

## MODEL TEST PAPER-I (SOLVED)

(FOR SR. SCHOOL CERTIFICATE EXAMINATION-2012)

### Chemistry (Theory)

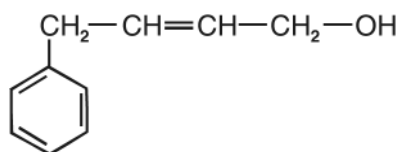
Time : 3 hours

Total Marks : 70

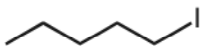
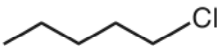
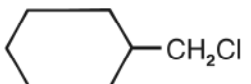
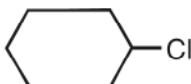
#### General Instruction

- (i) All questions are compulsory.
- (ii) Question number 1 to 8 are very short answer questions, carrying 1 mark each. Answer these in one word or about one sentence each.
- (iii) Question number 9 to 18 are short answer questions, carrying 2 marks each. Answer these in about 30 words each.
- (iv) Question number 19 to 27 are short answer questions, carrying 3 marks each. Answer these in about 40 words each.
- (v) Question number 28 to 30 are long answer questions, carrying 5 marks each. Answer these in about 70 words each.
- (vi) Use log table, if necessary.
- (vii) Use of calculator is not permitted.

1. Name the non-stoichiometric point defect responsible for colour in alkali metal halides. 1
2. Write the IUPAC name of coordination isomer of the compound  
 $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$  1
3. Write IUPAC name of the following compound



4. Chloroacetic acid has lower pKa value than acetic acid. 1
5. Write the structural formula of N, N-dimethylethanamine. 1
6. What happens when D-glucose is treated with the bromine water? 1
7. How does vulcanisation change the character of natural rubber? 1

8. Differentiate between antagonists and agonists. 1
9. Explain the following terms with suitable examples :-
- (i) Non-ionic detergents
- (ii) Tranquilizers 2
10. Write the names and structures of the monomers used for getting the following polymers.
- (i) PAN
- (ii) Nylon-6 2
11. Which one in the following pairs undergoes  $S_N2$  reaction faster and why?
- (i)  or 
- (ii)  or 
12. Give suitable reasons for the following :
- (i) Alkyl halides give cyanides with KCN but isocyanide with AgCN.
- (ii) The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride. 2
13. Compare the following complexes with respect to shape and magnetic behaviour
- (i)  $[\text{Ni}(\text{CN})_4]^{2-}$
- (ii)  $[\text{NiCl}_4]^{2-}$  2
14. Compare the chemistry of actinoids with that of lanthanoids with special reference to
- (a) oxidation state
- (b) chemical reactivity 2
15. Explain the following terms with a suitable example in each case
- (a) Shape selective catalysts 2
- (b) electroosmosis

Or

15. Write the difference between

- (a) Physisorption and Chemisorption
- (b) Catalyst and enzyme 2
16. What type of cell is the lead storage battery? Write the anode and the cathode reactions and the overall reaction occurring in a lead storage battery while operating or in use. 2
17. Account for the following – 2
- (a) The vapour pressure of a solution of glucose in water is lower than that of pure water.
- (b) Mixture of phenol and aniline shows (–)ve deviation from Raoult's law.
18. Write chemical equations for the preparation of sols : 2
- (a) Gold sol by reduction
- (b) hydrated ferric oxide sol by hydrolysis
19. An element has a bcc structure with a cell edge of 288 pm. The density of the metal is  $7.2 \text{ g cm}^{-3}$ . How many atoms and unit cells are there in 208g of the element. 3
20. At 300K, two solutions of glucose in water with concentration 0.01M and 0.001 M are separated by semipermeable membrane. On what solution pressure need to be applied to prevent osmosis? Also calculate magnitude of this applied pressure. [ $R = 0.821 \text{ L atm mol}^{-1} \text{ K}^{-1}$ ] 3
21. Calculate the standard cell potential of the galvanic cell in which the following reaction take place :
- $$2\text{Cr(s)} + 3\text{Cd}^{2+}(\text{aq}) \longrightarrow 2\text{Cr}^{3+}(\text{aq}) + 3\text{Cd(s)}$$
- Also calculate  $\Delta_r G^\circ$  value for the reaction.
- [Given  $E^\ominus_{\text{Cr}^{3+}/\text{Cr}} = -0.74 \text{ V}$ ;  $E^\ominus_{\text{Cd}^{2+}/\text{Cd}} = -0.4 \text{ V}$
- $F = 96500 \text{ C mol}^{-1}$ ]. 3
22. State briefly the principles which serve as basis for the following operations in metallurgy : 3
- (a) Zone refining
- (b) Vapour phase refining
- (c) Froth floatation process

