Roll No. .... Name ....

6P

Chemistry

Time : 3 Hrs.   **Class XI**   M.M. : 70

General Instructions :

(1)   **All questions are compulsory.**

(2)   **Question numbers 1 to 5 are very short type questions, each of 1 mark.**

(3)   **Question numbers 6 to 10 are short answer questions of 2 marks each.**

(4)   **Question numbers 11 to 22 are also short answer questions of 3 marks each.**

(5)   **Question number 23 carry 4 marks and question numbers 24 to 26 are long answer questions of 5 marks each.**

1. What will be the minimum pressure required to compress $500 dm^3$ of air at 1 bar to $200 dm^3$ at $30°C$.   1

2. Draw Lewis structures of HCOOH and CO_3^{2-}.   1

3. The following set of quantum numbers is not possible. Explain why :   1

$$n = 3, \; l = 3, \; m = -3, \; s = +\frac{1}{2}$$

4. What is the number of significant figures in $1·050 \times 10^4$?   1

5. Critical temperature for CO_2 and CH_4 are $31·1°C$ and $-81·9°C$ respectively. Which of these has stronger intermolecular forces and why ?   1

[2]

6. The increasing order of reactivity among group 1 elements is Li <Na <K <Rb <Cs whereas that among group 17 element F> Cl> Br> I. Explain. 2

7. Which hybrid orbitals are used by carbon atoms in the following molecules : 2
   (a) $CH_3 - CH_3$ (b) $CH_3CH = CH_2$
   (c) CH_3COOH (d) $CH \equiv CH$

8. Write the electronic configuration of Cu^+ and Cr^{3+} (Cu = 29, Cr = 24) 2

9. What are the four factors due to which ionisation enthalpy of main groups tends to decrease. Explain those factors. 2

10. Explain why BeH_2 molecule has a zero dipole moment although the Be–H bonds are polar ? 2

OR

Which out of the two, NH_3 and NF_3 has higher dipole moment and why ?

11. Which of the following pairs of elements would have more negative electron gain enthalpy : 3
   (a) O or F
   (b) F or Cl

12. Dinitrogen and dihydrogen react with each other to produce ammonia according to equation : 3
   $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
   Calculate the mass of ammonia produced if 200×10^3g dinitrogen reacts with 1×10^3g dihydrogen.

[3]

13. (a) State Hund's rule of maximum multiplicity and Aufbau Principle. 2
   (b) What is the lowest value of n that allows g orbital to exist ? 1

14. (a) Consider the following species : 1
   N^{3-}, O^{2-}, F^-, Na^+, Mg^{2+}, Al^{3+}
   Arrange them in order of increasing ionic radii with explanation.
   (b) Explain, why cations are smaller and anions are larger in radii than their parent atoms ? 2

15. Calculate the formal charge of each atom in O_3, $COCl_2$, NO_2^-.

16. In the reaction $A + B_2 \rightarrow AB_2$. Identify the limiting reagent, in following : 3
   (a) 300 atoms of A + 200 molecules of B
   (b) 2 mol of A + 3 mol of B_2
   (c) 5 mol of A + 2·5 mol of B_2

17. What are the frequency and wavelength of a photon emitted during a transition from n = 5 to n = 2 state in Hydrogen atom ? 3

18. Which of the following pairs of elements would you expect to have lower first ionisation Enthalpy and why : 3
   (a) Cl or F (b) Cl or S
   (c) K or Ar

19. (a) Sketch the bond moment and resultant depole moment in SO_2 and is $C_2H_2Cl_2$. 2

[4]

(b) Give reason for following statement :   1

The structure of NH_3 is pyramidal.   2+1=3

20. The drain cleaner, Drainex contains small bits of Al which reacts with caustic soda to produce H_2. What volume of dihydrogen at 20°C and 1 bar will released when 0·15g of Al reacts :   3

$$Al + 2NaOH + 2H_2O \rightarrow 2NaAlO_2 + 3H_2$$
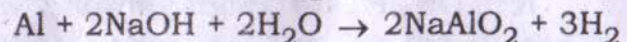
21. Butyric acid contain only C, H and O. A 4·24 mg sample of butyric acid is completely burned. It gives 8·45 mg of CO_2 and 3·46 mg of H_2O. What is the Mass percentage of each element of butyric acid ?   3

22. What is electronegativity ? Explain its trends across the period and down the group.   3

OR

(a) Give one difference between Electron gain enthalpy and electronegativity.   1

(b) Explain why :

(i) Be has higher ΔiH than B.   1

(ii) O has lower ΔiH than N and F.   1

23. Rakesh and Rohan were waiting for their chemistry class. But they learnt that their chemistry teacher was on leave that day. "Let us discuss something about chemistry" said Rakesh to Rohan. Both sat down is the park outside. "Our teacher frequently talks about atoms which we cannot see with our eyes. What should be the size and mass of an atom" asked Rohan to Rakesh. Rakesh said, "Atoms are very small in size and they possess a very small mass".

[5]

(a) What is Avogadro's number ?   2

(b) How do we express the mass of a large number of atoms ?   2

24. (a) State the reasons for stability of Half filled and fully filled configuration.   2

(b) A golf ball has a mass of 40g and a speed of 45 m/s. If the speed can be measured within the accuracy of 2%. Calculate the uncertainity in position.   3

OR

(a) Indicate the number of unpaired electrons in :   2

(i) $_{15}P$ (ii) $_{14}Si$

(iii) $_{24}Cr$ (iv) $_{26}Fe$

Also write their electronic configuration. 1

(b) The longest wavelength doublet absorption transition is observed at 589 nm and 589.6 nm. Calculate the Frequency of each transition and energy difference between two excited state.   2+3=5

25. (a) Compare the relative stability of following species on the basis of Molecular orbital theory and indicate their magnetic properties O_2^+, O_2^-. Also write configuration.   3

(b) Discuss the shape of following molecules using VSEPR :   2

PH_3 and SF_4

[6]
OR

(a) Compare the relative stability of following species on the basis of Molecular orbital theory and indicate their magnetic properties : N_2, N^+_2. Also write configurations.   3

(b) Discuss the shape of following molecules using VSEPR :   2

ClF_3 and ClF_5

26. (a) Define Charle's Law. Plot a graph V vs t °C. 2

(b) Pressure of 1g of an isolated ideal gas A at 27°C is found to be 2 bar, when 2g of another ideal gas B is introduced in the same flask at same temperature the pressure becomes 3 bar. Find a relatioinship between their molecular mass. $2+3=5$

OR

(a) Define Gay Lussac's Law. Plot its graph also.   2

(b) What will be pressure of a gaseous mixture when 0·5 L of H_2 at 0·8 bar and 2·0 L of dioxygen at 0·7 Bar are introduced in a 1 L Vessel at 27°C. $2+3=5$