PHYSICS PAPER 232/2 K.C.S.E 1997

Answer all the questions in section I and any one in section II

Take: specific heat capacity of water = 4200Jkg^{-1}K^{-1}
Latent heat of melting ice = 334,000Jkg^{-1}K^{1}
Planck's constant h = 3.34 x 10^{-34} JS
Speed of light, c = 3.0 x 10^{8}ms^{-1}

1. Figure 1 shows a circuit diagram for controlling the temperature of a room.

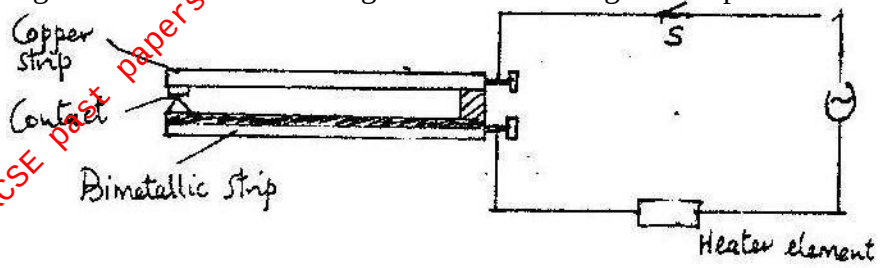


Fig. 1

(i) State and explain the purpose of the Bimetallic strip

(ii) Describe how the circuit controls the temperature when the switch is closed

(b) A drinking glass 0.02 kg contains 200gms of water at 20^{0}C. A mass of 0.04 kg of ice at 0^{0} C is dropped into the glass. Determine the final temperature of the mixture. Specific heat capacity of glass = 670kg^{-1}K^{-1}. (Give your answer to correct one decimal place)

2. (a) Figure 2 shows a uniform plank 20 m long, weighing 400N resting on two supports A and B 9cm apart. A person weighing 600N walks towards B starting at A.

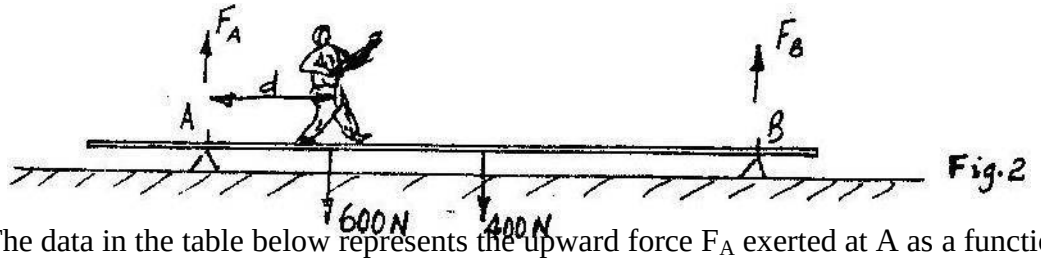
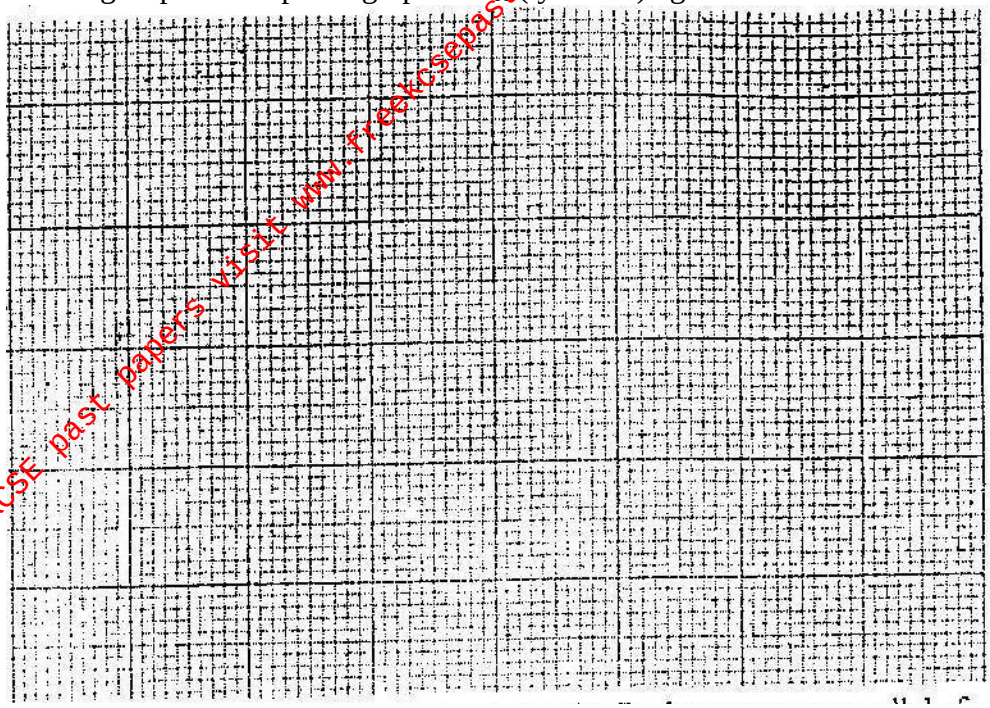


Fig.2

The data in the table below represents the upward force F_A exerted at A as a function of distance, d. The distance d is measured from A.

