

# RAMAKRISHNA MISSION VIDYAMANDIRA

Belur Math, Howrah – 711 202

## ADMISSION TEST – 2013

### CHEMISTRY (Honours)

Date : 18-06-2013

Full Marks : 50

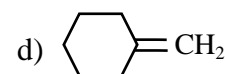
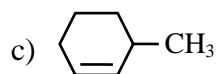
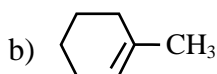
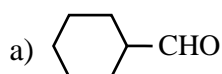
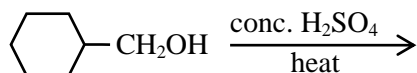
Time : 1.30 p.m – 3.30 p.m

Name : \_\_\_\_\_ Regn. No. : \_\_\_\_\_

Give tick mark(s) on appropriate answer(s) :(No negative marking)

[1×50]

1. What is the product of following reaction?



2. What is the number of primary alcohols possible with the molecular formula  $\text{C}_5\text{H}_{12}\text{O}$ ?

a) 5

b) 4

c) 3

d) 2

3. The compound 1,2-butadiene has

a) only  $\text{sp}^3$  hybridized carbon atoms

b) only  $\text{sp}^2$  hybridized carbon atom

c) both  $\text{sp}$  and  $\text{sp}^2$  hybridized carbon atoms

d)  $\text{sp}$ ,  $\text{sp}^2$  and  $\text{sp}^3$  hybridized carbon atoms

4. The C–H bond distance is the longest in

a)  $\text{C}_2\text{H}_2$

b)  $\text{C}_2\text{H}_4$

c)  $\text{C}_2\text{H}_6$

d)  $\text{C}_2\text{H}_2\text{Br}_2$

5. The two enantiomers of a compound can be separated by

a) fractional distillation

b) fractional crystallization

c) chromatographic technique

d) the use of suitable optically active reagent

6. Which of the following statements is correct?

a) +I Group stabilizes a carbocation

b) +I Group stabilizes a carbanion

c) –I Group stabilises a carbocation

d) –I Group destabilises a carbanion

7. Bromination of n-butane produces

a) 1-bromobutane as the major product

b) 2-bromobutane as the major product

c) both 1-bromo and 2-bromo products with equal percentages

d) both 1-bromo and 2-bromo products whose percentages depend upon temperature

8. The treatment of propene with  $\text{Cl}_2$  at  $500 - 600^\circ\text{C}$  produces

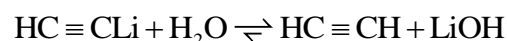
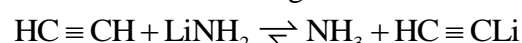
a) 1,2 – dichloropropene

b) allyl chloride

c) 2,3 – dichloropropene

d) 1,3 – dichloropropene

9. Consider the following reactions



Now, predict which of the following orders regarding base strength is correct?