Or

22. Describe the role of the following :
- Depressant in froth floatation process
  - Cryolite in the metallurgy of aluminium
  - Silica in the extraction of copper from copper pyrites ore. 3
23. Arrange the following in the order of property indicated for each set :
- $\text{NH}_3$ ,  $\text{PH}_3$ ,  $\text{AsH}_3$ ,  $\text{SbH}_3$ ,  $\text{BiH}_3$  (Decreasing basic strength)
  - $\text{F}_2$ ,  $\text{Cl}_2$ ,  $\text{Br}_2$ ,  $\text{I}_2$  (Increasing bond dissociation enthalpy)
  - $\text{H}_2\text{O}$ ,  $\text{H}_2\text{S}$ ,  $\text{H}_2\text{Se}$ ,  $\text{H}_2\text{Te}$  (Increasing bond angle) 3
24. Assign reason for the following :
- The enthalpies of atomisation of transition elements are high.
  - The metallic radii of the third (5d) series of transition elements are virtually the same as those of the corresponding members of the second series.
  - With the same d-orbital configuration  $[d^4]$   $\text{Cr}^{2+}$  ion is a reducing agent but  $\text{Mn}^{3+}$  ion is an oxidising agent. 3
25. How will you convert :
- Phenol to ethoxybenzene
  - butan-2-one to but-2-ene
  - 1-propoxypropane to propyl alcohol 3
26. (a) Explain with suitable reasons :
- Gabriel phthalimide synthesis is not used for the synthesis of aniline.
  - Although amino group is *o*, *p*-directing in aromatic electrophilic substitution reactions, aniline on nitration gives a substantial amount of *m*-nitroaniline.
- (b) Identify the A and B in the following reactions :
- $$\text{C}_6\text{H}_5\text{N}_2\text{Cl}^- \xrightarrow[\text{KCN}]{\text{Cu CN}} \text{A} \xrightarrow[\text{Partial hydrolysis}]{\text{H}_2\text{O}/\text{H}^+} \text{B}$$
27. (a) How are vitamins classified? Mention the deficiency diseases caused by lack of vitamin A and K.
- (b) Write the zwitter ionic form of amino acids. 3

28. (a) List two main differences between order and molecularity of a reaction.
- (b) A certain reaction is 50% complete in 20 minutes at 300K and the same reaction is again 50% complete in 5 minutes at 350K. Calculate the activation energy if it is a first order reaction

$$(R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}; \log 4 = 0.6020] \quad 5$$

Or

28. (a) Justify the statement that for a first order reaction half-life period ( $t_{1/2}$ ) is independent of the initial concentration of the reactant.
- (b) For a chemical reaction at 800°C,  $2\text{NO} + 2\text{H}_2 \longrightarrow \text{N}_2 + 2\text{H}_2\text{O}$  the following data were obtained.

$[\text{NO}] \times 10^{-4} \text{ mol L}^{-1}$	$[\text{H}_2] \times 10^{-3} \text{ mol L}^{-1}$	Initial rate ( $\text{mol L}^{-1} \text{ s}^{-1}$ )
1.5	4.0	$4.4 \times 10^{-4}$
1.5	2.0	$2.2 \times 10^{-4}$
0.5	2.0	$0.24 \times 10^{-4}$

What is the order of reaction w.r.t. NO and  $\text{H}_2$ ? Also calculate the rate constant at 800°C. 5

29. (a) Assign reasons for the following :
- (i)  $\text{H}_3\text{PO}_2$  and  $\text{H}_3\text{PO}_3$  act as good reducing agents while  $\text{H}_3\text{PO}_4$  does not.
- (ii) ICl is more reactive than  $\text{I}_2$ .
- (iii)  $\text{H}_2\text{S}$  is less acidic than  $\text{H}_2\text{Te}$ .

