MODEL SCHOOL NANGAVALLI

UNIT TEST 6

11th Standard

Date : 05-Sep-18

Chemistry   Reg.No. :

USING BLUE OR BLACK PEN ONLY

Time : 01:00:00 Hrs   Total Marks : 75

PART - A   15 x 1 = 15

1) Gases deviate from ideal behavior at high pressure. Which of the following statement(s) is correct for non-ideality?

   (a) at high pressure the collision between the gas molecule become enormous

   (b) at high pressure the gas molecules move only in one direction

   (c) at high pressure, the volume of gas become insignificant

   (d) at high pressure the intermolecular interactions become significant

2) Rate of diffusion of a gas is

   (a) directly proportional to its density   (b) directly proportional to its molecular weight

   (c) directly proportional to its square root of its molecular weight

   (d) inversely proportional to the square root of its molecular weight

3) Which of the following is the correct expression for the equation of state of van der Waals gas?

   (a) $\left(P + \frac{a}{n^2 V^2}\right)(V - nb) = nRT$ (b) $\left(P + \frac{na}{n^2 V^2}\right)(V - nb) = nRT$

   (c) $\left(P + \frac{an^2}{V^2}\right)(V - nb) = nRT$ (d) $\left(\frac{P + n^2 a^2}{V^2}\right)(V - ab) = nRT$

4) When an ideal gas undergoes unrestrained expansion, no cooling occurs because the molecules

   (a) are above inversion temperature   (b) exert no attractive forces on each other

   (c) do work equal to the loss in kinetic energy   (d) collide without loss of energy

5) Equal weights of methane and oxygen are mixed in an empty container at 298 K. The fraction of total pressure exerted by oxygen is

   (a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) $\frac{2}{3}$ (d) $\frac{1}{3} \times 273 \times 298$

6) The temperatures at which real gases obey the ideal gas laws over a wide range of pressure is called

   (a) Critical temperature   (b) Boyle temperature   (c) Inversion temperature   (d) Reduced temperature

7) A bottle of ammonia and a bottle of HCI connected through a long tube are opened simultaneously at both ends. The white ammonium chloride ring first formed will be

   (a) At the center of the tube   (b) Near the hydrogen chloride bottle   (c) Near the ammonia bottle

   (d) Throughout the length of the tube

8) The value of universal gas constant depends upon

   (a) Temperature of the gas   (b) Volume of the gas   (c) Number of moles of the gas

   (d) units of Pressure and volume.

9) The value of the gas constant R is

   (a) 0.082 dm^2 atm.   (b) 0.987 cal mol^{-1}K-1   (c) 8.3 J mol^{-1} K^{-1} (d) 8 erg mol^{-1} K^{-1}

10) Use of hot air balloon in sports at meteorological observation is an application of

   (a) Boyle's law   (b) Newton's law   (c) Kelvin's law   (d) Brown's law

11) The table indicates the value of van der Waals constant 'a' in $(dm^3)^2$ atm. mol^{-2}.

Gas	O_2	N_2	NH_3	CH_4
a	1.360	1.390	4.170	2.253

The gas which can be most easily liquefied is

(a) O_2 (b) N_2 (c) NH_3 (d) CH_4

12) Consider the following statements

i) Atmospheric pressure is less at the top of a mountain than at sea level

ii) Gases are much more compressible than solids or liquids

iii) When the atmospheric pressure increases the height of the mercury column rises.

Select the correct statement

(a) I and II   (b) II and III   (c) I and III   (d) I, II and III

13) Compressibility factor for CO_2 at 400 K and 71.0 bar is 0.8697. The molar volume of CO_2 under these conditions is

(a) $22.04\,dm^3$ (b) $2.24\,dm^3$ (c) $0.41\,dm^3$ (d) $19.5\,dm^3$

14) If temperature and volume of an ideal gas is increased to twice its values, the initial pressure P becomes

(a) 4P   (b) 2P   (c) P   (d) 3P

15) At identical temperature and pressure, the rate of diffusion of hydrogen gas is $3\sqrt{3}$ times that of a hydrocarbon having molecular formula C_nH_{2n-2}. What is the value of n ?

(a) 8   (b) 4   (c) 3   (d) 1

<div align="center">PART - B   6 x 2 = 12</div>

Answer six questions. Question No. 24 is compulsory. Answer any five from the remaining.

16) Suppose there is a tiny sticky area on the wall of a container of gas. Molecules hitting this area stick there permanently. Is the pressure greater or less than on the ordinary area of walls?

17) Which of the following gases would you expect to deviate from ideal behavior under conditions of low-temperature F_2, Cl_2, or Br_2? Explain.

18) Distinguish between diffusion and effusion.

19) Aerosol cans carry clear warning of heating of the can. Why?

20) Why do astronauts have to wear protective suits when they are on the surface of moon?

21) When ammonia combines with HCl, NH_4Cl is formed as white dense fumes. Why do more fumes appear near HCl?

22) Write a short note on the consequence of Boyle's law. (or) Give the relationship between pressure and density

23) When a real gas is converted from its initial to final state by adiabatic expansion, it is not possible to calculate its volume using Boyle's law. Why?

24) Calculate the pressure exerted by 2 moles of sulphur hexafluoride in a steel vessel of volume $6\,dm^3$ at 70°C assuming it is an ideal gas.

<div align="center">PART - C   6 x 3 = 18</div>

Answer six question. Question No. 32 compulsory. Answer any 5 form the remaining

25) State Boyle's law.