a)  $\text{HC} \equiv \text{C}^- < \text{OH}^- < \text{NH}_2^-$

b)  $\text{HC} \equiv \text{C}^- < \text{NH}_2^- < \text{OH}^-$

c)  $\text{OH}^- < \text{NH}_2^- < \text{HC} \equiv \text{C}^-$

d)  $\text{OH}^- < \text{HC} \equiv \text{C}^- < \text{NH}_2^-$

10. The electrophile in aromatic nitration is

a) nitronium ion

b) nitrinium ion

c) nitrite ion

d) nitrate ion

11. Butanenitrile may be prepared by  
 a) propyl alcohol with KCN  
 b) butyl alcohol with KCN  
 c) butyl chloride with KCN  
 d) propyl chloride with KCN
12. m-chlorobenzaldehyde on reaction with conc. KOH at room temperature gives  
 a) potassium m-chlorobenzoate and m-hydroxybenzaldehyde  
 b) m-hydroxybenzaldehyde and m-chlorobenzyl alcohol  
 c) m-chlorobenzyl alcohol and m-hydroxybenzyl alcohol  
 d) potassium m-chlorobenzoate and m-chlorobenzyl alcohol
13. The treatment of  $\text{CH}_3\text{CH}_2\text{COOH}$  with chlorine in the presence of phosphorus gives  
 a)  $\text{CH}_3\text{CH}_2\text{COCl}$   
 b)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$   
 c)  $\text{CH}_3\text{CH}(\text{Cl})\text{COOH}$   
 d)  $\text{CH}_2(\text{Cl})\text{CH}_2\text{COOH}$
14. Chlorobenzene can be prepared by reacting aniline with  
 a) hydrochloric acid  
 b) cuprous chloride  
 c) chlorine in the presence of anhydrous aluminium chloride  
 d) nitrous acid followed by heating with cuprous chloride
15. The treatment of phenol with phthalic anhydride in the presence of concentrated sulphuric acid produces  
 a) aspirin  
 b) methyl red  
 c) methyl orange  
 d) phenolphthalein
16. Electronegativity values of Fe,  $\text{Fe}^{+2}$  and  $\text{Fe}^{+3}$  are in the order  
 a)  $\text{Fe} > \text{Fe}^{+2} > \text{Fe}^{+3}$   
 b)  $\text{Fe}^{+2} > \text{Fe} > \text{Fe}^{+3}$   
 c)  $\text{Fe}^{+3} > \text{Fe} > \text{Fe}^{+2}$   
 d)  $\text{Fe}^{+3} > \text{Fe}^{+2} > \text{Fe}$
17. Bohr orbit radius of H atom is approximately  $0.53\text{\AA}$ . The radius for the first excited orbit is (in  $\text{\AA}$ )  
 a) 0.265  
 b) 1.06  
 c) 1.59  
 d) 2.12
18. The total number of electrons, protons and neutrons in the product formed by the loss of one  $\alpha$ -particle from  ${}_{92}\text{U}^{238}$  is  
 a) 326  
 b) 333  
 c) 324  
 d) 332
19. The ratio of the number of g.atoms of Pb to the number of gm atoms of U in a mineral is 0.33. Assuming that all the lead has come from uranium, the age of the mineral is ( $k = 1.5 \times 10^{-10} \text{ yrs}^{-1}$ )  
 a)  $1.9 \times 10^9$  years  
 b)  $19 \times 10^9$  years  
 c)  $0.19 \times 10^9$  years  
 d)  $0.019 \times 10^9$  years
20. Which of the following has the highest dipole moment?  
 a)  $\text{NH}_3$   
 b)  $\text{PH}_3$   
 c)  $\text{SbH}_3$   
 d)  $\text{AsH}_3$
21. Which of the following species has the lowest first Ionisation energy?  
 a)  $\text{O}_2^{-2}$   
 b)  $\text{O}_2$   
 c)  $\text{O}_2^+$   
 d)  $\text{O}_2^-$
22. The molecule that has linear structure is  
 a)  $\text{NO}_2$   
 b)  $\text{SiO}_2$   
 c)  $\text{SO}_2$   
 d)  $\text{CO}_2$
23. Each carbon atom in  $\text{CaC}_2$  is  
 a) sp hybridised  
 b)  $\text{sp}^2$  hybridised  
 c)  $\text{sp}^3$  hybridised  
 d)  $\text{dsp}^3$  hybridised
24. In the extraction of Iron from Haematite ore, lime stone is added to act as  
 a) flux  
 b) slag  
 c) a reducing agent  
 d) an oxidising agent
25. Amongst the followings which one is most stable?  
 a)  $\text{BaCO}_3$   
 b)  $\text{CaCO}_3$   
 c)  $\text{MgCO}_3$   
 d)  $\text{Na}_2\text{CO}_3$
26. Which of the following halogens has the lowest bond dissociation energy?  
 a)  $\text{F}_2$   
 b)  $\text{Cl}_2$   
 c)  $\text{Br}_2$   
 d)  $\text{I}_2$
27.  $\text{F}_2$  reacts with cold dilute (2%) NaOH solution to give  
 a) NaF,  $\text{O}_2$  and  $\text{H}_2\text{O}_2$   
 b) NaF,  $\text{OF}_2$  and  $\text{H}_2\text{O}$   
 c) NaF, NaOF and  $\text{H}_2\text{O}$   
 d) NaF,  $\text{O}_2$  and  $\text{H}_2\text{O}$
28. A red crystalline solid A reacts with  $\text{HNO}_3$  to form yellow powder B which is insoluble in water. Both A and B react with HCl to form  $\text{PbCl}_2$ , A and B are respectively  
 a)  $\text{PbO}$ ,  $\text{PbO}_2$   
 b)  $\text{Pb}_3\text{O}_4$ ,  $\text{PbO}_2$   
 c)  $\text{PbO}_2$ ,  $\text{Pb}_3\text{O}_4$   
 d)  $\text{PbO}_2$ ,  $\text{PbO}$

