Section B

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

6 **(a)** **(i)** Define acceleration.

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..... [1]

(a) **(ii)** State a scenario in which an object has an acceleration but is at rest.

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..... [1]

(b) The graph in Fig. 6.1 shows the variation of the acceleration of a ball bearing being released into a beaker filled with an unknown fluid.

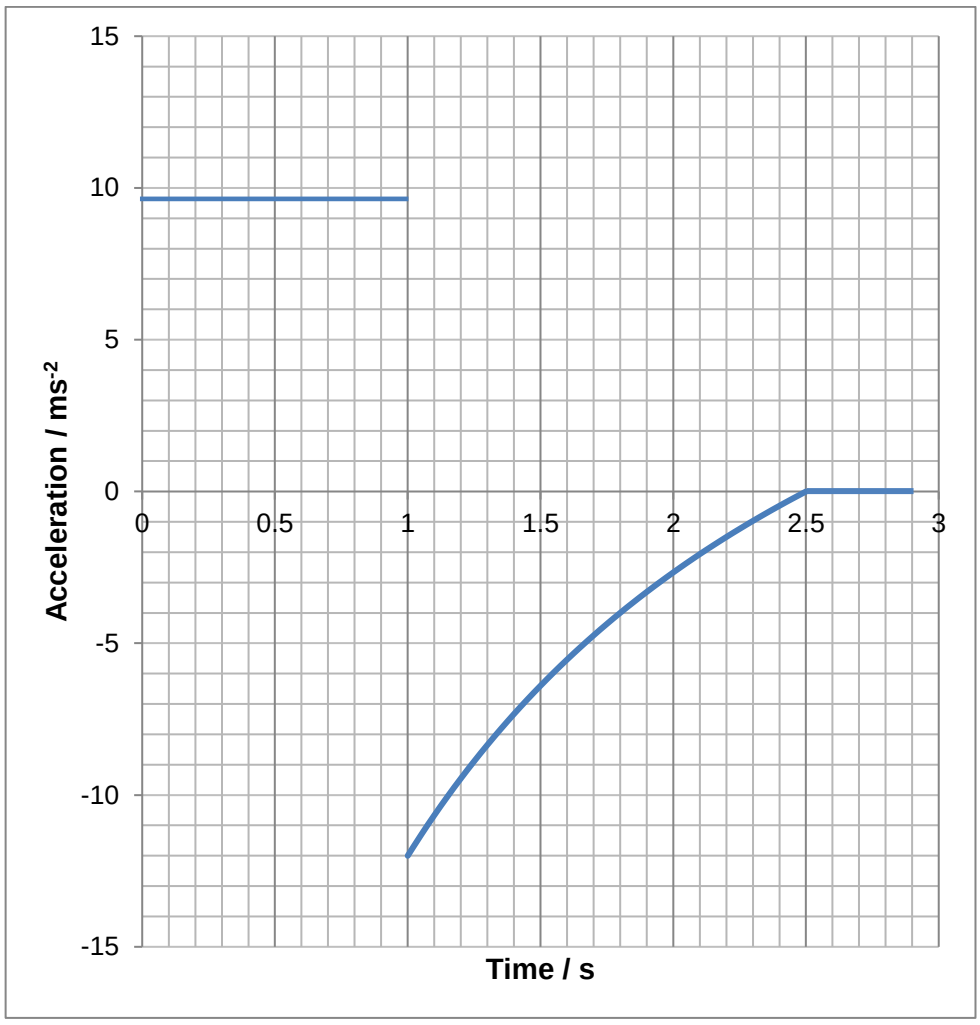

Fig. 6.1

(b) **(i)** Explain whether air resistance is negligible in Fig. 6.1.

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..... [1]

(ii) At the time of 2.5 s, the acceleration of the ball is zero. Explain whether this means that the ball has reached the bottom of the beaker.

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..... [1]

(iii) Draw a free body diagram indicating all forces acting on the ball bearing at the time of 2.5 s.

[1]

(iv) Determine the magnitude of the highest velocity of the ball bearing.

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

(v) Determine the terminal velocity of the ball bearing.

velocity = ... m s^{-1} [2]

(vi) Sketch a velocity time graph for the motion of the ball in Fig. 6.2. Indicate all relevant values on your graph.

