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Jars Education

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Time : 1 Hour 15 Minute

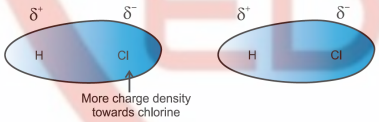
STD 11 Science Chemistry
Chapter Based Test

Total Marks : 40

SECTION A

* **Choose The Right Answer From The Given Options.[1 Marks Each]** **[5]**

1. Which is a more volatile liquid?
   (A) C_2H_5OH (B) CH_3COOH
   (C) $C_2H_5OC_2H_5$ (D) $C_2H_5OC_2H_5$
2. How does the surface tension of a liquid vary with increase in temperature?
   (A) Remains same. (B) Decreases.
   (C) Increases. (D) Increases.
3. Which of the following mixtures of gases does not obey Dalton's law of partial pressure?
   (A) O_2 and CO_2 (B) N_2 and O_2
   (C) Cl_2 and O_2 (D) Cl_2 and O_2
4. Consider the following figure:



   Which one of the following interactions is shown between the two HCl molecules?
   (A) Dipole-dipole interaction. (B) Ion-dipole interaction.
   (C) London forces. (D) London forces.
5. The kinetic theory of matter helped a great deal in understanding the behaviour of gases. Which of the following statements did not belong to it?
   (A) When the gas is heated by raising its temperature the molecules move faster
   (B) The molecules in a gas are always moving
   (C) Gases are made up of small particles called molecules
   (D) Gases are made up of small particles called molecules

* **Answer The Following Questions In One Sentence.[1 Marks Each]** **[6]**

6. Out of ethyl alcohol or Dimethyl ether, which one have higher vapour pressure at same temperature?
7. Define the term normal boiling point of a liquid.
8. Explain why Boyle's law cannot be used to calculate the volume of a real gas when it is converted from its initial state to final state by an adiabatic expansion.
9. Define aqueous tension.
10. The tyre of automobile is inflated to lesser pressure in summer than in winter. Why?

11. Why are liquids like ether and acetone kept in cool places?

SECTION B

*** Given Section consists of questions of 2 marks each.** **[6]**

1. Name the energy which arises due to motion of atoms or molecules in a body. How is this energy affected when the temperature is increased?
2. Explain the effect of increasing the temperature of a liquid, on intermolecular forces operating between its particles, what will happen to the viscosity of a liquid if its temperature is increased?
3. Define inversion temperature of a gas.

SECTION C

*** Given Section consists of questions of 3 marks each.** **[9]**

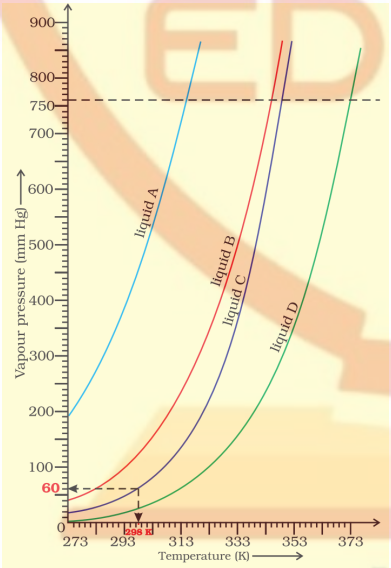
1. Calculate the pressure exerted by 1.00mol of $CO_2(g)$ at 298K that occupies 65.4mL using van der Waals' equation.

   'a' for CO_2 is 3.592 L^2bar/ mol^2,

   'b' = 0.0427L mol^{-1}.

   Compare it with the pressure predicted by ideal gas equation for the same conditions of T and P?

2. The variation of vapour pressure of different liquids with temperature is shown in Fig.



   a. Calculate graphically boiling points of liquids A and B.
   b. If we take liquid C in a closed vessel and heat it continuously. At what temperature will it boil?
   c. At high altitude, atmospheric pressure is low (say 60 mm Hg). At what temperature liquid D boils?
   d. Pressure cooker is used for cooking food at hill station. Explain in terms of vapour pressure why is it so?

3. A mixture of CO and CO_2 is found to have a density of 1.50gL^{-1} at 20°C and 740mm pressure. Calculate the composition of the mixture.