- (b) Draw the structure of

- (i)  $\text{XeOF}_4$
- (ii)  $\text{H}_2\text{S}_2\text{O}_7$

5

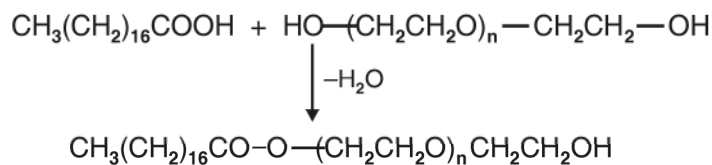
Or

29. (a) Complete the following chemical equations
- (i)  $\text{P}_4(\text{s}) + \text{NaOH}(\text{aq}) + \text{H}_2\text{O}(\text{l}) \longrightarrow$
- (ii)  $\Gamma(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{O}_3(\text{g}) \longrightarrow$
- (b) Assign a reason for each of following :
- (i) Bi(V) is a stronger oxidising agent than Sb(V).
- (ii) Fluorine does not exhibit any positive oxidation state.
- (iii) In solution of  $\text{H}_2\text{SO}_4$  in water, the second dissociation constant  $K_{a2}$  is less than the first dissociation constant  $K_{a1}$ .

30. (a) Describe the following reactions
- (i) Cannizzaro reaction
  - (ii) Cross Aldol condensation
- (b) Give chemical tests to distinguish between :
- (i) Phenol and benzoic acid
  - (ii) Acetophenone and benzophenone
- (c) Arrange the following in increasing order of acid strengths :
- $(\text{CH}_3)_2\text{CHCOOH}$ ,  $\text{CH}_2\text{CH}_2\text{CH}(\text{Br})\text{COOH}$ ,  $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{COOH}$     5
- Or
30. An organic compound (A)  $\text{C}_5\text{H}_{10}\text{O}$  gives positive 2, 4-DNP Test. It does not reduce Tollens' reagent but forms an addition compound with sodium hydrogen sulphite. On reaction with iodine in presence of sodium hydroxide, yellow precipitate B and another compound C is formed. On oxidation with  $\text{KMnO}_4$  it forms two acids D and E. Identify A, B, C, D and E.

## MARKING SCHEME

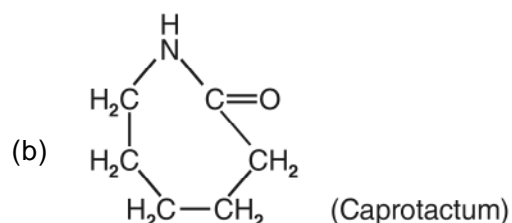
Q. No.	Value Points	Marks
1.	F–Center or Metal excess defect	1
2.	$[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$ Hexaamminechromium (III) hexacyanocobaltate (III)	1
3.	$\begin{array}{c} \text{CH}_2 - \text{CH} = \text{CH} - \text{CH}_2 - \text{OH} \\ \text{4} \quad \text{3} \quad \text{2} \quad \text{1} \\   \\ \text{C}_6\text{H}_5 \end{array}$ 4-Phenylbut-2-en-1-ol	1
4.	Chloroacetic acid is stronger acid than acetic acid due to –I effect of chlorine atom. Therefore, it has lower $\text{pK}_a$ value.	1
5.	$\begin{array}{c} \text{CH}_3 - \text{CH}_2 - \text{N} - \text{CH}_3 \\   \\ \text{CH}_3 \end{array}$	1
6.	$\begin{array}{ccc} \text{CHO} & & \text{COOH} \\   & &   \\ (\text{CHOH})_4 & \xrightarrow{\text{Br}_2 \text{ water}} & (\text{CHOH})_4 \\   & &   \\ \text{CH}_2\text{OH} & & \text{CH}_2\text{OH} \\ & & \text{Gluconic acid} \end{array}$	1
7.	In vulcanisation, sulphur forms cross links at the reactive sites of double bonds and thus the rubber gets stiffened.	1
8.	Drugs that bind to the receptor site and inhibit its natural function, are called antagonists. Drugs that mimic the natural messenger by switching on receptor, are called agonists.	1
9.	(a) Non-ionic detergents do not contain any ion in their constitution. One such detergent is formed when stearic acid reacts with polyethylene glycol.	1



