

Reg. No.,

Code No. 9016

Name : ...

Time : 2 Hours

Cool-off time : 15 Minutes

Second Year – March 2018

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.
- Use the 'Cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- Read the instructions carefully.
- 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.

വിദ്യാർത്ഥികൾക്കുള്ള പൊതുനിർദ്ദേശങ്ങൾ :

- നിർദ്ദിഷ്ട സമയത്തിന് പുറമെ 15 മിനിറ്റ് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും.
- 'കൂൾ ഓഫ് ടൈം' ചോദ്യങ്ങൾ പരിചയപ്പെടാനും ഉത്തരങ്ങൾ ആസൂത്രണം ചെയ്യാനും ഉപയോഗിക്കുക.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- നിർദ്ദേശങ്ങൾ മുഴുവനും ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ, എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നല്കിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

(Questions 1 to 7) : Carry one score each. Answer all questions. (Scores : $7 \times 1 = 7$)

1. What is the co-ordination number of particles present in FCC crystal structure ?
2. Identify the order of reaction if the unit of rate constant is $\text{mol L}^{-1} \text{s}^{-1}$.
3. What is the structure of chromate ion ($(\text{CrO}_4)^{2-}$) ?
4. Name the test used to identify primary amines using CHCl_3 and ethanolic KOH.
5. Which among the given vitamins is water soluble ?
 - (a) A
 - (b) B
 - (c) D
 - (d) E
6. What is the crosslinked polymer obtained by the polymerisation of phenol and formaldehyde ?
7. _____ is an artificial sweetner which is unstable at cooking temperature.

(Questions 8 to 20) : Answer any ten. Each question carries two scores.

(Scores : $10 \times 2 = 20$)

8. (a) Based on the nature of intermolecular forces, classify the following solids :
 - (i) SiO_2
 - (ii) Ice **(Score : 1)**(b) ZnO turns yellow on heating. Why ? **(Score : 1)**
9. A solution contains 15 g urea (molar mass = 60 g mol^{-1}) per litre of solution in water has the same osmotic pressure as a solution of glucose (molar mass = 180 g mol^{-1}) in water. Calculate the mass of glucose present in one litre of its solution. **(Scores : 2)**
10. Define minimum boiling azeotropes with example. **(Scores : 2)**

11. Write the chemical equation of the following reactions :
- (a) Preparation of XeO_3 from XeF_6 . (Score : 1)
- (b) Mixing PtF_6 and Xe. (Score : 1)
12. Explain how the complexes of nickel, $[\text{Ni}(\text{CN})_4]^{2-}$ and $[\text{Ni}(\text{CO})_4]$ have different structures, but do not differ in their magnetic behaviour. (Ni, Atomic No : 28) (Scores : 2)
13. Complete the reaction :
- (a) $\text{CH}_3\text{CH}_2\text{Br} \xrightarrow{\text{AgCN}}$ _____ (Score : 1)
- (b) $\text{CH}_3\text{CH}_2\text{Br} \xrightarrow[\text{Dry ether}]{\text{N}}$ _____ (Score : 1)
14. During the β -elimination reaction of 2-bromopentane in an alcoholic solution of KOH results Pent-2-ene as major product and Pent-1-ene as minor product. State the rule to explain the reaction. (Scores : 2)
15. Aromatic aldehydes undergo electrophilic substitution reactions. Write the nitration reaction of benzaldehyde with chemical equation. (Scores : 2)
16. Briefly describe Gatterman Koch reaction. (Scores : 2)
17. How can it convert methyl iodide to ethanamine ? (Scores : 2)
18. State two differences between globular and fibrous proteins. (Scores : 2)
19. Match the following :
- | | |
|---------------------------------------|---------------------|
| (a) Polyacrylonitrile | (i) Terylene |
| (b) 1, 3-Butadien-Acrylonitrile | (ii) Natural Rubber |
| (c) Ethylene glycol-Terephthalic acid | (iii) Buna-N |
| (d) cis-1, 4-polyisoprene | (iv) Acrilan |
- (Scores : 2)
20. (a) What are drugs ? (Score : 1)
- (b) Write an example for a drug classified based on its chemical structure. (Score : 1)

(Questions 21 to 29) : Answer any seven. Each question carries three scores.

(Scores : $7 \times 3 = 21$)

21. An element crystallises as FCC with density 2.8 g cm^{-3} . Its unit cell having edge length $4 \times 10^{-8} \text{ cm}$. Calculate the molar mass of the element. (Given $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$)

(Scores : 3)

22. Write the anode and cathode reactions occur in the operation of a lead storage battery. Mention the electrolyte used in the battery.

