

# AIEEE - 2011 SOLUTIONS Paper Code 'S'

## CHEMISTRY

1. Silver Mirror test is given by which one of the following Compounds?

1) Formaldehyde  
2) Benzophenone  
3) Actaldehyde 4) Acetone

**Ans:** 1 or 3

2. A 5.2 molal aqueous solution of methyl alcohol,  $\text{CH}_3\text{OH}$ , is supplied. What is the mole fraction of methyl alcohol in the solution?

1) 0.086            2) 0.050  
3) 0.100            4) 0.190

**Ans:** 1

3. Trichloroacetaldehyde was subjected to Cannizzaro's reaction by using NaOH. The mixture of the products contains sodium tri-chloroacetate and another compound. The other compound is?

1) 2, 2, 2 - Trichloropropanol  
2) Chloroform  
3) 2, 2, 2 - Trichloroethanol  
4) Trichloromethanol

**Ans:** 3

4. The rate of a chemical reaction doubles for every  $10^\circ\text{C}$  rise of temperature. If the temperature is raised by  $50^\circ\text{C}$ , the rate of the reaction increases by about?

1) 32 times        2) 64 times  
3) 10 times        4) 24 times

**Ans:** 1

**Sol:**  $r_2 = r_1 \cdot 2^n$

Where  $n = \Delta T/10$

5. 'a' and 'b' are Vander Waal's constant for gases. Chlorine is more easily liquefied than ethane because

1) a for  $\text{Cl}_2 < a$  for  $\text{C}_2\text{H}_6$  but b for  $\text{Cl}_2 > b$  for  $\text{C}_2\text{H}_6$   
2) a for  $\text{Cl}_2 > a$  for  $\text{C}_2\text{H}_6$  but b for  $\text{Cl}_2 < b$  for  $\text{C}_2\text{H}_6$   
3) a and b for  $\text{Cl}_2 > a$  and b for  $\text{C}_2\text{H}_6$   
4) a and b for  $\text{Cl}_2 < a$  and b for  $\text{C}_2\text{H}_6$

**Ans:** 2

**Sol:** Inter molecular forces and molecular weight is more for  $\text{Cl}_2$ , hence  $\text{Cl}_2$  has high boiling point than  $\text{C}_2\text{H}_6$ . But the size of molecule  $\text{C}_2\text{H}_6$  is greater than  $\text{Cl}_2$  hence for  $\text{C}_2\text{H}_6$  b is greater than  $\text{Cl}_2$

$a_{\text{Cl}_2} > a_{\text{C}_2\text{H}_6}$  but  $b_{\text{C}_2\text{H}_6} > b_{\text{Cl}_2}$

6. The entropy change involved in the isothermal reversible expansion of 2 moles of an ideal gas from a volume of  $10\text{dm}^3$  to a volume of  $100\text{dm}^3$  at  $27^\circ\text{C}$  is:

1)  $32.3 \text{ J mol}^{-1} \text{ K}^{-1}$   
2)  $42.3 \text{ J mol}^{-1} \text{ K}^{-1}$   
3)  $38.3 \text{ J mol}^{-1} \text{ K}^{-1}$   
4)  $35.8 \text{ J mol}^{-1} \text{ K}^{-1}$

**Ans:** 3

**Sol:**  $\Delta S = 2.303nR \log (V_2/V_1)$

7. A vessel at  $1000\text{K}$  contains  $\text{CO}_2$  with a pressure of 0.5 atm. Some of the  $\text{CO}_2$  is converted into CO on the addition of graphite. If the total pressure at equilibrium is 0.8 atm, the value of K is?

