2019 III 06 **1000** **Seat No.** | | | | | |

Time : 2½ Hours **CHEMISTRY**

Subject Code

H	7	0	3

Total No. of Questions : 27 (Printed Pages : 8) **Maximum Marks : 55**

***INSTRUCTIONS* :** (*i*) *All* questions are compulsory, however question numbers **19**, **21**, **26** and **27** have internal choice.

(*ii*) Section-A consists of **9** questions of **1** mark each.

Section-B consists of **10** questions of **2** marks each.

Section-C consists of **6** questions of **3** marks each.

Section-D consists of **2** questions of **4** marks each.

(*iii*) Every question should be attempted only once.

(*iv*) Use of calculator is not permitted, however logarithmic table will be provided on request.

Section-A

1. The stoichiometric defect that decreases the density of an ionic solid is 1

   - Frenkel defect
   - Interstitial defect
   - Metal excess defect
   - Schottky defect

2. For the reaction, $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$, the reaction rate = $K[H_2]\ [Br_2]^{½}$; the statement that is true about this reaction is 1

   - the reaction is of second order
   - the order of the reaction is 3/2
   - the unit of K is s^{-1}
   - the molecularity of the reaction is 3/2

3. In the froth floatation process NaCN is used as a 1

- stabiliser
- collector
- depressant
- leaching agent

4. The pair of ions which will have the same spin only magnetic moment is 1

- Fe^{+3} and Ni^{+2}
- Mn^{+2} and Co^{+2}
- Mn^{+2} and Fe^{+3}
- Ni^{+2} and Mn^{+2}

5. The co-ordination number and oxidation state of the central metal atom in the complex $[Cr(NH_3)_5(NO_2)]SO_4$ are ..... respectively. 1

- 4 and 3
- 6 and 3
- 6 and 2
- 6 and 4

6. Draw a neat labelled diagram of the Hydrogen-Oxygen fuel cell. 1

7. Why does the rate of decomposition of N_2O_5 increase when the temperature changes from 0°C to 50°C ? 1

8. Draw a neat labelled diagram of the electrodialysis process used for the purification of a colloidal solution. 1

9. Write only the structure of the major product formed when ethanal reacts with each of the following reagents : 1

   (*a*) HCN

   (*b*) Zn-Hg/conc. HCl.

Section-B

10. Classify the following solids as metallic, molecular, ionic or covalent solids : 2

    (*a*) Sodium Chloride

    (*b*) Silica.

    Draw a neat labelled diagram of a tetrahedral void observed in a crystal lattice.

11. Differentiate between positive deviation and negative deviation from Raoult's law, exhibited by binary solutions. (any *two* points) 2

12. A solution, prepared by dissolving 10 g of a non-volatile solute in 200 g of water, has a vapour pressure of 31.84 mm of Hg at 308 K. The vapour pressure of pure water at 308 K is 32 mm of Hg. Calculate the molar mass of the solute. 2

13. Write only the mathematical expression used to calculate the activation energy of a chemical reaction at two different temperatures.

    Starting from the integrated rate law equation for a first order reaction, derive the expression for its half life. 2

14. Give *one* point of distinction between the following : 2

    (*a*) Homogeneous catalysis and heterogeneous catalysis

    (*b*) Physisorption and chemisorption.

15. Draw a neat labelled diagram of the zone refining method used for purification of elements.

    Name the electrolytic process used in the extraction of Aluminium from purified Al_2O_3. 2

16. Write any *two* anomalous properties of Fluorine.

    State the geometry of : 2

    (*a*) XeF_4 and

    (*b*) XeF_6.

17. Draw the structures of the optical isomers of $[CrCl_2(ox)_2]^{3-}$.

Write the formula of Ammine bromido chlorido nitrito-N-platinate (II) ion. 2

18. When Rohan visited his grandmother in the village, he requested her to use teflon coated utensils for cooking purpose.

(*a*) What is the advantage of using teflon coated cookware ?