1

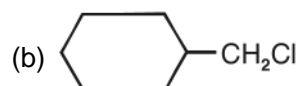
(b) Tranquilizers are a class of chemical compounds used for the treatment of stress, and mild or even severe mental diseases, e.g., chlordiazepoxide and meprobamate. 1

10. (a)  $\text{CH}_2 = \text{CH} - \text{CN}$   
(Acrylonitrile)



11. (a) 

As iodine is a better leaving group because of its large size, It will be released at a faster rate in the presence of incoming nucleophile. 1

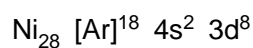


It is primary halide and therefore undergoes  $\text{S}_{\text{N}}2$  reaction faster. 1

12. (a) KCN is ionic compound and produces  $\text{CN}^-$ , so it combines with RX and gives cyanides as major product because of higher bond enthalpy of C-C bond than that of C - N bond, while with AgCN it gives isocyanide due to covalent nature of Ag-C bond by attacking through N atom. 1
- (b) In chlorobenzene carbon is  $\text{sp}^2$  hybridised while in cyclohexane it is  $\text{sp}^3$  hybridised. Due to the more electronegativity difference in cyclohexyl chloride, its dipole moment is higher than that of chlorobenzene. 1



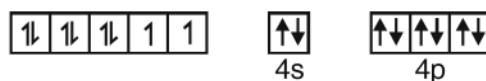
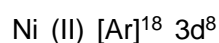
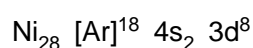
13. (a)  $[\text{Ni}(\text{CN})_4]^{2-}$



$dsp^2$  hybridization  
(Square Planar)  
(Diamagnetic)

1

(b)  $[\text{NiCl}_4]^{2-}$



$sp^3$  hybridization  
tetrahedral  
(paramagnetic)

1

14. (a) All the lanthanoids exhibit a common stable oxidation state of +3. In addition some lanthanoids also show oxidation states of +2 and +4 where  $L_n^{2+}$  and  $L_n^{4+}$  have more stable  $4f^0$ ,  $4f^7$  or  $4f^{14}$  configuration. Members of the actinoids family exhibit more variable oxidation states as compared to the elements belonging to lanthanoids. 1

(b) Actinoids are more reactive than lanthanoids due to bigger size. 1

15. (a) Zeolites are known as shape selective catalysts, because their activity depends on pore size and shape and size of reactant and product molecules. 1

(b) Electroosmosis : When the movement of colloidal particles is prevented by some suitable means, it is observed that the dispersion medium begins to move in an electric field. This phenomenon is called electroosmosis. 1

Or

15. (a) Physisorption have weak van der Waal attraction forces while in chemisorption there are stronger chemical bonds [40 kJ to 200 kJ/mol.] 1

