

INTERNATIONAL INDIAN SCHOOL - DAMMAM  
SECOND TERMINAL EXAMINATION 2014-2015  
CHEMISTRY – XI SET A

TIME: 3 hours

Max marks: 70

General Instructions:

All questions are compulsory.

Question nos. 1 to 5 are very short answer questions and carry 1 mark each.

Question nos. 6 to 10 are short answer questions and carry 2 marks each.

Question nos. 11 to 22 are also short answer questions and carry 3 marks each.

Question no 23 is a value based question carrying 4 marks.

Question nos. 24, 25 & 26 are long answer questions and carry 5 marks each.

1. Write the quantum numbers  $n, l, m_l$  and  $m_s$  for the unpaired electron in an element with atomic number 11. 1
2. Give the IUPAC name of the following compound: 1  
$$\text{CH}_2 = \text{CH} - \underset{\text{Cl}}{\text{CH}} - \text{CH}(\text{OH}) - \text{CH}_3$$
3. Statues and monuments in India are affected by acid rain. Justify. 1
4. Write van der Waals equation of state for  $n$  moles of a gas. 1
5. Which geometrical isomer of but-2-ene has a higher boiling point and why? 1
6. Explain the hybridization in ethene molecule with the help of a diagram. 2
7. Draw the saw horse projection formula of the staggered and eclipsed conformation of ethane. Which conformation is more stable and why? 2
8. a) Why is nitric acid added to sodium extract before adding silver nitrate for testing halogens? 1  
b) Name the technique used to separate glycerol from spent-lye in soap industry. 1
9. An organic compound on analysis gave the following percentage composition: carbon 54.24%, hydrogen 9.05% and oxygen 36.71%. Determine the empirical and molecular formula if the molecular mass of the compound is 88 u. (Atomic mass of C = 12, H = 1, O = 16). 2
10. Account for the following: 1  
i) Beryllium and magnesium do not give characteristic colour to the flame.

ii) Lithium salts are commonly hydrated while those of the other alkali ions usually anhydrous 1

OR

Write any four similarities between Beryllium and Aluminium. 2

11. 34.05 mL of phosphorus vapour weighs 0.0625 g at  $546^{\circ}\text{C}$  and 0.1 bar pressure. What is the molar mass of phosphorus? ( $R = 0.083 \text{ bar dm}^3 \text{ K}^{-1} \text{ mol}^{-1}$ ) 3

12. Give reasons: 1

a) But-1-yne is more acidic than but-2-yne. 1

b) Straight chain isomers have higher boiling point than their branched isomers. 1

c) Benzene is an aromatic compound. 1

13. a) State Heisenberg's Uncertainty Principle. 1

b) Draw the boundary surface diagrams for the three 2p orbitals. 1

c) Explain photoelectric effect. 1

14. Discuss the various reactions that occur in the preparation of sodium carbonate by Solvay process. 3

15. a) Dihydrogen ( $\text{H}_2$ ) and dioxygen ( $\text{O}_2$ ) react with each other to form water. Calculate the mass of water produced if  $4 \times 10^3 \text{ g}$  of dihydrogen reacts with  $35 \times 10^3 \text{ g}$  of dioxygen. 3

b) Identify the limiting reagent and excess reagent.

c) Calculate the mass of the excess reactant which will remain unreacted. 3

(Atomic mass of H = 1, O = 16).

16. a) Derive the equation for partial pressure of a gas in terms of its mole fraction 2

$$p_1 = x_1 \times P_{\text{total}}$$

b) It is difficult to cook food on hills. Give reason. 1

OR

a) What do you mean by the following terms: 2

i) Boyle temperature ii) Viscosity 2

b) The size of weather balloon becomes larger as it ascends up into higher altitudes. 1

Give reason.

17. a) Depict the galvanic cell in which the reaction  $\text{Fe(s)} + 2\text{Ag}^+(\text{aq}) \rightarrow \text{Fe}^{2+}(\text{aq}) + 2\text{Ag(s)}$  takes place. Further show: 2

(i) which of the electrode is negatively charged,

(ii) the carriers of the current in the cell, and 2

(iii) individual reaction at each electrode.

b) Given the standard electrode potentials. 1

$\text{Cr}^{3+}/\text{Cr} = -0.74\text{V}$ ,  $\text{K}^+/\text{K} = -2.93\text{V}$ ,  $\text{Ag}^+/\text{Ag} = 0.80\text{V}$ ,  $\text{Hg}^{2+}/\text{Hg} = 0.79\text{V}$ .

$\text{Mg}^{2+}/\text{Mg} = -2.37\text{V}$ . Arrange these metals in the increasing order of reducing power.

