Instruction to use Heat Experiment Set

1. Expansion and contraction of solid (steel)

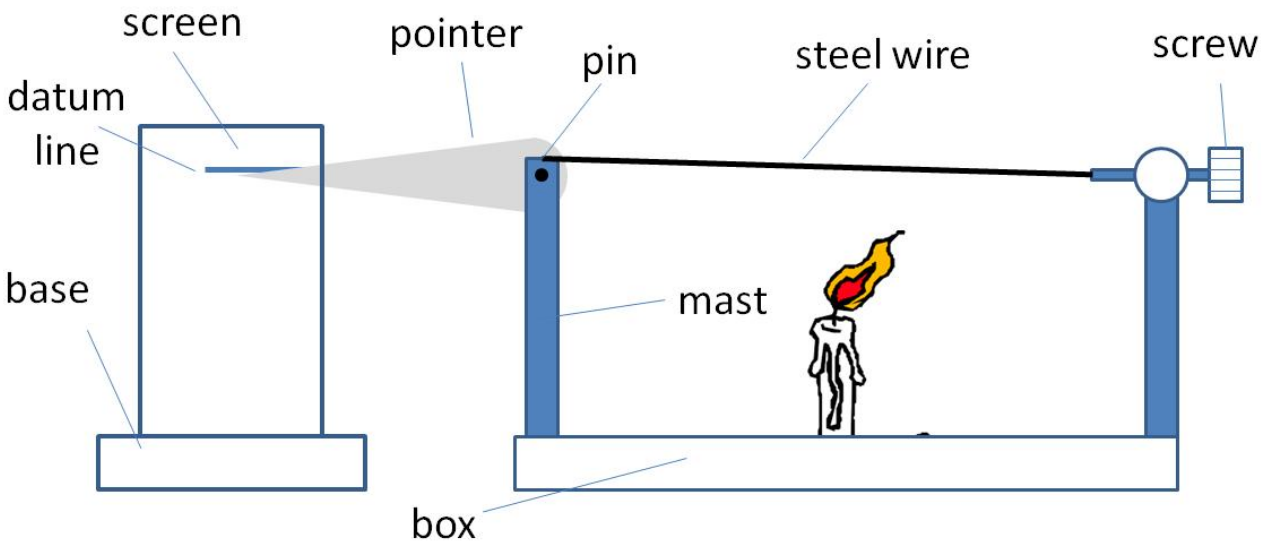

Figure 1

(a) Set up the apparatus as shown in figure 1. (without lighting up the candle)

(b) Adjust the screw till the pointer is pointing at the datum line.

(c) Light up the candle and observe the pointer moves downward as time past.

(d) Extinguish the candle and observe the pointer moves upward as time past.

(e) Conclude the observation.

2. Expansion and contraction of gas (air)

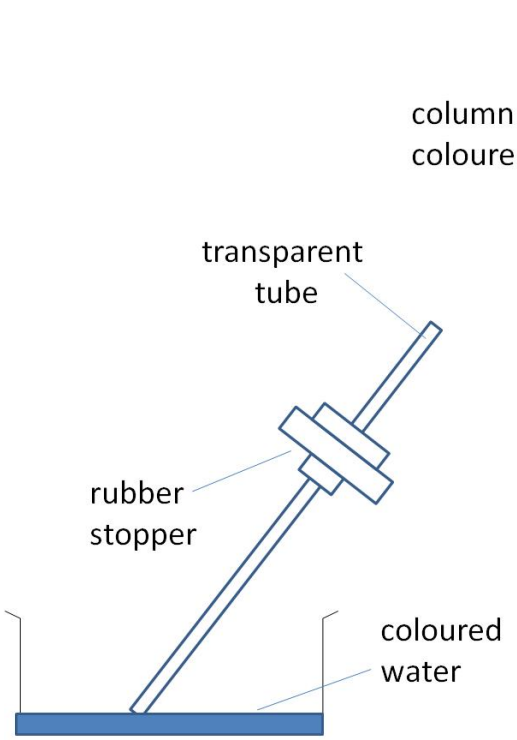

Figure 2a

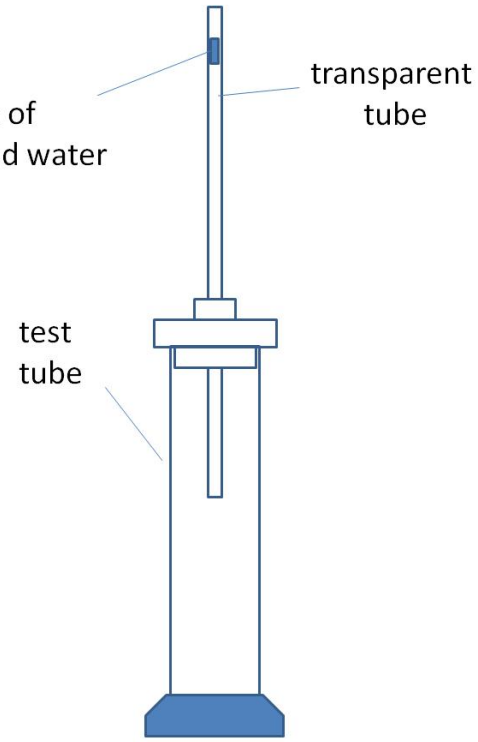

Figure 2b

(a) Push the transparent tube through the rubber stopper

(b) Dip the top of transparent tube into coloured water such that a column of coloured water is trapped at the top of the transparent tube as shown in figure 2a.

(c) Insert the rubber stopper into the test tube.

(d) Grab the test tube with both palms to heat up the air in the tube.

