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. An electronic transition from excited state to ground state in one or more steps emits 10 lines. The number of lines falling in UV spectrum are: **[4]**

   a) 5   b) 6

   c) 4   d) 3

2. The correct order of basic nature is: **[4]**

   A. $B_2O_3 < Al_2O_3 < ln_2O_3 < Tl_2O$

   B. $B_2O_3 > Al_2O_3 > ln_2O_3 > Tl_2O$

   C. $B_2O_3 < Tl_2O < Al_2O_3 < ln_2O_3$

   D. $B_2O_3 < ln_2O_3 < Tl_2O < Al_2O_3$

   a) B only   b) D only

   c) A only   d) C only

3. An aqueous solution contains 0.10 M H_2S and 0.20 M HCl. If the equilibrium constants for the formation of HS^- from H_2S is 1.0×10^{-7} and that of S^{2-} from HS^- ions is 1.2×10^{-13} then the concentration of S^{2-} ions in aqueous solution is: **[4]**

   a) 6×10^{-21} b) 5×10^{-8}

   c) 3×10^{-20} d) 5×10^{-19}

4. Which of the following statements is correct? **[4]**

   i. The presence of reacting species in a covered beaker is an example of open system.

   ii. There is an exchange of energy as well as matter between the system and the surroundings in a closed system.

   iii. The presence of reactants in a closed vessel made up of copper is an example of a closed system.

   iv. The presence of reactants in a thermos flask or any other closed insulated vessel is an example of a closed system.

a) Option (i)

b) Option (ii)

c) (iv)

d) Option (iii)

5. The pH of pure water at a given temperature is 6.8. If 100 mL of 0.02 M HCl and 100 mL of 0.02 M NH_4OH are **[4]** mixed at that temperature, the pH of mixture will be: [K_a of (NH_4^+) = 10^{-8}]

a) 4.1

b) 4.8

c) 5.4

d) 6.2

6. Which process is not involved in the reaction? **[4]**

$KO_2 + H_2O + CO_2 \longrightarrow KHCO_3 + O_2$

a) Hydrolysis

b) Non redox change

c) Acid-base reaction

d) Auto-redox

7. Litharge is chemically: **[4]**

a) PbO

b) Pb_3O_4

c) $Pb(CH_3COO)_2$

d) PbO_2

8. Arrange the following in increasing order of heat of hydrogenation : **[4]**

a) P > Q > R > S

b) Q > P > S > R

c) Q > S > R > P

d) R > S > Q > P

9. In the presence of peroxide, hydrogen chloride and hydrogen iodide do not give anti-Markownikoff's addition to **[4]** alkenes because

a) One of the steps is endothermic in both the cases

b) Both are highly ionic

c) All the steps are exothermic in both the cases

d) One is oxidising and the other is reducing

10. The vapour pressure of a dilute solution of glucose is 750 mm of Hg at 373 K. The mole fraction of solute is: **[4]**

a) $\frac{1}{35}$

b) $\frac{1}{10}$

c) $\frac{1}{76}$

d) $\frac{1}{7.6}$

11. If molality of the dilute solution is doubled, the value of molal depression constant (K_f) will be: **[4]**

a) doubled

b) tripled

c) unchanged

d) halved

12. If E_1°, E_2° and E_3° are the standard electrode potentials for $X^{2+}|X$, $X^{3+}|X^{2+}$, and $X^{3+}|X$ electrodes, respectively, **[4]** find the CORRECT relation.

a) $2E_3^\circ = 2E_2^\circ - E_1^\circ$

b) $3E_3^\circ = E_2^\circ + 2E_1^\circ$

c) $E_3^\circ = 2E_2^\circ - 3E_1^\circ$

d) $4E_3^\circ = 3E_2^\circ - 2E_1^\circ$

13. Which of the following statements is **not** correct about order of a reaction? **[4]**

a) The order of a reaction is always equal to the sum of the stoichiometric coefficients of reactants in the balanced chemical equation for a reaction.	b) Order of a reaction is experimentally determined quantity.
c) The order of a reaction can be a fractional number.	d) The order of a reaction is the sum of the powers of molar concentration of the reactants in the rate law expression.

