



# INDIAN SCHOOL MUSCAT FINAL TERM EXAMINATION CHEMISTRY

CLASS: XI

Sub. Code: 043

Time Allotted: 3 Hrs

10.02.2019

Max. Marks: 70

**General Instructions:**

- (a) All questions are compulsory.
- (b) Section A: Q.no. 1 to 5 are very short answer questions and carry 1 mark each.
- (c) Section B: Q.no. 6 to 12 are short answer questions and carry 2 marks each.
- (d) Section C: Q.no. 13 to 24 are also short answer questions and carry 3 marks each.
- (e) Section D: Q.no. 25 to 27 are long answer questions and carry 5 marks each.
- (f) There is no overall choice. However, an internal choice has been provided in two questions of one mark, two questions of two marks, four questions of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.
- (g) Use of log tables if necessary, use of calculators is not allowed.

**SECTION A**

1. Write the IUPAC name and symbol of element with atomic number 112.

**OR**

Write the general outer electronic configuration of transition metals.

2. Arrange the following in the increasing order of basic character:  
AsH<sub>3</sub>, NH<sub>3</sub>, SbH<sub>3</sub>, BiH<sub>3</sub>, PH<sub>3</sub>
3. Why is 3d orbital filled before 4s?
4. Describe the orbital with quantum numbers  $n=4$ ,  $l=3$  and the maximum number of electrons that can be accommodated in this orbital.

**OR**Draw the boundary surface of a) 2p<sub>x</sub> b) 3d<sub>xy</sub> orbitals.

5. State Gay Lussac's law of gaseous volumes.

**SECTION B**

6. Define 2  
a) Threshold energy      b) node
7. Using the concept of hybridisation, explain the shape of ethene molecule. 2

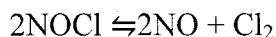
**OR**

Explain the shapes of the following using VSEPR theory.

- (i) ClF<sub>3</sub> (ii) H<sub>3</sub>O<sup>+</sup>
8. Calculate the  $\Delta H$  for the reaction  $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$ , given C=C, C-H, C=O, O=O and O-H are 615, 414, 741, 498 and 464 kJ/mol respectively. 2

**OR**

Calculate the  $\Delta G$  at 400K for



Given  $\Delta H = 77.2 \text{ kJ/mol}$ ,  $\Delta S = 122 \text{ J/K}$

9. List any two diagonal relationship shown between lithium and magnesium. 2
10. Give the IUPAC names of the following: 2
- a)  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}=\underset{\begin{array}{c} | \\ \text{CH}_2\text{CHO} \end{array}}{\text{C}}\text{CH}_2\text{CH}_3$
- b)  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{COC}_2\text{H}_5$
11. If the density of 3M solution of sodium chloride is 1.25g/ml, calculate the molality of solution. 2  
[Na=23, Cl=35.5]
12. a) Calculate the de Broglie wavelength of a bullet of mass  $2.2 \times 10^{-3}$  Kg fired with a velocity of 300 m/s. [h= $6.6 \times 10^{-34}$  Js] 2
- b) Calculate the energy of each of the photons which correspond to light of frequency  $3 \times 10^{15}$  Hz.

## SECTION C

13. a) What are isoelectronic species? Name one cation that will be isoelectronic with  $\text{F}^-$  ion.  
b) Explain why cations are smaller than corresponding anions.
14. a) Explain expanded octet molecules and give two examples.  
b) Which is more polar and why:  $\text{NH}_3$  or  $\text{NF}_3$

**OR**

15. i) Differentiate between bonding and antibonding molecular orbital.  
 ii) Using molecular orbital theory, explain why  $\text{Be}_2$  molecule does not exist.  
 a) Differentiate between ferromagnetism and ferrimagnetism.  
 b) What are 12 – 16 compounds?