SECTION D

* Case study based questions [4]

1. Read the passage given below and answer the following questions from (i) to (v).

Chemical properties of a substance do not change withthe change of its physical state; but rate of chemicalreactions do depend upon the physical state. Many timesin calculations while dealing with data of experiments werequire knowledge of the state of matter. Therefore, itbecomes necessary for a chemist to know the physical laws which govern the behaviour of matter indifferent states. Intermolecular forces are the forces ofattraction and repulsion between interactingparticles (atoms and molecules). This termdoes not include the electrostatic forces thatexist between the two oppositely charged ionsand the forces that hold atoms of a moleculetogether i.e., covalent bonds.Attractive intermolecular forces are knownas van der Waals forces, in honour of Dutchscientist Johannes van der Waals (1837-1923) . van der Waals forces vary considerablyin magnitude and include dispersion forcesor London forces, dipole-dipole forces, anddipole-induced dipole forces. A particularlystrong type of dipole-dipole interaction ishydrogen bonding. Only a few elements canparticipate in hydrogen bond formation, therefore it is treated as a separatecategory.

Atoms and nonpolar molecules are electricallysymmetrical and have no dipole momentbecause their electronic charge cloud issymmetrically distributed. But a dipole maydevelop momentarily even in such atoms andmolecules. The temporary dipoles of two different atomattract each other. Similarly temporary dipolesare induced in molecules also. This force ofattraction was first proposed by the Germanphysicist Fritz London, and for this reasonforce of attraction between two temporary dipoles is known as London force. dispersion force forces are always attractive and interactionenergy is inversely proportional to the sixthpower of the distance between two interactingparticles (i.e.,$1/r^6$ where r is the distancebetween two particles). These forces areimportant only at short distances (~500 pm)and their magnitude depends on thepolarisability of the particle.

Dipole-dipole forces act between the moleculespossessing permanent dipole. Ends of thedipoles possess “partial charges” and thesecharges are shown by Greek letter delta (δ).Partial charges are always less than the unitelectronic charge (1.6×10^{-19} C). The polarmolecules interact with neighbouringmolecules. This interactionis stronger than the London forces but isweaker than ion-ion interaction because onlypartial charges are involved. The attractiveforce decreases with the increase of distancebetween the dipoles. As in the above case herealso, the interaction energy is inverselyproportional to distance between polarmolecules. Dipole-dipole interaction energybetween stationary polar molecules is proportional to $1/r^3$ and thatbetween rotating polar molecules is proportional to $1/r^6$, where r is the distancebetween polar molecules.

Dipole–Induced Dipole Forcesare type of attractive forces operate betweenthe polar molecules having permanent dipoleand the molecules lacking permanent dipole.Permanent dipole of the polar moleculeinduces dipole on the electrically neutralmolecule by deforming its electronic cloud. Thus an induced dipole is developedin the other molecule. In this case alsointeraction energy is proportional to $1/r^6$where r is the distance between twomolecules. Induced dipole moment dependsupon the dipole moment present in thepermanent dipole and the polarisability of theelectrically neutral molecule.

i. Partial charges are always less than the unit electronic charge:
   a. (1.6×10^{-19} C)
   b. (1.6×10^{-18} C)
   c. (1.6×10^{-17} C)

d. $(1.6\times10^{-16}$ C)

ii. Temporary dipoles are induced in molecules also. ,this force of attraction was first proposed by:
   a. Johannes van der Waals
   b. Fritz London
   c. Robert Boyle
   d. Joseph Lewis Gay Lussac

iii. Atoms and nonpolar molecules are electrically:
   a. Compositional
   b. Unsymmetrical
   c. Symmetrical
   d. All the above

iv. Partial Charges denoted by greek letter ....
   a. $\in$
   b. ζ
   c. δ
   d. η

v. The attractive force ... with the ... of distance between the dipoles.
   a. Increase, increase
   b. Decrease, decrease
   c. Increase, decrease
   d. Decreases, increase

SECTION E

*** Given Section consists of questions of 5 marks each.** **[10]**

1. In terms of Charles' law explain why –273 °C is the lowest possible temperature.

2.
   a. Define an ideal gas.
   b. Define boiling point of a liquid.
   c. Which will have higher viscosity Glycerol or ethylene glycol and why?
   d. What are real gases?
   e. What do you understand by the term laminar flow?

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