- (b) Almost all the enzymes are globular proteins and used as biochemical catalyst while catalysts are chemical substance used for increasing the rate of chemical reactions. 1
16. (a) Lead storage battery is a secondary battery.  $\frac{1}{2}$   
 Anode :  $\text{Pb(s)} + \text{SO}_4^{2-}(\text{aq}) \longrightarrow \text{PbSO}_4(\text{s}) + 2\text{e}^-$   $\frac{1}{2}$   
 Cathode :  $\text{PbO}_2(\text{s}) + \text{SO}_4^{2-}(\text{aq}) + 4\text{H}^+(\text{aq}) + 2\text{e}^- \longrightarrow \text{PbSO}_4(\text{l}) + 2\text{H}_2\text{O(l)}$   $\frac{1}{2}$   
 Overall reaction :  
 $\text{Pb(s)} + \text{PbO}_2(\text{s}) + 4\text{H}^+(\text{aq}) + 2\text{SO}_4^{2-}(\text{aq}) \longrightarrow 2\text{PbSO}_4(\text{s}) + 2\text{H}_2\text{O(l)}$   $\frac{1}{2}$
17. (a) Vapour pressure of pure water gets decreased by addition of nonvolatile glucose, which covers some surface area and lesser surface area is available for vapourisation of water molecules. 1
- (b) In this case the intermolecular hydrogen bonding between phenolic proton and lone pair on nitrogen atom of aniline is stronger than the respective intermolecular hydrogen bonding between similar molecules. 1
18. (a)  $2\text{AuCl}_3 + 3\text{SnCl}_2 \longrightarrow 3\text{SnCl}_4 + 2\text{Au}$  (Gold sol). 1
- (b)  $\text{FeCl}_3 + 3\text{H}_2\text{O} \longrightarrow \text{Fe}_2\text{O}_3 \cdot \text{XH}_2\text{O} + 3\text{HCl}$  sol 1
19. Volume of the unit cell =  $(288 \times 10^{-10} \text{ cm})^3$   
 =  $2.39 \times 10^{-23} \text{ cm}^3$
- Volume of 208 g of the element =  $\frac{\text{Mass}}{\text{Density}} = \frac{208\text{g}}{7.2\text{g cm}^{-3}}$  1  
 =  $28.88 \text{ cm}^3$
- No. of unit cells =  $\frac{28.88 \text{ cm}^3}{2.39 \times 10^{-23} \text{ cm}^3/\text{unit cell}}$  1  
 =  $12.08 \times 10^{23} \text{ unit cells}$
- Since the unit cell is bcc therefore, number of atoms per unit cell is 2
- Total number of atoms in 208 of element =  $2 \times 12.08 \times 10^{23}$  1  
 =  $24.16 \times 10^{23}$

20. (a) For 0.01 M solution

$$\pi_1 = C_1 RT$$

$$\pi_1 = 0.01 \times 0.0821 \times 300 = 0.2463 \text{ atm. } 1$$

For 0.001 M solution.

$$\pi_2 = 0.001 \times 0.0821 \times 300$$

$$= 0.02463 \text{ atm. } .$$

- (b) The solvent particles pass from dilute to concentrate solution, i.e., from 0.001M to 0.01 M solution. Therefore, pressure should be applied on 0.01m solution to prevent osmosis.  $\frac{1}{2}$

- (c) The magnitude of pressure applied = 0.2463 atm  
1

21. Cr | Cr<sup>3+</sup> || Cd<sup>2+</sup> | Cd

$$E_{\text{cell}}^{\theta} = E_{\text{R}}^{\theta} - E_{\text{L}}^{\theta}$$

$$= -V0.4V - (-V0.74V) = 0.34 \text{ V} \quad 1$$

$$\therefore \Delta G^{\circ} = -nF E_{\text{cell}}^{\theta}$$

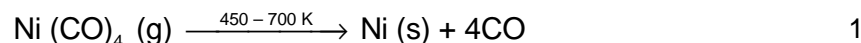
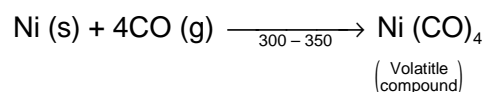
$$\Delta G^{\circ} = -6 \times 96500 \text{ C mol}^{-1} \times 0.34 \text{ V} = -6 \times 96500 \times 0.34 \text{ CV mol}^{-1} \quad 1$$

$$\Delta G^{\circ} = -196860 \text{ J mol}^{-1}$$

$$\Delta G^{\circ} = -196.86 \text{ kJ mol}^{-1} \quad 1$$

22. (a) **Zone Refining** : Impure metal rod is heated with circular heater from one end. The metal melts and on cooling the pure metal gets solidified while impurities go into the molten zone. 1

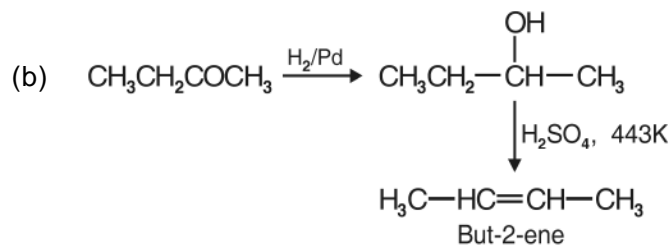
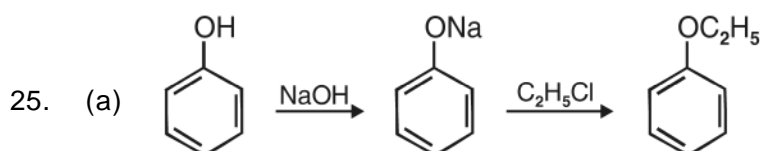
- (b) **Vapour Phase Refining** : The metal is converted to a volatile compound which on further heating breaks down to give pure metal.

