



SURAJ BHAN DAV PUBLIC SCHOOL
FIRST TERM EXAMINATION-2024
CLASS XI
CHEMISTRY

10

MM:70

TIME : 3Hrs

General Instructions :

- a) There are 33 questions in this question paper
- b) Section A consists of 16 multiple choice questions carrying 1 mark each.
- c) Section B consists of 5 very short answer questions carrying 2 marks each.
- d) Section C consists of 7 short answer questions carrying 3 marks each.
- e) Section D consists of 2 case based questions carrying 4 marks each.
- f) Section E consists of 3 long answer questions carrying 5 marks each.
- g) All questions are compulsory.
- h) Use of log tables and calculators is not allowed.

Section A

1. $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
What will be the volume of CO_2 liberated at STP by oxidation of 20g of glucose?
a. 12L
 b. 22.4 L
c. 14.93 L
d. 16L
2. What is the mass percentage of silicon in 100g of sodium silicate, Na_2SiO_3 ?
[Na = 23, Si = 28, O = 16 u]
a. 16.7%
 b. 23.0%
c. 28.0%
d. 82.0%
3. The energy of first orbit of hydrogen is -13.6 eV, the energy of first orbit of He^+ will be
 a. -13.6 eV
 b. -27.2 eV
c. -54.4 eV
d. -36.0 eV
4. Which of the following pairs of d orbitals have electron density along the axis?
a. d_{z^2}, d_{zx}
 b. d_{xz}, d_{yz}
c. $d_{z^2}, d_{x^2-y^2}$
d. $d_{zy}, d_{x^2-y^2}$

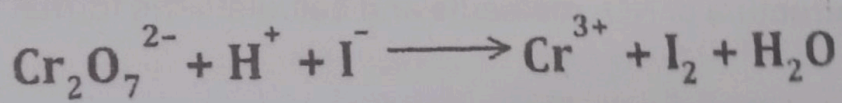
5. Lanthanum ($Z = 57$ u), belongs to which period and block of the modern periodic table?
- 6th period, d block
 - 6th period, f block
 - 7th period, d block
 - 7th period, f block
6. The IUPAC name of the element with $Z = 120$ u is
- Unbinilium
 - Ununillium
 - Unbillium
 - Ununoctium
7. Glycerol is a highly viscous liquid due to
- Covalent bonding
 - H bonding
 - Ionic bonding
 - Van der Waals' forces of attraction
8. π -bond is formed by
- p_z - p_z overlapping along internuclear axis
 - p_x - p_z overlapping perpendicular to internuclear axis
 - s- p overlapping
 - p_x - p_x overlapping perpendicular to internuclear axis
9. Which of the following has highest covalent character?
- LiCl
 - LiBr
 - LiF
 - LiI
10. Which of the following is T shaped?
- SF_4
 - ClF_3
 - I_3^-
 - PCl_3
11. The correct decreasing order of boiling point of HF, H_2O and NH_3 is
- $HF > H_2O > NH_3$
 - $H_2O > HF > NH_3$
 - $NH_3 > HF > H_2O$
 - $H_2O > NH_3 > HF$
12. In KO_2 , the average oxidation state of oxygen is.
- 1
 - 2
 - 1/2
 - 0

For Question numbers 13 to 16 two statements are given – one labelled Assertion (A) and the other labelled Reason (R) . Select the correct answer to these questions from the codes (a) , (b) , (c) and (d) , as given below :

- 13 a. Both Assertion (A) and Reason (R) are correct statements , and Reason (R) is the correct explanation of the Assertion (A).
 b. Both Assertion (A) and Reason (R) are correct statements but Reason (R) is not the correct explanation of the Assertion (A).
 15 c. Assertion (A) is correct but Reason (R) is incorrect statement.
 14 d. Assertion (A) is incorrect but Reason (R) is correct statement.
13. **Assertion (A)** : Molarity does have unit , that is , molL⁻¹
Reason (R) : Molarity does not change with temperature.
14. **Assertion (A)** : 4f orbital is filled before 3d orbital
Reason (R) : Orbitals are filled with electrons according to Aufbau's principle.
15. **Assertion (A)** : Ionic radius of Na⁺ is smaller than Na
Reason (R) : Effective nuclear charge of Na⁺ is higher than Na
16. **Assertion (A)** : In HF oxidation state of F is -1
Reason (R) : F being most electronegative will show -1 oxidation state in its compound

Section B

17. Bromine has two naturally occurring isotopes .One of them ⁷⁹Br has a mass of 78.9u and an abundance of 50.5%. Calculate atomic mass of other isotope , that is ⁸¹Br. Average atomic mass of Br is 79.9 g mol⁻¹.
18. With the help of molecular orbital theory , show that N₂ molecule has a triple bond and O₂ molecule has a double bond.
19. The threshold frequency for a metal is 7.0 x 10¹⁴ s⁻¹. Calculate the Kinetic energy of an electron emitted when radiation of frequency 1.0 x 10¹⁵ s⁻¹ hits the metal.
20. Balance the following ionic equation.



21. The first and second ionization enthalpies and the electron gain enthalpy, all in kJ mol⁻¹, of the three elements are given below :

Element	$\Delta_i H_1$	$\Delta_i H_2$	$\Delta_{eg} H$
I	419	3051	-48
II	1681	3374	-328
III	1008	1846	-295

Which of the above elements is likely to be :

- a. The most reactive metal *Element II*
 b. The most reactive non metal *Element I*

Section C

22. Commercially available conc. HCl contains 45% HCl by mass.

- What is the molarity of this solution? The density is 1.19 g/mL
- What volume of conc. HCl is required to make 1.00 L of 0.24 M HCl?

