Topical Past Paper Worksheets

IGCSE Physics (0625) Paper 4

[Short-answer and structured questions]

Exam Series: February/March 2017 - October/November 2024

Format Type B:
Each question is followed by its answer scheme

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Introduction

Each Topical Past Paper Questions Workbook contains a comprehensive collection of hundreds of questions and corresponding answer schemes, presented in worksheet format. The questions are carefully arranged according to their respective chapters and topics, which align with the latest IGCSE or AS/A Level subject content. Here are the key features of these resources:

1. The workbook covers a wide range of topics, which are organized according to the latest syllabus content for Cambridge IGCSE or AS/A Level exams.
2. Each topic includes numerous questions, allowing students to practice and reinforce their understanding of key concepts and skills.
3. The questions are accompanied by detailed answer schemes, which provide clear explanations and guidance for students to improve their performance.
4. The workbook's format is user-friendly, with worksheets that are easy to read and navigate.
5. This workbook is an ideal resource for students who want to familiarize themselves with the types of questions that may appear in their exams and to develop their problem-solving and analytical skills.

Overall, Topical Past Paper Questions Workbooks are a valuable tool for students preparing for IGCSE or AS/A Level exams, providing them with the opportunity to practice and refine their knowledge and skills in a structured and comprehensive manner. To provide a clearer description of this book's specifications, here are some key details:

- Title: Cambridge IGCSE Physics (0625) Paper 4 Topical Past Papers
- Subtitle: Exam Practice Worksheets With Answer Scheme
- Examination board: Cambridge Assessment International Education (CAIE)
- Subject code: 0625
- Years covered: February/March 2017 - October/November 2024
- Paper: 4 (extended)
- Number of pages: 1134
- Number of questions: 566

Contents

Chapter 1

Motion, forces and energy

1.1 Physical quantities and measurement techniques

1. 0625_w22_qp_42 Q: 2

(a) A pendulum swings with a time period of approximately one second.

Describe how to use a stop-watch to determine the time period of the pendulum.

....

....

....

.... [3]

(b) Complete Table 2.1 by writing in each space of the right-hand column which **one** of the following devices is used to measure the quantity in the left-hand column.

digital balance, measuring cylinder, metre rule

micrometer screw gauge, stop-watch, thermocouple

Table 2.1

quantity	device
volume of water in a glass	
width of a small swimming pool	
thickness of a piece of aluminium foil	

[3]

Answer:

Question	Answer	Marks
(a)	(use stop-watch to) time oscillations	B1
	(use of fiduciary) aid to determine a complete cycle	B1
	(use of) multiple oscillations **AND** division (to determine period)	B1
(b)	quantity / device volume of water in a glass / measuring cylinder width of a small swimming pool / metre rule thickness of a piece of aluminium foil / micrometer screw gauge 1 mark for each correct response	B3

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2. 0625_s17_qp_42 Q: 1

(a) **(i)** Speed is a scalar quantity and velocity is a vector quantity.

State how a *scalar* quantity differs from a *vector* quantity.

....

....[1]

(ii) Underline the **two** scalar quantities in the list below.

energy **force** **impulse** **momentum** **temperature** [1]

(b) A boat is moving at constant speed.

On Fig. 1.1, sketch a distance-time graph for the boat.

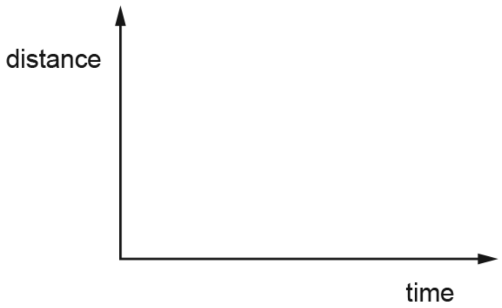

Fig. 1.1

[1]

(c) The boat in **(b)** is moving due west at a speed of 6.5 m/s relative to the water. The water is moving due south at 3.5 m/s.

In the space below, draw a scale diagram to determine the size and direction of the resultant of these two velocities. State the scale used.

scale ....

size of resultant velocity = ...

direction of resultant ....

