**MASTERS PU COLLEGE, HASSAN**

**PHYSICS TOPIC: Heat & Thermodynamics**

1. (d) Heat released to convert *x* *gm* of steam at 100°*C* to water at 100°*C* is *x* × 540 *cals*.

If *y* *gm* of ice is converted from 0°*C* to water at 100°*C* it requires heat *y* × 80 + *y* × 1 × 100 = 180 *y*

∴  or 

1. (b) When length of the liquid column remains constant, then the level of liquid moves down with respect to the container, thus *γ* must be less than 3*α*.

Now we can write *V* = *V*0(1 + *γ* Δ*T*)

Since *V* = *Al*0 = [*A*0 (1 + 2*α*Δ*T*)]*l*0 = *V*0 (1 + 2*α*Δ*T*)

Hence *V*0(1 + *γ* Δ*T*) = *V*0(1 + 2*α*Δ*T*) ⇒ *γ* = 2*α*.

1. (c) By using



1. (b) According to energy conservation, change in potential energy of the ball, appears in the form of heat which raises the temperature of the ball.

*i.e.* 

*h*1

*h*2

⇒ 



1. (c) 
2. (c) ,  and 

⇒ 

1. (a) Power 

But the calorific value of fuel is only 2 *k cal*/*gm*. Hence claim is invalid.

1. (c) Efficiency of a carnot engine is given by 

or ⇒  ⇒ 

1. (b) 

Since  ⇒ 

Eliminating  we find 

Hence

1. (b)  ⇒ 

 is to reduce two times *i.e.* temperature of the gas will have to reduce four times or 

During adiabatic process 

⇒  ⇒ 

1. (b) Let the initial pressure of the three samples be  and , then ,  and



⇒ 

1. (b) *V-T* graph is a straight line passing through origin. Hence,  or 

  and 

Also 



 for helium gas. Hence 

1. (b)  is negative (volume is decreasing) and

 is positive (volume is increasing) and

since, 

 net work done is positive and area between semicircle which is equal to 

1. (c)  

 

and 

⇒ 

1. (a) In a cyclic process ⇒ 

⇒  ⇒ 

1. (b) Since the gas is enclosed in a vessel, therefore, during heating process, volume of the gas remains constant. Hence, no work is done by the gas. It means heat supplied to the gas is used to increase its internal energy only.

Initial internal energy of the gas is 

Since  moles get dissociated into atoms, therefore, after heating, vessel contains  moles of diatomic gas and  moles of a mono-atomic gas. Hence the internal energy for the gas, after heating, will be equal to



Hence, the heat supplied = increase in internal energy



1. (a) Let the process start from initial pressure  volume  and temperature .

*A*(*PA*, *VA*, *TA*)





(i) Isothermal expansion  at temperature  to twice the initial volume 

1. Compression at constant pressure  to original volume 

(iii) Isochoric process (at volume ) to initial condition 

1. (b)  ⇒ 

⇒ *T*Final = 70°*C*

Hence 



1. (c) 

⇒  ⇒ 

1. (d) = constant ⇒ 

Comparing above equation with given equation

 ⇒ 

1. (c) If thermal resistance of each rod is considered *R* then, the given combination can be redrawn as follows

*A*

*B*

*C*

20°*C*

120°*C*

*R*

*R*

*R*

*R*

*R*

2*R*

2*R*

120°*C*

*A*

*C*

*B*

*θ*

20°*C*

*R*

*R*

(Heat current)*AC* = (Heat current)*AB*

⇒ 

1. (b) No, In convection the hot liquid at the bottom becomes lighter and hence it rises up. In this way the base of the convection is the difference in weight and upthrust. In the state of weightlessness this difference does not occur, so convection is not possible.
2. (d) For the two sheets *H*1 = *H*2 (*H* = Rate of heat flow)

⇒  ⇒ *θ* = 80°*C*

1. (a) Rate of heat loss per unit area due to radiation *i.e.* emissive power 





1. (a) Black bulb absorbs more heat in comparison with painted bulb. So air in black bulb expands more. Hence the level of alcohol in limb *X* falls while that in limb *Y* rises.
2. (a) Heat current  ⇒ 

In first case : 

In second case :

∴ 

1. (b) 
2. (c) All wavelengths are emitted.
3. (d)
4. (d) 