1. How is lattice enthalpy related with stability of an ionic compound ?. 1

2. Calculate the mass of 0.1 mole of KNO_3 . 1

3. Define oxidising agent. 1

4. Write chemical equations to show that H_2O_2 behaves as oxidizing as well as reducing agent ? 1

5. What do you understand by photochemical smog ? 1

6. Gastric juice contains about 3g of HCl per litre. If a person produces about 2.5l of gastric juice per day, how many antacid tablets containing 400mg of Al (OH) $_3$ are needed to neutralize all the HCl produced in one day? 2

7. Chlorine is prepared in the laboratory by treating manganese dioxide (MnO_2) with aqueous hydrochloric acid according to the reaction

$$4HCl_{(aq)} + MnO_{2(s)} \rightarrow 2H_2O_{(l)} + MnCl_{2(aq)} + Cl_{2(g)}$$

How many grams of HCl react with 5.0 g of manganese dioxide?

8. Justify that the following reactions are redox reactions: 2

(a) $CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(g)$

(b) $Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$

9. What do you understand by 'Autoprotolysis of water'? 2

10. What are the reactions involved for ozone layer depletion in stratosphere ? 2

11. What volume of oxygen at N.T.P is needed to cause the complete combustion of 200 mL of acetylene ?Also calculate the volume of carbon dioxide formed . 3

12. A 25 watt bulb emits monochromatic yellow light of wavelength of 0.57μm. Calculate the rate of emission of quanta per second. 3

13. Considering the elements F, Cl, O and N, arrange them in the order of their increasing chemical reactivity in terms of oxidizing property.

OR 3

Define Electron Gain enthalpy .Would you expect the second electron gain enthalpy of O as positive, more negative or less negative than the first? Justify your answer. 3

14. (i)Discuss the shape of the following molecules using the VSEPR model:

PH_3, $SiCl_4$

(ii) Use molecular orbital theory to explain why the Be_2 molecule does not exist. 3

15. Give reasons: 3

(i) Ice floats on water .

(ii) Free rotation is not possible in pi bonds .

(iii) BeF_2 and H_2O are both tri atomic molecules but have different shapes .

16.Arrange the following : 3
(i) LiH ,NaH and CaH in order of increasing ionic character .
(ii) H-H,D-D and F-F in order of increasing order of bond dissociation enthalpy .
Give reason

17. A compound contains 4.07% hydrogen , 24.27% carbon, and 71.65% chlorine. Its molar mass is 98.96 g
What are its empirical formula and molecular formula . 3

18. Balance the following equations :

(a) MnO_4^- (aq) + SO_2 (g) → Mn^{2+} (aq) + HSO_4^- (aq) (in acidic solution)

(b) H_2O_2 (aq) + Fe^{2+} (aq) → Fe^{3+} (aq) + H_2O (l) (in acidic solution) 3

19.Neon gas is generally used in the sign boards. If it emits strongly at 616 nm, calculate
(a) the frequency of emission, (b) distance traveled by this radiation in 30 s
(c) energy of quantum and (d) number of quanta present if it produces 2 J of energy. 3

OR

19. Nitrogen laser produces a radiation at a wavelength of 337.1 nm. If the number of photons emitted is 5.6×10^{24}, calculate the power of this laser. 3

20. The first ($\Delta_i H1$) and the second ($\Delta_i H2$) ionization enthalpies (in kJ mol^{-1}) and the ($\Delta_{eg} H$) electron gain enthalpy (in kJ mol^{-1}) of a few elements are given below: 3

Elements	$\Delta_i H1$	$\Delta_i H2$	$\Delta_{eg} H$
I	520	7300	–60
II	419	3051	–48
III	1681	3374	–328
IV	1008	1846	–295
V	2372	5251	+48
VI	738	1451	–40

Which of the above elements is likely to be :

(a) the least reactive element.

(b) the most reactive metal.

(c) the most reactive non-metal.

(d) the least reactive non-metal.

(e) the metal which can form a stable binary halide of the formula MX_2, (X=halogen).

(f) the metal which can form a predominantly stable covalent halide of the formula MX (X=halogen)?

21. (i) Write postulates of Plank's Quantum Theory . (ii) Define – Photo electric effect 3

22. (i) Give the structure of $BeCl_2$ in solid phase . 1
(ii) Differentiate between Covalent radius and vanderWaal's radius. 2

23. A factory was started near a village . Suddenly villagers started feeling the presence of irritating vapours in the village and cases of headache , chest pain cough and breathing problems increased . Villagers blamed the emissions from the chimney of the factory for such problems . Explain what could have happened. Give chemical reactions for the support of your explanation. What is your view for such a problem and provide possible solution for such a problem ? 4

24. (i) Explain, giving reasons, which of the following sets of quantum numbers are **not** possible.

a $n=0 \quad l=0 \quad m_l=0 \quad m_s=+\frac{1}{2}$

b $n=1 \quad l=0 \quad m_l=0 \quad m_s=-\frac{1}{2}$

c $n=1 \quad l=1 \quad m_l=0 \quad m_s=+\frac{1}{2}$

d $n=2 \quad l=1 \quad m_l=0 \quad m_s=-\frac{1}{2}$

(ii) Write the electronic configuration of Cr^{3+} (Atomic no. of Cr = 24)
(iii) Derive deBroglie's equation .

5

OR

(i) Arrange the following orbitals in the order of their increasing energies
4s, 5p, 4d , 5s , 4f ,
(ii) What are the limitations of Bohr's atomic model (Any Two)

(iii) What happens to the kinetic energy of electrons when (i) the intensity of light falling on the metal surface is decreased (ii) frequency of light is increased . 5

25. Give reasons for the following :

(i) The electron affinities of the halogens decreases in the order Cl> F>Br>I
(ii) Nitrogen has high first ionization enthalpy than oxygen.
(iii) Ionic radius of Al^{3+} is smaller than that of Al .
(iv) The increasing order of reactivity among group 1 element is Li<Na< K< Rb< Cs whereas that of group 17 is F> Cl> Br>I
(v) The second electron gain enthalpy of an element is positive . 5

OR

(i) What are the various factors due to which the ionization enthalpy of the main group elements tends to decrease down a group?
(ii) How would you explain the fact that the first ionization enthalpy of sodium is lower than that of magnesium but its second ionization enthalpy is higher than that of magnesium?
(iii) Which of the following elements has most positive electron gain enthalpy? Give reasons for your answer. Flourine, nitrogen, neon. 5

26. (i) Which out of NH_3 and NF_3 has higher dipole moment and why?

(ii) Distinguish between a sigma and a pi bond

(iii) Draw energy level diagram for N_2 molecule . (MOT) 5

OR

26. (i) Draw diagrams showing the formation of a double bond and a triple bond between carbon atoms in C_2H_4 and C_2H_2 molecules.

(ii) Compare the relative stability of the following species and indicate their magnetic properties:

O_2^+, O_2^- (superoxide), O_2^{2-} (peroxide) 5