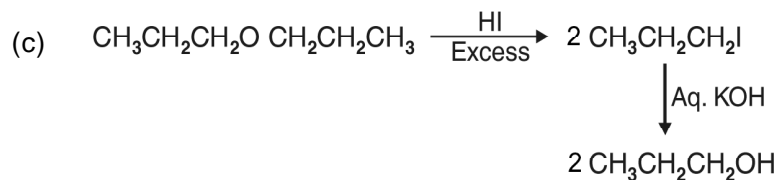


- (c) **Froth Floatation Process** : In this process sulphide ore particles are wetted with oil and rise to the surface along with the froth and are separated. The earthy matter wetted by water settles down at the bottom. 1

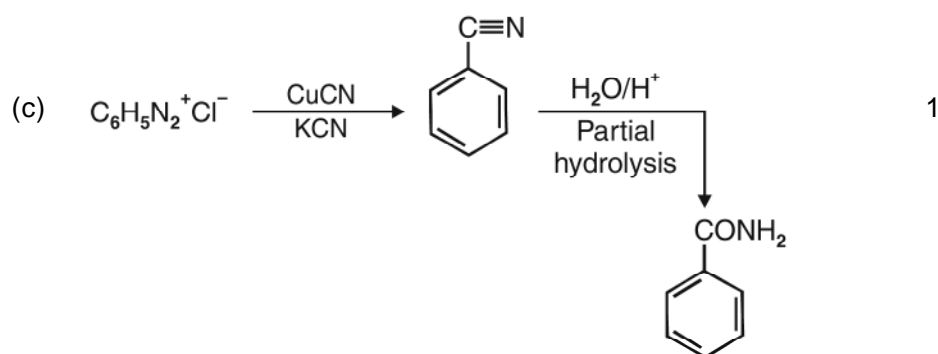
Or

22. (a) Depressant prevents the formation of froth of one ore in a mixture of two sulphide ores. 1
- (b) Cryolite is added to lower the melting point of the mix and brings conductivity. 1
- (c) Silica is used for removal of FeO as slag,  $\text{FeSiO}_3$  in the metallurgy of copper. 1
23. Arrangement of the following compound in the order of property indicated for each set.
- (a)  $\text{NH}_3 > \text{PH}_3 > \text{AsH}_3 > \text{SbH}_3 > \text{BiH}_3$  [Decreasing basic strength] 1
- (b)  $\text{I}_2 < \text{F}_2 < \text{Br}_2 < \text{Cl}_2$  [Increasing bond dissociation enthalpy] 1
- (c)  $\text{H}_2\text{Te} < \text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{O}$  [Increasing bond angle] 1
24. (a) Strong M–M interactions due to participation both ns and (n – 1) d electrons, the enthalpies of atomisation of transition elements are high. 1
- (b) Due to lanthanoid contraction the sizes of 5d series do not increase and remain almost the same as corresponding members of 4d series. 1
- (c)  $\text{Cr}^{2+}$  is reducing agent because  $E^\ominus_{\text{Cr}^{3+}/\text{Cr}^{2+}}$  is negative. This is because of stable configuration of  $\text{Cr}^{3+}$  ion. On the other hand  $E^\ominus_{\text{Mn}^{3+}/\text{Mn}^{2+}}$  is positive due to extra stability of  $\text{Mn}^{2+}$  which has [Ar]  $3d^5$  configuration. 1