[4]

[Total: 7]

Answer:

(a)(i)	(a scalar) does **not** have direction	**B1**
(a)(ii)	energy **and** temperature	**B1**
(b)	straight line **and** non-zero gradient	**B1**
(c)	scale $\geqslant$ 1 cm: 1 m/s	**B1**
	two arrows/lines **and** correct resultant OR rectangle and correct diagonal (towards bottom left)	**B1**
	7.2→7.6 m/s	**B1**
	26.0° $\leqslant$ angle below E–W $\leqslant$ 30.5° OR 239.5° $\leqslant$ bearing $\leqslant$ 244°	**B1**
	Total:	**7**

1.2 Motion

3. 0625_s24_qp_42 Q: 2

(a) Define acceleration.

....

.... [1]

(b) A train has a total mass of 520 000 kg. The train accelerates at 1.1 m/s^2.

(i) Calculate the time taken for the train to increase its speed from 15 m/s to 28 m/s.

time = ... [2]

(ii) Calculate the force required to produce an acceleration of 1.1 m/s^2 for this train.

force = ... [2]

(iii) The train uses electric motors.

Explain why the force on the train due to the motors is greater than the value calculated in **(ii)**.

....

.... [1]

[Total: 6]

Answer:

Question	Answer	Marks
(a)	change in velocity per unit time **OR** rate of change of velocity **OR** (a =) $\Delta v / \Delta t$	**B1**
(b)(i)	12 s	**A2**
	(Δt =) $\Delta v / a$ **OR** 13 / 1.1	C1
(b)(ii)	570 000 N	**A2**
	$F = ma$ **OR** (F =) ma **OR** (F =) 520 000 × 1.1	C1
(b)(iii)	(additional force is needed to overcome) friction **OR** air resistance **OR** drag	**B1**

4. 0625_w24_qp_42 Q: 1

(a) A rocket has an initial mass of 7.4×10^6 kg.

(i) Calculate the initial weight of the rocket.

weight = ... [1]

(ii) Define, in words, the term weight.

....

.... [1]

(b) Fig. 1.1 shows part of the speed-time graph for the rocket as it leaves the ground and travels into space.