1) 0.3 atm        2) 0.18 atm  
3) 1.8 atm        4) 3 atm

**Ans:** 3

**Sol:**  $\text{CO}_2(\text{g}) + \text{C}(\text{s}) \rightleftharpoons \text{CO}(\text{g})$

at eq. pressure 0.5 - x - 2x

$P_T = 0.5 + x = 0.8$

So,  $\therefore K_p = 1.8$

8. A gas absorbs a photon of 355 nm and emits at two wave-lengths. If one of the emissions is at 680 nm, the other is?

1) 743 nm        2) 518 nm  
3) 1035 nm        4) 325 nm

**Ans:** 1

**Sol:**  $E_T = E_1 + E_2$

i.e.  $\frac{hc}{\lambda_T} = \frac{hc}{\lambda_1} + \frac{hc}{\lambda_2}$

9. In a face centred cubic lattice, atom A occupies the corner positions and atom B occupies the face centre positions. If one atom of B is missing from one of the face centred points, the formula of the compound is?

1)  $\text{A}_2\text{B}_3$             2)  $\text{A}_2\text{B}_5$   
3)  $\text{A}_2\text{B}$             4)  $\text{AB}_2$

**Ans:** 2

**Sol:** After removing atoms, formula is  $\text{AB}_{5/2}$  i.e.  $\text{A}_2\text{B}_5$

10. Among the following the maximum covalent character is shown by the compound?

1)  $\text{AlCl}_3$             2)  $\text{MgCl}_2$   
3)  $\text{FeCl}_2$             4)  $\text{SnCl}_2$

**Ans:** 1

**Sol:** According to Fajan's rule

1) Polarisation  $\propto$  charge on cations  
2) In turn polarisation  $\propto$  covalent character

$\text{Al}^{+3}\text{Cl}_3, \text{Mg}^{+2}\text{Cl}_2, \text{Fe}^{+2}\text{Cl}_2, \text{Sn}^{+2}\text{Cl}_2$

$\text{AlCl}_3$  is most covalent

11. Which one of the following orders presents the correct sequence of the increasing basic nature of the given oxides?

1)  $\text{Na}_2\text{O} < \text{K}_2\text{O} < \text{MgO} < \text{Al}_2\text{O}_3$   
2)  $\text{K}_2\text{O} < \text{Na}_2\text{O} < \text{Al}_2\text{O}_3 < \text{MgO}$   
3)  $\text{Al}_2\text{O}_3 < \text{MgO} < \text{Na}_2\text{O} < \text{K}_2\text{O}$   
4)  $\text{MgO} < \text{K}_2\text{O} < \text{Al}_2\text{O}_3 < \text{Na}_2\text{O}$

**Ans:** 3

**Sol:** As electropositive character increases basic nature metal oxides increases

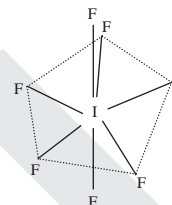
$\text{Al}_2\text{O}_3 < \text{MgO} < \text{Na}_2\text{O} < \text{K}_2\text{O}$

12. The Structure of  $\text{IF}_7$  is?

1) Octahedral  
2) Pentagonal bipyramid  
3) Square Pyramid  
4) trigonal bipyramid

**Ans:** 2

**Sol:**  $\text{IF}_7$  exhibits Pentagonal bipyramidal shape

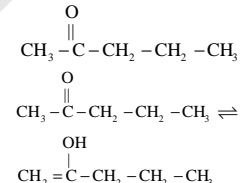


13. Identify the compound that exhibits tautomerism

1) 2-Pentanone 2) Phenol  
3) 2-Butene 4) Lactic acid

**Ans:** 1

**Sol:** 2-Pentanone



2-Pentanone present in the liquid state hence it exhibits tautomerism

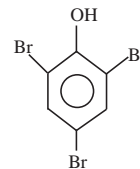
( $\text{C}_6\text{H}_5\text{O}_{11}$  is solid MP =  $42^\circ\text{C}$ )

14. Phenol is heated with a solution of mixture of KBr and  $\text{KBrO}_3$ . The major product obtained in the above reaction is:

1) 4-Bromophenol  
2) 2, 4, 6-Tribromophenol  
3) 2-Bromophenol  
4) 3-Bromophenol

