2

(a)

Fig. 2.1 shows a body P supported by 3 wires under tension. The tension in each wire is represented by T_1, T_2 and T_3. Body Q sits on a flat surface.

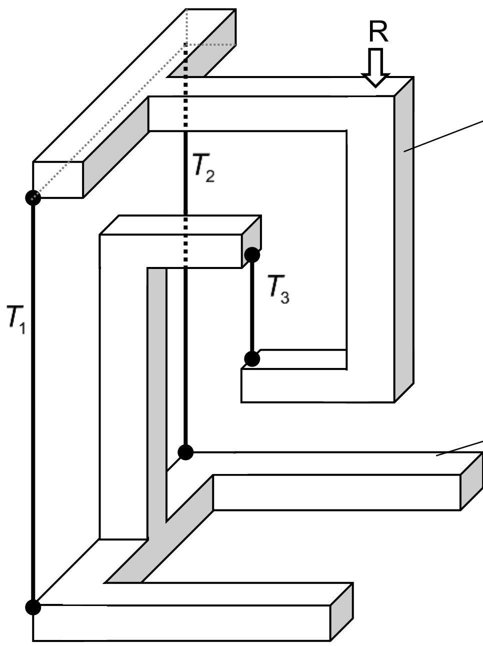

Fig. 2.1

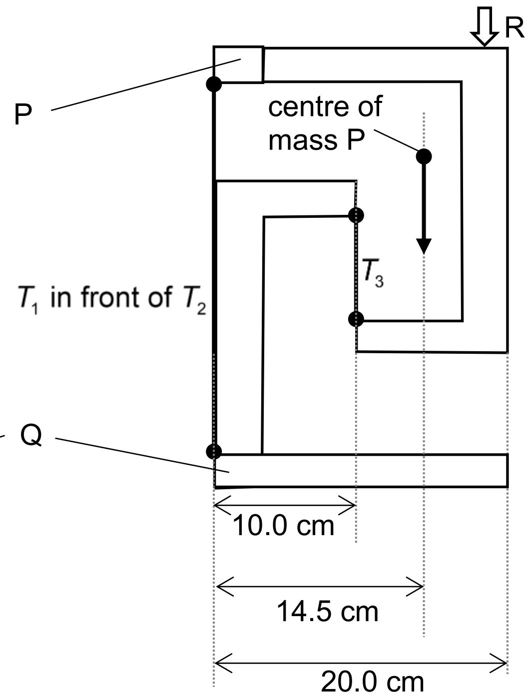

Fig. 2.2

Fig. 2.2 shows the side view of the 2 structures. The mass of body P is 350 g, and acts at a point along a vertical that is 14.5 cm away from wires under tension T_1 and T_2.

(i)

On Fig 2.1, draw arrows to indicate the direction of tensile forces in each of the 3 wires acting on body P. [1]

(ii)

At equilibrium, the magnitude of tensile forces in wire 1 and wire 2 is the same, $|T_1| = |T_2|$.
Determine the magnitude of T_3.

T_3 = ... N [2]

(iii)

Without further calculation, explain which of the wire(s) is/are more likely to break if a further load is placed onto the structure at location R.

……………………………...…………………………………………..…………………………………………….

……………………………………………………………………………..…………………………..………………..[1
]

$$f_r = 0.55\ f_N$$

(b)

A bar magnet of uniform density is attracted to and makes contact with a rough ferromagnetic surface, as shown in Fig. 2.3. The magnet is of mass 0.160 kg. The maximum friction f_r between the magnet and the surface is given by the expression:

$$f_r = 0.55\ f_N$$

where f_N is the normal contact force between the magnet and the rough surface.

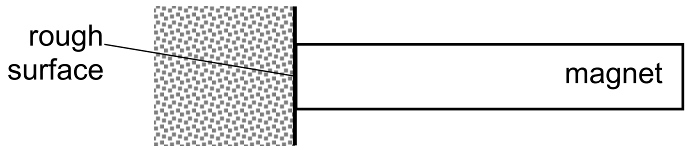

Fig. 2.3

The temperature of the magnet is raised gradually until the magnet falls off the surface.

Determine

(i)

the magnitude of f_N to just prevent the magnet from slipping

N = …………………………………. N [2]

(ii)

the reaction force on magnet necessary to just prevent the magnet from falling.

reaction force = ………………………………….. N

direction = ………………………………….. [2]

[Total: 8]