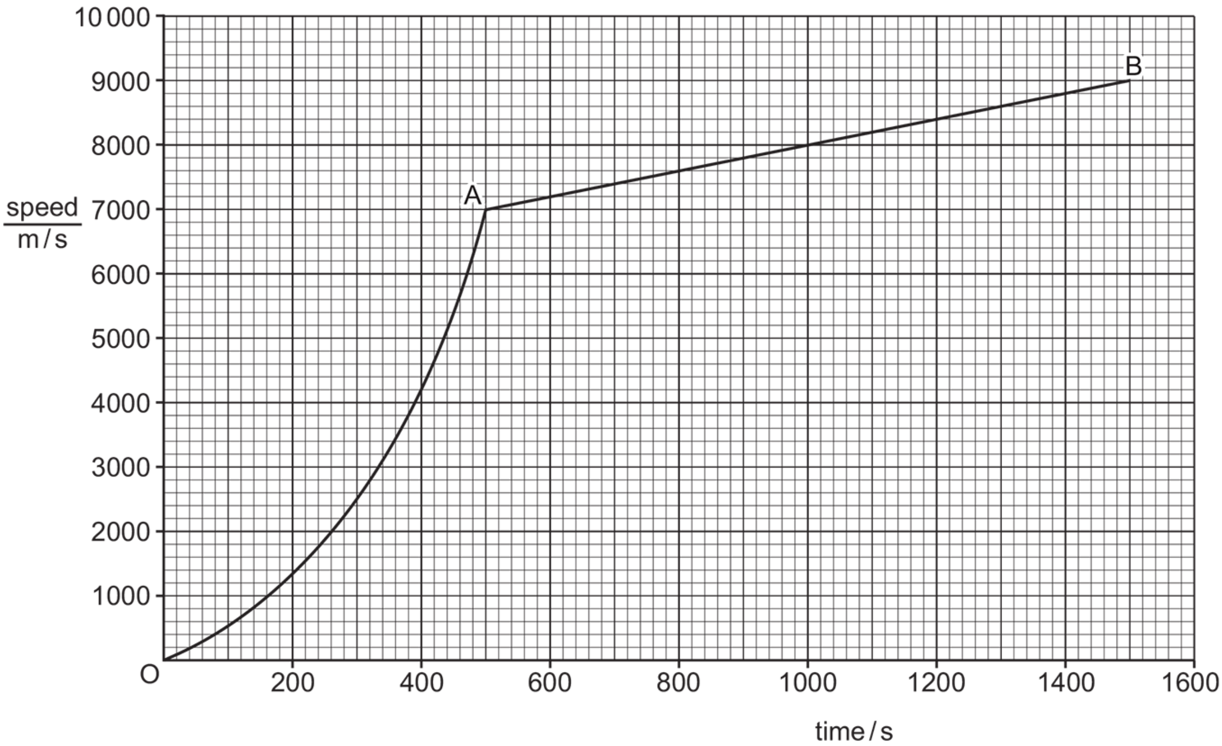

Fig. 1.1

(i) Describe the motion of the rocket:

From O to A ....

From A to B ....
[2]

(ii) Draw a tangent to the graph at time = 400 s and use this to calculate the acceleration of the rocket at this time. Show your working.

acceleration = ... [2]

(c) Rockets are used to launch satellites into space. When the satellite is released, the rocket returns to the Earth.

Explain in terms of forces why the rocket reaches terminal velocity as it travels through the atmosphere back to the Earth.

....

....

.... [2]

[Total: 8]

Answer:

Question	Answer	Marks
(a)(i)	7.3×10^7 N	**B1**
(a)(ii)	(weight is) the gravitational force on a mass / an object (with mass) **OR** (weight is) the effect of a gravitational field on a mass	**B1**
(b)(i)	(from O to A) increasing acceleration	**B1**
	(from A to B) constant / uniform acceleration	**B1**
(b)(ii)	tangent drawn at time = 400 s	**M1**
	$\Delta y / \Delta x$ from candidate's tangent seen **AND** $17\ m/s^2 \leqslant$ acceleration $\leqslant 23\ m/s^2$	**A1**
(c)	resistive force / air resistance / drag increases as velocity increases	**B1**
	until gravitational force is balanced by air resistance (at terminal velocity) OR until resultant / net force is zero (at terminal velocity)	**B1**

5. 0625_m23_qp_42 Q: 1

(a) A boat crosses a river. The boat points at right angles to the river bank and it travels at a speed of 3.5 m/s relative to the water.

A river current acts at right angles to the direction the boat points. The river current has a speed of 2.5 m/s.

By drawing a scale diagram or by calculation, determine the speed and direction of the boat relative to the river bank.

speed = ...

direction relative to the river bank = ...

[4]

(b) Speed is a scalar quantity and velocity is a vector quantity.

State the names of **one** other scalar quantity and **one** other vector quantity.

scalar quantity ....

vector quantity ....

[2]

Answer:

Question	Answer		Marks
(a)	speed = 4.3 m / s	speed = 4.3 m / s	**A2**
	correct vector triangle or rectangle drawn	use of Pythagoras' theorem e.g. $a^2 + b^2 = c^2$ OR (speed =) $\sqrt{(2.5^2 + 3.5^2)}$	(C1)
	direction = 54° or 55°	direction = 54° or 55°	**A2**
	resultant velocity vector (including arrow)	use of trigonometry to find angle e.g. tan Θ = 3.5 / 2.5	(C1)
(b)	a scalar quantity distance, time, mass, energy, temperature		**B1**
	a vector quantity force, weight, acceleration, momentum, electric field strength, gravitational field strength		**B1**

6. 0625_s23_qp_41 Q: 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.