18. a) Arrange the following set of compounds in order of their decreasing relative reactivity with an electrophile,  $\text{E}^+$  and give reason. 1

Chlorobenzene, 2,4-dinitrochlorobenzene, p-nitrochlorobenzene

- b) Convert the following: 1  
 i) Benzene to m-nitrochlorobenzene 1  
 ii) Hexane to benzene
19. a) In sulphur estimation, 0.157 g of an organic compound gave 0.4813 g of barium sulphate. What is the percentage of sulphur in the compound? 2  
 (Atomic mass of Ba = 137, S = 32, O = 16)  
 b) Kjeldahl method is not applicable to certain compounds containing nitrogen. Identify these compounds and give reason. 1
20. a) Explain disproportionation reaction with a suitable example. 1  
 b) Balance the following redox reaction in basic medium: 2  

$$\text{MnO}_4^- (\text{aq}) + \text{Br}^- (\text{aq}) \rightarrow \text{MnO}_2 (\text{s}) + \text{BrO}_3^- (\text{aq})$$
21. Write balanced equations for the reactions between 3  
 a) Slaked lime and chlorine.  
 b) Sodium peroxide and water.  
 c) Decomposition of  $\text{LiNO}_3$ .
22. a) Electromagnetic radiation of wavelength 242 nm is just sufficient to ionize the sodium atom. Calculate the ionization energy of sodium in kJ per mole. 2  
 ( $h = 6.626 \times 10^{-34} \text{ Js}$ ,  $c = 3 \times 10^8 \text{ ms}^{-1}$ )  
 b) Calculate the radius of the first orbit of  $\text{He}^+$ ? 1
23. A large number of fish were suddenly found floating dead in a nearby lake which had an abundance of phytoplankton. Polluted water may contain large amounts of inorganic and organic compounds. Clean water would have a BOD value less than 5 ppm, while highly polluted river water could have a BOD value more than 17 ppm. The quality of water is of vital concern for mankind. There are some international standards for drinking water that has to be followed i.e the concentrations of fluoride, sulphate, nitrate etc. 4  
 a) What was the cause for a large number of fish found floating dead in the nearby lake?  
 b) Define the term BOD.  
 c) What happens if there is excess nitrate in drinking water?  
 d) What values are possessed by people who do not dump household and industrial waste into drains that enter directly to water bodies like river, lake etc.
24. a) Write the Lassaigne's test for the detection of nitrogen in an organic compound. 2  
 b) Identify & define the isomerism shown by the following pairs of compounds: 2  
 i)  $\text{CH}_3\text{COCH}_3$  and  $\text{CH}_3\text{CH}_2\text{CHO}$     ii)  $\text{CH}_3\text{OC}_3\text{H}_7$  and  $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$   
 c) Arrange the following carbocations in the order of their increasing stabilities. 1  
 $(\text{CH}_3)_3\overset{+}{\text{C}}\text{CH}_2$ ,  $(\text{CH}_3)_3\overset{+}{\text{C}}$ ,  $\text{CH}_3\text{CH}_2\overset{+}{\text{C}}\text{H}_2$ ,  $\text{CH}_3\overset{+}{\text{C}}\text{HCH}_2\text{CH}_3$   
 OR 2  
 a) Define resonance effect. Explain positive resonance effect in aniline with the help of resonance structures.

- b) What are electrophiles and nucleophiles? Give examples. 2
- c) Write the bond line formula of 2,3-dimethylbutanal 1
25. a) Determine the bond orders of  $O_2$  and  $O_2^{2-}$ . Compare their relative stabilities and indicate their magnetic behaviour. 2
- b) Although geometries of  $NH_3$  and  $H_2O$  molecules are distorted tetrahedral, bond angle in water is less than that of ammonia. Discuss. 2
- c) Draw and predict the shapes of  $BrF_5$ ,  $SF_4$  on the basis of VSEPR theory. 1
- OR
- a) Although both  $CO_2$  and  $H_2O$  are triatomic molecules, the shape of  $H_2O$  molecule is bent while that of  $CO_2$  is linear. Explain this on the basis of dipole moment. 2
- b) Distinguish between sigma and pi bonds 1
- c) Draw the resonance structures of  $CO_3^{2-}$ . 1
26. a) An alkene (A) on ozonolysis gives a mixture of butanal and propan-2-one. Write the IUPAC name and structure of (A) along with the chemical equation involved. 2
- b) Explain the following reactions with the help of a suitable example: 1
- i) Friedel Crafts alkylation of benzene 1
- ii) Kolbe's electrolytic synthesis 1
- iii) Dehydrohalogenation of alkyl halides 1
- OR
- a) Write balanced equations for the following: 1
- i) Addition of water to propyne and warming it with mercuric sulphate along with dilute  $H_2SO_4$  at 333K. 1
- ii) Addition of  $HBr$  to propene in the absence of benzoyl peroxide. 1
- iii) Heating of n-hexane in the presence of anhydrous  $AlCl_3$  and hydrogen chloride gas. 1
- b) The C—C bond length in benzene is 139 pm which is intermediate between C—C single bond (154 pm) and C=C double bond (133pm). Explain. 1
- c) Out of benzene, m-dinitrobenzene and toluene which will undergo nitration most easily? Give reason. 1

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