29. A white sublimable substance that turns black on treatment with a  $\text{NH}_3$  solution can be  
 a)  $\text{Hg}_2\text{Cl}_2$                       b)  $\text{HgCl}_2$                       c)  $\text{As}_2\text{O}_3$                       d)  $\text{ZnCO}_3$
30. A mixture of  $\text{NH}_4\text{Cl}$  and  $\text{NH}_4\text{I}$  on being heated with solid  $\text{K}_2\text{Cr}_2\text{O}_7$  and conc.  $\text{H}_2\text{SO}_4$ , the solid mixture gives vapours of a dark colour which forms a yellow solution with aqueous  $\text{NaOH}$ . On acidification with acetic acid followed by treatment with lead acetate, the yellow solution gives a yellow precipitate. The dark colour vapours obtained in the above mentioned reaction is  
 a)  $\text{CrO}_2\text{I}_2$  only                      b)  $\text{CrO}_2\text{Cl}_2$  only                      c)  $\text{CrO}_2\text{Cl}_2$  and  $\text{I}_2$                       d)  $\text{CrO}_2\text{I}_2$  and  $\text{Cl}_2$

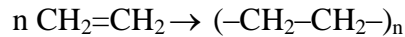
**Statement for Q31, 32 and 33:** The hydrogen like species  $\text{Li}^{+2}$  is in a spherically symmetric state  $S_1$  with one radial node. Upon absorbing light the ion undergoes transition to a state  $S_2$ , which has one radial node and energy equal to that of ground state hydrogen atom.

31. The state  $S_1$  is  
 a) 1s                      b) 2s                      c) 2p                      d) 3s
32. Energy of the state  $S_1$  in unit of hydrogen atom ground state energy is  
 a) 0.75                      b) 1.50                      c) 2.25                      d) 4.50
33. The orbital angular momentum quantum number of the state  $S_2$  is  
 a) 0                      b) 1                      c) 2                      d) 3
34. Assuming that Hund's rule is violated, the bond order and the magnetic nature of a homonuclear diatomic molecule is  
 a) 1 and diamagnetic                      b) 1 and paramagnetic                      c) 0 and diamagnetic                      d) 0 and paramagnetic

**Statement for Q35 and 36:** Two containers are connected through a tap (initially the tap was closed). Container A contains some gas at a volume  $V_1$  and pressure  $P_1$  while the container B (which has a volume  $V_2$ ) is completely empty. Suddenly the tap is opened, adiabatically. As a consequence the gas in A starts moving towards B. The process continues till both the containers get uniformly filled up by gas. The final volume and pressure of the gas is  $V_1+V_2$  and  $P$ .