26) A balloon filled with air at room temperature and cooled to a much lower temperature can be used as a model for Charle's law.

27) Name two items that can serve as a model for Gay Lusaac' law and explain.

28) Give the mathematical expression that relates gas volume and moles. Describe in words what the mathematical expression means.

29) What are ideal gases? In what way real gases differ from ideal gases.

30) Give suitable explanation for the following facts about gases.
   (a) Gases don't settle at the bottom of a container.
   (b) Gases diffuse through all the space available to them
   (c) Explain with an increase in temperature.

31) Suggest why there is no hydrogen (H_2) in our atmosphere. Why does the moon have no atmosphere?

32) When the driver of an automobile applies brake, the passengers are pushed toward the front of the car but a helium balloon is pushed toward back of the car. Upon forward acceleration the passengers are pushed toward the front of the car. Why?

33) In the below figure, let us find the missing parameters [volume in (b) and pressure in (c)]
   $P_1 = 1$ atm, $P_2 = 2$ atm, $P_3 = ?$ atm
   $V_1 = 1 dm^3$, $V_2 = ? dm^3$, $V_3 = 0.25 dm^3$
   $T_1 = 298$ K, $T_2 = 298$ K, $T_3 = 298$ K.

Fig. (a)   Fig. (b)   Fig. (c)
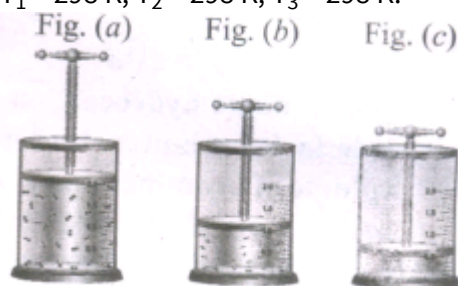
<center>PART - D</center>   5 x 5 = 25
<center>**Answer all five questions**</center>

34) a) Write the Van der Waals equation for a real gas. Explain the correction term for pressure and volume.

<center>**(OR)**</center>

   b) Derive the values of vanderwaals equation constants in terms of critical constants.

35) a) A sample of gas at 15°C at 1 atm. has a volume of 2.58 dm^3. When the temperature is raised to 38°C at 1 atm does the volume of the gas increase? If so, calculate the final volume.

<center>**(OR)**</center>

   b) Derive the ideal gas equation by combining the empirical gas laws.

36) a) In an experiment of verification of Charle's law, the following are the set of readings taken by a student.

Experiment	Volume (L)	Temperature (^{0}C)
1	1.54	20
2	1.65	40
3	1.95	100
4	2.07	120

   What is the average value of the constant of proportionality?

<center>**(OR)**</center>

   b) A neon-di-oxygen mixture contains 70.6 g of di-oxygen and 167.5 g of neon. If the pressure of the mixture of gases in the cylinder is 25 bar, what is the partial pressure of di-oxygen and neon in the mixture? (Atomic mass of Ne=20u)

37) a) Solve

Figure a
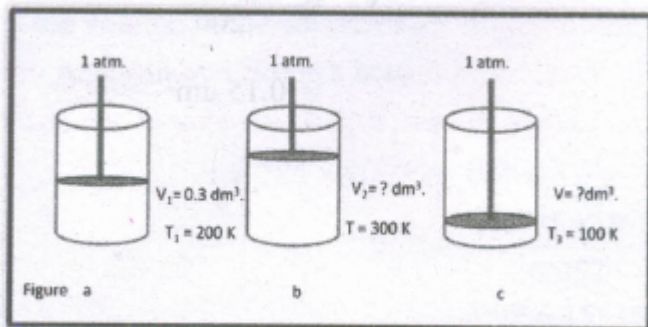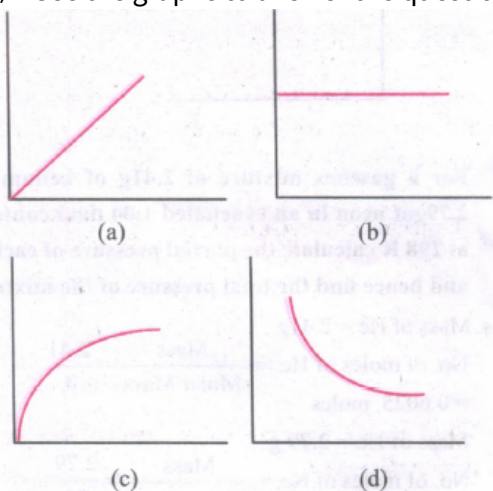
Effect of temperature on volume of the gas to verify Charles law All the container a, b and c have same pressure of 1 atm. If T_1, T_2, and T_3 are, respectively, at 200, 300 and 100 K, and $V_1 = 0.3$ dm^3, calculate V_2 and V_3.

(OR)

b) Use the graphs to answer the question below.

i) Which of the graphs is the best representation of pressure and temperature (measured I kelvin) for one mole of ideal gas

ii) Which of the graphs is the best representation of pressure and volume of one mole of an ideal gas.

iii) Which of the above graph represents PV vs P of one mole of an ideal gas?

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4	2.07	120

What is the average value of the constant of proportionality?

(OR)

b) Which of following flasks has higher pressure
(a) 5.00 L containing 4.15 g of Helium at 298 K
(b) 10.0 L containing 56.2 g Argon at 303 K

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