SECTION A (25 Marks)

1. 6.31cm√1 -0.02=6.29cm√1

2. The match stick placed on the metal block gets extinguished earlier

   The metal block conducts the heat away from the burning point extinguishing the match stick

3. To magnify the mercury thread so that the mercury level is clearly seen.

4. $S = ut + \frac{1}{2}at^2$

   $S = (16x5) + (\frac{1}{2}x\text{-}0.8x25)$ √1 √1

   S=80+(-10)

   S=70m√1

5. $V.R = \frac{teeth\ on\ driven\ wheel}{teeth\ on\ driving\ wheel}$ √1

   $= \frac{100}{25} = 4$

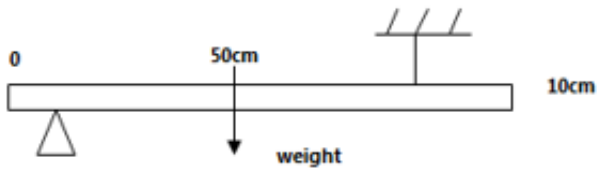
   $n = \frac{M.A}{VR}x100$ √1

   $M.A = \frac{85x4}{100}$

   M.A=3.4√1

6. Steam transfers more heat energy to the body than boiling water

7. μ=ρℓbhg√1

8. 

9. F=Ke

   $K = \frac{F}{e} = \frac{50}{2} = 25N/M$ √1

   $\therefore F = 25x2.5x10^{-2}$ √1

   $= 0.625N$

10. Increases surface tension

    Molecules decrease in kinetic energy hence less mobile.

11. $p=h\,pg$

    $4x1.0x10^5=hx1025x10\sqrt{1}$

    $\therefore h=\dfrac{40x10^5}{10250}\sqrt{1}\quad 39.02\sqrt{1}$

12. The earthen jug has pores which allow water to diffuse / seep out and evaporate causing a cooling effect/ latent heat of evaporation causes cooling.

13. Air flowing above the capillary tube has a high velocity resulting in low pressure region atmospheric pressure push the water upward in the capillary tube

14. The sum of the vertically upward forces is equal to the sum of the vertically downward forces.

SECTION B (55 Marks)

15. a) i) The rate of change of momentum is directly proportional to the external resultant force and take place in the direction of the force $\sqrt{1}$.

    ii) Δ momentum=mv-mu

    $$Rate\ of\ \Delta m=\frac{mv-mu}{t}\sqrt{1}$$

    $$\therefore \frac{mv-mu}{t}\propto F\ and\ F=K\left(\frac{mv-mu}{t}\right)\sqrt{1}$$

    K is established to be unity ie

    $$Hence\ F=\frac{mv-mu}{t}=M\frac{(v-u)}{t}\ \ and\ \ F=ma\ where\ a=\frac{v-u}{t}\sqrt{1}$$

    b) Momentum before =momentum after$\sqrt{1}$

    $m_1u_1+m_2u_2=mv$ $\sqrt{1}$ but $m_2u_2=0$

    $3x5=4v$

    V=3.75m/s$\sqrt{1}$

    $ii)\ KE=\dfrac{1}{2}mv^2$ $\sqrt{1}$

    $=\dfrac{1}{2}x3x5^2$

    =37.5J$\sqrt{1}$

    $iii)\ KE=\dfrac{1}{2}mv^2$

    $=\dfrac{1}{2}x4x3.75^2\ \sqrt{1}$

    =28.125J$\sqrt{1}$

    iv) Some KE before was converted to heat and sound hence the lower energy collision$\sqrt{1}$

16.

a) i) Boyles' law states that pressure of a fixed mass of a gas is inversely proportional to its volume provided its temperature is kept constant√1

b) i) Pressure√1 and temperature√1

ii) Plot a graph of pressure against temperatures √1 The graph is extrapolated √1 to cut the temperature axis at the absolute zero temperature√1.

c). At low temperature the state of the gas changes to liquid√1

d) By making the tube as short as possible.

e. $\frac{P_1V_1}{T_1}=\frac{P_2V_2}{T_2}$ √1

$P_2=\frac{P_1V_1T_2}{T_1V_2}$

$P_2=\frac{469\,x1.6x2.4x10^5}{300\,x3}$ √1√1

$P_2=2.001\,x10^5\,Pa$

17. a) Its mass must be 1 unit√1

Its temperature must be constant during the change in state√1

b) Heat gained= Heat lost√1

$\frac{30}{1000}L+\frac{30}{1000}x4200\,x38=\frac{25}{1000}x400\,x22+\frac{150}{1000}x4200\,x22$ √1

0.03L+4788=220+13860

$L=\frac{9292}{0.03}$ √1

$L=309,733\,Jkg^{-1}$

c) i) Q=MCΘ

=3.0x4200x80√1

=1008000J√1

ii) Q=CΔΘ√1

=450x80=36000J√1

iii) Pt=(1008000+36000) √1

3000t=1044000√1

t= 348s√1

18.

a) Using rollers.
Lubricating the surface
Smoothening the surface

b) I Work done=Fx
=200x22√1=400J√1

II Work done=Mgh
=30x10x7.5√1
=2250J√1

III Work done by force-work done on mass√1
4400-2250= 2150J√1

ii) $ii)\ Efficiency = \frac{Work\ output}{work\ input}$ √1

$= \frac{2150}{4400} x100$ √1

=48.86%√1

19. a) Heat entering from the hot end of the metal increases the vibration√1 of the atoms I the metal at that end. These atoms in turn collide with neighbouring atoms √1 increasing the vibrations and hence passing the energy along. √1

OR

Metals have free electrons which travel throughout the body of the metal, Heat energy entering the hot end of the metal increases the vibrations of the particles at that end. The free electrons in that region gain more kinetic energy and because they are free to move, spread heat energy to the other parts of the metal.

b) i) Formation of icebergs which poses a great danger to ships as navigators cannot see the submerged part of the ice.

ii) Water pipes burst when the water flowing through the pipes freeze. √1

c) i) Index Q√1

ii) Alcohol√1

iii) Alcohol√1/liquid x

iv) Using a magnet to return the steel indices to the mercury surfaces√1

d) The steel rod is cooled √1 to very low temperatures, That would make it to contract, The steel rod is fitted into the brass ring when is in the contracted state. They are left to attain normal room temperature√1 which allow the steel rod expand to fit tightly inside the brass ring.