1 Fig. 3.1 shows a simple turbine, similar to those used in a nuclear power station.

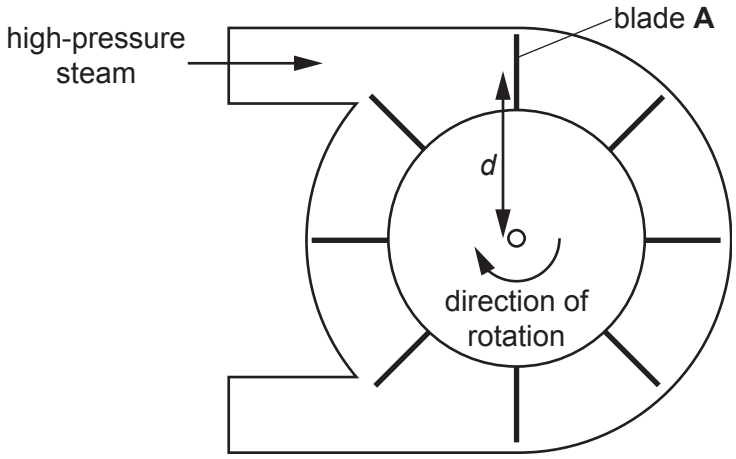

Fig. 3.1

(iii) When the turbine spins, blade **A** moves with a constant speed but a changing velocity.

Explain why the velocity of blade **A** changes.

.....

..... [1]

MARK SCHEME:

	the direction (of blade A) changes ;	1

2 Fig. 6.1 shows a bee collecting pollen from a flower.

Fig. 6.1

(a) The maximum speed of a bee is 5.8 m / s.

(i) Calculate the maximum distance a bee can travel in 60 seconds.

maximum distance = ... m [2]

MARK SCHEME:

(a)(i)	(d =) $v \times t$ / (d =) 5.8 × 60 ; 348 or 350 (m) ;	**2**

3 Fig. 9.3 shows a speed-time graph for part of the toy boat's journey.

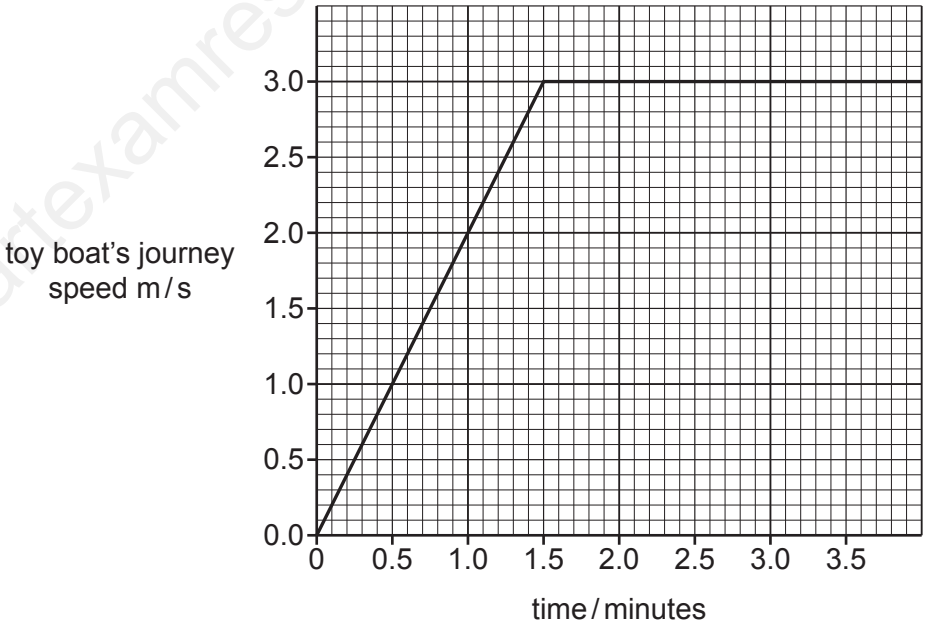

Fig. 9.3

(i) Use Fig. 9.3 to describe the motion of the toy boat for this part of the journey.

.....

.....

..... [2]

(ii) Suggest why the shape of this graph is **not** a realistic description of the motion of the toy boat at 1.5 minutes.

.....

.....

..... [1]

MARK SCHEME:

)(i)	initially / in first 1.5 mins, **constant** acceleration ; then / after 1.5 min, acceleration is zero / **constant** speed ;	**2**
(ii)	(idea that) change in acceleration would take some time / change more gradually / graph would be a curve at 1.5 mins ;	**1**

4 Meteoroids are lumps of rock which travel through space.

(a) During its journey through space, a meteoroid travels at a constant speed of 25 000 m / s.

(i) Calculate the time taken for the meteoroid to travel 1000 m.

time = ... s [2]

(ii) Fig. 3.1 shows a speed–time graph for the meteoroid as it enters the atmosphere of a planet.

