

- 2 Mass X of 220 g and mass Y of 600 g are connected by an inelastic string that passes over a frictionless pulley as shown in Fig. 2.1. The system is released from rest. Mass X slides on the smooth tabletop and hits a vertical board that is attached to a spring that is firmly attached to a fixed triangular block.

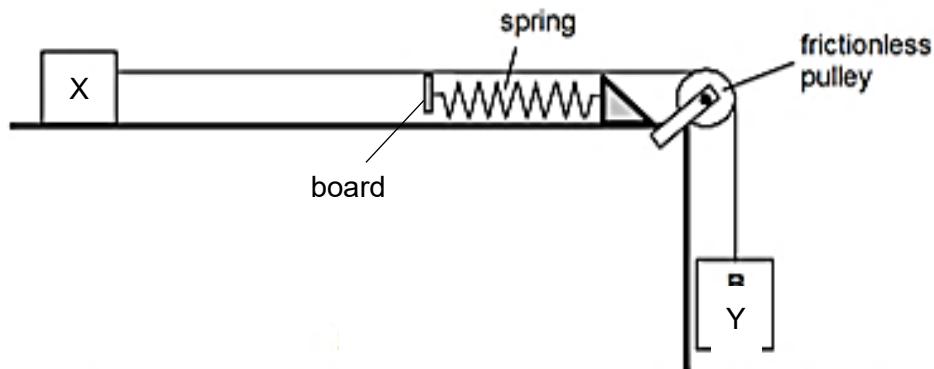


Fig. 2.1

- (a) In Fig. 2.2, draw the free-body diagrams of mass X and Y after they are released from rest. Label the forces clearly.



Fig. 2.2

[2]

- (b) (i) Show that the magnitude of the acceleration of mass X is  $7.2 \text{ m s}^{-2}$  just before it hits the spring.

[2]

- (ii) Calculate the tension in the string just before mass X hits the spring.

tension = ..... N [1]

- (iii) Calculate the resultant force on the two masses just before mass X hits the spring.

resultant force = ..... N [1]

- (c) A student calculates the speed of mass X and the board immediately just after the collision using the conservation of linear momentum since both objects move at the same speed at that instant.

Explain whether you agree with the method used by the student.

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[2]

