HALF YEARLY

CLASS 11 - CHEMISTRY

Time Allowed: 3 hours **Maximum Marks:** 70

	Section A	
1	Molecular mass is the a) maximum of atomic masses of the elements present in a molecule b) minimum of atomic masses of the elements present in a molecule c) average of atomic masses of the elements present in a molecule d) sum of atomic masses of the elements present in a molecule	**[1]**
2	Which of the following represents the SI unit for heat capacity? a) J s^{-1} b) J K^{-1} mol $^{-1}$ c) J C^{-1} d) J K^{-1}	**[1]**
3	The mass of an atom of nitrogen in amu is, a) $\frac{28}{6.023\times10^{23}}$ b) $\frac{1}{6.023\times10^{23}}$ g c) $\frac{14}{6.023\times10^{23}}$ d) 14 amu	**[1]**
4	Find the energy of the photons which correspond to light of frequency 3×10^{15} Hz (Hint: h = Planck's constant = 6.626×10^{-34} Js). a) 1.308×10^{-18} J b) 2.988×10^{-18} J c) 0.988×10^{-18} J d) 1.988×10^{-18} J	**[1]**

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5	**Assertion (A):** In case of isoelectronic ions the ionic size increases with the increase in atomic number. **Reason (R):** The greater the attraction of nucleus, greater is the ionic radius. a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) Both A and R are false.	**[1]**
6	Which important property did Mendeleev use to classify the elements in his periodic table? a) Atomic weight b) Atomic number c) Atomic mass d) Melting point	**[1]**
7	Dietary calcium from various dairy and food products are essential for healthy bones. X - 90, a radioactive isotope, a component of waste generated by nuclear power facilities enters our body through ingestion. Our body mistakes X for Ca incorporating it into our bones which results in increased risk of leukaemia and other cancers. Which of the following could possibly be X? a) Rb b) Sr c) Po d) Th	**[1]**
8	**Assertion (A):** Nuclear charge does not affect the ionization potential of the atom. **Reason (R):** Nuclear charge tells about the stability of configuration. a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) Both A and R are false.	**[1]**
9	The species having pyramidal shape is:	**[1]**

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	a) SF_2O b) BrF_3 c) SiO_3^{2-} d) SO_3	
10	Rank the following bonds in order of increasing polarity: H - N, H - O, H - C. a) H - C < H - N < H - O. b) H - C < H - O < H - N. c) H - O < H - N < H - C d) H - N < H - O < H - C	**[1]**
11	The electronic configurations of three elements, A, B and C are given below. A $1s^2 2s^2 2p^6$ B $1s^2 2s^2 2p^6 3s^2 3p^3$ C $1s^2 2s^2 2p^6 3s^2 3p^5$ Stable form of **A** may be represented by the formula: a) A_2 b) A_3 c) A d) A_4	**[1]**
12	The correct decreasing order of the boiling points of given compounds is a) HF > H_2O > NH_3 b) NH_3 > H_2O > HF c) NH_3 > HF > H_2O d) H_2O > HF > NH_3	**[1]**
13	**Assertion (A):** $PbCl_2$ is more stable than $PbCl_4$. **Reason (R):** $PbCl_4$ is powerful oxidising agent. a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.	**[1]**

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	c) A is true but R is false. d) A is false but R is true.	
14	Suppose that 1.00 kJ of heat is transferred to 2.00 mol argon (at 298 K, 1 atm). What will the final temperature T_f be if the heat is transferred at constant pressure? a) 301 K b) 335 K c) 322 K d) 376 K	**[1]**
15	The entropy change can be calculated by using the expression $\Delta S = \frac{q_{rev}}{T}$ When water freezes in a glass beaker, choose the correct statement amongst the following: a) ΔS (system) decreases and ΔS (surroundings) also decreases. b) ΔS (system) decreases but ΔS (surroundings) increases. c) ΔS (system) decreases but ΔS (surroundings) remains the same. d) ΔS (system) increases but ΔS (surroundings) decreases.	**[1]**
16	**Assertion (A):** A process for which $\Delta S_{system} > 0$ as well as $\Delta H > 0$ passes from non - spontaneous to spontaneous state as temperature is increased. **Reason (R):** At higher temperature, $T\Delta S$ exceeds ΔH . a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	**[1]**
	Section B	
17	Write an expression for molarity and molality of a solution.	**[2]**
18	Which of the following are isoelectronic species i.e., those having the same number of electrons? Na^+ , K^+ , Mg^{2+} , Ca^{2+} , S^{2-} , Ar	**[2]**
19	The atomic number of an element is 16. Determine its position in accordance to its electronic configuration.	**[2]**
20	Draw the structure of the following species ClO_4^- .	**[2]**

