CHEMISTRY

JEE main - Chemistry

Time Allowed: 1 hour   **Maximum Marks: 100**

General Instructions:

- All questions are compulsory.

- There are 25 questions where the first 20 questions are MCQs and the next 5 are numerical.

- You will get 4 marks for each correct response and 1 mark will be deducted for an incorrect answer.

CHEMISTRY (Section-A)

1. Maximum number of electrons that can be accommodated in shell with n = 4 are: **[4]**

   a) 50   b) 16

   c) 32   d) 72

2. Which of the following ground state electronic configuration of an atom requires the lowest energy to remove an **[4]** electron from its isolated gaseous atom?

   a) $1s^2 \, 2s^2 \, 2p^3$ b) $1s^2 \, 2s^2 \, 2p^6 \, 3s^1$

   c) $1s^2 \, 2s^2 \, 2p^6$ d) $1s^2 \, 2s^2 \, 2p^5$

3. The correct relation between K_p and Kc for the reaction $aX + bY \rightarrow bZ + aW$ is: **[4]**

   a) $K_p = \dfrac{K_c}{(a+b)^2}$ b) $K_p = K_c[RT]^{a+b}$

   c) $K_p = K_c[RT]$ d) $K_p = K_c$

4. For an adiabatic expansion of a perfect gas $\dfrac{\Delta P}{P}$ is equal to: **[4]**

   a) $\gamma \dfrac{\Delta V}{V}$ b) $-\gamma \dfrac{\Delta V}{V}$

   c) $\dfrac{\Delta V}{V}$ d) $-\gamma^2 \dfrac{\Delta V}{V}$

5. The reaction that proceeds in forward reaction: **[4]**

   a) $NH_4Cl + NaOH \rightarrow H_2O + NH_3 + NaCl$ b) $Mn^{2+} + 2H_2O + 2Cl_2 \rightarrow MnO_2 + 4H^+ + 2Cl^-$

   c) $SnCl_4 + Hg_2Cl_2 \rightarrow SnCl_2 + 2HgCl_2$ d) $S_4O_6^{2-} + 2I^- \longrightarrow 2S_2O_3^{2-} + I_2$

6. Which of the following is not an example of redox reaction?   **[4]**

   i. $CuO + H_2 \rightarrow Cu + H_2O$

   ii. $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

   iii. $2K + F_2 \rightarrow 2KF$

   iv. $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCI$

a) ii and iii   b) iv and i

c) i and ii   d) iii and iv

7. Lead pipes are corroded quickly by: **[4]**

     a) Conc. H_2SO_4 b) Dil. H_2SO_4

     c) Acetic acid   d) Water

8. In CH_3CH_2OH, the bond that undergoes heterolytic cleavage most readily is **[4]**
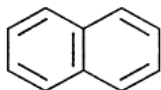
     a) O-H   b) C-C

     c) C-H   d) C-O

9. Which of the following compounds will show aromatic character? **[4]**

     I   **II**   **III**   **IV**

     a) II and IV   b) I, II and IV

     c) I and II   d) II and III

10. A 5% solution (by mass) of cane sugar in water has freezing point of 271 K and freezing point of pure water is 273.15 K. The freezing point of a 5% solution (by mass) of glucose in water is **[4]**

     a) 271 K   b) 269.07 K

     c) 273.15 K   d) 277.23 K

11. Which of the following is correct for a 10% and 20% (w/w) aqueous solution of sucrose? (K_b of water = 0.52 K kg mol^{-1}) **[4]**

a)

Solution of sucrose (w/w)	Molality (mol kg-1)	B.P. (^oC)
10%	0.32	100.167
20%	0.73	100.380

b)

Solution of sucrose (w/w)	Molality (mol kg-1)	B.P. (^oC)
10%	0.21	100.151
20%	0.92	100.337

c)

Solution of sucrose (w/w)	Molality (mol kg-1)	B.P. (^oC)
10%	0.41	99.83
20%	0.26	99.62

d)

Solution of sucrose (w/w)	Molality (mol kg^{-1})	B.P. (^oC)
10%	0.32	100.322
20%	0.073	100.782