D (m)	0	2	4	6	8	10
F_A(N)	800	650	500	350	200	50

(i) On the grid provided plot a graph of F (y – axis) against the distance d.



(ii) From the graph determine how far beyond point B, the person can walk before the plank tips

(b) In the set up in the figure 3, the metre rule is in equilibrium

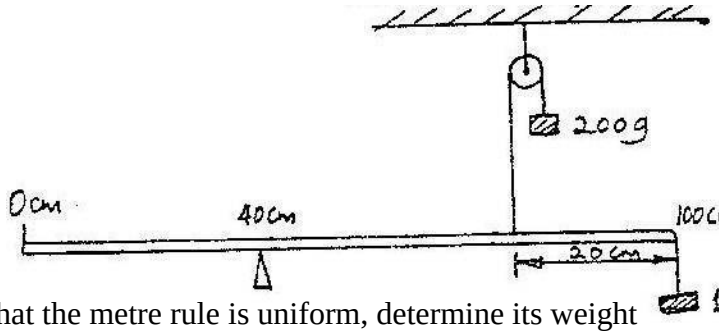
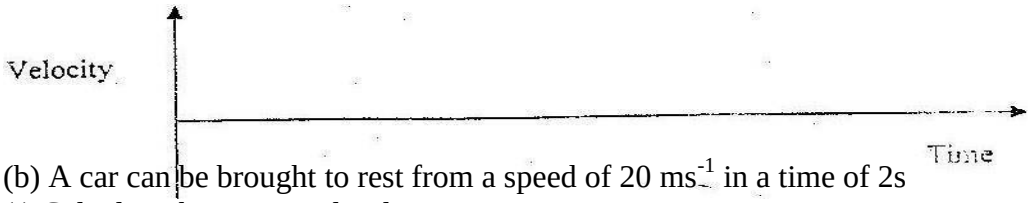


Fig. 3

Given that the metre rule is uniform, determine its weight

3. (a) A stone is thrown vertically upwards from the edges of a platform. Eventually the stone lands without bouncing on the ground below the platform. Taking the upward velocity to be positive sketch on the axis provided the velocity time graph of the motion of the stone.



(b) A car can be brought to rest from a speed of 20 ms^{-1} in a time of 2s

(i) Calculate the average deceleration

(ii) If the driver's reaction time is 0.2s, determine the shortest stopping distance

4. Figure 4 shows a force- distance graph for a car being towed on a horizontal ground

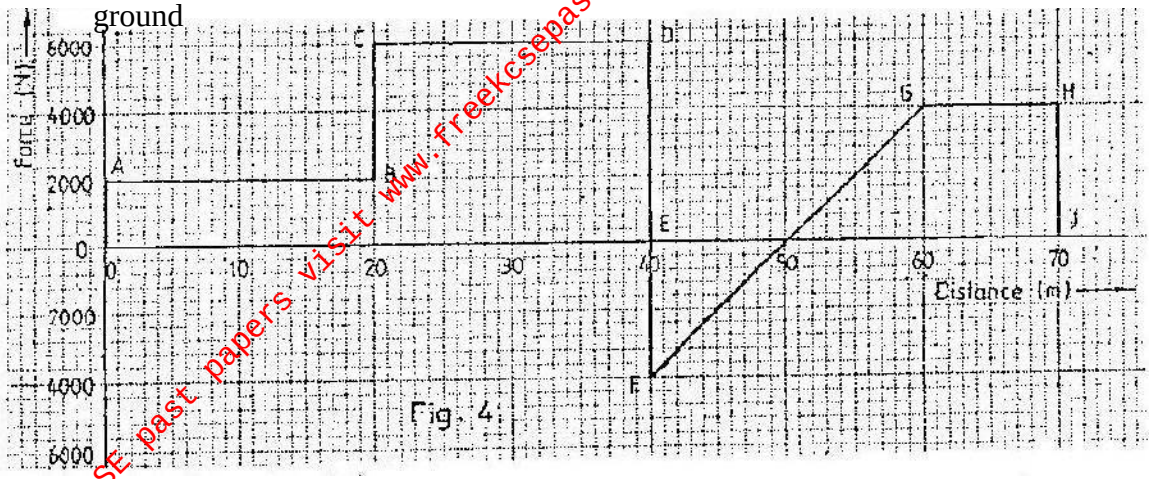


Fig. 4

(a) Calculate the total work done

(b) If the velocity just before reaching point D is $0.6ms^{-1}$, calculate the power developed by the agent providing the force at this point.