**Ans:** 2

**Sol:** In aqueous medium phenol with  $\text{Br}_2$  gives tribromo phenol



15. Ethylene glycol is used as an antifreeze in a cold climate. Mass of ethylene glycol which should be added to 4 kg of water to prevent it from freezing at  $-6^\circ\text{C}$  will be : ( $K_f$  for water =  $1.86 \text{ K Kg mol}^{-1}$ , and molar mass of ethylene glycol =  $62 \text{ g mol}^{-1}$ )

1) 400.0g        2) 304.60 g  
3) 804032 g        4) 204.30 g

**Ans:** 3

**Sol:**  $\Delta T_f = i \cdot K_f \cdot m$

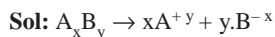
16. The degree of dissociation ( $\alpha$ ) of a weak

electrolyte,  $A_xB_y$  is related to van't Hoff factor (i) by the expression ?

$$1) \alpha = \frac{x+y-1}{i-1} \quad 2) \alpha = \frac{x+y+1}{i-1}$$

$$3) \alpha = \frac{i-1}{(x+y-1)} \quad 4) \alpha = \frac{i-1}{(x+y+1)}$$

Ans: 3



$$1 - \alpha \times \alpha \quad y\alpha$$

$$i = \frac{i-1}{(x+y+1)}$$

17. Boron cannot form which one of the following anions?

- 1)  $B(OH)_4^-$     2)  $BO_2^-$
- 3)  $BF_6^{3-}$
- 4)  $BH_4^-$

Ans: 3

Sol: Maximum covalency for any 2nd period element possible is only 4. Hence  $BF_6^{3-}$  are not possible

18. The strongest acid amongst the following compound is :

- 1)  $CH_3CH_2CH(Cl)CO_2H$
- 2)  $C(CH_2CH_2CH_2COOH)$
- 3)  $CH_3COOH$
- 4)  $HCOOH$

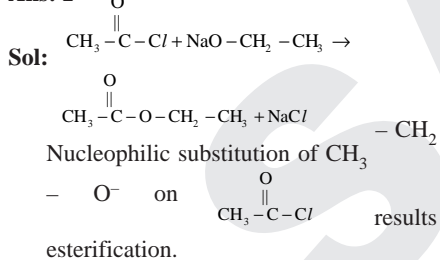
Ans: 1

Sol:  $CH_3-CH_2-\underset{\substack{| \\ Cl}}{CH}-COOH$  is the strongest acid due to -I inductive effect at  $\alpha$ -carbon

19. Sodium ethoxide has reacted with ethanoyl chloride. The compound that is produced in the above reaction is?

- 1) Ethyl Chloride
- 2) Ethyl ethanoate
- 3) Diethyl ether    4) 2 - Butane

Ans: 2

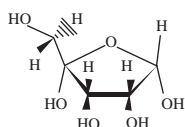
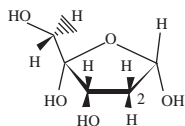


20. The presence or absence of hydroxy group on which carbon atom of sugar differentiates RNA and DNA

- 1) 3<sup>rd</sup>    2) 4<sup>th</sup>    3) 1<sup>st</sup>    4) 2<sup>nd</sup>

Ans : 4

Sol:



In DNA Deoxy ribose is present which has 2 Hydrogen atoms on the 2nd

carbon. In RNA Ribose is present

21. The outer electron configuration of Gd (Atomic.No : 64) is?

- 1)  $4f^1 5d^4 6s^2$     2)  $4f^7 5d^1 6s^2$
- 3)  $4f^3 5d^5 6s^2$     4)  $4f^8 5d^0 6s^2$

Ans : 2

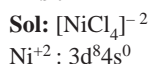
Sol: Gadolinium exhibits half filled  $f^7$  configuration.