23. a. An atom of an element contains 24 electrons and 28 neutrons. Deduce the number of protons, number of nucleons and write the electronic configuration of the element.

b. State Hund's rule.

24. a. Show that the circumference of the Bohr orbit for the Hydrogen atom is an integral multiple of the de Broglie wavelength associated with the electron revolving around the orbit.

c. An electron is in one of the 5f orbitals. Give the possible values of n, l and m_l for this electron.

25. Give reason for the following:

- Electron gain enthalpy of fluorine is less negative than that of chlorine.
- Anionic radius is always more than that of neutral atom.
- Ionization enthalpy of phosphorus is more than that of Sulphur.

26. a. Draw a diagram to show the formation of σ and π bonds in ethyne molecule.

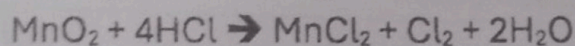
c. Bond angle in dimethyl ether, having molecular formula, $\text{CH}_3 - \text{O} - \text{CH}_3$ is more than in H_2O . Justify.

27. a. Both NH_3 and NF_3 molecules are pyramidal in shape and have one lone pair of electrons each, but dipole moment of NH_3 is more than that of NF_3 . Explain.

b. Write the Lewis structure of NO_2 molecule and calculate the formal charge on nitrogen atom.

28. a. Give one example of disproportionation reaction.

b. Identify the oxidizing and reducing agent in the following reaction:



N = 7
O = 8

Section D

The following questions are case - based questions. Read the passage carefully and answer the questions that follow.

29. Mole concept is the most important in all aspects of chemistry. one mole of every gas at STP occupies 22.4 L of volume. Amount of product formed in a chemical reaction depends on limiting reagent which is present in smaller amount than required by balanced chemical equation. One mole of substance contains 6.022×10^{23} particles. Atomic mass expressed in 'u' is mass of 1 atom whereas atomic mass expressed in grams is mass of 6.022×10^{23} atoms. Molarity equation $M_1V_1 = M_2V_2$ is not universally applicable in neutralization reaction. It depends upon basicity of acid and acidity of base.

- What is the mass of 5.6 L of O_3 at STP?
- 500 mL of 1 M solution is diluted to 5000 mL, what will be the molarity of resultant solution?
- 8.0 g of Mg is burnt in 2.0 g of O_2 . How much MgO will be formed?
[Mg=24 u, O= 16 u]

30. Observe the table given below and answer the following questions.

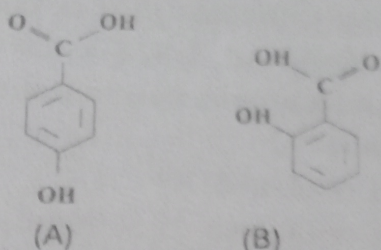
Group	1	2	13	14	15	16	17
Formula of Hydride	LiH NaH KH	CaH_2	B_2H_6 AlH_3	CH_4 SiH_4 GeH_4 SnH_4	NH_3 PH ₃ AsH ₃ SbH ₃	H ₂ O H ₂ S H ₂ Se H ₂ Te	HF HCl HBr HI
Formula of oxide	Li_2O Na_2O K_2O	MgO CaO SrO BaO	B_2O_3 Al_2O_3 Ga_2O_3 In_2O_3	CO_2 SiO_2 GeO_2 SnO_2 PbO_2	N_2O, N_2O_5 P_2O_5, P_4O_{10} As_2O_3, As_2O_5 Sb_2O_3, Sb_2O_5 Bi_2O_3	SO_2 SeO_2 TeO ₂	ClO_2

- Which oxide in group 14 is acidic in nature?
- In group 1, which oxide is most basic as shown in the table.
- (i) What is the nature of Cl_2O_7 and As_2O_3 ? *acidic, basic*
(ii) How many valence electrons are there in group 15 elements? *-3*

Section E

31. a. Yellow light emitted from a sodium lamp has a wavelength of 580 nm. Calculate the frequency and wave number of the yellow light. (2)
- b. What is the wavelength of light emitted when the electron in a hydrogen atom undergoes transition from an energy level with $n=4$ to an energy level with $n=2$?
[$R=109677 \text{ cm}^{-1}$] (3)

32. a. Structures of molecules of two compounds are given below: (2)



- (i) Name the type of H-bonding present in (A) and (B).
- (ii) Which of the above two compounds will show higher melting point.

- b. Arrange the following bonds in order of increasing ionic character. Give reason to support your answer. (2)

N-H, F-H, C-H and O-H

- d. Write the shapes associated with sp^3d and dsp^2 hybrid orbitals. (1)

33. a. Write the general electronic configuration of 'f' block elements. (1)

- b. Electron gain enthalpy values of inert gases are zero. Why? (1)

- c. Arrange the following species in decreasing order of size.
 O^{2-} , F^- , Mg^{2+} , Na^+ , N^{3-} (1)

- d. Why the number of elements in first period is only two? (1)

- e. Predict formula of stable binary compound that would be formed by the given pair of elements: element with atomic no. 56 and oxygen (1)

N, O, F, Na, Mg