



## CHEMISTRY

## SECTION-A

1. Which one of the following compound is obtained when grignard reagent ( $\text{CH}_3\text{MgBr}$ ) is treated with water?

(1) Ethane (2) Ethyl alcohol  
(3) Methyl alcohol (4) Methane

2. The central atom of which one of the following molecules, has 3 bond pairs and 2 lone pairs of electrons in its valence shell?

(1) Boron trifluoride  
(2) Phosphorous trichloride  
(3) Chlorine trifluoride  
(4) Xenon trioxide

3. In which of the following system, doubling the volume of the container causes equilibrium to shift to the right?

(1)  $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons 2\text{HCl}(\text{g})$   
(2)  $2\text{CO}(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{CO}_2(\text{g})$   
(3)  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$   
(4)  $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$

4. Which of the following process involves the gain of energy?

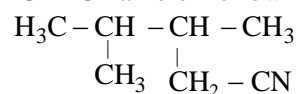
(1)  $\text{O}(\text{g}) + \text{e}^- \rightarrow \text{O}^-(\text{g})$   
(2)  $\text{Na}(\text{g}) + \text{e}^- \rightarrow \text{Na}(\text{g})$   
(3)  $\text{O}^-(\text{g}) + \text{e}^- \rightarrow \text{O}^{2-}(\text{g})$   
(4)  $\text{O}^{2-}(\text{g}) \rightarrow \text{O}^-(\text{g}) + \text{e}^-$

5. **Assertion:**  $\text{PH}_3$  is more basic than  $\text{NH}_3$ .

**Reason:** Electronegativity of N is more than phosphorus.

(1) Assertion is correct, reason is correct: reason is a correct explanation for assertion.  
(2) Assertion is correct, reason is correct; reason is not a correct explanation for assertion  
(3) Assertion is correct, reason is incorrect  
(4) Assertion is incorrect, reason is correct

6. IUPAC name of following compound is



(1) 1-Cyano-2, 3-dimethylbutane  
(2) 1-Cyano-2, 3-dimethylpentane  
(3) 2, 3-Dimethylbutanenitrile  
(4) 3, 4-Dimethylpentanenitrile

7. **Assertion:** The thermodynamic factor which determines the spontaneity of a process is the free energy. For a process to be spontaneous the free energy must be -ve.

**Reason:** The change in free energy is related to the change in enthalpy and change in entropy. The change in entropy for a process must always be positive if it is spontaneous.

(1) Assertion is correct, reason is correct; reason is a correct explanation for assertion.  
(2) Assertion is correct. reason is correct: reason is not a correct explanation for assertion.  
(3) Assertion is correct. reason is incorrect.  
(4) Assertion is incorrect, reason is correct.

8. For the reaction:  $\text{A} + 2\text{B} \rightarrow \text{C}$

5 mole of A and 8 mole of B will produce

(1) 5 mole of C (2) 4 mole of C  
(3) 8 mole of C (4) 12 mole of C

9. Match the following lists and select the correct answer:

List-I		List-II	
(A)	$1s^2, 2s^2 2p^6, 3s^2 3p^6, 4s^1$	(P)	d-Block element
(B)	$1s^2, 2s^2 2p^6, 3s^2 3p^6$	(Q)	Halogen
(C)	$1s^2, 2s^2 2p^6, 3s^2 3p^6, 3d^6, 4s^2$	(R)	Alkali metal
(D)	$1s^2, 2s^2 2p^5$	(S)	Noble gas

(1)  $\text{A} \rightarrow \text{P}, \text{B} \rightarrow \text{Q}, \text{C} \rightarrow \text{R}, \text{D} \rightarrow \text{S}$   
(2)  $\text{A} \rightarrow \text{R}, \text{B} \rightarrow \text{S}, \text{C} \rightarrow \text{P}, \text{D} \rightarrow \text{Q}$   
(3)  $\text{A} \rightarrow \text{P}, \text{B} \rightarrow \text{R}, \text{C} \rightarrow \text{Q}, \text{D} \rightarrow \text{S}$   
(4)  $\text{A} \rightarrow \text{Q}, \text{B} \rightarrow \text{S}, \text{C} \rightarrow \text{R}, \text{D} \rightarrow \text{P}$

10. For the reaction:  $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$ .

If  $\Delta U = 2.0 \text{ kcal}$ ,  $\Delta S = 50 \text{ cal K}^{-1}$  at 300 K then the value for  $\Delta G$  of the above reaction is