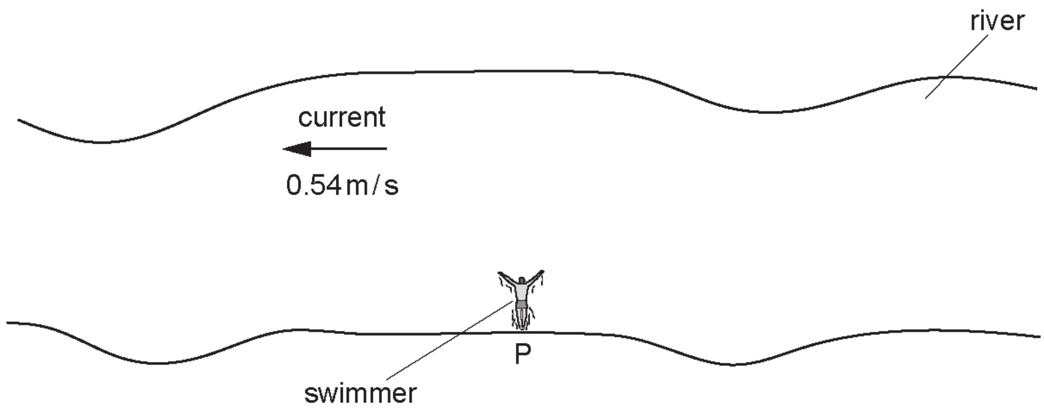

Fig. 1.1 (not to scale)

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.

(a) **(i)** Determine, relative to the river bank, both the magnitude and direction of the swimmer's velocity.

magnitude of velocity = ...

direction of velocity ....
[4]

(ii) After 1.5 minutes, the swimmer reaches point Q.

Calculate the distance between P and Q.

distance = ... [3]

(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]

Answer:

Question	Answer	Marks
(a)(i)	(magnitude of velocity =) 0.90 m / s	**A2**
	use of Pythagoras' theorem e.g. $a^2 + b^2 = c^2$ OR (speed =) $\sqrt{(0.54^2 + 0.72^2)}$ **OR** correct vector triangle or rectangle drawn	C1
	(direction of velocity =) 53° (to riverbank)	**A2**
	use of trigonometry to find angle e.g. $\tan\theta = 0.72 / 0.54$ **OR** (only) angle with horizontal identified on the diagram	C1
(a)(ii)	(distance =) 81 m	**A3**
	$v = s / t$ **OR** (s =) vt **OR** (s =) 0.9(0) × 90	C1
	(time =) 1.5 × 60 (= 90) **OR** (time =) 90	C1
(b)	friction (of water backwards) **OR** resistance (on swimmer backwards)	**B1**
	(friction / resistance) balances forward force **OR** (there is) no resultant force	**B1**

7. 0625_m22_qp_42 Q: 1

A ball rolls down a ramp and onto a horizontal surface. The first section of the horizontal surface is smooth. The second section of the horizontal surface is rough. Fig. 1.1 shows a speed–time graph for the ball.

