Reg.

Name

Code No. 5016

Time : 2 Hours
Cool-off time : 15 Minutes

Second Year – March 2017

Part – III

CHEMISTRY

Maximum : 60 Scores

General Instructions to Candidates :

- There is a 'cool-off time' of 15 minutes in addition to the writing time of 2 hrs.
- You are not allowed to write your answers nor to discuss anything with others during the 'cool-off time'.
- Use the 'cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- All questions are compulsory and only internal choice is allowed.
- When you select a question, all the sub-questions must be answered from the same question itself.
- Calculations, figures and graphs should be shown in the answer sheet itself.
- Malayalam version of the questions is also provided.
- Give equations wherever necessary.
- Electronic devices except non-programmable calculators are not allowed in the Examination Hall.

നിർദ്ദേശങ്ങൾ :

- നിർദ്ദിഷ്ട സമയത്തിന് പുറമെ 15 മിനിറ്റ് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും. ഈ സമയത്ത് ചോദ്യങ്ങൾക്ക് ഉത്തരം എഴുതാനോ, മറ്റുള്ളവരുമായി ആശയവിനിമയം നടത്താനോ പാടില്ല.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം എഴുതണം.
- ഒരു ചോദ്യനമ്പർ ഉത്തരമെഴുതാൻ തെരഞ്ഞെടുത്തു കഴിഞ്ഞാൽ ഉപചോദ്യങ്ങളും അതേ ചോദ്യനമ്പരിൽ നിന്ന് തന്നെ തെരഞ്ഞെടുക്കേണ്ടതാണ്.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നൽകിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

1. (a) Identify the non-stoichiometric defect

(i) Schottky defect (ii) Frenkel defect

(iii) Interstitial defect (iv) Metal deficiency defect **(Score : 1)**

(b) What type of substance could make better permanent magnets – ferromagnetic or ferrimagnetic ? Justify your answer. **(Scores : 2)**

(c) In terms of Band theory write the differences between conductor and insulator. **(Score : 1)**

2. (a) Henry's law is related to solubility of a gas in liquid.

(i) State Henry's law.

(ii) Write any two applications of Henry's law. **(Scores : 2)**

(b) 1000 cm^3 of an aqueous solution of a protein contains 1.26 gm of the protein. The osmotic pressure of such a solution at 300 K is found to be 2.57×10^{-3} bar. Calculate molar mass of the protein. ($R = 0.083$ L bar mol^{-1} K^{-1}) **(Scores : 2)**

3. (a) Represent the galvanic cell based on the cell reaction given below : **(Score : 1)**

$Cu_{(s)} + 2\ Ag^{+}_{(aq)} \rightarrow Cu^{2+}_{(aq)} + 2Ag_{(s)}$

(b) Write the half cell reactions of the above cell. **(Score : 1)**

(c) $\wedge^{\circ}_{m}$ for NaCl, HCl and NaAc are 126.4, 425.9 and 91.0 S cm^2 mol^{-1} respectively. Calculate $\wedge^{\circ}_{m}$ for HAc. **(Scores : 2)**

4. (a) Plot a graph showing variation in the concentration of reactants against time for a zero order reaction. **(Score : 1)**

(b) What do you mean by zero order reaction ? **(Score : 1)**

(c) The initial concentration of the first order reaction, $N_2O_{5(g)} \rightarrow 2NO_{2(g)} + \frac{1}{2}O_{2(g)}$, was 1.24×10^{-2} mol L^{-1} at 300 K. The concentration of N_2O_5 after '1' hour was 0.20×10^{-2} mol L^{-1}. Calculate the rate constant of the reaction at 300 K. **(Scores : 2)**

5. There are mainly two types of adsorption. They are physisorption and chemisorption.

(a) Differentiate between physisorption and chemisorption. **(Scores : 2)**

(b) Write any two applications of adsorption. **(Score : 1)**

6. Leaching is a process of concentration of ores. Explain the leaching of alumina from bauxite. **(Scores : 3)**

7. Nitrogen forms a number of oxides and oxoacids.

(a) Which of the following is a neutral oxide of Nitrogen ?

(i) N_2O

(ii) N_2O_5

(iii) NO_2

(iv) N_2O_4 **(Score : 1)**

(b) Prepare a short write-up on Nitric acid highlighting its laboratory preparation, chemical properties and uses. **(Scores : 4)**

OR

Phosphorous forms a number of compounds.

