Reg. No.

Name : ...

Code No. 9016

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 × 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 mol L^{-1} s^{-1}.

3. What is the structure of chromate ion ($(CrO_4)^{2-}$) ?

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 × 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, $[Ni(CN)_4]^{2-}$ and $[Ni(CO)_4]$ have different structures, but do not differ in their magnetic behaviour. (Ni, Atomic No : 28) **(Scores : 2)**

13. Complete the reaction :

(a) $CH_3CH_2Br \xrightarrow{AgCN}$ _____ **(Score : 1)**

(b) $CH_3CH_2Br \xrightarrow[\text{Dry ether}]{N}$ _____ **(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 4×10^{-8} cm. Calculate the molar mass of the element. (Given $N_A = 6.022 \times 10^{23}$ 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
CH_3COOCH_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. **(Scores : 2)**

(b) Why lyophilic colloids are used as protective colloids ? **(Score : 1)**

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

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

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

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

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

On the basis of the above data, predict the temperature at which carbon can be used as a reducing agent for $MgO_{(s)}$. **(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 15^{th} group elements. **(Score : 1)**

(b) H_2O is less acidic than H_2S. **(Score : 1)**

(c) H_3PO_2 act as a good reducing agent while H_3PO_4 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 Na_2CrO_4 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 $H_2 - O_2$ fuel cell. **(Scores : 2)**

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31. (a) Draw the structures of geometrical isomers of $[Fe(NH_3)_2(CN)_4]^-$ **(Scores : 2)**

(b) Write the formula of pentaamminecarbonatocobalt (III) chloride. **(Score : 1)**

(c) Write any two limitations of valance 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.

(i) $HCHO + CH_3MgBr \xrightarrow[(2)\ H_2O]{(1)\ \text{Dry ether}} A + Mg(OH)Br$

(ii) $B + CH_3MgBr \xrightarrow[(2)\ H_2O]{(1)\ \text{Dry ether}} CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-OH + Mg(OH)Br$ **(Scores : 2)**

(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)**