SAMPLE PAPER TERM -1 EXAMINATION, 2019-2020
CLASS – XI
CHEMISTRY

Time Allowed : 3 Hours **Max. Marks-70**

General Instructions:

1. ***All questions are compulsory. There are 37 questions in all.***
2. ***The question paper has four section : Section –A, Section-B, Section-C and Section D.***
3. ***Section –A contains 20 questions of one mark. Section B contains 7 questions of two marks , Section-C contains 7 questions of three marks and Section –D contains 3 question of five marks each.***
4. ***There is no overall choice(s) . However , an internal choice (s)has been provided in 2 questions of two marks, 2 questions of three marks and all three questions of 5 marks. You have to attempt only one of the choices in such questions.***
5. ***Use of calculator is not permitted . You may ask for logarithmic tables, if required.***

SECTION-A

1. Express 32.392800 to four significant figures. **(1)**

2. Why are Bohr's orbits called stationary states? **(1)**

3. How many electrons are present in 16g of methane? **(1)**

4. What volume of 12M HCl will be required to prepare 0.15M HCl in 500 mL? **(1)**

5. Which of the two is more ionic - NaCl or NaI and why? **(1)**

6. Which orbital does not have directional characteristics? **(1)**

7. Which among the following has linear geometry?

a) CO_2 b) H_2S c) O_3 d) SO_2 **(1)**

8. Which one of the following contains ionic, covalent and coordinate bonds? represented by **(1)**

a) NaOH b) NaCl
c) NaCN d) NaNC

9. Which of the following angle corresponds to sp2 hybridisation? **(1)**

a) 90^0 b) 180^0
c) 109^0 d) 120^0

10. A vessel contains 4.4 g of CO_2. It contains _____ moles of CO_2. **(1)**

11. Which of the following pairs are chemically dissimilar?

a) Na and K b) Ba and Sr c) Ca and Zn d) Cu and Ni **(1)**

12. Which of the following is not correct for Boyle's law at 27^0C?

a) P=380 mm Hg, V = 100 mL b) P=1 atm, V = 0.05 L

c) P=1 atm, V = 0.5 dm^3 d) P= 190 mm Hg, V = 0.2 dm^3 **(1)**

13. If a gas expands at constant temperature, it indicates that

a) KE of molecules decreases b) pressure of the gas increases
c)K.E. of the molecules remains same d) number of molecules of the gas increases **(1)**

14. A gas expands from a volume of 1 m^3 to a volume of 2m^3 against an external pressure of 10^5 N m^{-2}. The work done by the gas will be

a) 10^5 kJ b) 10^2 kJ c) 10^2 J d) 10^3 J **(1)**

15. Write the equation of state for real gases. **(1)**

16. Under which of the following condition is the relation $\Delta H = \Delta U + P\Delta V$ valid for a closed system?

a) Constant temperature b) constant temperature and pressure
c)constant pressure d) constant temperature, pressure and composition **(1)**

17. State whether the following properties are extensive or intensive: **(1)**
a) Pressure b) Molar heat capacity

18. Which is not true about the noble gases?
a. They are non metallic in nature
b. They exist in atomic form
c. They are radioactive in nature
d. Xenon is the most reactive among these **(1)**

19. Which one of the following is incorrect statement?
a) Ionisation enthalpy of nitrogen is greater than that of chlorine.
b) Electron gain enthalpy of fluorine is greater than that of chlorine.
c) Ionisation enthalpy of Be is greater than that of boron
d) Electronegativity of fluorine is greater than that of chlorine. **(1)**

20. Assign the oxidation number to the underlined elements :- **(1)**
a) $\underline{P}O_4^{3-}$ b) $\underline{S}_2O_3^{2-}$

SECTION-B

21. Give reason: "Although geometries of ammonia and water molecules are distorted tetrahedral, bond angle in water is less than that of ammonia". Also draw both the structures. **(2)**

22. A sample of drinking water was found to be severely contaminated with chloroform $CHCl_3$ which is carcinogenic in nature. The level of contamination was 15 ppm (by mass).

i) Express this in per cent by mass.
ii) Determine the molarity of chloroform in the water sample.