(1) + 12.4 kcal (2) - 12.4 kcal  
(3) - 6.4 kcal (4) + 6.4 kcal

11.  $\text{Ph}-\text{CHO} + \text{CH}_3-\text{CHO} \xrightarrow{\text{OH}^-/\Delta}$

Product obtained is

(1)  $\text{Ph}-\text{CH}=\text{CH}-\text{CHO}$   
(2)  $\text{Ph}-\text{CH}_2-\text{CH}-\text{CHO}$   

$$\begin{array}{c} | \\ \text{OH} \end{array}$$
  
(3)  $\text{CH}_3-\text{CH}_2-\text{CH}-\text{Ph}$   

$$\begin{array}{c} | \\ \text{OH} \end{array}$$
  
(4)  $\text{Ph}-\text{CH}-\text{CH}_2-\text{Ph}$   

$$\begin{array}{c} | \\ \text{OH} \end{array}$$



12. Which of the following test is not used for testing of proteins?

- (1) Million's test (2) Molisch's test  
(3) Biuret test (4) Ninhydrin test

13. The ion(s) having  $4f^{14} 5d^0 6s^0$  outer electronic configuration is/are

- (1)  $\text{Yb}^{2+}$  (2)  $\text{Lu}^{3+}$   
(3)  $\text{Yb}^{3+}$  (4) Both (1) & (2)

14. If (S)- glyceraldehyde has a specific rotation of  $-8.7^\circ$ , then what is the specific rotation of (R)- glyceraldehyde?

- (1)  $-8.7^\circ$   
(2)  $+8.7^\circ$   
(3)  $0.0^\circ$   
(4) Cannot be determined from the information given

15. Match the list-I with List-II and select the answer from the given codes:

List-I		List-II	
(A)	$\text{C(s)} + \text{O}_2\text{(g)} \rightarrow \text{CO}_2\text{(g)}$	(P)	$\Delta H = \Delta U + RT$
(B)	$\text{N}_2\text{(g)} + 3\text{H}_2\text{(g)} \rightarrow 2\text{NH}_3\text{(g)}$	(Q)	$\Delta H = \Delta U$
(C)	$\text{NH}_4\text{HS(s)} \rightarrow \text{NH}_3\text{(g)} + \text{H}_2\text{S(g)}$	(R)	$\Delta H = \Delta U - 2RT$
(D)	$\text{PCl}_5\text{(g)} \rightarrow \text{PCl}_3\text{(g)} + \text{Cl}_2\text{(g)}$	(S)	$\Delta H = \Delta U + 2RT$

- (1)  $A \rightarrow P, B \rightarrow Q, C \rightarrow R, D \rightarrow S$   
(2)  $A \rightarrow R, B \rightarrow Q, C \rightarrow P, D \rightarrow S$   
(3)  $A \rightarrow P, B \rightarrow R, C \rightarrow S, D \rightarrow Q$   
(4)  $A \rightarrow Q, B \rightarrow R, C \rightarrow S, D \rightarrow P$

16. Which of the following is the correct order?

- (1)  $\text{AsH}_3 > \text{NH}_3 > \text{PH}_3$  (Reducing property)  
(2)  $\text{H}_3\text{PO}_2 > \text{H}_3\text{PO}_3 > \text{H}_3\text{PO}_4$  (Reducing property)  
(3)  $\text{HOCl} < \text{HClO}_2 < \text{HClO}_3$  (Oxidising property)  
(4)  $\text{HF} > \text{HCl} > \text{HBr} > \text{HI}$  (Acidic strength)

17. Turn bull's blue and Prussian's blue respectively are

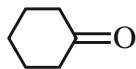
- (1)  $\text{Fe}[\text{Fe}(\text{CN}_6)]^{2-}$  and  $\text{Fe}[\text{Fe}(\text{CN}_6)]$   
(2)  $\text{Fe}[\text{Fe}(\text{CN}_6)]$  and  $\text{Fe}[\text{Fe}(\text{CN}_6)]^{2-}$   
(3)  $\text{Fe}[\text{Fe}(\text{CN}_6)]^-$  and  $\text{Fe}[\text{Fe}(\text{CN}_6)]^-$   
(4)  $\text{Fe}[\text{Fe}(\text{CN}_6)]^-$  and  $\text{Fe}[\text{Fe}(\text{CN}_6)]^-$

18. **Statement-I:** Bond order can assume any value including zero.