35. The assumptions made during the process is/are  
 a) the collisions are elastic and interaction is there among the gas molecules  
 b) gas molecules are point mass and walls are rigid  
 c) the distance covered in between two successive collisions is free path  
 d) no heat enters or exits the chamber
36. The amount of net work done is  
 a)  $-P.V_2$                       b)  $-P(V_1+V_2)$                       c) zero                      d)  $P.V_2$
37. Which of the following statements is/are **incorrect**?  
 a) Energy of a system always decreases in a spontaneous process  
 b) Entropy of a system always decreases in a spontaneous process  
 c) Entropy of a system always increases in a spontaneous process  
 d) Entropy of the universe always increases in a spontaneous process
38. Which of the following processes is/are associated with increase of enthalpy?  
 a) the boiling of water  
 b) the condensation of water vapor  
 c) the dissociation of water into hydrogen and oxygen  
 d) the conversion of acetylene to benzene
39. Which of the following 0.1 molar aqueous solution has the highest boiling point?  
 a) urea                      b)  $\text{BaCl}_2$                       c)  $\text{KCl}$                       d)  $\text{Na}_2\text{SO}_4$
40. A law that relates the solubility of a gas to its pressure called—  
 a) the distribution law                      b) Raoult's law                      c) Henry's law                      d) Ostwald's law

41. The polymerization of ethylene to linear polyethylene is represented by the reaction



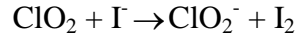
'n' being large integral value. Given that the average enthalpies of bond dissociation for C=C and C-C at 298 K are 590 and 331 kJ mole<sup>-1</sup>, respectively. The enthalpy of polymerization per mole of ethylene at 298 K is

- a) -72 kJ                      b) +921 kJ                      c) 0                      d) -195 kJ

42. In FCC metal, the no. of atoms per unit cell is—

- a) 8                      b) 14                      c) 6                      d) 4

43. In a reaction



the order of the reaction with respect to ClO<sub>2</sub> was determined by starting with a large excess of I<sup>-</sup>, so that its concentration was essentially constant. The rate = k [ClO<sub>2</sub>]<sup>m</sup> and k includes I<sup>-</sup> as constant. The following data was observed

time/sec	[ClO <sub>2</sub> ] x 10 <sup>4</sup> / (mol lit <sup>-1</sup> )
1.0	4.77
2.0	4.31
3.0	3.91
4.0	3.53

What will be the order of the reaction?

- a) 2                      b) 0                      c) 1                      d) fractional order

44. Which of the following statements is **wrong** about galvanic cells?

- a) cathode is the positive electrode  
 b) cathode is the negative electrode  
 c) electrons flow from anode to cathode in the external circuit  
 d) reduction occurs at cathode

45. With increasing temperature the equilibrium constant of a reversible reaction tends towards—

- a) 0                      b) 1                      c) -1                      d) ∞

46. How much will the potential of Zn/Zn<sup>+2</sup> change if the solution of Zn<sup>+2</sup> is diluted 10 times?

- a) increase by 0.03 V      b) decrease by 0.03 V      c) increase by 0.059 V      d) decrease by 0.059 V

47. In a compound A<sub>x</sub>B<sub>y</sub>,

- a) mole of A = mole of B = mole of A<sub>x</sub>B<sub>y</sub>  
 b) equivalent of A = equivalent of B = equivalent of A<sub>x</sub>B<sub>y</sub>  
 c) y times mole of A = x times mole of B = (x+y) times mole of A<sub>x</sub>B<sub>y</sub>  
 d) y times mole of A = x times mole of B

48. The number of moles of KmnO<sub>4</sub> that will be required to react completely with one mole of ferrous oxalate in acidic solution is

- a) 3/5                      b) 2/5                      c) 4/5                      d) 1

49. Solubility product constants (K<sub>sp</sub>) of salts of types MX, MX<sub>2</sub> and M<sub>3</sub>X at temperature T are given as 4.0 x 10<sup>-8</sup>, 3.2 x 10<sup>-14</sup> and 2.7 x 10<sup>-15</sup>, respectively. Solubilities of the salt at T are in the order

- a) MX > MX<sub>2</sub> > M<sub>3</sub>X      b) M<sub>3</sub>X > MX<sub>2</sub> > MX      c) MX<sub>2</sub> > M<sub>3</sub>X > MX      d) MX > M<sub>3</sub>X > MX<sub>2</sub>

50. An element retains 1/10<sup>th</sup> of its original radio-activity after 2.303 time-unit. The half life in the same unit is—

- a) 2.303                      b) 0.0693                      c) 0.693                      d) 0.2303