22. The magnetic moment (spin only) of  $[NiCl_4]^{2-}$  is :

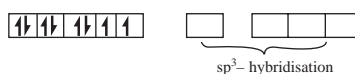
- 1) 2.82 BM    2) 1.41 BM
- 3) 1.82 BM    4) 5.46 BM

Ans : 1



$Cl^-$  is a weak ligand

have no pairing of non bonding electrons takes place



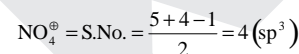
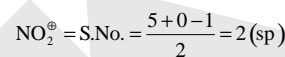
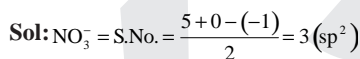
$n = 2$

hence  $\mu = \sqrt{n(n+2)} \text{ B.M}$   
 $= \sqrt{2(2+2)} = 2.82 \text{ BM}$

23. The hybridisation of orbitals of N atom in  $NO_3^-, NO_2^+$  and  $NH_4^+$  are respectively :

- 1)  $sp, sp^3, sp^2$     2)  $sp^2, sp^3, sp$
- 3)  $sp, sp^2, sp^3$     4)  $sp^2, sp, sp^3$

Ans : 4



24. Ozonolysis of an organic compound gives formaldehyde as one of the products. This confirms the presence of :

- 1) an isopropyl group
- 2) an acetylenic triple bond
- 3) two ethylenic double bonds
- 4) a vinyl group

Ans : 4

Sol: Ozonolysis of an organic compound give formaldehyde when it containing atleast one vinylic double bond.  $H_2C=CH-R$

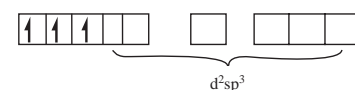
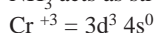
25. Which of the following facts about the complex  $[Cr(NH_3)_6]Cl_3$  is wrong?

- 1) The complex is an outer orbital complex
- 2) The complex gives white precipitate with silver nitrate solution
- 3) The complex involved  $d^2sp^3$  hybridisation and is octahedral in shape
- 4) The complex is paramagnetic

Ans: 1



$NH_3$  acts as strong ligand

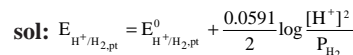


It is inner orbital complex

26. The reduction potential of hydrogen half-cell will be negative if :

- 1)  $p(H_2) = 2 \text{ atm}$  and  $[H^+] = 1.0 \text{ M}$
- 2)  $p(H_2) = 2 \text{ atm}$  and  $[H^+] = 2.0 \text{ M}$
- 3)  $p(H_2) = 1 \text{ atm}$  and  $[H^+] = 2.0 \text{ M}$
- 4)  $p(H_2) = 1 \text{ atm}$  and  $[H^+] = 1.0 \text{ M}$

Ans: 1



27. In context of the lanthanoids, which of the following statements is not correct?

- 1) Because of similar properties the separation of lanthanoids is not easy
- 2) Availability of 4f electrons results in the formation of compounds in +4 state for all the members of the series
- 3) There is a gradual decrease in the radii of the members with increasing atomic number in the series
- 4) All the members exhibit +3 oxidation state

Ans : 2

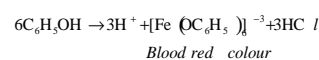
Sol: All the lanthanoids cannot form +4 oxidation state

28. Which of the following reagents may be used to distinguish between phenol and benzoic acid?

- 1) Molisch reagent
- 2) Neutral  $FeCl_3$
- 3) Aqueous NaOH
- 4) Tollen's reagent

Ans : 2

Sol:



29. Which of the following statements regarding sulphur is incorrect?

- 1) At  $600^\circ C$  the gas mainly consists of  $S_2$  molecules.
- 2) The Oxidation state of sulphur is never less than +4 in its compounds.
- 3)  $S_2$  molecule is paramagnetic
- 4) The vapour at  $200^\circ C$  consists mostly of  $S_8$  rings.

Ans : 2

Sol: Sulphur can exhibit -2, +2, +1 oxidation states also

30. Which of the following statements is wrong?

- 1) Single N - N bond is weaker than the single P - P bond.
- 2)  $N_2O_4$  has two resonance structures.
- 3) The stability of hydrides increases from  $NH_3$  to  $BiH_3$  in group 15 of the periodic table.
- 4) Nitrogen cannot form  $d\pi - p\pi$  bond.

Ans : 3

Sol: Stability of VA group hydrides decreases from  $NH_3$  to  $BiH_3$  due to the decrease in M - H bond energy  $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$