**Statement-II:** Higher the bond order, shorter is the bond length and greater is the bond energy.

- (1) Statement I and statement II both are correct.  
(2) Statement I and statement II both are incorrect.  
(3) Statement I is correct but statement II is incorrect.  
(4) Statement I is incorrect but statement II is correct.

19. **Statement – I:**

The IPAC name of the compound 

is cyclohexylidene methanone.

**Statement – II:**

$\text{CH}_2 = \text{C} = \text{O}$  is called ketene.

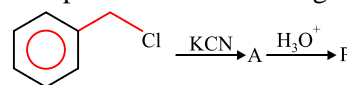
- (1) Statement I and statement II both are correct.  
(2) Statement I and statement II both are incorrect.  
(3) Statement I is correct but statement II is incorrect.  
(4) Statement I is incorrect but statement II is correct.

20. **Statement-I:** Solubility of ionic compounds in water depends on both the lattice energy and the hydration energy.

**Statement-II:** Ionic compounds dissolve in water when their hydration energy is exceeds the lattice energy.

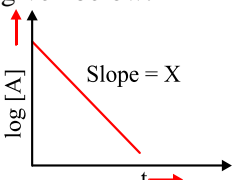
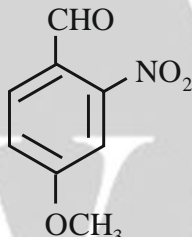
- (1) Statement I and statement II both are correct.  
(2) Statement I and statement II both are incorrect.  
(3) Statement I is correct but statement II is incorrect.  
(4) Statement I is incorrect but statement II is correct.

21. The product P in following reaction is:



- (1) 2-phenylpropanoic acid  
(2) benzoic acid  
(3) 2-phenylethanoic acid  
(4) phenylmethanoic acid



22. Among the given compounds, the compound which is oxidised to prepare methyl ethyl ketone is  
(1) tert-butyl alcohol  
(2) butan-2-ol  
(3) propan-2-ol  
(4) butanol
23. Which of the following represents the correct increasing order of acidic behaviour of the molecules given below ethyne, benzene and hexane?  
(1) Benzene < Hexane < Ethyne  
(2) Hexane < Benzene < Ethyne  
(3) Hexane < Benzene > Ethyne  
(4) Ethyne < Hexane < Benzene
24. A graph of  $\log [A]$  v/s  $t$  for first order reaction is given below.
- 
- X is equal to:
- (1)  $\frac{0.693}{k}$  (2)  $\frac{k}{2.303}$   
(3)  $-\frac{k}{2.303}$  (4)  $\log [A]_0$
25. Count the total number of S – O bonds, which are having equal length in bisulphate ion?  
(1) 3 (2) 4  
(3) 5 (4) 6
26. Which one of the following pairs of pyrimidine bases are present in DNA?  
(1) Cytosine and uracil  
(2) Cytosine and guanine  
(3) Cytosine and adenine  
(4) Cytosine and thymine
27.  $\text{CH}_3\text{CONH}_2$  and  $\text{CH}_3\text{CH}_2\text{NH}_2$  are distinguished by reacting with:  
(1) aq. NaOH and heat  
(2) aq. HCl and heat  
(3)  $\text{Br}_2$  water  
(4) acidic  $\text{KMnO}_4$
28.  $\text{H}_2\text{S}(\text{g}) \rightarrow \text{HS}^-(\text{g}) + \text{H}^+(\text{g})$ ,  $\Delta H^\circ = x_1$ ,  $\Delta H_f^\circ (\text{H}_2\text{S}(\text{g})) = x_2$ ,  $\Delta H_f^\circ (\text{H}^+(\text{g})) = x_3$   
Hence,  $\Delta H_f^\circ (\text{HS}^-)$  is:  
(1)  $x_1 + x_2 - x_3$  (2)  $x_3 - x_1 - x_2$   
(3)  $x_1 - x_2 - x_3$  (4)  $x_3 - x_1 - x_2$
29. Aqueous solution of which of the following compounds is the best conductor of electric current?  
(1) 0.1 M urea  
(2) 0.1 M glucose  
(3) 0.1 M sodium chloride  
(4) 0.1 M Barium hydroxide
30. For a reaction;  $\text{A} + 2\text{B} \rightarrow \text{Product}$ , the rate law is given as  $r = k[\text{A}][\text{B}]^2$ . If A is taken in excess, then what will be the overall order of the reaction?  
(1) 2 (2) 3  
(3) 1 (4) 0
31. Select the incorrect statement about a catalyst:  
(1) It increases the rate of reaction  
(2) It does not affect the energy of activation  
(3) It does not alter  $\Delta G$  of a reaction  
(4) It does not change the equilibrium constant of a reaction
32. The correct IUPAC name of the compound
- 
- is:
- (1) 2-formyl-5-methoxynitrobenzene  
(2) 4-formyl-3-nitroanisole  
(3) 4-methoxy-2-nitrobenzaldehyde  
(4) 4-methoxy-6-nitrobenzaldehyde
33. Correct statement(s) with respect to  $[\text{Ni}(\text{CN})_4]^{2-}$  ion is/are:  
(1) The central  $\text{Ni}^{2+}$  ion is  $\text{sp}^3$  hybridised  
(2) It is a planar complex  
(3) It is paramagnetic in nature  
(4) Both (1) and (3)
34. How many times does light travel faster in vacuum than an electron in Bohr first orbit of hydrogen atom?  
(1) 13.7 times (2) 67 times  
(3) 137 times (4) 97 times
35. Van't Hoff factor for the aqueous solution of  $\text{AlCl}_3$  is 2.8. The percentage dissociation of  $\text{AlCl}_3$  is:  
(1) 60% (2) 75%  
(3) 80% (4) 90%