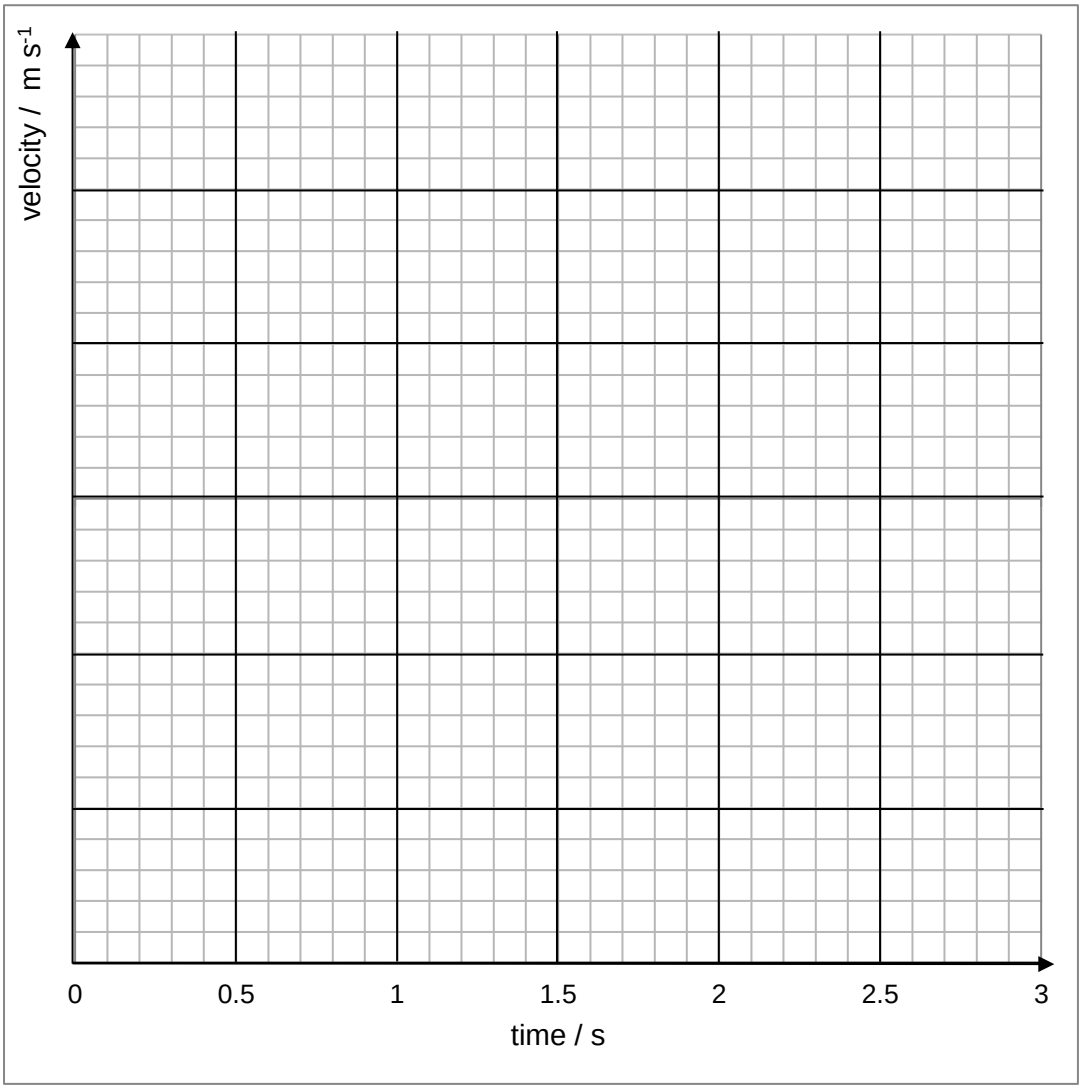

Fig. 6.2

[2]

(c) Fig. 6.3 below shows part of an experiment that is being used to estimate the speed of an air gun pellet.

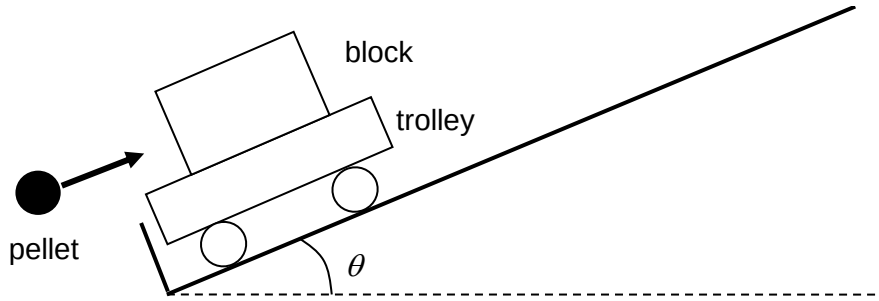

Fig. 6.3

The pellet which is moving parallel to the track, strikes the block with a speed of *u* before it is embedded to the block. The trolley and the block then move along the smooth track, rising a vertical height, *h*.

(i) Explain how the speed of the pellet *u* can be determined from measurements of *h*.

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..... [2]

(ii) Explain whether the speed of pellet *u,* is an underestimated or overestimated if frictional forces are not negligible.

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..... [1]

(d) The following data is collected from the experiment:

Mass of trolley and block	0.50 kg
Mass of pellet	0.0020 kg
Speed of trolley and block immediately after impact	0.40 m s^{-1}

(i) State the principle of conservation of linear momentum.

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..... [2]

(ii) Calculate the speed of the pellet just before impact.

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

(e) Use your answer from part **(d)** to show that the collision between the pellet and block is inelastic.

[2]

[Total: 20]