1 Fig. 1.1 shows a straight section of a river where the water is flowing from right to left at a speed of 0.54 m / s.
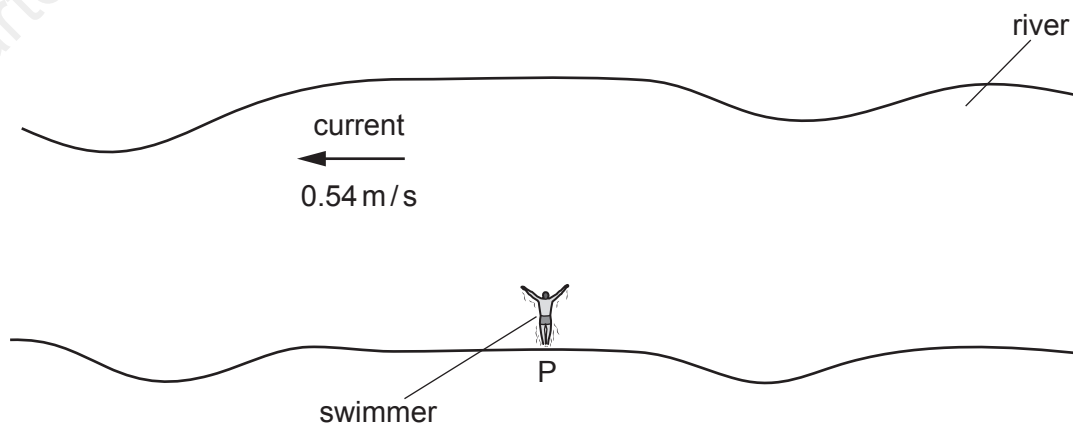

Fig. 1.1 (not to scale)

A swimmer starts at point P and swims at a constant speed of 0.72 m / s relative to the water and at right angles to the current.

(b) When the swimmer is crossing the river, his actions produce a constant forward force on his body.

Explain why he moves at a constant speed.

....

....

....

.... [2]

MARK SCHEME:

friction (of water backwards) **OR** resistance (on swimmer backwards)	**B1**
(friction / resistance) balances forward force **OR** (there is) no resultant force	**B1**

2 **(c)** An object is released from the balloon. It starts at rest and eventually reaches a constant speed.

(i) On the axes of Fig. 1.2, sketch a speed–time graph to show this motion.

Fig. 1.2

[3]

(ii) State the values of the initial acceleration and the final acceleration of the object.

initial acceleration ....

final acceleration ....

[2]

MARK SCHEME:

(i)	starts at origin	**B1**
	finishes horizontal by eye	**B1**
	gradient decreasing smoothly to 0	**B1**
(ii)	$10 \, m/s^2$ (down)	**B1**
	0 ignore any unit	**B1**

3 Fig. 2.1 shows a motorcyclist accelerating along a straight horizontal section of track.
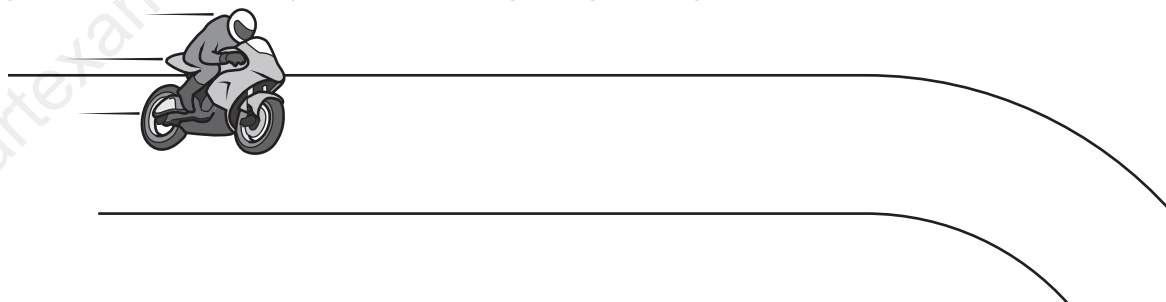

Fig. 2.1

The motorcyclist and motorcycle have a combined mass of 240 kg.

(b) At the end of the straight section, the track remains horizontal but bends to the right, as shown in Fig. 2.1.

When the motorcyclist reaches the bend, she travels around the bend in a circular path at a constant speed.

(i) Velocity is a vector quantity.

State how a vector quantity differs from a scalar quantity.

....

.... [1]

MARK SCHEME:

(i)	(vector) has direction (as well as magnitude) **OR** scalar does not have direction	**B1**