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21	Graphically show the total work done in an expansion when the state of an ideal gas is changed reversibly and isothermally from (p_t , V_t) to (p_f , V_f). With the help of a pV plot compare the work done in the above case with that carried out against a constant external pressure p_f .	**[2]**
	Section C	
22	The vapour density of a mixture of NO_2 and N_2O_4 is 38.3 at 27°C. Calculate the number of moles of NO_2 in 100 g of the mixture.	**[3]**
23	1. Assuming the density of water to be 1g/cm^3 , calculate the volume occupied by one molecule of water. 2. Assuming the water molecule to be spherical, calculate the diameter of the water molecule. 3. Assuming that oxygen atom occupies half of the volume occupied by the water molecule, calculate approximately the diameter of the oxygen atom. **OR** 10 mL of a solution of NaCl containing KCl, gave an evaporation 0.93 g of the mixed salt. This salt - mixture gave 1.865 g of AgCl by reacting with Ag NO_3 solution. Calculate the quantity of NaCl in 10 mL of the solution. Given: Atomic masses Ag = 108, Cl = 35.5, K =39.0, N = 14.0, O = 16.0	**[3]**
24	Explain giving reasons, which of the following sets of quantum numbers are not possible. 1. n = 0, l = 0, m_l = 0, m_s = +1/2 2. n = 1, l = 0, m_l = 0, m_s = - 1/2 3. n = 1, l = 1, m_l = - 0, m_s = +1/2 4. n = 2, l = 1, m_l = 0, ms = - 1/2 5. n = 3, l= 3, m_l = - 3, m_s = +1/2 6. n = 3, l = 2, m_l = 0, m_s = +1/2	**[3]**
25	What are the limitations of Rutherford model of atoms? **OR** Calculate the wave number for the longest wavelength transition in the Balmer atomic hydrogen.	**[3]**

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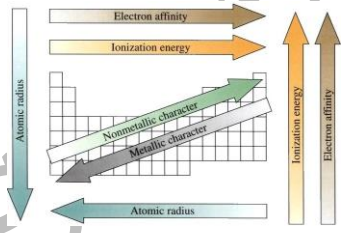
26	Use periodic table to answer the following questions: Identify the element with five electrons in the outer sub - shell. **OR** What is screening or shielding effect? How does it influence the ionization enthalpy?	**[3]**
27	Arrange the following sets of molecules in the decreasing order of bond angle. 1. SF_6 , CCI_4 , H_2O, NH_3 2. CH_4 , NH_3 , H_2O, BF_3 3. H_2O, BEH_2 , $AICI_3$, BeH_2 H_2S	**[3]**
28	10 moles of an ideal gas expand isothermally and reversibly from a pressure of 5 atm to 1 atm at 300 K. What is the largest mass that can be lifted through a height of 1 m by this expansion?	**[3]**
	Section D	
29	**Read the following text carefully and answer the questions that follow:** A qualitative measure of the ability of an atom in a chemical compound to attract shared electrons to itself is called electronegativity. Unlike ionization enthalpy and electron gain enthalpy, it is not a measurable quantity. However, a number of numerical scales of electronegativity of elements viz., Pauling scale, Mulliken - Jaffe scale, Allred - Rochow scale have been developed. In 1922 assigned arbitrarily a value of 4.0 to fluorine, the elements considered to have the greatest ability to attract electrons. The electronegativity of any given element is not constant; it varies depending on the element to which it is bound. Though it is not a measurable quantity, it does provide a means, strong tendency to gain electrons.  Therefore, electronegativity is directly related to the non - metallic properties of elements. It can be further extended to say that electronegativity is inversely related to the metallic properties of elements. Thus, the increase in electronegativities across a period is accompanied by an increase in non - metallic properties (or decrease in metallic properties) of elements 1. What is the increasing order of electronegativity in N, C, P, Si?(1) 2. What is the Increasing order of atomic radii Li, Na, K, Rb, Cs? (1)	**[4]**

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	3. Why oxygen has lower ionization enthalpy than nitrogen? (2) **OR** What happens to metallic character down the group? (2)	
30	**Read the following text carefully and answer the questions that follow:** Entropy is the measure of degree of randomness or disorderness in an isolated system and is represented by the symbol S. Greater the degree of randomness, higher is the entropy. In case of chemical reactions, it shows the rearrangement of atoms or ions from one pattern in the reactants to another (in the products). If the structure of product is more disordered as compared to reactants, entropy of the reaction increases and if the structure of reactant is more disordered as compared to products, it results in decreased entropy. Entropy is also a state function, i.e. depends only on initial and final states of a system, so entropy change can be given as : $\Delta S = S_2 - S_1 = \Sigma S_{products} - \Sigma S_{reactants}$ 1. If the temperature of crystalline solid is raised from 0 K to 115K what is the change in entropy? (1) 2. Predict the dissolution of NH_4Cl in water. (1) 3. Predict whether the entropy increases/decreases when liquid crystallize into a solid. (2) **OR** Why enthalpy of graphite is lower than that of diamond? (2)	**[4]**
	Section E	
31	A compound made up of two elements A and B has A = 70 %, B = 30 %. Their relative number of moles in the compound are 1.25 and 1.88. Calculate 1. atomic masses of the elements A and B 2. molecular formula of the compound, if its molecular mass is found to be 160. **OR** A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38 g carbon dioxide, 0.690 g of water and no other products. A volume of 10.0 L (measured at S.T.P) of this welding gas is found to weigh 11.6 g. Calculate	**[5]**

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	1. empirical formula, 2. molar mass of the gas, and 3. molecular formula.	
32	What were the weaknesses or limitations of Bohr's model of atoms? Briefly describe the quantum mechanical model of atom? **OR** Indicate the number of unpaired electrons in: 1. P 2. Si 3. Cr 4. Fe and 5. Kr.	**[5]**
33	How is molecular orbital different from atomic orbital? Give electronic configuration of 1. H_2^+ 2. Li_2 3. B_2 4. C_2 . Calculate their bond order and predict their magnetic behaviour. **OR** Use the molecular orbital energy level diagram to show that N_2 would be expected to have a triple bond, F_2 , a single bond, and Ne_2 , no bond.	**[5]**

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