Section B

Answer **one** question from this Section in the spaces provided.

8 **(a)** State what is meant by an **inelastic** collision between two objects by reference to:

(i) the speed of the objects

.....

.....

..... [2]

(ii) the energy of the objects.

.....

..... [1]

(b) Two spheres A and B are suspended by threads from fixed points so that, when the spheres are at rest, they are touching with their centres on the same horizontal level, as shown in Fig. 8.1.

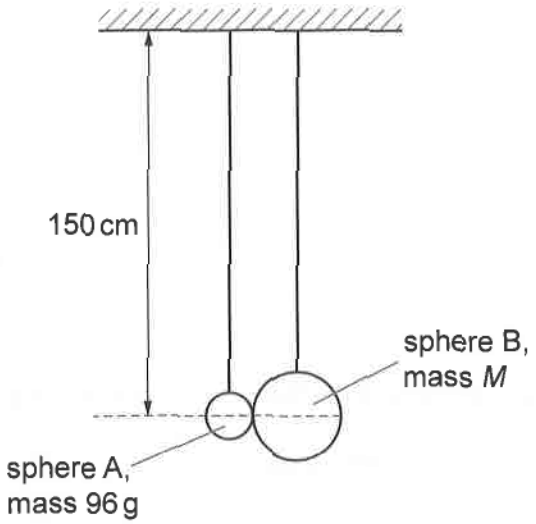

Fig. 8.1 (not to scale)

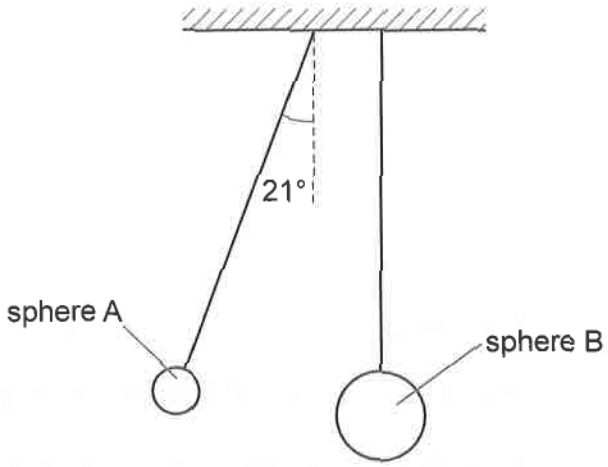

Fig. 8.2 (not to scale)

Sphere A has mass 96 g and the mass of sphere B is *M*.
The vertical distance of the support from the centre of sphere A is 150 cm.

Sphere A is displaced to one side so that the thread supporting it is at an angle of 21° to the vertical, as shown in Fig. 8.2.

Sphere A is released. Show that the horizontal speed with which it strikes sphere B is $1.4\,m\,s^{-1}$.

[3]

(c) The spheres in **(b)** collide.
Sphere A rebounds with a horizontal speed of $0.79\,m\,s^{-1}$. Sphere B moves off with a horizontal speed V. During the collision, 14% of the initial kinetic energy of sphere A is transferred to other forms of energy.

For sphere B immediately after the collision, determine:

(i) the magnitude p of its momentum

p = ... $kg\,m\,s^{-1}$ [2]

(ii) its kinetic energy.

kinetic energy = ... J [2]

(d) Use your answers in **(c)** to determine, for sphere B:

(i) its initial horizontal speed

speed = ... $m\,s^{-1}$ [2]

(ii) its mass *M*.

M = ... kg [1]

(e) State and explain whether, during the collision between the two spheres, both spheres are stationary at the same time.

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..... [3]

(f) Calculate the magnitude of the impulse on sphere A during the collision.

impulse = ... $kg\,m\,s^{-1}$ [2]

(g) By reference to the direction of the impulse in **(f)**, explain why, for the initial speed of sphere B to be in a horizontal direction, the centres of the spheres are on the same horizontal level at the time of collision.

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..... [2]

[Total: 20]