14. The standard e.m.f. of a galvanic cell involving cell reaction with n = 2 is found to be 0.295V at 25°C. The equilibrium constant of the reaction would be: (Given F = 96500 C mol^{-1}, R = 8.314 JK^{-1} mol^{-1}) **[4]**

    a) 1.0×10^2 b) 2.0×10^{11}

    c) 1.0×10^{10} d) 4.0×10^{12}

15. The strongest oxidizing agent is _____. **[4]**
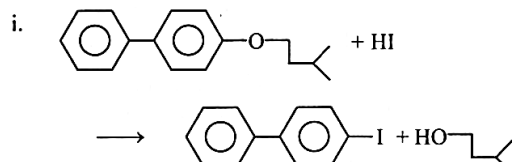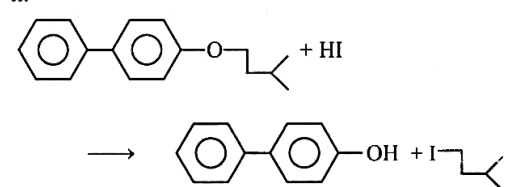
    a) F_2 b) Cl_2

    c) Br_2 d) I_2

16. A co-ordination complex has the formula $PtCl_4 2KCl$. Electrical conductance measurement indicate the presence of three ion in one formula unit. Treatment with $AgNO_3$ produces no precipitate of AgCl. What is the co-ordination number of Pt in this complex? **[4]**

    a) 5   b) 3

    c) 6   d) 4
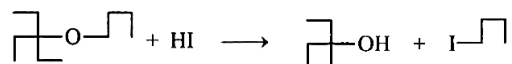
17.

The major product of the above reaction is: **[4]**
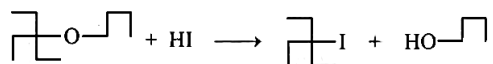
    a)   b)

    c)   d)

18. Find the incorrect reactions from the following. **[4]**

i.
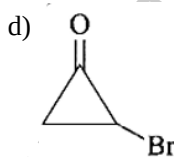
ii.

iii.
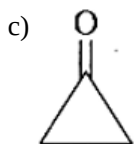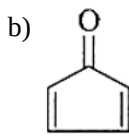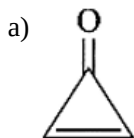

a) i, iii   b) ii, iii

c) i, iv   d) ii, iv

19. Which carbonyl compound has maximum dipole moment? **[4]**

a)   b)

c)   d)

20. Sequence of reagents required for the conversion of aniline to m-bromonitrobenzene are _____. **[4]**

a) $NaNO_2HCl/0-5^oC$, HBF_4, $NaNO_2/Cu/\Delta$, Br_2CH_3COOH

b) Br_2/CH_3COOH, $NaNO_2/HCl$ $0 - 5^oC$, $CuBr/HBr$

c) $(CH_3CO)_2/OPyridine$, Conc. HNO_3 + Conc. H_2SO_4, H_2OH+, Br_2CCl_4

d) $(CH_3CO)_2O$ Pyridine, conc. HNO_3 + Conc. H_2SO_4, H_2OH_+, $CuBrHBr$

CHEMISTRY (Section-B)

21. If the solubility product of AB_2, is 3.20×10^{-11} M^3, then the solubility of AB_2 in pure water is _____ $\times 10^{-4}$ mol L^{-1}. **[4]**

[Assuming that neither kind of ion reacts with water]

22. Acidified potassium permanganate solution oxidises oxalic acid. The spin-only magnetic moment of the manganese product formed from the above reaction is _____ B.M. (Nearest Integer) **[4]**

23. The volume of HCl, containing 73 g L^{-1}, required to completely neutralise NaOH obtained by reacting 0.69 g of metallic sodium with water, is _____ mL. (Nearest Integer) **[4]**

(Given: molar Masses of Na, Cl, O, H are 23, 35.5, 16 and 1 g mol^{-1} respectively).

24. A metallic atom that has an equal number of total s- and total p - electrons then find total vacant orbital(s) in the valence shell of that atom. **[4]**

25. The Bom-Haber cycle for KC1 is evaluated with the following data: **[4]**

$\Delta_f H^\circ$ for $KCl = -436.7$ kJ mol^{-1}; $\Delta_{sub} H^\circ$ for $K = 89.2$ kJ mol^{-1}; $\Delta_{ionization} H^\circ$ for K = 419.0 kJ mol^{-1}; $\Delta_{electron\ gain} H^\circ$ for Cl(g) = -348.6 kJ mol^{-1}; $\Delta_{bond} H^\circ$ for Cl_2 = 243.0 kJ mol^{-1}. The magnitude of lattice enthalpy of KCl in kJ mol^{-1} is _____. (Nearest integer)