**OR**

- i) Which two postulates of kinetic theory of gases are responsible for the deviation of gases from the ideal gas behaviour?
  - ii) The density of a gaseous oxide at 2 bar is the same as that of nitrogen gas measured at 5 bar at a given temperature. Find the molar mass of the oxide.
16. An element with density  $6.22\text{g/cm}^3$  forms an fcc lattice with edge length  $4.077 \times 10^{-8}$  cm. Calculate the molar mass and atomic radius of that element. [Given:  $N_A = 6.022 \times 10^{23}$ ]
17. a) State the third law of thermodynamics.  
b) Derive the relation  $C_p - C_v = R$
18. Balance the following redox reaction using ion-electron method in basic medium:  
 $\text{Cr}(\text{OH})_3 + \text{IO}_3^- \rightarrow \text{I}^- + \text{CrO}_4^{2-}$
19. Give reason  
a) Lithium does not form peroxide  
b) Alkaline earth metals are harder than alkali metals  
c) Potassium carbonate cannot be prepared by Solvay's process

20. a) Name the repeating units in silicates. 3  
b) What are zeolites? Give an example.

21. Complete and balance the following reactions 3  
a)  $P_4 + NaOH + H_2O \rightarrow$   
b)  $BF_3 + NaH \rightarrow$   
c)  $SiO_2 + HF \rightarrow$

**OR**

Draw the structure of

- $H_3PO_3$
  - $H_4P_2O_6$
  - $(HPO_3)_n$
22. a) What is the reason for i) permanent hardness and ii) temporary hardness of water? 3  
b) What are covalent hydrides? Give one example each of different types of covalent hydrides.
23. Ethyne when passed through red hot iron tube at 873K gives X as the product. X when treated with chloromethane in presence of anhydrous  $AlCl_3$  gives Y. Identify X and Y and write the reactions involved. 3

**OR**

Explain with equations

- Wurtz reaction
  - Friedel craft acylation
  - Dehydrohalogenation
24. Define 3  
a) BOD  
b) Eutrophication  
c) Green Chemistry

#### SECTION D

25. a) State LeChatelier's principle. 5  
b) Describe the effect of  
i) increase in temperature and  
ii) increase in pressure  
on the equilibrium of the following endothermic reaction  
 $CH_4(g) + H_2O(g) \rightleftharpoons CO(g) + 3H_2(g)$   
c) At 450K,  $K_p = 2.0 \times 10^{10}$ /bar for the given reaction at equilibrium  
 $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ . What is  $K_c$  at this temperature? [ $R = 0.083 \text{ Lbar/K/mol}$ ]

**OR**

- Define solubility product.
  - Write the expression for solubility product of magnesium hydroxide.
  - Calculate the pH of 0.1 M Sodium hydroxide solution.
  - The ionisation constant of dimethylamine is  $5.4 \times 10^{-4}$ . Calculate its degree of ionisation in its 0.02M solution.
26. a) Explain the mechanism of Kolbe's electrolysis of sodium acetate. 5  
b) How will you distinguish between propene and propyne?  
c) Draw the geometrical isomers of but-2-ene.

**OR**

- i) Predict the product of ozonolysis of 2-methyl but-2-ene.
- ii) What happens when phenol is heated with zinc dust?
- iii) Convert benzene to nitrobenzene.
- iv) Explain aromaticity of benzene using Huckle's rule.

27. a) Explain the following

5

- i. Sodium fusion extract is boiled with nitric acid before testing halogens
  - ii. Aniline is purified by steam distillation
  - iii.  $\text{NO}_2\text{CH}_2\text{O}^-$  is more stable than  $\text{CH}_3\text{CH}_2\text{O}^-$
- b) Define hyperconjugation. Draw hyperconjugation resonances in but-1-ene.

**OR**

- i) Draw the resonance structures of  $\text{C}_6\text{H}_5\text{NH}_2$ .
- ii) Draw a pair of chain isomers and functional isomers of  $\text{C}_4\text{H}_9\text{OH}$ .
- iii) Define electromeric effect.

**End of the Question Paper**

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SET B



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- Use of log tables if necessary, use of calculators is not allowed.