### SECTION-B

36. Which of the following species has permanent dipole moment?

- (1)  $\text{BF}_3$  (2)  $\text{XeF}_4$   
(3)  $\text{PCl}_5$  (4)  $\text{ClF}_3$

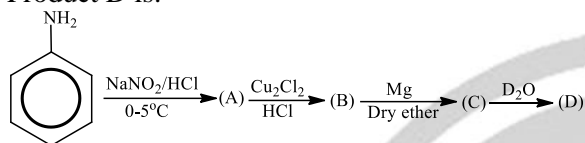
37. In which of the following molecules are all the bonds not equal?

- (1)  $\text{AlF}_3$  (2)  $\text{NF}_3$   
(3)  $\text{ClF}_3$  (4)  $\text{BF}_3$

38. Extensive property among the following is:

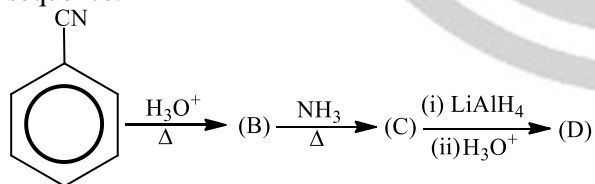
- (1) Temperature (2) Volume  
(3) Pressure (4) Density

39. Consider the following reaction sequence:  
Product D is:



- (1)
- (2)
- (3)
- (4)

40. Identify the product (D) in the following reaction sequence:



- (1)
- (2)
- (3)
- (4)

41. In the decomposition reaction of ammonia:  
 $2\text{NH}_3(\text{g}) \rightleftharpoons \text{N}_2(\text{g}) + 3\text{H}_2(\text{g})$ . 2 moles of  $\text{NH}_3$  are introduced in the vessel of 1 litre. At equilibrium, 1 mole  $\text{NH}_3$  was left, the value of  $K_C$  will be:

- (1) 0.75 (2) 0.70  
(3) 1.75 (4) 1.70

42. The freezing point of a solution containing 8.1 g of  $\text{HBr}$  in 100 g of water, assuming the acid to be 90% ionized is [ $H = 1$ ,  $Br = 80$ ,  $K_f$  for water =  $1.86 \text{ K kg mol}^{-1}$ ]

- (1)  $0.85^\circ\text{C}$  (2)  $-3.53^\circ\text{C}$   
(3)  $0^\circ\text{C}$  (4)  $-0.35^\circ\text{C}$

