_2O_5 in CCl_4 at 318K has been studied by monitoring the   (2)
   concentration of N_2O_5 in the solution. Initially the concentration of N_2O_5 is 2.33 mol L^{-1} and after
   184 minutes, it is reduced to 2.08 mol L^{-1}. The reaction takes place according to the equation
       $2\,N_2O_5\,(g) \rightarrow 4\,NO_2\,(g) + O_2\,(g)$
   Calculate the average rate of this reaction in terms of hours, minutes and seconds. What is the rate of
   production of NO_2 during this period?

   OR

   Hydrolysis of methyl acetate in aqueous solution has been studied by titrating the liberated acetic acid
   against sodium hydroxide. The concentration of the ester at different times is given below.

t/min	0	30	60	90
$C/mol\ L^{-1}$	0.8500	0.8004	0.7538	0.7096

   Show that it follows a pseudo first order reaction, as the concentration of water remains nearly
   constant (55 mol L–1), during the course of the reaction. What is the value of k′ in this equation Rate
   $= k'\,[CH_3COOCH_3]\,[H_2O]$

21. Determine the order of reaction and also determine the units of rate constant.   (2)

(A)$_0$
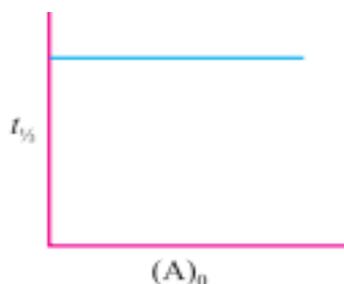
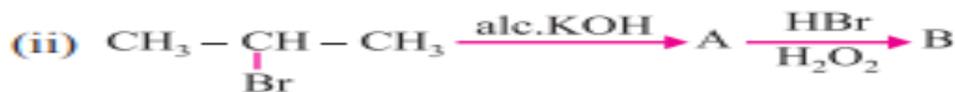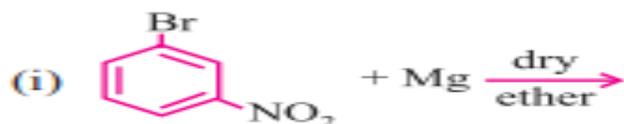22. Write the mechanism of hydration of ethene to yield ethanol.   (2)

23. Draw the structure of: (2)

   (i) Hypochlorous acid

(ii) Chlorous acid

24. (2)

Identify the products :

(i) + Mg $\xrightarrow{\text{dry ether}}$

(ii) $CH_3 - \underset{\underset{Br}{|}}{CH} - CH_3 \xrightarrow{\text{alc.KOH}} A \xrightarrow[H_2O_2]{\text{HBr}} B$

25. In a crystalline solid, the atoms A and B are arranged as follows: (2)

(a) Atoms A are arranged in ccp array.

(b) Atoms B occupy all the octahedral voids and half of the tetrahedral voids. What is the formula of the compound?

SECTION C

Q.No 26 -30 are Short Answer Type II carrying 3 marks each.

26. The E° values in respect of electrodes of Cr, Mn and iron are: (3)

$Cr^{+3}/Cr^{+2} = -0.4$ V

$Mn^{+3}/Mn^{+2} = +1.5$ V

$Fe^{+3}/Fe^{+2} = +0.8$ V

Compare the feasibilities of further oxidation of these ions.

OR

(i) For the first-row transition metals the Eo values are:

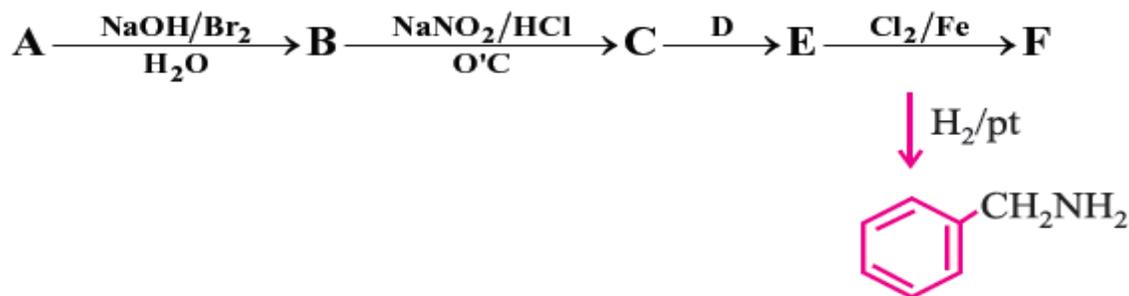| E°	V	Cr	Mn	Fe	Co	Ni	Cu
(M^{2+}/M)	−1.18	− 0.91	−1.18	− 0.44	− 0.28	− 0.25	+0.34

Explain the irregularity in the above values.