## SECTION A

- Why is 3d orbital filled before 4s? 1
- Describe the orbital with quantum numbers  $n=4$ ,  $l=3$  and the maximum number of electrons that can be accommodated in this orbital. 1

OR

Draw the boundary surface of a)  $2p_x$  b)  $3d_{xy}$  orbitals.

- Arrange the following in the increasing order of basic character:  
 $AsH_3$ ,  $NH_3$ ,  $SbH_3$ ,  $BiH_3$ ,  $PH_3$  1
- State Gay Lussac's law of gaseous volumes. 1
- Write the IUPAC name and symbol of element with atomic number 112. 1

OR

Write the general outer electronic configuration of transition metals.

## SECTION B

- Calculate the de Broglie wavelength of a bullet of mass  $2.2 \times 10^{-3}$  Kg fired with a velocity of 300 m/s. [ $h=6.6 \times 10^{-34}$  Js] 2
  - Calculate the energy of each of the photons which correspond to light of frequency  $3 \times 10^{15}$  Hz. 2
- If the density of 3M solution of sodium chloride is 1.25g/ml, calculate the molality of solution. [Na=23, Cl=35.5] 2

2



2

**OR**

Given  $\Delta H = 77.2 \text{ kJ/mol}$ ,  $\Delta S = 122 \text{ J/K}$

2

**OR**

(i)  $\text{ClF}_3$     (ii)  $\text{H}_3\text{O}^+$

b) node

## SECTION C

c)  $\text{SiO}_2 + \text{HF} \rightarrow$

**OR**

iii.  $(\text{HPO}_3)_n$

b) What are zeolites? Give an example.

$$\text{Cr}(\text{OH})_3 + \text{IO}_3^- \rightarrow \text{I}^- + \text{CrO}_4^{2-}$$

c) Potassium carbonate cannot be prepared by Solvay's process

- 17 An element with density  $6.22\text{g/cm}^3$  forms an fcc lattice with edge length  $4.077 \times 10^{-8}$  cm. Calculate the molar mass and atomic radius of that element. [Given:  $N_A = 6.022 \times 10^{23}$ ] 3
- 18 a) State the third law of thermodynamics. 3  
b) Derive the relation  $C_p - C_v = R$
- 19 a) Differentiate between ferromagnetism and ferrimagnetism. 3  
b) What are 12 – 16 compounds?
- OR**
- i) Which two postulates of kinetic theory of gases are responsible for the deviation of gases from the ideal gas behaviour?  
ii) The density of a gaseous oxide at 2 bar is the same as that of nitrogen gas measured at 5 bar at a given temperature. Find the molar mass of the oxide.
- 20 a) What are isoelectronic species? Name one cation that will be isoelectronic with  $F^-$  ion. 3  
b) Explain why cations are smaller than corresponding anions.
- 21 a) Explain expanded octet molecules and give two examples. 3  
b) Which is more polar and why:  $NH_3$  or  $NF_3$
- OR**
- i) Differentiate between bonding and antibonding molecular orbital.  
ii) Using molecular orbital theory, explain why  $Be_2$  molecule does not exist.
- 22 a) What is the reason for i) permanent hardness and ii) temporary hardness of water? 3  
b) What are covalent hydrides? Give one example each of different types of covalent hydrides.
- 23 Define 3  
a) BOD  
b) Eutrophication  
c) Green Chemistry
- 24 Ethyne when passed through red hot iron tube at 873K gives X as the product. X when treated with chloromethane in presence of anhydrous  $AlCl_3$  gives Y. Identify X and Y and write the reactions involved. 3

**OR**

Explain with equations

- a) Wurtz reaction  
b) Friedel craft acylation  
c) Dehydrohalogenation

### SECTION D

- 25 a) Explain the following 5  
i. Sodium fusion extract is boiled with nitric acid before testing halogens  
ii. Aniline is purified by steam distillation  
iii.  $NO_2CH_2O^-$  is more stable than  $CH_3CH_2O^-$   
b) Define hyperconjugation. Draw hyperconjugation resonances in but-1-ene.
- OR**
- i) Draw the resonance structures of  $C_6H_5NH_2$ .  
ii) Draw a pair of chain isomers and functional isomers of  $C_4H_9OH$ .  
iii) Define electromeric effect.