(c) An electric pump can raise water from a low level reservoir to the higher – level reservoir at the rate of 3.0×10^5 kg per hour. The vertical height of the water raised 360m. If the rate of energy loss in form of heat is 200KW, determine the efficiency of the pump

5. (a) State two factors that affect the strength of an electromagnet.

(b) In the set up in figure 5, the suspended metre rule is in equilibrium balanced by the magnet and the weight shown. The iron core is fixed to the bench.

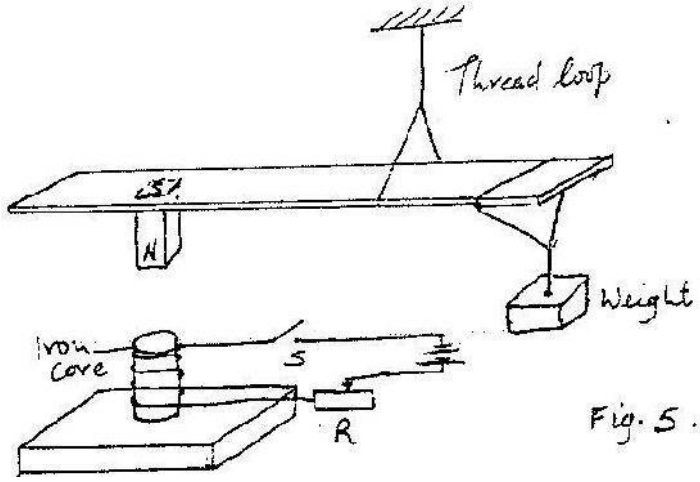


Fig. 5.

(i) State and explain the effect on metre rule when the switch S is closed

(ii) What would be the effect of reversing the battery terminals

(iii) Suggest how the set up in figure 5 can be adapted to measure the current flowing in the current circuit.

(c) Electrons emitted from a metal when light of a certain frequency is shone on the metal are found to have a maximum energy of 8.0×10^{-19}J. If the work function of the metal is 3.2×10^{-19}J, determine the wavelength of the light used.

SECTION II

6. (a) (i) Distinguish between semiconductor and conductors

Semiconductors Conductors

(ii) Give one example of a semiconductor and one for a conductor

Semiconductors Conductors

(b) An **npn** transistor is operating in the common emitter mode

(i) Draw the circuit diagram and indicate the direction of the currents

(ii) Given that the emitter current is 2.0 m A and that 0.5% of the electrons diffusing into the base combine there with holes, determine the values of the base current and the collector current

(ii) By increasing the p.d across the emitter – base junction in (ii), the emitter current increase to 4mA. Determine the transistor current amplification

7. a) i. Distinguish between transverse and longitudinal waves

ii. Give one example of a transverse and one example of longitudinal.

b) Figure 6 shows the displacement of a particle in a progressive wave incident on a boundary between deep and shallow regions.

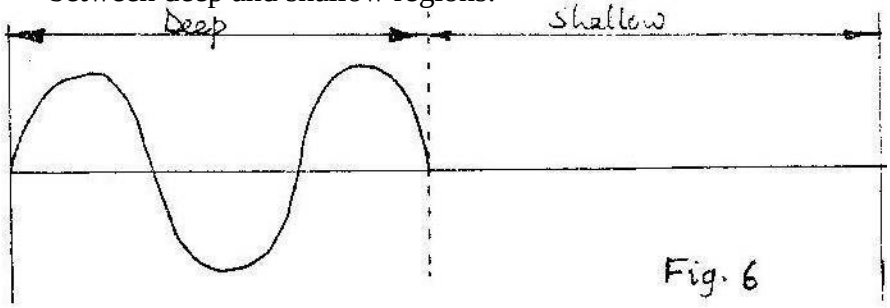


Fig. 6

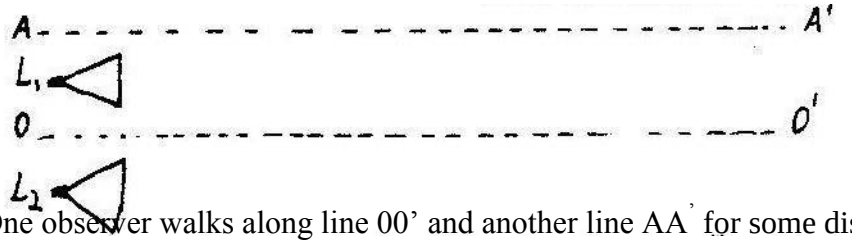
i. Complete the diagram to show what is observed after boundary. (assume no loss of energy)

ii. Explain the observation in (i) above.

(c) Water waves are observed as they pass a fixed point at a rate of 30 crests per minute. A particular wave crest takes 2s to travel between two fixed points 6m apart. Determine for the wave:

(a) The frequency (1mk) (b) Wavelength (3mks)

(d) Figure 7 shows two loud speakers L_1 and L_2 connected to a signal generator



One observer walks along line 00' and another line AA' for some distance. Describe the observations made by each observer and give reasons for your answer.