(ii) Which is a stronger reducing agent Cr^{2+} or Fe^{2+} and why?

(iii) What are the different oxidation states exhibited by the lanthanoids?

27. (i) Prepare pure sample of 1° amine from 1° alkyl halide. (3)

(ii) Write the structure of reagents/organic compounds 'A' to 'F':

$$A \xrightarrow[H_2O]{NaOH/Br_2} B \xrightarrow[O'C]{NaNO_2/HCl} C \xrightarrow{D} E \xrightarrow{Cl_2/Fe} F$$

$$\downarrow H_2/pt$$

(structure: benzene ring with CH$_2$NH$_2$ substituent)

OR

Give a chemical test to distinguish between the following pairs of compounds.

(i) Methylamine and dimethylamine

(ii) Secondary and tertiary amines

(iii) Ethylamine and aniline

28. The density of chromium is 7.2 g cm^{-3}. If the unit cell is a cubic with length of 289 pm, (3)
Determine the type of unit cell.
(Atomic mass of Cr = 52 u and NA =6.022 × 10^{23} atom mol^{-1}).

29. (i) List the reactions of glucose which cannot be explained by its open chain structure. (3)

(ii) Write the products of oxidation of glucose with:

(a) Bromine water

(b) Nitric acid

30. (a) How is XeF$_6$ prepared from the XeF$_4$? Write the chemical equation for the reaction. (3)

(b) Deduce the structure of XeF$_6$ using VSEPR theory.

(c) How does XeF$_2$ reacts with PF$_5$?

SECTION D
Q.No 31 to 33 are long answer type carrying 5 marks each.

31. (I) Give appropriate reason for each of the following: (5)

(i) Metal fluorides are more ionic than metal chlorides.

(ii) Perchloric acid is stronger than sulphuric acid.

(iii) Addition of chlorine to KI solution gives it a brown colour but excess of Cl$_2$ makes it

colourless.

(II) Arrange the following in the order of the property indicated for each set:

(i) F_2, Cl_2, Br_2, I_2 (Increasing bond dissociation energy)

(ii) HF, HCl, HBr, HI (decreasing acid strength)

OR

A. (i) How does O_3 react with lead sulphide? Write chemical equation.

(ii) What happens when SO_2 is passed in acidified $KMnO_4$ solution?

(iii) SO_2 behaves with lime water similar to CO_2. Explain why?

B. An amorphous solid 'A' burns in air to form a gas 'B' which turns lime water milky. The gas is also produced as a by-product during roasting of sulphide ore. This gas decolorizes acidified aq. $KMnO_4$ solution. Identify the solid 'A' and the gas 'B' and write the reaction involved. Write it's any two uses.

32. (a) Write the chemical equation for the reaction involved in Cannizzaro reaction.   (5)

(b) Draw the structure of semi carbazone of ethanal

(c) Why pka of F-CH2COOH is lower than that of Cl–CH2COOH

(d) Write the product in the following reaction

$$CH_3CH = CHCH_2CN \xrightarrow[\text{(2) } H_2O]{\text{(1) DIBAL - H}}$$
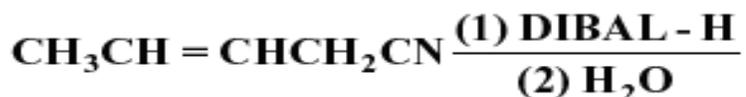
(e) How can you distinguish between propanal and propanone?

OR

(a) Write the products of the following reactions:

(i) ⬡=O + H_2N–OH $\xrightarrow{H^+}$

(ii) $2C_6H_5CHO + NaOH \longrightarrow$
         Conc.

(iii) $CH_3COOH \xrightarrow{Cl_2/P}$

(b) Give simple tests to distinguish between the following pairs of compounds.

(i) Benzaldehyde and Benzoic acid

(ii) Propanal and propanone

33. (i) Depict the galvanic cell in which the reaction $Zn\ (s) + 2Ag^+ \rightarrow Zn^{2+} + 2Ag\ (s)$ takes place. (5)

Further show:

(a) Which of the electrode is negatively charged?

(b) The carriers of the current in the cell.

(c) Individual reaction at each electrode.

(ii) The resistance of a conductivity cell containing 0.001M KCl solution at 298 K is 1500 Ω.

What is the cell constant if conductivity of 0.001M KCl solution at 298 K is

$0.146 \times 10^{-3}\ S\ cm^{-1}$?

(iii) Define molar conductivity.

OR

(a) Define Kohlrausch's law.

(b) Suggest a way to determine the Λ^o_m for CH_3COOH.

(c) The Λ^o_m for sodium acetate, HCl, NaCl are 91.0, 425.9 and 126.4 S cm^2 mol^{-1} respectively

at 298 K. Calculate Λ^o_m for CH_3COOH.