(*b*) Write the name and structure of the monomer of teflon. 2

19. Name the following : 2

(*a*) An analgesic that also prevents platelet coagulation.

(*b*) The class of detergents with germicidal property.

(*c*) The artificial sweetener with the highest sweetness value.

(*d*) An antibiotic with bactericidal effect.

Or

Name the following :

(*a*) A compound added to soaps to impart antiseptic properties.

(*b*) The class of drugs used in the treatment of mental disorders.

(*c*) The process by which esters of fatty acids are converted to soap.

(*d*) A broad spectrum antibiotic.

Section-C

20. State Faraday's First Law of Electrolysis.

Calculate the standard Gibb's free energy of an electrochemical cell in which the following reaction occurs at 25°C : 3

$$2Al(s) + 3Fe^{+2}(aq) \rightarrow 2Al^{+3}(aq) + 3Fe(s)$$

Given :

$E^0_{Al^{+3}/Al} = -1.66$ V

$E^0_{Fe^{+2}/Fe} = -0.44$ V

F = 96500 C.

21. Draw the structure of dichromate ion.

Given below are the transition metal ions of 3d series : 3

$$Zn^{+2},\ Cu^{+2},\ Cr^{+3},\ Sc^{+2}$$

(*a*) Select the ion which is colourless, giving the reason.

(*b*) Select the ion which is most paramagnetic, giving the reason.

Or

Draw the structure of chromate ion.

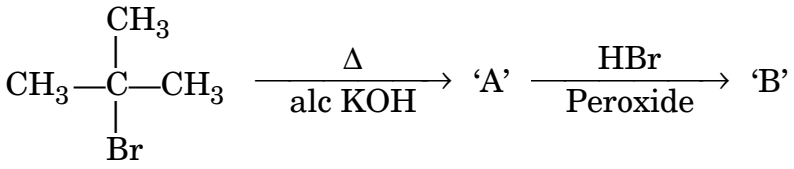
Given below are the transition metals of 4d and 5d series :

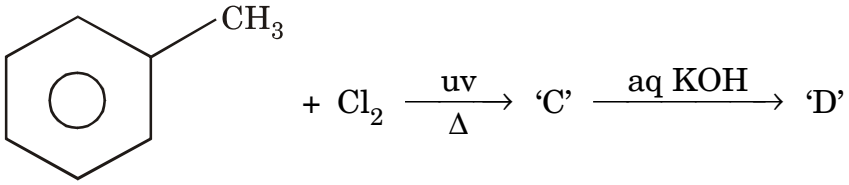
Zr, Mo, Hf, Cd

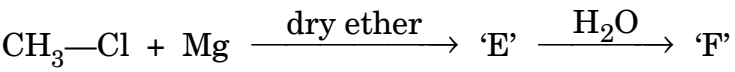
(*a*) Select the softest metal, giving the reason.

(*b*) Select the pair of metals which occur together as minerals, giving the reason.

22. Write the structures of the compounds 'A', 'B', 'C', 'D', 'E' and 'F' in the following chemical equations : 3

(*a*) 

(*b*) 

(*c*) 

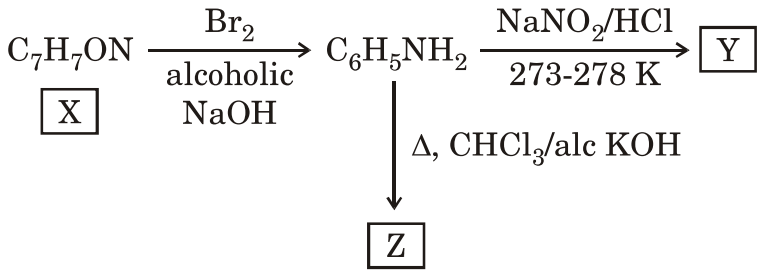
23. Write chemical equations to show what happens when : 3

(*a*) Phenol reacts with Bromine water.

(*b*) Ethanol reacts with conc. sulphuric acid at 413 K.