- 26 a) Explain the mechanism of Kolbe's electrolysis of sodium acetate.  
b) How will you distinguish between propene and propyne?  
c) Draw the geometrical isomers of but-2-ene.

5

**OR**

- i) Predict the product of ozonolysis of 2-methyl but-2-ene.  
ii) What happens when phenol is heated with zinc dust?  
iii) Convert benzene to nitrobenzene.  
iv) Explain aromaticity of benzene using Huckle's rule.

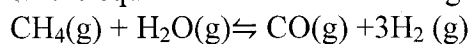
- 27 a) State LeChatelier's principle.

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- b) Describe the effect of

- i) increase in temperature and  
ii) increase in pressure

on the equilibrium of the following endothermic reaction



- c) At 450K,  $K_p = 2.0 \times 10^{10}$ /bar for the given reaction at equilibrium

$2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$ . What is  $K_c$  at this temperature? [ $R = 0.083 \text{ Lbar/K/mol}$ ]

**OR**

- i) Define solubility product.  
ii) Write the expression for solubility product of magnesium hydroxide.  
iii) Calculate the pH of 0.1 M Sodium hydroxide solution.  
iv) The ionisation constant of dimethylamine is  $5.4 \times 10^{-4}$ . Calculate its degree of ionisation in its 0.02M solution.

**End of the Question Paper**



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SET C



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**SECTION A**

- 1 State Gay Lussac's law of gaseous volumes. 1
- 2 Write the IUPAC name and symbol of element with atomic number 112. 1

**OR**

Write the general outer electronic configuration of transition metals.

- 3 Describe the orbital with quantum numbers  $n=4$ ,  $l=3$  and the maximum number of electrons that can be accommodated in this orbital. 1

**OR**Draw the boundary surface of a)  $2p_x$  b)  $3d_{xy}$  orbitals.

- 4 Arrange the following in the increasing order of basic character:  
 $\text{AsH}_3$ ,  $\text{NH}_3$ ,  $\text{SbH}_3$ ,  $\text{BiH}_3$ ,  $\text{PH}_3$  1
- 5 Why is 3d orbital filled before 4s? 1

**SECTION B**

- 6 If the density of 3M solution of sodium chloride is 1.25g/ml, calculate the molality of solution.  
[Na=23, Cl=35.5] 2



Draw the structure of

- i.  $\text{H}_3\text{PO}_3$
- ii.  $\text{H}_4\text{P}_2\text{O}_6$
- iii.  $(\text{HPO}_3)_n$

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- 25 a) Explain the mechanism of Kolbe's electrolysis of sodium acetate.  
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**OR**

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- ii) What happens when phenol is heated with zinc dust?
- iii) Convert benzene to nitrobenzene.
- iv) Explain aromaticity of benzene using Huckle's rule.

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- a) Explain the following
  - i. Sodium fusion extract is boiled with nitric acid before testing halogens
  - ii. Aniline is purified by steam distillation
  - iii.  $\text{NO}_2\text{CH}_2\text{O}^-$  is more stable than  $\text{CH}_3\text{CH}_2\text{O}^-$
- b) Define hyperconjugation. Draw hyperconjugation resonances in but-1-ene.

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**OR**

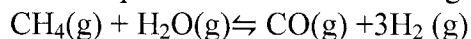
- i) Draw the resonance structures of  $\text{C}_6\text{H}_5\text{NH}_2$ .
- ii) Draw a pair of chain isomers and functional isomers of  $\text{C}_4\text{H}_9\text{OH}$ .
- iii) Define electromeric effect.

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- a) State LeChatelier's principle.
- b) Describe the effect of
  - i) increase in temperature and
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on the equilibrium of the following endothermic reaction



c) At 450K,  $K_p = 2.0 \times 10^{10}$ /bar for the given reaction at equilibrium

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**OR**

- i) Define solubility product.
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**End of the Question Paper**