Observe the column of coloured water rises up in the transparent tube.

(e) Remove both palms from the test tube.

Observe the column of coloured water lowers down in the transparent tube.

(f) Conclude the observation.

3. Expansion and contraction of liquid (water)

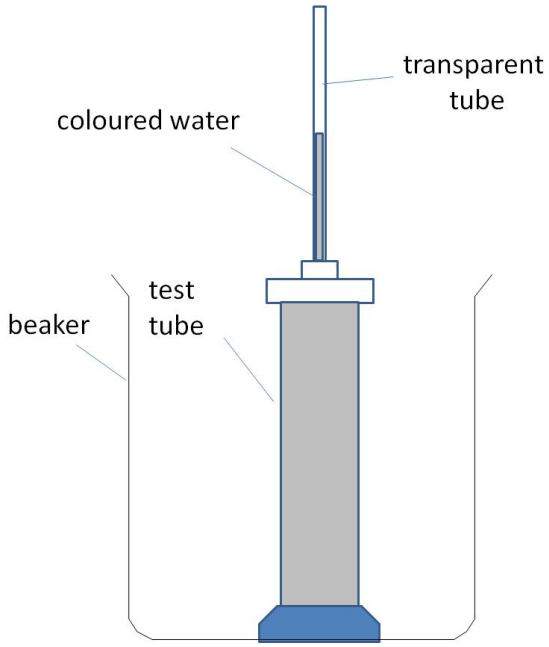

Figure 3

(a) Push the transparent tube through the rubber stopper

(b) Fill coloured water into the test tube to about 5 mm away from the brim.

(c) Insert the rubber stopper into the test tube.

You will see a column of coloured water rises up the transparent tube.

Adjust the water level by adjusting the tightness of the rubber stopper against the test tube.

(d) Place the test tube in a beaker as shown in figure 3.

(e) Pour hot water (80^{o}C to 100^{o}C) into the beaker.

*Observe the column of coloured water lowers down in the transparent tube before rising again to a much higher height along the transparent tube.

(e) Remove the test tube from the beaker and allows it to cool in air.

Observe the column of coloured water lowers down in the transparent tube.

(f) Conclude the observation.

*The test tube (which is a solid) is directly in contact with the hot water and therefore it expands before the coloured water does. When the test tube expands, the volume increases, hence the water level drops. Subsequently as heat is conducted into the water, the liquid water expands more than the solid test tube, the water level rises to a higher level than the original level.

4. Basic understand of thermometer

(a) Each division of the marking on the thermometer base plate is 1 ^{o}C.

(b) The red liquid in the thermometer is dyed alcohol.

(c) The liquid in glass thermometer works based on the expansion of liquid.

(d) The error of the thermometer can be corrected by adjusting the base plate.

5. Conductor and insulator

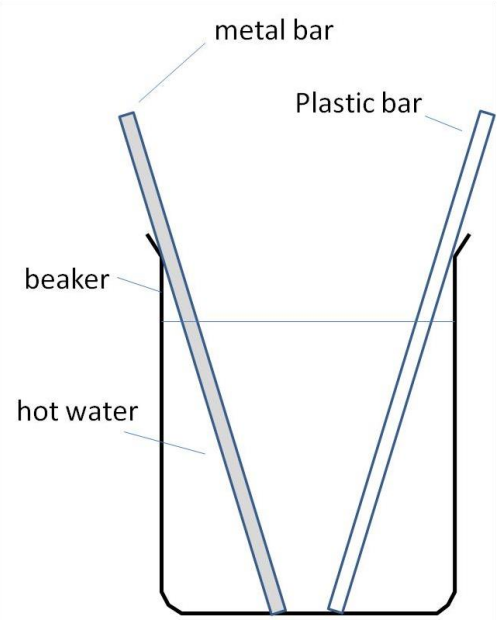

Figure 5

(a) Insert a plastic rod and a metal rod simultaneously into a beaker of hot water as shown.

(b) Touch the two rods at the same time after about 30 seconds.

(c) Conclude the observation.

Note : the metal bar is made from aluminium

6. Heat flow from high temperature to low temperature

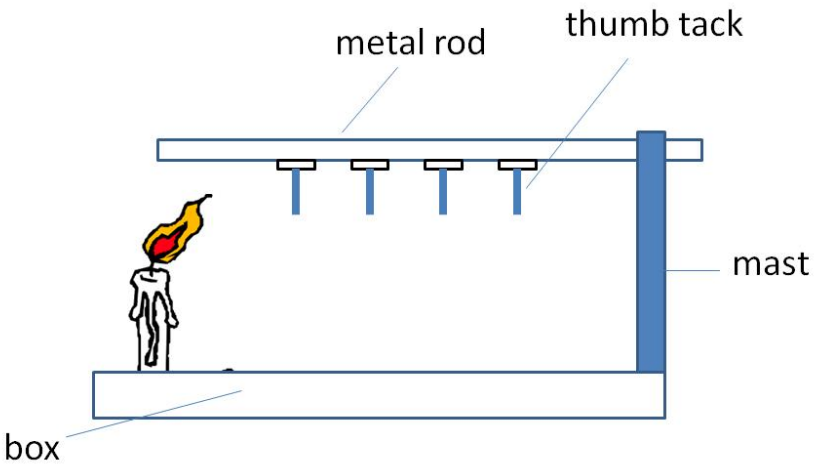

Figure 6

(a) Set up the apparatus as shown in figure 1. (without lighting up the candle)

(b) The thumb tacks are attached to the metal rod by wax.

(c) Light up the candle and observe the sequence of the thumb tacks falls off the metal rod.

(d) Conclude the observation.