(a) The gas liberated when calcium phosphide is treated with dil. HCl is

(i) Cl_2

(ii) H_2

(iii) PH_3

(iv) All the above **(Score : 1)**

(b) Prepare a short write up on PCl_3 and PCl_5 highlighting the preparation and chemical properties of PCl_3 and structure of PCl_5. **(Scores : 4)**

8. (a) Transition elements are 'd' block elements.

(i) Write any four characteristic properties of transition elements. **(Scores : 2)**

(ii) Cr^{2+} and Mn^{3+} have d^4 configuration. But Cr^{2+} is reducing and Mn^{3+} is oxidising. Why ? **(Score : 1)**

(b) Which of the following is not a lanthanoid element ?

(i) Cerium

(ii) Europium

(iii) Lutetium

(iv) Thorium **(Score : 1)**

9. $[Co(NH_3)_5SO_4]Cl$ and $[Co(NH_3)_5Cl]SO_4$ are co-ordination compounds.

(a) Identify the isomerism shown by the above compounds. **(Score : 1)**

(b) Write the IUPAC names of the above compounds. **(Scores : 2)**

(c) Identify the ligands in each of the above compounds. **(Score : 1)**

10. (a) An ambident nucleophile is

(i) Ammonia

(ii) Ammonium ion

(iii) Chloride ion

(iv) Nitrite ion **(Score : 1)**

(b) Halo alkanes and Halo arenes are organohalogen compounds.

(i) Suggest a method for the preparation of alkyl chloride. **(Score : 1)**

(ii) Aryl halides are less reactive towards Nucleophilic substitution reactions. Give reasons. **(Scores : 2)**

11. (a) Arrange the following compounds in the order of increasing boiling points :
Ethanol, Propan-1-ol, Butan-1-ol, Butan-2-ol **(Score : 1)**

(b) In the lab students were asked to carry out the reaction between phenol and conc. HNO_3. But one student, 'A' carried out the reaction between phenol and dil. HNO_3. Do you think that the student 'A' got the same result as others. Substantiate with suitable explanations.
[Also write the chemical equations wherever necessary] **(Scores : 3)**

12. (a) The product obtained when benzene is treated with carbon monoxide and hydrogen chloride in presence of anhydrous $AlCl_3$ is

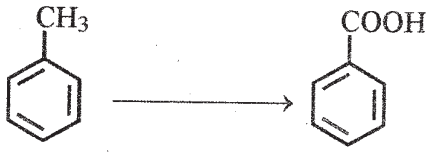
(i) Chlorobenzene

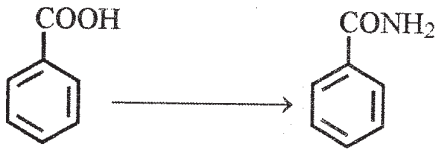
(ii) Phenol

(iii) Benzaldehyde

(iv) Benzoic acid **(Score : 1)**

(b) How will you carry out the following conversions ?

(i) 

(ii) 

(iii) $CH_3CH_2COOH \rightarrow CH_3CH_2CH_2OH$

(iv) $CH_3COOH \rightarrow CH_3CO–O–CO–CH_3$ (acetic anhydride) **(Scores : 4)**

OR

(b) Explain the following :

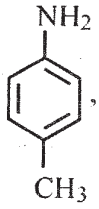
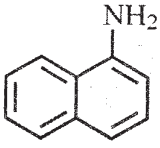
(i) Esterification

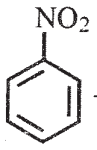
(ii) Tollen's test

(iii) HVZ reaction

(iv) Decarboxylation of Carboxylic acid. **(Scores : 4)**

13. (a) Classify the following amines as primary, secondary and tertiary

 ,  , $(C_2H_5)_2NH$,  **(Score : 1)**

(b)  $\xrightarrow{Sn \text{ \& } HCl}$ B $\xrightarrow{Br_2/H_2O}$ C

Identify the products B and C and write their formulae. **(Scores : 2)**

14. (a) Which of the following is a polysaccharide ?

(i) Maltose

(ii) Sucrose

(iii) Fructose

(iv) Cellulose

(Score : 1)

(b) Explain the amphoteric behaviour of amino acid. **(Scores : 2)**

15. (a) Which of the following is not applicable to Nylon 6, 6 ?

(i) Synthetic polymer

(ii) Fibre

(iii) Addition polymer

(iv) Condensation polymer. **(Score : 1)**

(b) Differentiate between thermoplastics and thermosetting plastics. Write one example each to them. **(Scores : 2)**

16. 'Antibiotics, antiseptics and disinfectants are antimicrobial drugs.'
Explain any one of the above mentioned drugs with examples. **(Scores : 3)**