12. Electrolysis of molten I $(CH_3COO)_3$ liberates the gases at anode and cathode in the ratio of: **[4]**

     a) 1 : 6   b) 9 : 1

     c) 6 : 1   d) 1 : 12

13. Which one is correct about order of reaction? **[4]**

| a) It is determined empirically and is not necessarily related to the stoichiometry of reaction | b) It is governed by the mechanism of the reaction, that is, by the number of species that must collide for the reaction to occur |
| c) all of these | d) It represents the dependence of reaction rate on concentration of reacting species |

14. In the atmosphere of industrial smog, copper corrodes to form: **[4]**

   a) copper nitrate

   b) copper sulphide

   c) basic copper carbonate and sulphate

   d) copper oxide

15. Which species has the maximum number of lone pair of electron on the central atom? **[4]**

   a) SnF_4

   b) $[ClO_3]^-$

   c) $[I_3]^-$

   d) XeF_4

16. Which of the following statements is correct for valence bond theory? **[4]**

   a) A definite number of vacant orbitals of metal are utilized in the coordinate bonds with ligands.

   b) All of these

   c) The coordination number is equal to the number of vacant orbitals utilized in the formation of coordinate bonds.

   d) The hybridization of metal orbitals determines the geometry of complex.

17. The major product of the following reaction is **[4]**
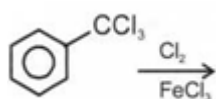
   a)

   b)

   c)

   d)

18. Match the following: **[4]**

Column A	Column B
i. Amide	a. p-$CH_3C_6H_5(OH)$
ii. Alcohol	b. $C_6H_5CH_2OCH_3$
iii. Enol	c. $C_6H_5CH_2(CH_2)_2CH = CHOH$
iv. Phenol	d. $C_2H_5CONH_2$
	e. $CH_3(CH_2)_3CH_2OH$

   a) i - b, ii - d, iii - e, iv - c

   b) i - d, ii - c, iii - e, iv - a

   c) i - d, ii - e, iii - c, iv - a

   d) i - b, ii - a, iii - e, iv - c

19. Compound (X)C_4H_8O gives positive haloform test but does not give 2, 4-DNP derivative is: **[4]**

a)

b)

c)

d)
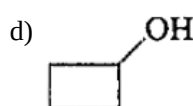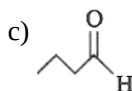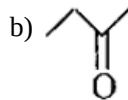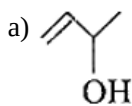
20. In which of the following molecules π-electron density in ring is maximum? **[4]**

a)

b)

c)

d)
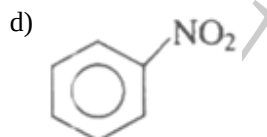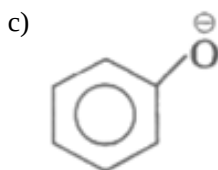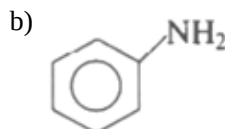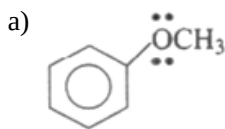
CHEMISTRY (Section-B)

21. The solubility of $CdSO_4$ in water is 8.0×10^{-4} mol L^{-1}. Its solubility in 0.01 M H_2SO_4 solution is _____ $\times$ **[4]**

10^{-6} mol L^{-1}. (Round off to the nearest integer).

(Assume that solubility is much less than 0.01 M)

22. In the ground state of atomic Fe(Z = 26), the spin-only magnetic moment is _____ $\times 10^{-1}$ BM. (Round off **[4]**

to the nearest integer).

[Given: $\sqrt{3} = 1.73, \sqrt{2} = 1.41$]

23. When 0.01 mol of an organic compound containing 60% carbon was burnt completely, 4.4 g of CO_2 was **[4]**

produced. The molar mass of compound is _____ g mol^{-1} (Nearest integer).

24. Which is/are non-existing? **[4]**

$CF_6^{2-}, BF_6^{3-}, Ne_2, AlF_6^{3-}, NCl_5, PI_6^{-}, SiF_6{}^{2-}$

25. 28.0 L of CO_2 is produced on complete combustion of 16.8 L gaseous mixture of ethene and methane at 25°C **[4]**

and 1 atm. Heat evolved during the combustion process is _____ kJ. Given:

$\Delta H_C (CH_4) = -900\,kJ\,mol^{-1}$

$\Delta H_C (C_2H_4) = -1400\,kJ\,mol^{-1}$.