## Section A

Answer **all** the questions in this Section in the spaces provided.

**1** **(a)** State Newton's second law of motion.

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……..

…….....[2]

**(b)** Two objects X and Y are attached together by a rope of negligible mass over a frictionless pulley in Fig. 1.1.

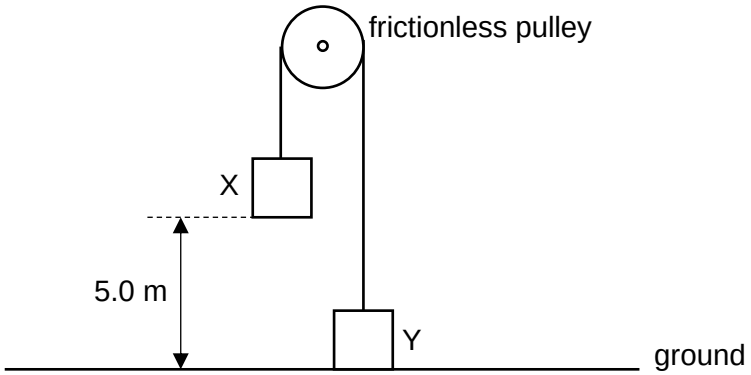


**Fig. 1.1**

The mass of object X is greater than the mass of object Y. Object Y is held on the ground and object X is at a vertical height of 5.0 m above the ground. Object Y is released. Air resistance is negligible.

**(i)** Explain why the acceleration of object X is less than the acceleration of free fall *g*.

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……..... [1]

**(ii)** Show that the acceleration of object Y is given by the relation

$$a = \frac{m_X - m_Y}{m_X + m_Y} g$$

where $m_X$ is the mass of object X, $m_Y$ is the mass of object Y, and $g$ is the acceleration of free fall.

[3]

**(iii)** The mass of object X is 6.0 kg and the mass of object Y is 3.0 kg. Calculate the time taken by object X to reach the ground.

time taken = …… s [2]

[Total: 8]