Shiksha Classes Bhandara

Subject : Chemistry **Topic : Gaseous State** **M.M. : 100**

Marking Scheme:

(i) Each question is allotted 4 (four) marks for each correct response.

(ii) ¼ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

Q.1 For a monoatomic gas, kinetic energy = E. The relation with rms velocity is –
(A) $u = (2E/M)^{1/2}$ (B) $u = (3E/2M)^{1/2}$
(C) $u = (E/2M)^{1/2}$ (D) $u = (E/3M)^{1/2}$

Q.2 Which of the following mixture when burnt to produce $CO_2(g)$ and H_2O (ℓ), will cause a 40% reduction in volume
(A) 10ml $C_3H_6O_2$ + 50ml O_2
(B) 40ml $C_2H_2O_4$ + 60ml O_2
(C) 10ml C_3H_8 + 110ml O_2
(D) 20ml C_2H_6O + 80ml O_2

Q.3 Find the temperature at which 3 moles of SO_2 will occupy a volume of 10 litres at a pressure of 15 atms. a = 6.71 atm lit^2 mol^{-2} , b = 0.0564 lit mol^{-1}
(A) 350.5724ºC (B) 250.5724ºC
(C) 150.5724ºC (D) 450.5724ºC

Q.4 A vessel of volume 0.02 m^3 contains a mixture of hydrogen and helium at 20°C and 2 atm pressure. The mass of mixture is 5 gms. Find the ratio of mass of hydrogen to that of helium in the mixture
(At. wt. He = 4)
(A) 1 : 2 (B) 1 : 3
(C) 2 : 3 (D) 3 : 2

Q.5 The average, RMS and most probable speed of gas molecules at STP increase in the order
(A) RMS < average speed < most probable speed
(B) Most probable speed < average speed < RMS
(C) Average speed < RMS < most probable speed
(D) RMS < most probable speed < average speed

Q.6 Equal volumes of SO_2 and He at a temperature T and pressure P are allowed to effuse through a hole. The rate of effusion of helium is
(A) Equal to the rate of effusion of SO_2
(B) Four times the rate of effusion of SO_2
(C) Half of the rate of effusion of SO_2
(D) Twice the rate of effusion of SO_2

Q.7 Flask X is filled with 20g of CH_4 gas at 100°C and another identical flask Y with 40g O_2 gas at the same temperature. Which one of the following statements is correct –
[Molar masses (g mol^{-1}) CH_4 = 16.0, O_2 = 32.0]
(A) The pressure of the gases in the two flasks are identical.
(B) The pressure of CH_4 in flask X is higher than that of O_2 in flask Y.
(C) The pressure of CH_4 in flask X is lower than that of O_2 in flask Y.
(D) The pressure of CH_4 in flask X is half that of O_2 in flask Y.

Q.8 Joule-Thomson expansion of an ideal gas is an
(A) Isothermal process (B) Isobaric process
(C) Isoenthalpic process (D) Ideal process

Q.9 The rate of effusion of helium gas at a pressure of 1000 torr is 10 torr min^{-1} What will be the rate of effusion of hydrogen gas at a pressure of 2000 torr at the same temperature?
(A) 20 torr min^{-1} (B) 40 torr min^{-1}
(C) $20\sqrt{2}$ torr min^{-1} (D) 10 torr min^{-1}

Q.10 Oxygen is present in 1-litre flask at a pressure of 7.6×10^{-10} mmHg. Calculate the number of oxygen molecules in the flask at 0ºC.
(A) 2.686×10^{10} (B) 26.86×10^{10}
(C) 0.626×10^{12} (D) 4.123×10^{8}

Q.11 The compressibility of a gas is less than unity at STP. Therefore –
(A) $V_m > 22.4$ L (B) $V_m < 22.4$ L
(C) $V_m = 22.4$ L (D) $V_m = 44.8$ L

Q.12 One litre flask contains air, water vapour and a small amount of liquid water at a pressure of 200 mm Hg. If this is connected to another 1 litre evacuated flask. What will be the final pressure of the gas mixture at equilibrium? Assume the temperature to be 50ºC. Aqueous tension at 50ºC.
Aqueous tension at 50ºC = 93 mm Hg.
(A) 126.5 mm. (B) 146.5 mm.
(C) 312.5 mm. (D) 178.5 mm.