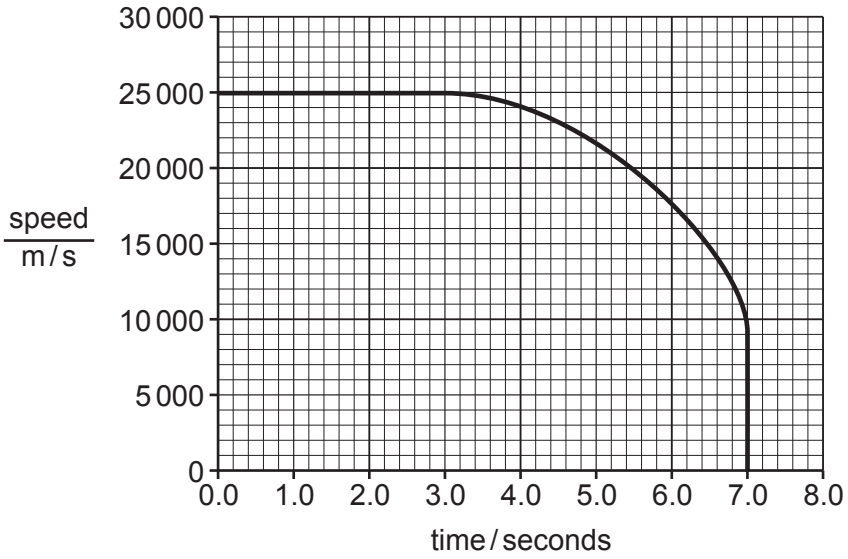

Fig. 3.1

Describe the motion of the meteoroid shown in Fig. 3.1.

.....

.....

.....

.....

..... [3]

MARK SCHEME:

Question	Answer	Marks
(a)(i)	(t =) d / v or 1000 / 25 000 ; (*in any form*) (t =) 0.04 (s) ;	**2**
(a)(ii)	0–3 s / initially constant speed ; then slows down / decelerates / negative acceleration / non-constant deceleration ; (at 7 s) it stops / hits the ground / speed becomes 0 ;	**3**

5 Fig. 9.1 shows the motion of a sprinter running a race.

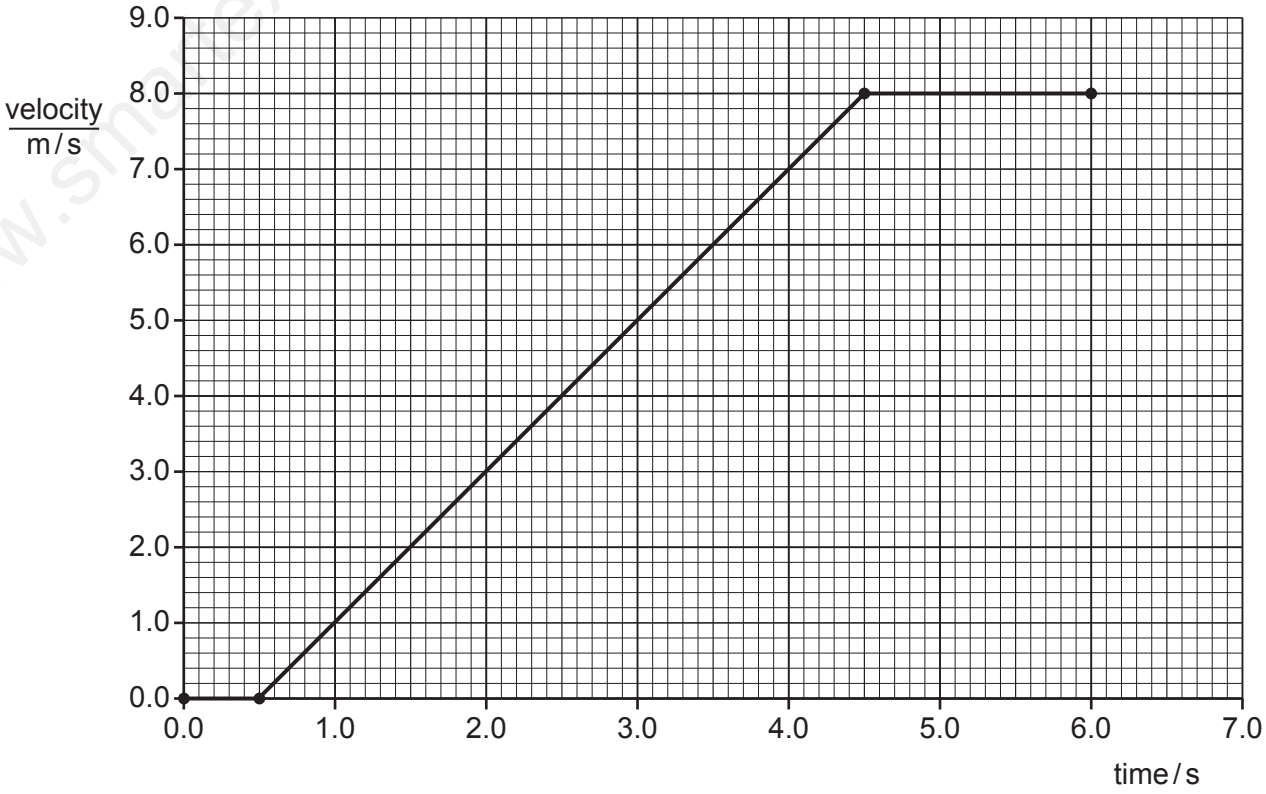

Fig. 9.1

(a) Describe the motion of the sprinter during the first 0.5 seconds of the race.

.....

..... [1]

(b) Show that the maximum acceleration of the sprinter is 2.0 m / s^2.

[1]

(c) This acceleration is caused by a resultant force of 160 N.

Calculate the mass of the sprinter.

mass = ... kg [2]

MARK SCHEME:

(a)	stationary ;	**1**
(b)	(a =) 8.0 / 4.0 ;	**1**
(c)	(m =) F / a **or** 160 / 2.0 ; 80 (kg) ;	**2**