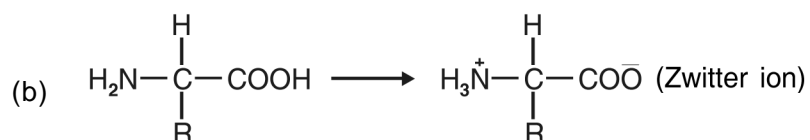




26. (a) Ar-X does not exhibit nucleophilic substitution reaction readily due to partial double bond character of C - X bond, therefore ArNH<sub>2</sub> cannot be prepared by Gabriel phthalimide process. 1
- (b) Amino group is *o*, *p*-directing towards electrophilic substitution reaction but due to the formation of anilinium ion -N<sup>+</sup>H<sub>3</sub> it gives *m*-product also. 1



27. (a) Vitamins are broadly classified as water soluble and fat soluble vitamins,  
Water soluble : B, C  
Fat soluble : A, D, E and K 1  
Deficiency disease of vitamin A is night blindness  
Deficiency disease of Vitamin K is increases blood clotting time.  
 $\frac{1}{2} \times 2$



28. (a)

<i>Order of Reaction</i>	<i>Molecularity of Reaction</i>
Order of reaction corresponds to sum of the exponents to which the concentration terms is raised in rate law expression.	Molecularity corresponds to no. of reacting species in elementary reaction.
It may be zero.	It can never be zero.
It may be fractional.	It can never be fractional
It is experimentally determined.	It is a theoretical term. $\frac{1}{2} \times 4$

$$(b) \quad k = \frac{0693}{t_{\frac{1}{2}}} \Rightarrow k_1 = \frac{0693}{20 \text{ min}} = 0.03465 \text{ min}^{-1} \quad \frac{1}{2}$$

$$k_2 = \frac{0693}{5 \text{ min}} = 0.1386 \text{ min}^{-1}$$

$$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left( \frac{1}{T_1} - \frac{1}{T_2} \right)$$

$$\log \left[ \frac{0.1386}{0.03465} \right] = \frac{E_a}{2.303 \times 8.314 \text{ JK}^{-1} \text{ mol}^{-1}} \times \left( \frac{1}{300\text{K}} - \frac{1}{350\text{K}} \right)$$

$$E_a = 24205.8 \text{ J mol}^{-1} = 24.2 \text{ kJ mol}^{-1} \quad \frac{1}{2}$$

Or

28. (a) As per first order integrated rate law

$$t = \frac{2.303}{k} \log \frac{[A]_0}{[A]}$$

half-life period  $t = t_{1/2}$

$$\text{when } [A] = \frac{[A]_0}{2}$$

$$\Rightarrow t_{1/2} = \frac{2.303}{k} \log \frac{[A]_0}{[A]_0/2} \times 2$$

$$\Rightarrow t_{1/2} = \frac{2.693}{k}$$

It means half life period ( $t_{1/2}$ ) is independent of the initial concentration. 2

(b) According to data using in a hypothetical equation :

$$\text{Rate} = k[\text{NO}]^x [\text{H}_2]^y$$

$$\text{Rate}_1 = 4.4 \times 10^{-4} = k [1.5]^x [4.0]^y$$

$$\text{Rate}_2 = 2.2 \times 10^{-4} = k [1.5]^x [2.0]^y$$

$$\text{Rate}_3 = 0.24 \times 10^{-4} = k [0.5]^x [2.0]^y$$

Compare  $\text{Rate}_1$  with  $\text{Rate}_2$

$$\frac{\text{Rate}_1}{\text{Rate}_2} = \frac{4.4 \times 10^{-4}}{2.2 \times 10^{-4}} = \frac{k [1.5]^x [4.0]^y}{k [1.5]^x [2.0]^y}$$

$$2 = (2)^y$$

$$y = 1$$

Similarly by comparing  $\text{Rate}_2$  and  $\text{Rate}_3$

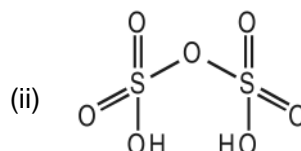
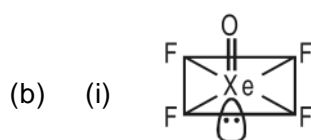
$$3^x = 3^2 \Rightarrow x = 2$$

$$\text{Rate} = k [\text{NO}]^2 [\text{H}_2]^1$$

$$0.24 \times 10^{-4} = k [0.5]^2 \times [2.0]^1$$

$$k = 4.88 \times 10^{-8} \text{ mol}^{-2} \text{ litre}^2 \text{ min}^{-1} \quad 1$$

