UNIT 5

STATES OF MATTER

Each question carries one score

1) Name the gas law that relates pressure and volume ?

Ans : Boyle's law

2)Which gas law is represented by an isobaric plot ?

Ans :Charle's law

3) If 22.4 L of H_2 contains 6.022×10^{23}molecules at STP, What will be the number of molecules present in the same volume of NH_3 at STP ?

Ans : 6.022×10^{23} molecules

4] Under what conditions of temperature and pressure do real gases approach ideal behaviour ?

Ans : low pressure, high temperature

5] Name the scale of temperature starting at -273˚C

Ans : Kelvin scale or absolute scale of temperature

6] In the ideal gas equation (pV = nRT), what does R represent ?

Ans : Universal gas constant

7] What is the temperature at which a real gas obeys ideal gas law over an appreciable range of pressure ?

Ans : Boyle temperature or Boyle point

8] For any gas pV/nRT = Z. What does Z represent ?

Ans : compressibility factor

9] What is the Ideal gas equation modified for real gases called ?

Ans : van der Waals' equation

10] The size of weather balloons increases at higher altitudes. Name the gas law involved.

Ans : Boyle's law

Each question carries 2 score

11] Derive the Ideal gas equation

Ans : By Boyle's law……. V α 1/p (Equation 1), when T is constant

By Charle's law…… V α T (Equation 2) , when p is constant

By Avogadro's law….. V α n (equation 3) , when p and T are constant

From equations 1,2 and 3

V α nT/p

V = nRT/p [R is universal gas constant]

pV = nRT [This is the Ideal gas equation]

12] State the gas law represented by the expression $p_1 V_1 = p_2 V_2$

Ans: It is the representation of Boyle's law. It states that at a given temperature the volume of the given mass of gas is inversely proportional to its pressure.

13] Give the vander Waals' equation. What are the units of constants 'a'

and 'b' ?

Ans: $(p + n^2a/v^2) (V-nb) = nRT$

Unit of a : atm L^2 mol^{-2}

unit of b : L mol^{-1}

14) Which are the two faulty assumptions made in the kinetic theory of gases?

Ans:i)There is no intermolecular attraction between the gas molecules

ii) The volume of the gas molecules is negligible compared to the total volume of the container

15) Derive a relationship between density and molar mass of a gas

Ans: pV = nRT----------By Ideal gas equation

n = w/M , where w is the mass of gas and M is the molecular mass of the gas.

pV = wRT/M

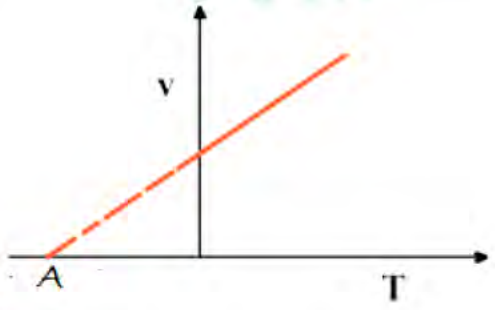
p = wRT/MV (but w/V = d)

M =dRT/P

16) A child observes bubbles rise in a large fish tank. What would be the change in size of the rising bubbles and why?

Ans: The bubbles would increase in size. This is because the pressure is more at the bottom of the tank .So as the pressure decreases the Volume of bubbles increase in accordance to Boyle's law

17) Name the law represented by the following graph. Give the significance of point marked 'A'



Ans: The graph represents Charle's law

The point 'A' is absolute zero or zero kelvin or -273˚C . At this temperature the gas is supposed to occupy zero volume.

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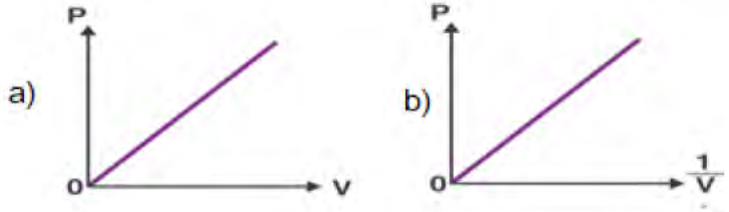

Which of the above graphs correctly represents Boyle's law. Give a mathematical representation of Boyle's law

Ans: Graph 'b' represents Boyle's law

$p_1V_1=p_2V_2$

19) V litres of a gas that fills a large room can be compressed into a small cylinder. Justify the statement

Ans: According to the kinetic theory of gases gas molecules have no intermolecular attraction. Hence they are separated by a large distance. This makes them highly compressible

20) Match the following

A	B
a) Isotherm	i) Charle's law
b) Isobar	ii) high *p*, low T
c) Real gas	iii) Boyle's law
d) Ideal gas	iv) low P, high T

Ans: a-iii , b-i , c-ii , d-iv

Each question carries 3 score

21) What are the causes for the deviation of real gases from ideal behaviour?

Ans: This is due to the two faulty assumptions of the kinetic theory of gases that can be explained as follows

i) Gases have no intermolecular attraction. Molecules do have attraction with each other or the gases would not liquefy under high pressure.

ii) The volume occupied by each gas molecule is negligible compared to the total volume of the container. Under high pressure ,the volume occupied by the gas molecule is very low. Hence its volume may not be considered negligible.