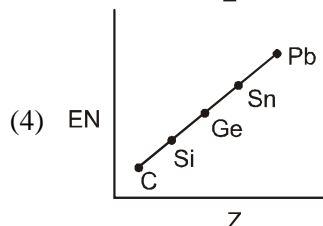
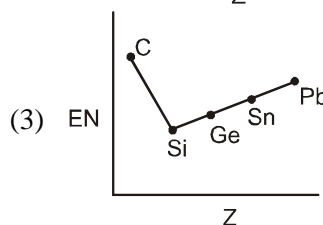
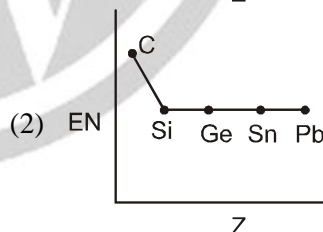
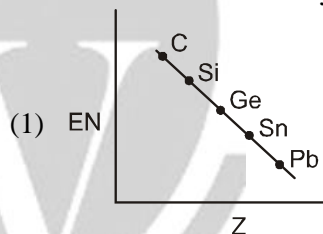
43. How many structural isomers of all the tertiary alcohols with molecular formula  $\text{C}_6\text{H}_{14}\text{O}$ ?

- (1) 2 (2) 3  
(3) 4 (4) 5

44. If the molar conductance values of  $\text{Ca}^{2+}$  and  $\text{Cl}^-$  at infinite dilution are respectively  $118.88 \times 10^{-4} \text{ m}^2 \text{ mho mol}^{-1}$  and  $77.33 \times 10^{-4} \text{ m}^2 \text{ mho mol}^{-1}$  then that of  $\text{CaCl}_2$  is: (in  $\text{m}^2 \text{ mho mol}^{-1}$ )

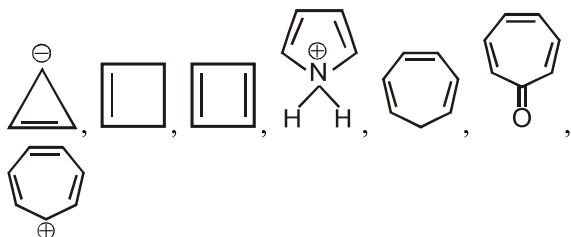
- (1)  $118.88 \times 10^{-4}$  (2)  $154.66 \times 10^{-4}$   
(3)  $273.54 \times 10^{-4}$  (4)  $196.21 \times 10^{-4}$

45. Which of the following is the correct graph for EN values of carbon family:





46. How many species out of the following are aromatic?



- (1) 2                      (2) 4  
(3) 6                      (4) 5
47. Two mole of a monoatomic ideal gas is expanded irreversibly and isothermally at T Kelvin until its volume is doubled and q Joules heat is absorbed from surrounding.  $\Delta S_{\text{total}}$  (J/K) (system + surrounding) is:
- (1) Zero                      (2)  $2R \ln 2 - q/T$   
(3)  $3R \ln 2 - q/T$                       (4)  $-2R \ln 2 + q/T$
48. An alkene gives two moles of HCHO, one mole of  $\text{CO}_2$  and one mole of  $\text{CH}_3-\text{C}(=\text{O})-\text{CHO}$  on ozonolysis.

What is its structure?

- (1)  $\text{CH}_2 = \text{CH} - \underset{\text{CH}_3}{\text{CH}} - \text{CH} = \text{CH}_2$   
(2)  $\text{CH}_2 = \text{C} = \underset{\text{CH}_3}{\text{C}} - \text{CH} = \text{CH}_2$   
(3)  $\text{CH}_3 - \underset{\text{CH}_3}{\text{C}} = \text{CH} - \text{CH} = \text{CH}_2$   
(4)  $\text{CH}_2 = \text{C} = \text{CH} - \underset{\text{CH}_3}{\text{CH}} - \text{CH} = \text{CH}_2$

49. Enthalpy of combustion of methane and ethane are  $-210 \text{ kcal/mol}$  and  $-368 \text{ kcal/mol}$  respectively.

The enthalpy of combustion of decane is

- (1)  $-158 \text{ kcal}$   
(2)  $-1632 \text{ kcal}$   
(3)  $-1700 \text{ kcal}$   
(4) Data is incomplete

50. Total vapour pressure of mixture of 1 mol of volatile component A ( $p_A^\circ = 100 \text{ mmHg}$ ) and 3 mol of volatile component B ( $p_B^\circ = 60 \text{ mmHg}$ ) is 75 mm. For such case:

- (1) There is positive deviation from Raoult's law  
(2) Boiling point has been lowered  
(3) Force of attraction between A and B is smaller than that between A and A or between B and B  
(4) All the above statements are correct