29. (a) (i)  $\text{H}_3\text{PO}_4$  exhibit +5 oxidation state which is highest oxidation state for phosphorus, so it does not act as a good reducing agent and also no H is directly attached to P atom. 1
- (ii) I-Cl bond is weaker than I - I bond because the extent of overlapping is less. 1
- (iii) In  $\text{H}_2\text{Te}$ , H-Te bond is weaker than H-S bond in  $\text{H}_2\text{S}$ . So it is more acidic than  $\text{H}_2\text{S}$ . 1



29. (a) (i)  $P_4 + 3NaOH + 3H_2O \longrightarrow PH_3 + 3NaH_2PO_2$  1
- (ii)  $2I^- (aq) + H_2O(l) + O_3(g) \longrightarrow 2OH^- + I_2(s) + O_2(g)$  1
- (b) (i) Bi(V) is stronger oxidising agent due to greater magnitude of inert pair effect as compared to Sb(V) because of more diffused 4f orbitals present in bismuth. 1
- (ii) Fluorine always exhibits -1 oxidation state due to its highest electronegativity (4.0) in the periodic table. 1
- (iii) First ionisation of  $H_2SO_4$  to  $H_3O^+$  and  $HSO_4^-$  occurs almost completely. The ionisation of  $HSO_4^-$  to  $H_3O^+$  and  $SO_4^{2-}$  is very difficult because  $HSO_4^-$  is an ionic species. That is why  $K_{a2} \ll K_{a1}$ . 1
30. (a) (i) Cannizzaro reaction  
 $HCHO + HCHO + \text{conc. KOH} \rightarrow CH_3OH + HCOOK$  1
- (ii) Cross Aldol Condensation  

$$CH_3CHO + CH_3CH_2CHO \xrightarrow[\text{(ii) } \Delta]{\text{(i) dil. NaOH}}$$

$$CH_3CH = CH - CHO$$

$$+ CH_3CH_2CH = \underset{\text{CH}_3}{\text{C}} - CHO$$

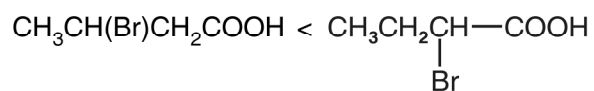
$$+ CH_3 - CH = \underset{\text{CH}_3}{\text{C}} - CHO$$

$$+ CH_3 - CH_2 - CH = \underset{\text{CHO}}{\text{CH}}$$
 1

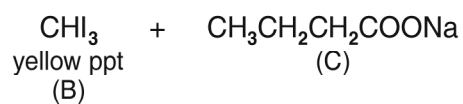
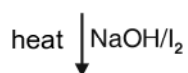
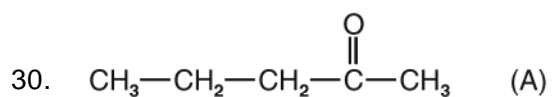
(b)	<b>Phenol</b>	<b>Benzoic acid</b>	
(i)	It does not react with $NaHCO_3$ solution	It gives brisk effervescence of $CO_2$ gas.	1
(ii)	<b>Acetophenone</b> Add NaOH and $I_2$ $\xrightarrow{\text{heat}}$ yellow coloured ppt. of $CHI_3$ is formed.	<b>Benzophenone</b> Add NaOH and $I_2 \xrightarrow{\text{heat}}$ No ppt. is formed	1



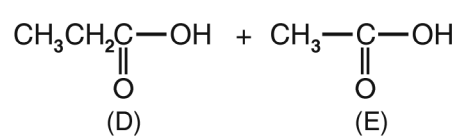
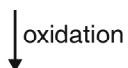
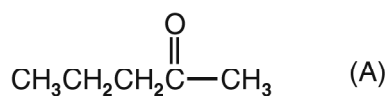
(c) Increasing order of acid strengths.  $(\text{CH}_3)_2\text{CHCOOH} <$



Or



1



2