INDIAN SCHOOL AL WADI AL KABIR

Class: XI	**Department: SCIENCE 2020 -21** **SUBJECT: PHYSICS**	**Date of submission: 2/02/2020**
Worksheet No: 12&13 WITH ANSWERS	**CHAPTER: THERMODYNAMICS** & **KINETIC THEORY OF GASES**	**Note:** **A4 FILE FORMAT**
Name of the student:	**Class & Sec:**	**Roll No:**

OBJECTIVE TYPE QUESTIONS

1. In an open system, for maximum work, the process must be entirely
   a) irreversible
   b) reversible
   c) adiabatic
   d) isothermal
2. Wooden clothes keep the body warm, because wool
   a. Is a bad conductor
   b. Increases the temperature of body
   c. Decrease the temperature
   d. All of these
3. Mercury thermometer can be used to measure temperature up to
   a. 260^0C
   b. 100^0C
   c. 360^0C
   d. 500^0C
4. A quantity of heat required to change the unit mass of a solid substance from solid state to liquid state, while the temperature remains constant, is known as
   a. Latent heat of vaporisation
   b. Sublimation
   c. Condensation
   d. latent heat of fusion
5. At a common temperature, a block of wood and a block of metal feel equally cold or hot. The temperature of block and wood are
   a. Equal to the temperature of the body
   b. Less than the temperature of the body
   c. Greater than temperature of the body
   d. Either b or c

Answer. 1) Answer: b
Explanation: A reversible process gives the maximum work.
2) a) Is a bad conductor of heat.
3) c) 360^0C

4) d. latent heat of fusion

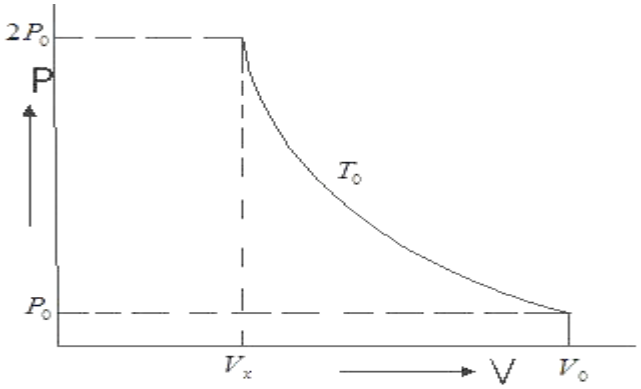
5) (b) equal to the temperature of the body

Explanation: Since both the block of metal and the block of wood feel equally cold or hot, their temperatures must be equal to the temperature of the body. Otherwise there will be heat flow between the body and either of the blocks. And as the thermal conductivity of the metal is more than that of the wood, it would either feel hotter or colder than that the block of wood.

6. The specific heat of a gas in an isothermal process _____
7. The change in temperature of a body is 50^0C. The change in temperature on the Kelvin scale is ……..
8. On the absolute scale of temperature given by Kelvin, steam point has a value of ……

9.The specific heat of a gas in an adiabatic process is _____

10. Zeroth law of thermodynamics.....
    i. Deals with conversion of mass and energy
    ii. Deals with reversibility and irreversibility of process
    iii. States that if two system are both in equilibrium with a third system, they are in thermal equilibrium with each other
    iv. Deals with heat engines.
11. An Ideal gas undergoes a state change according to PV diagram. What is the value Vx.



    i. $V_0/2$
    ii. V_0
    iii. $2\ V_0$
    iv. $V_0/4$

12. Suppose a container is evacuated to have just one molecule of a gas in it. Let V_a & V_{rms} represent the Average Speed and rms speed of the molecule
    i. $V_a > V_{rms}$
    ii. $V_a < V_{rms}$
    iii. $V_a = V_{rms}$
    iv. V_{rms} is undefined

13. There are two statement
    Statement A. Equal volumes of all gases at the same temperature T and pressure P contain an equal no of Molecules
    Statement B: The no of molecules in one mole of any gas is $6.0255 * 10^{22}$.

which one of the following is correct
i. A and B both
ii. A only
iii. B only
iv. A and B both are incorrect

14. Let A & B are two sample of ideal gases of equal mole .let T be the temperature of both the gas Let E_A and E_B are there total energy respectively .Let M_A and M_B are these respective Molecular Mass .which of these is true
    a. $E_A > E_B$
    b. $E_A < E_B$
    c. $E_A = E_B$
    d. none of these
15. A container contains N_2 gas at T K. The no of moles of gas is n_0. Consider it behaves like ideal gas. It rms speed is v_0
    What is the total translational kinetic energy
    a. $3/2 n_0 RT$
    b. $3/2 RT$
    c. $1/2 RT$
    d. $1/2 n_0 RT$

ANSWER- 6) infinity-Given the process is isothermal which means its temperature won't increase. $\mathbf{S = \Delta Q/m \times \Delta T}$

$\mathbf{\Delta T = 0}$

Therefore, specific heat will be infinity, as it is defined as heat supplied per unit increase in temperature.