(*c*) Methanal is treated with ethyl magnesium bromide followed by hydrolysis.

24. An aromatic compound 'X' having molecular formula C_7H_7ON undergoes a series of reactions as shown below. Write the formulae and names of compounds 'X', 'Y' and 'Z'. 3



25. Give scientific reasons for the following : 3

(*a*) Tryptophan is classified as an essential amino acid.

(*b*) DNA is the chemical basis of heredity.

(*c*) Product of hydrolysis of sucrose is known as invert sugar.

Section-D

26. Answer the following : 4

(*a*) Why does the stability of +5 oxidation state of group 15 elements decrease down the group ?

(*b*) Write the hydrides of group 15 elements in the decreasing order of their basicity.

(*c*) Write a balanced chemical equation to show the hydrolysis of calcium phosphide.

(*d*) Name the oxoacid of phosphorus which shows reducing property.

Or

Answer the following :

(*a*) Why does H_2O exist as a liquid while H_2S is a gas ?

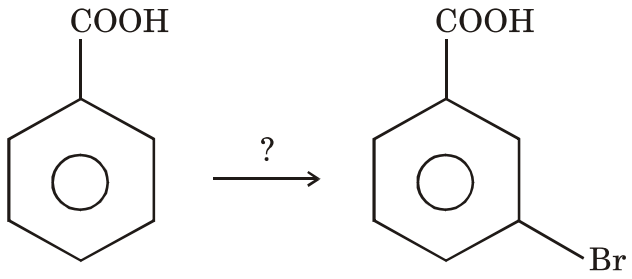
(*b*) Write the hydrides of group 16 elements in the decreasing order of their thermal stability.

(*c*) Write chemical equation to show how sulphuric acid is converted to oleum.

(*d*) Name the allotropic form of oxygen.

27. Do as directed : 4

(*a*) Write the reagent used to bring about the following conversion :

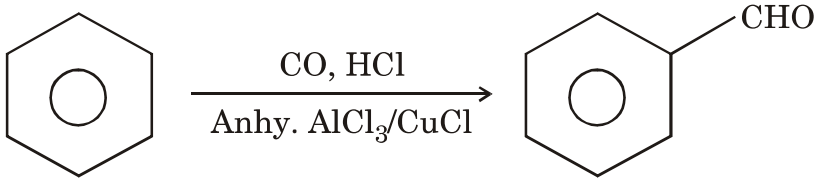


(*b*) Write labelled chemical equation to show, what happens when Benzoyl chloride is hydrogenated in the presence of palladium and barium sulphate.

(*c*) Arrange the following compounds in the increasing order of their acidic strength :

CCl_3COOH, $NC—CH_2COOH$, CF_3COOH, NO_2CH_2COOH.

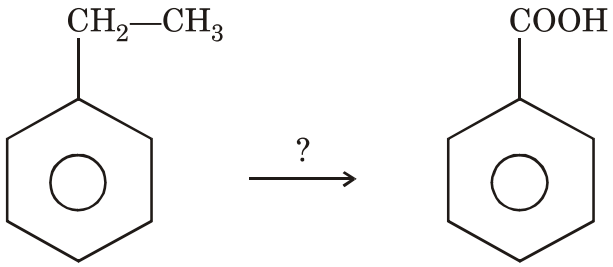
(*d*) State the name of the reaction in the following conversion :



Or

Do as directed :

(*a*) Write the reagent used to bring about the following conversion :



(*b*) Write labelled chemical equation to show, what happens when Benzene is treated with acetylchloride in the presence of anhydrous $AlCl_3$.

(*c*) Arrange the following compounds in the increasing order of their reactivity towards nucleophilic addition reaction :

$HCHO,\ C_6H_5CHO,\ CH_3CHO,\ CH_3CH_2CHO.$

(*d*) State the name of the reaction in the following conversion :

$$2CH_3CHO \xrightarrow[(ii)\ \Delta]{(i)\ \text{dil NaOH}} CH_3—CH = CH—CHO$$