Code No. 1016

Time : 2 Hours
Cool-off time : 15 Minutes

Second Year – March 2016

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) Which of the following is a molecular solid ?

(a) Diamond (b) Graphite

(c) Ice (d) Quartz **(Score : 1)**

(b) Unit cells can be classified into primitive and centered unit cells. Differentiate between primitive and centered unit cells. **(Score : 1)**

(c) Presence of excess Sodium makes NaC*l* crystal coloured. Explain on the basis of crystal defects. **(Scores : 2)**

2. (a) Number of moles of the solute per kilogram of the solvent is

(a) Mole fraction (b) Molality

(c) Molarity (d) Molar mass **(Score : 1)**

(b) 'The extent to which a solute is dissociated or associated can be expressed by Van't Hoff factor.' Substantiate the statement. **(Score : 1)**

(c) The vapour pressure of pure benzene at a certain temperature is 0.850 bar. A non-volatile, non-electrolyte solid weighing 0.5 g when added to 39 g of benzene (molar mass 78 g mol^{-1}), vapour pressure becomes 0.845 bar. What is the molar mass of the solid substance ? **(Scores : 2)**

3. (a) Which of the following is a secondary cell ?

(a) Dry cell (b) Leclanche cell

(c) Mercury cell (d) None of these **(Score : 1)**

(b) What is the relationship between resistance and conductance ? **(Score : 1)**

(c) One of the fuel cells uses the reaction of hydrogen and oxygen to form water. Write down the cell reaction taking place in the anode and cathode of that fuel cell. **(Scores : 2)**

4. (i) The molecularity of the reaction $2NO + O_2 \rightarrow 2NO_2$ is,

(a) 5 (b) 2

(c) 3 (d) 0 **(Score : 1)**

(ii) (a) What do you mean by rate of a reaction ? **(Score : 1)**

(b) What will be the effect of temperature on rate of a reaction ? **(Score : 1)**

(iii) A first order reaction is found to have a rate constant, $k = 5.5 \times 10^{-14} s^{-1}$. Find out the half-life of the reaction. **(Score : 1)**

5. (i) Catalysis can be classified into two groups – homogeneous and heterogeneous.

(a) What do you mean by homogeneous catalysis ?

(b) Write one example for heterogeneous catalysis. **(Scores : 2)**

(ii) Which of the following is an emulsifying agent ?

(a) Milk (b) Butter

(c) Gum (d) Lamp black **(Score : 1)**

6. (a) Which of the following is the ore of zinc ?

(a) Bauxite (b) Magnetite

(c) Malachite (d) Calamine **(Score : 1)**

(b) There are several methods for refining metals. Explain a method for refining Zirconium. **(Scores : 2)**

7. (a) Account for the following :

(i) NH_3 acts as a Lewis base.

(ii) PCl_3 fumes in moist air.

(iii) Fluorine shows only –1 oxidation state. **(Scores : 3)**

(b) (i) Suggest any two fluorides of Xenon.

(ii) Write a method to prepare any one of the above mentioned Xenon fluorides. **(Scores : 2)**

OR

(a) Account for the following :

(i) H_2O is a liquid while H_2S is a gas.

(ii) Noble gases have very low boiling points.

(iii) NO_2 dimerises to N_2O_4. **(Scores : 3)**

(b) (i) What are interhalogen compounds ?

(ii) Suggest any two examples of interhalogen compounds. **(Scores : 2)**

8. (a) Which of the following oxidation state is not shown by Manganese ?

(a) +1 (b) +2

(c) +4 (d) +7 **(Score : 1)**

(b) Represent the structure of dichromate ion. **(Score : 1)**

(c) Potassium permanganate ($KMnO_4$) is a strong oxidizing agent. Write any two oxidizing reactions of $KMnO_4$. **(Scores : 2)**

9. (a) Write down the ionization isomer of $[Co(NH_3)_5Cl]SO_4$. **(Score : 1)**

(b) Write the IUPAC name of the above compound. **(Score : 1)**

(c) $[Ni(CO)_4]$ is diamagnetic while $[NiCl_4]^{2-}$ is paramagnetic though both are tetrahedral. Why ? **(Scores : 2)**

10. (a) Aryl halides are less reactive in nucleophilic substitution reactions.

(i) Write any two reasons for less reactivity. **(Score : 1)**

(ii) Give one example for nucleophilic substitution reactions of aryl halides. **(Score : 1)**

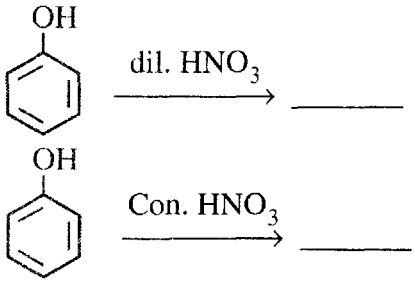
(b) Write a method for the preparation of alkyl halides. **(Score : 1)**

(c) Which of the following is not a polyhalogen compound ?

(a) Chloroform (b) Freon

(c) Carbon tetrachloride (d) Chloro benzene **(Score : 1)**

11. (a) Complete the following :



(Scores : 2)

(b) Explain the following :

(i) Esterification

(ii) Williamson Synthesis **(Scores : 2)**

12. Aldehydes, Ketones and Carboxylic acids are Carbonyl compounds.

(a) Aldehydes differ from Ketones in their oxidation reactions. Illustrate with one example. **(Score : 1)**

(b) How will you prepare benzaldehyde by Gatterman-Koch reaction ? **(Score : 1)**

(c) Write the reactions of carboxylic acid with the following reagents. (Write the chemical equations)

(i) Thionyl chloride ($SOCl_2$)

(ii) Chlorine in presence of small amount of red phosphorous.

(iii) Lithium Aluminium hydride ($LiAlH_4$)/ether. **(Scores : 3)**

OR

(a) Write a test to distinguish between aldehydes and ketones. **(Score : 1)**

(b) How will you prepare benzaldehyde by Etard's reaction ? **(Score : 1)**

(c) How will you bring about the following conversions ? (Write the chemical equations)

(i) Ethanol → Ethanoic acid

(ii) Benzamide → benzoic acid

(iii) Benzaldehyde → meta nitro benzaldehyde **(Scores : 3)**

13. Amines are classified as primary, secondary and tertiary amine.

(a) Represent the structure of secondary and tertiary amine.

(b) How will you convert nitrobenzene to aniline ?

(c) Aniline does not undergo Friedel-Crafts reaction. Why ? **(Scores : 3)**

14. Cane Sugar, Glucose and Starch are Carbohydrates.

(a) Represent the structure of Glucose. **(Score : 1)**

(b) Write a method to prepare Glucose from Starch. Write the chemical equation of the reaction. **(Score : 1)**

(c) Suggest any two uses of Carbohydrates. **(Score : 1)**

15. Polymers can be classified based on molecular forces.

(a) Classify the following polymers into elastomers and fibres :

Rubber, Nylon 6,6, Buna-S, Terylene **(Scores : 2)**

(b) What do you mean by thermosetting polymers ? Give one example. **(Score : 1)**

16. (a) Identify an analgesic from the following :

(a) equanil (b) aspirin

(c) serotonin (d) cimetidine **(Score : 1)**

(b) Differentiate between antiseptics and antibiotics. **(Scores : 2)**