Q.13 Since the atomic weights of C, N and O are 12, 14 and 16 respectively, among the following pair, the pair that will diffuse at the same rate is-
(A) Carbon dioxide and nitrous oxide
(B) Carbon dioxide and nitrogen peroxide
(C) Carbon dioxide and carbon monoxide
(D) Nitrous oxide and nitrogen peroxide

Q.14 If the pressure of a given mass of gas is reduced to half and temperature is doubled simultaneously, the volume will be-
(A) Same as before (B) Twice as before
(C) Four time as before (D) One fourth as before

Q.15 The r.m.s. velocity of hydrogen is $\sqrt{7}$ times the r.m.s. velocity of nitrogen. If T is the temperature of gas
(A) $T(H_2) = T(N_2)$ (B) $T(H_2) > T(N_2)$
(C) $T(H_2) < T(N_2)$ (D) $T(H_2) = \sqrt{7}\ T(N_2)$

Q.16 Calculate the temperature at which average speed of H_2 equals that of O_2 at 320 K.
(A) 12.75 K (B) 18.75 K
(C) 16.15 K (D) 8.23 K

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Q.17 A closed vessel contains equal number of nitrogen and oxygen molecules at pressure of P mm. If nitrogen is removed from the system, then the pressure will be-

(A) P (B) 2P

(C) P/2 (D) P^2

Q.18 At low pressure, the vander waals equation is written as :

(A) $Z = 1 - \frac{a}{RTV}$ (B) $Z = 1 - \frac{RTV}{a}$

(C) $Z = 1 + \frac{a}{RTV}$ (D) $Z = 1 + \frac{RTV}{a}$

Q.19 At the start of an experiment, one end of a U tube of 6 mm glass tubing is immersed in concentrated ammonia solution and the other end is immersed in concentrated hydrochloric acid solution. At the point in the tube where vapours of NH_3 and HCl, meet, a white cloud of $NH_4Cl(s)$ forms. At what fraction of distance along the tube from the ammonia solution does the white cloud first form ?

(A) 0.295 (B) 0.595

(C) 0.395 (D) 0.995

Q.20 20% of N_2O_4 molecules are dissociated in a sample of gas at 27ºC and 760 torr. Calculate the density of the equilibrium mixture.

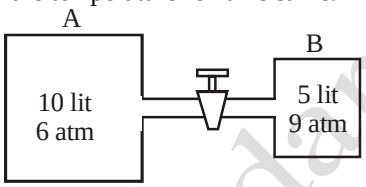
(A) 2.594 gm/lit. (B) 1.294 gm/lit.

(C) 0.524 gm/lit. (D) 4.592 gm/lit.

For Q.21-Q.25 :

The answer to each question is a NUMERICAL VALUE.

Q.21 The stop cock connecting the two bulbs of volume 5 litre and 10 litre containing as ideal gas at 9 atm and 6 atm respectively, is opened. The final pressure (in atm) if the temperature remains same.



Q.22 Each atom in 4gm He and 20gm Ne is moving with speed 4×10^2 m sec^{-1}. The kinetic energy (in J/mole) per mole of mixture is–

Q.23 Two vessels of capacities 3 litres and 4 litres are separately filled with a gas. The pressures are respectively 202 kPa and 101 kPa. The two vessels are connected. The gas pressure (in kPa) will be now, at constant temperature.

Q.24 2 gms of hydrogen diffuses from a container in 10 minutes. How many gms of oxygen would diffuse through the same time under similar conditions ?

Q.25 The ratio of average molecular kinetic energy of UF_6 to that of H_2, both at 300 K is-

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