Topic :- KINETIC THEORY

1. To double the volume of a given mass of an ideal gas at 27°C keeping the pressure constant, one must raise the temperature in degree centigrade to
   a) 54°   b) 270°   c) 327°   d) 600°

2. The following sets of values for C_V and C_P of a gas has been reported by different students. The units are $cal/g\text{-}mole\text{-}K$. Which of these sets is most reliable
   a) $C_V = 3, C_P = 5$ b) $C_V = 4, C_P = 6$ c) $C_V = 3, C_P = 2$ d) $C_V = 3, C_P = 4.2$

3. At what temperature is the root mean square velocity of gaseous hydrogen molecules equal to that of oxygen molecules at 47°C
   a) 20 K b) 80 K c) -73 K d) 3 K

4. Molecules of a gas behave like
   a) Inelastic rigid sphere   b) Perfectly elastic non-rigid sphere
   c) Perfectly elastic rigid sphere   d) Inelastic non-rigid sphere

5. A cylinder contains 10 kg of gas at pressure of $10^7 \, N/m^2$. The quantity of gas taken out of the cylinder, if final pressure is $2.5 \times 10^6 \, N/m^2$, will be (Temperature of gas is constant)
   a) 15.2 kg b) 3.7 kg c) Zero   d) 7.5 kg

6. In the adjoining figure, various isothermals are shown for a real gas. Then
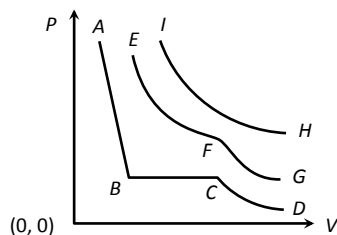
   a) EF represents liquification   b) CB represents liquification
   c) HI represents the critical temperature   d) AB represents gas at a high temperature

7. One mole of an ideal monoatomic gas requires 210 J heat to raise the temperature by 10K, when heated at constant temperature. If the same gas is heated at constant volume to raise the temperature by 10K then heat required is
   a) 238 J b) 126 J c) 210 J d) 350 J

8. The ratio of root mean square velocity of O_3 and O_2 is

   a) 1:1　　　　　　　b) 2:3　　　　　　　c) 3:2　　　　　　　d) $\sqrt{2}:\sqrt{3}$

9. At a given temperature the $r.m.s.$ velocity of molecules of the gas is
   a) Same
   b) Proportional to molecular weight
   c) Inversely proportional to molecular weight
   d) Inversely proportional to square root of molecular weight

10. Graph of specific heat at constant volume for a monoatomic gas is

    a)　　　　　　　b)　　　　　　　c) $\frac{3}{2}R$　　　　　　　d) $\frac{3}{2}R$
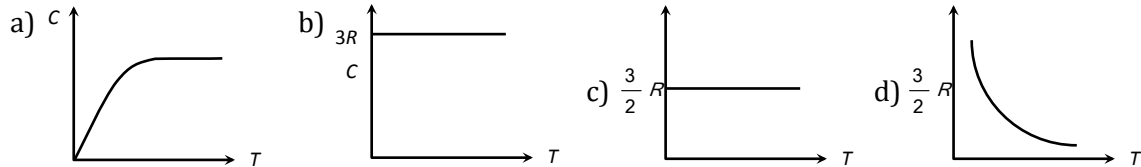
11. PV versus T graph of equal masses of H_2, He and O_2 is shown in fig. Choose the correct alternative
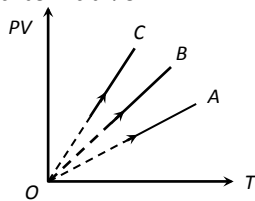
    a) C corresponds to H_2, B to He and A to O_2　　　b) A corresponds to He, B to H_2 and C to O_2
    c) A corresponds to He, B to O_2 and C to H_2　　　d) A corresponds to O_2, B to H_2 and C to He

12. Which of the following cylindrical rods will conduct maximum heat, when their ends are maintained at a constant temperature difference?
    a) $l = 1$m, $r = 0.2$m　　b) $l = 1$m, $r = 0.1$m　　c) $l = 10$m, $r = 0.1$m　　d) $l = 0.1$m, $r = 0.3$m

13. A container with insulating walls is divided into two equal parts by a partition fitted with a value. One part is filled with an ideal gas at a pressure p and temperature T, whereas the other part is completely evacuated. If the valve is suddenly opened, the pressure and temperature of the gas will be

    a) $\frac{p}{2}, T$　　　　　　b) $\frac{p}{2}, \frac{T}{2}$　　　　　　c) p, T　　　　　　d) $p, \frac{T}{2}$

14. Four molecules of a gas have speeds 1, 2, 3 and 4 kms⁻¹. The value of rms speed of the gas molecules is

    a) $\frac{1}{2}\sqrt{15}$ kms⁻¹　　b) $\frac{1}{2}\sqrt{10}$ kms⁻¹　　c) 2.5 kms⁻¹　　d) $\sqrt{\frac{15}{2}}$ kms⁻¹

15. A body cools from 50°C to 40°C in 5 min. Its temperature comes down to 33.33°C in next 5 min. The temperature of surroundings is
    a) 15°C　　　　　　b) 20°C　　　　　　c) 25°C　　　　　　d) 10°C

16. Which of the following statements is true

a) Absolute zero degree temperature is not zero energy temperature

b) Two different gases at the same temperature pressure have equal root mean square velocities

c) The root mean square speed of the molecules of different ideal gases, maintained at the same temperature are the same

d) Given sample of 1 cc of hydrogen and 1 cc of oxygen both at NTP; oxygen sample has a large number of molecules

17. The figure below shows the plot of $\frac{pV}{nT}$ *versus* p for oxygen gas at two different temperatures.
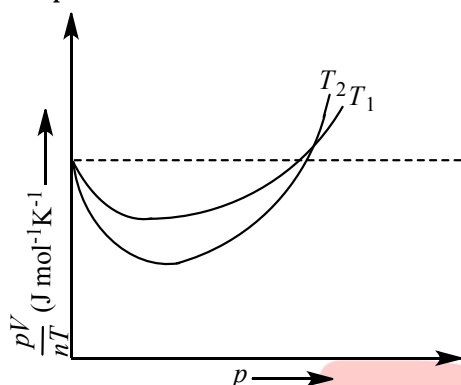
Read the following statements concerning the above curves.

I. The dotted line corresponds to the ideal gas behavior

II. $T_1 > T_2$

III. The value of $\frac{pV}{nT}$ at the point where the curves meet on the y-axis is the same for all gases.

a) (i) only   b) (i) and (ii) only   c) All of these   d) None of these

18. The absolute temperature of a gas is determined by

a) The average momentum of the molecules   b) The velocity of sound in the gas

c) The number of molecules in the gas   d) The mean square velocity of the molecules

19. If V_H, V_N and V_0 denote the root –mean square velocities of molecules of hydrogen, nitrogen and oxygen respectively at a given temperature, then

a) $V_N > V_O > V_H$ b) $V_H > V_N > V_O$ c) $V_O = V_N = V_H$ d) $V_O > V_H > V_N$

20. Air inside a closed container is saturated with water vapour. The air pressure is p and the saturated vapour pressure of water is $\bar{p}$. If the mixture is compressed to one half of its volume by maintaining temperature constant, the pressure becomes

a) $2(p + \bar{p})$ b) $(2p + \bar{p})$ c) $(p + \bar{p}/2$ d) $p + 2\bar{p}$