(Scores : 3)

23. For hydrolysis of methyl acetate in aqueous solution, the following results were observed.

t/s	0	30	60
$\text{CH}_3\text{COOCH}_3$ C/mol L ⁻¹	0.60	0.30	0.15

Show that it follows pseudo first order reaction as the concentration of water remains constant.

(Scores : 3)

24. (a) State Hardy-Schulze rule with the help of example.
(b) Why lyophilic colloids are used as protective colloids ?

(Scores : 2)

(Score : 1)

25. Gibbs energy of formation ($\Delta_f G$) of $\text{MgO}_{(s)}$ and $\text{CO}_{(g)}$ at 1273 K and 2273 K are given below :

$$\Delta_f G [\text{MgO}_{(s)}] : -941 \text{ kJ mol}^{-1} \text{ at } 1273 \text{ K}$$

$$\Delta_f G [\text{CO}_{(g)}] : -439 \text{ kJ mol}^{-1} \text{ at } 1273 \text{ K}$$

$$\Delta_f G [\text{MgO}_{(s)}] : -314 \text{ kJ mol}^{-1} \text{ at } 2273 \text{ K}$$

$$\Delta_f G [\text{CO}_{(g)}] : -628 \text{ kJ mol}^{-1} \text{ at } 2273 \text{ K}$$

On the basis of the above data, predict the temperature at which carbon can be used as a reducing agent for $\text{MgO}_{(s)}$.

(Scores : 3)

26. (a) What is the formula of phosphine ? (Score : 1)
(b) How phosphine is prepared in laboratory ? (Scores : 2)
27. Assign the possible reason for the following :
- (a) Stability of +5 oxidation state decreases and that of +3 oxidation state increases down to 15th group elements. (Score : 1)
(b) H₂O is less acidic than H₂S. (Score : 1)
(c) H₃PO₂ act as a good reducing agent while H₃PO₄ does not. (Score : 1)
28. Give reasons for the following :
- (a) Transition metals and many of their compounds act as catalyst. (Score : 1)
(b) Scandium (Z = 21) does not exhibit variable oxidation state and yet it is regarded as a transition element. (Score : 1)
(c) Write the step involved in the preparation of Na₂CrO₄ from chromite ore. (Score : 1)
29. How would you account for the following :
- (a) Aldehydes are more reactive than ketones towards nucleophilic addition reaction. (Score : 1)
(b) Boiling point of aldehydes are lower than alcohols. (Score : 1)
(c) Addition reaction of sodium hydrogen sulphite is useful for separation and purification of aldehydes. (Score : 1)

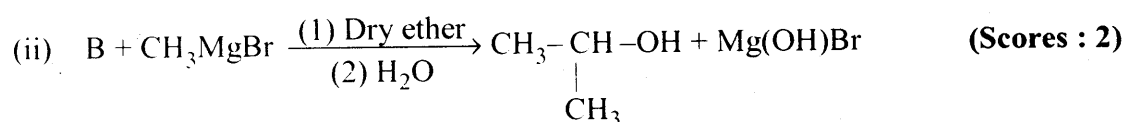
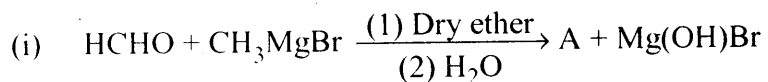
(Questions 30 to 33) : Answer any three. Each question carries four scores.

(Scores : 3 × 4 = 12)

30. (a) What are primary batteries ? (Score : 1)
(b) The cell potential of a mercury cell is 1.35 V, and remain constant during its life. Give reason. (Score : 1)
(c) Write the equations of the reactions involved at each electrode in a H₂ – O₂ fuel cell. (Scores : 2)

31. (a) Draw the structures of geometrical isomers of $[\text{Fe}(\text{NH}_3)_2(\text{CN})_4]^-$ (Scores : 2)
- (b) Write the formula of pentaamminecarbonatocobalt (III) chloride. (Score : 1)
- (c) Write any two limitations of valence bond theory. (Score : 1)

32. (a) Grignard reagents are important class of organometallic compounds used to prepare alcohols. Identify the compounds A and B and write the formula.



- (b) Write the name of products formed when salicylic acid is treated with acetic anhydride in acid medium. (Scores : 2)

33. Lucas test is used to identify primary, secondary and tertiary alcohols.

- (a) Explain the process.
- (b) Name the reagents used in the test. (Scores : 4)