7) 50K
8) 373.15K
9) Zero as $\Delta Q = 0$
10) (iii)
11) As the temperature is constant PV = constant
$2P_0 V_x = P_0 V_0$
$V_x = V_0 / 2$

12)

. average speed is define
$V_a = \sum V / N$
$= V/1 = V$
mean square speed = $\sum V^2 / N$
$= V^2$
root mean square = $(\sum V^2 / N)^{1/2} = V$
So $V_a = V_{rms}$

13) i)

Statement A is Avogadro law. So true

Avogadro no is $6.0255 * 10^{23}$ So second one is true

14) $E_A = 3/2\ nRT$
$E_B = 3/2\ nRT$
So $E_A = E_B$
15) $KE = (3/2)\ nRT$
$= (3/2)\ n_0RT$

VERY SHORT ANSWER QUESTIONS (BASIC LEVEL)

16. State first law of thermodynamics
17. State second law of thermodynamics
18. What is isothermal process? Also give essential conditions for an isothermal process to take place.
19. State the number of degrees of freedom possessed by a monoatomic molecule in space. (Ans.3)
20. The absolute temperature of a gas is increased 4 times its original value. What will be the change in r.m.s. velocity of its molecules?

$$V_{rms} \alpha \sqrt{T}$$

$$V'_{rms} \alpha \sqrt{4T}$$

$$V'_{rms} / V_{rms} = 2$$

$$V'_{rms} = 2V_{rms}$$

Change in rms velocity of molecules = $V_{rms} - V_{rms} = V_{rms}$

SHORT ANSWER QUESTIONS - (INTERMEDIATE LEVEL):

21. Why do birds swell their feathers in winter?
    (Ans. To maintain a column of air, which acts an insulator and hence to avoid loss of heat from the body to the surroundings.)
22. If a drop of water falls on a hot plate, it takes longer time to evaporate. Why?

(Ans. The vapour formed at the instant of landing of the drop acts as an insulator and prevents the heat being passed on to the water above.)

23. Explain how, cooking is faster in a pressure cooker than an ordinary vessel.
(Ans. Food is **cooked** more quickly in a **pressure cooker** because at the higher **pressure** the boiling point of water rises from 100 °C (212 °F) to 121 °C (250 °F). The hotter steam is able to transmit its thermal energy to the food and hence the food gets cooked faster)
24. Why burns from steam more serious than those from boiling water?
(Ans. Steam at 100°C has 22.6 x 10^5 J of heat energy more than water at 100°C)
25. Define absolute zero, according to kinetic interpretation of temperature?
26. Cooking gas containers are kept in a lorry moving with uniform speed. What will be the effect on temperature of the gas molecules?

Temperature of gas molecules will remain same because temperature of gas molecules depends on their relative kinetic energy with respect to center of mass molecules, as all molecules along with centre of mass will move with same speed, so there velocity with respect to each other would be zero, hence will have zero relative kinetic energy due to motion so it will not affect temperature

27. When a gas is heated, its temperature increases. Explain it on the basis of kinetic theory of gases.

Molecules of a gas are in a state of continuous random motion. They possess kinetic energy. When a gas is heated, there is an increase in the average kinetic energy per molecule of the gas. Hence, its temperature increases (the average kinetic energy per molecule being proportional to the absolute temperature of the gas).

LONG ANSWER TYPE QUESTIONS - ADVANCED LEVEL QUESTIONS

28. A gas is contained in a cylinder with a movable piston on which a heavy block is placed. Suppose the region outside the chamber is evacuated and the total mass of the block and the movable piston is 102 kg. When 2140 J of heat flows into the gas, the internal energy of the gas increases by 1580 J. What is the distance s through which the piston rises?
(Ans. Total heat supplied =Work done + Change in internal energy
So work done=2140-1580=560 J
Let s be the distance moved then
the work done is given by =Fs
Fs=560
s=560/F
=560/102*10
s=.54 m)

29. In changing the state of a gas adiabatically from an equilibrium state A to another equilibrium state B, an amount of work equal to 22.3 J is done on the system. If the gas is taken from state A to B via a process in which the net heat absorbed by the system is 9.35 cal, how much is the net work done by the system in the latter case? (Take 1 cal = 4.19 J)

Here, when the change is adiabatic, $\Delta Q = 0$, $\Delta W = -22.3$ J

If ΔU is change in internal energy of the system, then

as $\Delta Q = \Delta U + \Delta W$

$0 = \Delta U - 22.3$ or $\Delta U = 22.3$ J

In the second case, $\Delta Q = 9.35$ cal $= 9.35 \times 4.2$J $= 39.3$ J

$\Delta W = ?$

As $\Delta U + \Delta W = \Delta Q$

$\therefore$ $\Delta W = \Delta Q - \Delta U = 39.3 - 22.3 = 17.0$ J.

30. Two cylinders A and B of equal capacity are connected to each other via a stopcock. A contains a gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stopcock is suddenly opened. Answer the following:
(a) What is the final pressure of the gas in A and B ?
(b) What is the change in internal energy of the gas?
(c) What is the change in the temperature of the gas?

Answer: (a) Since the final temperature and initial temperature remain the same,

$\therefore$ $P_2V_2 = P_1V_1$

But $P_1 = 1$ atm, $V_1 = V$, $V_2 = 2V$ and $P_2 = ?$

$\therefore$ $$P_2 = \frac{P_1V_1}{V_2} = \frac{1 \times V}{2V} = 0.5 \text{ atm}$$

(b) Since the temperature of the system remains unchanged, change in internal energy is zero.

(c) The system being thermally insulated, there is no change in temperature (because of free expansion)

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