OR

a) Define mole. What is the SI unit of mole?
b) Write any two drawbacks of Dalton's atomic theory. **(2)**

23. a) First member of each group of representative element shows anomalous behaviour. Illustrate with an example.

b)Arrange the elements N, P, O and S in the order of increasing first ionisation enthalpy. Justify your answer. **(2)**

24. Density of a gas is found to be 5.46 g/dm^3 at 27^{0}C and at 2 bar pressure. What will be its density at STP?

OR

Give reasons:
i. Evaporation causes cooling.
ii. Vapour pressure of acetone is less than that of ether at same temperature. **(2)**

25. Calculate the formal charge on
i) S in HSO_4^- ii) Cl in $HClO_4$ **(2)**

26. a) Define molar heat capacity.
b)Defferentiate between reversible and irreversible processes in thermodynamics. **(2)**

27. a) Calculate the number of radial and angular nodes in 4d orbital.
b)Draw the shapes of following orbitals
i) an orbital with l=0
ii) an orbital with l=1 **(2)**

SECTION-C

28. Chlorine is prepared in the laboratory by treating manganese dioxide (MnO2) with aqueous HCl according to the reaction,
$4HCl\ (aq) + MnO_2\ (s) \rightarrow 2H_2O\ (l) + MnCl_2\ (aq) + Cl_2(g)$
How many gram of HCl reacts with 5.0 g of MnO_2? **(3)**

29. i). With the help of molecular orbital diagrams explain which of the two is more stable H_2^+or H_2^- and why?
ii). All bonds in PCl_5 are not equal. Explain.

OR

What are bonding and anti bonding molecular orbitals? Draw the molecular orbital diagram of He_2 molecule and explain if this molecule exists or not. **(3)**

30. a) Write the significance of Vander Waals constants ?
b) Calculate the total pressure in a mixture of 8g of dioxygen and 4 g of dihydrogen confined vessel of $1m^3$ **(3)**

31. a) A compound on analysis was found to contain C = 34.6%, H = 3.85% and O = 61.55. Calculate its empirical formula.
b)What is the difference between empirical and molecular formula? **(3)**

32. a) Write the electronic configuration of V^{4+} (At. No =22) and Zn^{2+} (At. No. =30).

b) What designation is given to an orbital having :
i) n=3,l=1 ii) n=4 , l=2 **(1+2=3)**

33. a) Balance the following equation in acidic medium
$Cr_2O_7^{2-}(aq) + SO_{2(g)} \longrightarrow Cr^{3+}(aq) + SO_4^{2-}(aq)$
b)Justify that the reaction following reaction is a redox reaction.
$2Cu_2O(s) + Cu_2S(s) \rightarrow 6Cu(s) + SO_2(g)$ **(2+1=3)**

34. Explain the following on the basis of Valence bond theory. Draw the structures also.
a) BF_3 is planar but NH_3 is not.
b) CCL_4 and $SiCl_4$ are tetrahedral

OR

a) Show the resonance structures of ozone molecule.
b) Discuss the shapes of following molecules on the basis of VSEPR theory.
i) AsF5 ii) BCl_3 **(1+2=3)**

SECTION-D

35. a) Explain the shape of SF_6 molecule on the basis of hybridization.

b)What will be the effect of hydrogen bonding on following properties of a substance:-

i) Solubility

ii) volatility

c) What is the hybrid state of each carbon atom in the following molecule

i) CH_3-CH=CH_2

OR

a) Using the concept of hybridization explain the structure of ethene molecule.

b)Arrange the following in order of

i) increasing N-O bond length

ii) increasing bond angles

NO_2^+, NO_2^-, NO_3^-. Give reasons.

c) Though Cl has nearly same electronegativity as N, yet there is no H-bonding in HCl. Why? **(2+2+1=5)**

36. a) State the principle that suggests the presence of only two electrons in an orbital.

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 the two excited states. (Planck's constant=6.63×10^{-34} J s).

OR

a) What kind of information about an electron in an atom is obtained from its wave function?

b) A microscope using suitable photons is employed to locate an electron in an atom within a distance of 0.1 Å. What is the uncertainty involved in the measurement of its velocity? (Planck's constant=6.63×10^{-34} J s). **(2+3=5)**

37. a) Comment on the thermodynamic stability of NO(g) given

½ N2 (g) + ½ O2 (g) □ NO (g) ; Δr H = 90 kJ/mol

NO (g) + ½ O2 (g) □ NO2 (g) ; Δr H =-74 kJ/mol

b)Calculate the entropy change in the surroundings when 1.00 mol of H2O (l) is formed under standard conditions. Δf H = -286 kJ/mol

c)Predict the spontaneity of the reaction When ΔH > 0 and ΔS < 0 **(2+1+1=5)**

OR

a) Calculate the standard enthalpy of formation of one mole of CH3OH (l), if the combustion of one mole of methanol takes place at 298 K and 1 atm and after combustion CO2 (g) and H2O (l) are produced and 726 kJ of heat is liberated. Assume that the standard enthalpies of formation of CO2 (g) and H2O (l) are -393 kJ/mol and -286 kJ mol respectively.

b) Derive the relationship between ΔH and ΔU for an ideal gas. Explain each term involved in the equation. **(3+2=5)**