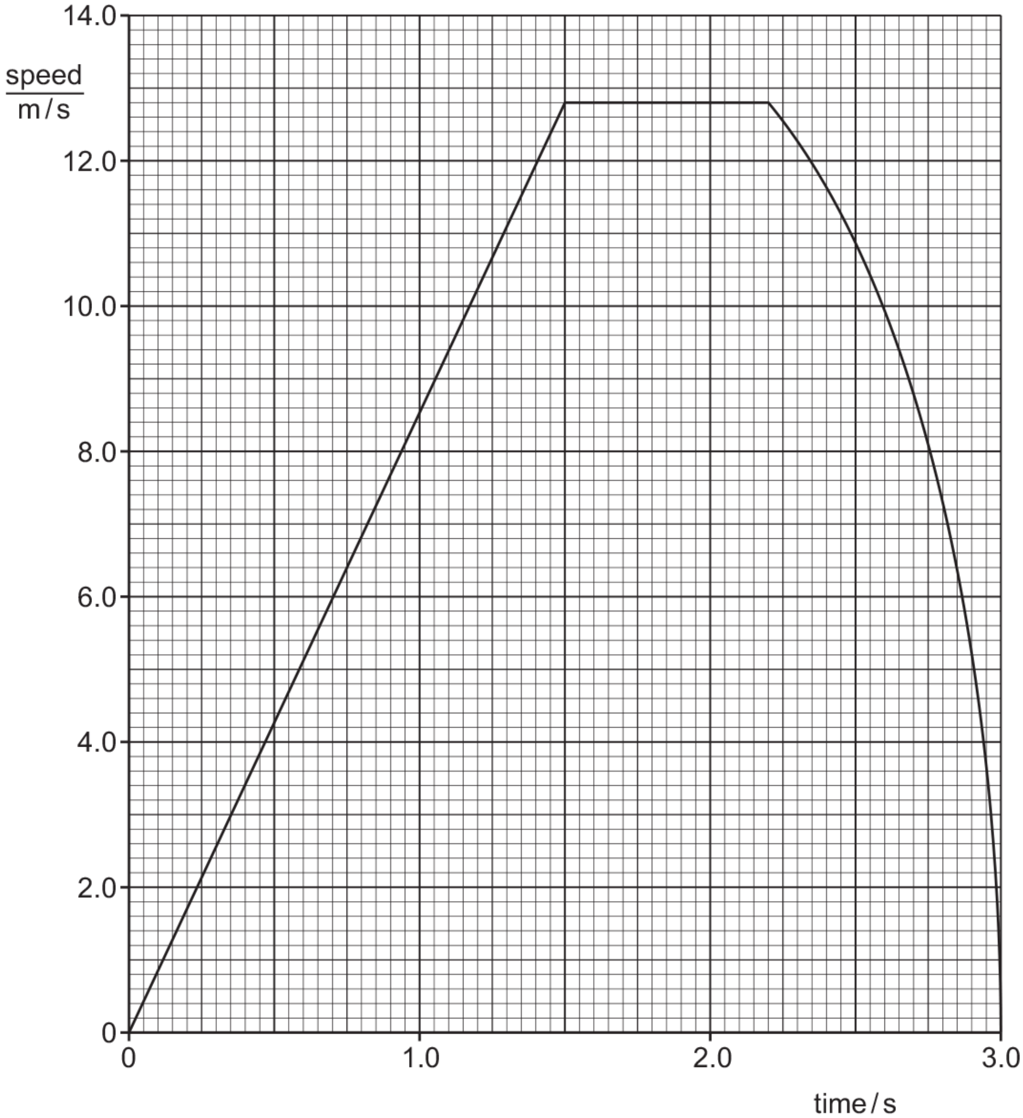

Fig. 1.1

(a) State the time when the ball reaches the start of the rough section of the horizontal surface.

time = ... [1]

(b) Explain how Fig. 1.1 shows that there is **no** resultant force on the ball when it rolls along the smooth section of the horizontal surface.

....

.... [2]

(c) Using Fig. 1.1, determine the acceleration of the ball as it rolls down the ramp.

acceleration = ... [3]

(d) The ball starts from rest at the top of the ramp.

Show that the length of the ramp is 9.6 m.

[2]

Answer:

Question	Answer	Marks
(a)	2.2 s	**B1**
(b)	*Any two from:* • Line on graph is horizontal / gradient is zero • (therefore) no acceleration / speed is constant • (resultant) force causes / is proportional to acceleration	**B2**
(c)	8.5 ms^{-2}	**A3**
	(a =) $\Delta v / t$ in any form OR gradient of graph OR 12.8 / 1.5 OR other suitable values from graph	**(C1)**
	(1.5, 12.8) both seen OR alternative suitable points on the line identified	**(C1)**
(d)	0.5 × 12.8 × 1.5 (= 9.56 / 9.6 m) OR 6.4 × 1.5 (= 9.6)	**A2**
	(length of ramp) = area under graph (between 0–1.5 s) OR average velocity × time	**(C1)**

8. 0625_w21_qp_42 Q: 1

Fig. 1.1 shows a space rocket accelerating away from a launch pad.

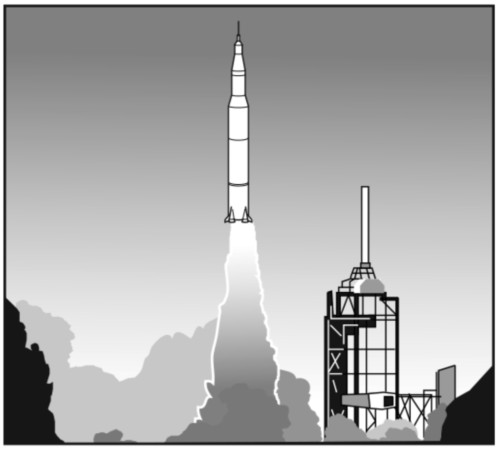

Fig. 1.1

Fig. 1.2 is a speed–time graph for the first 30 s of the rocket's flight.

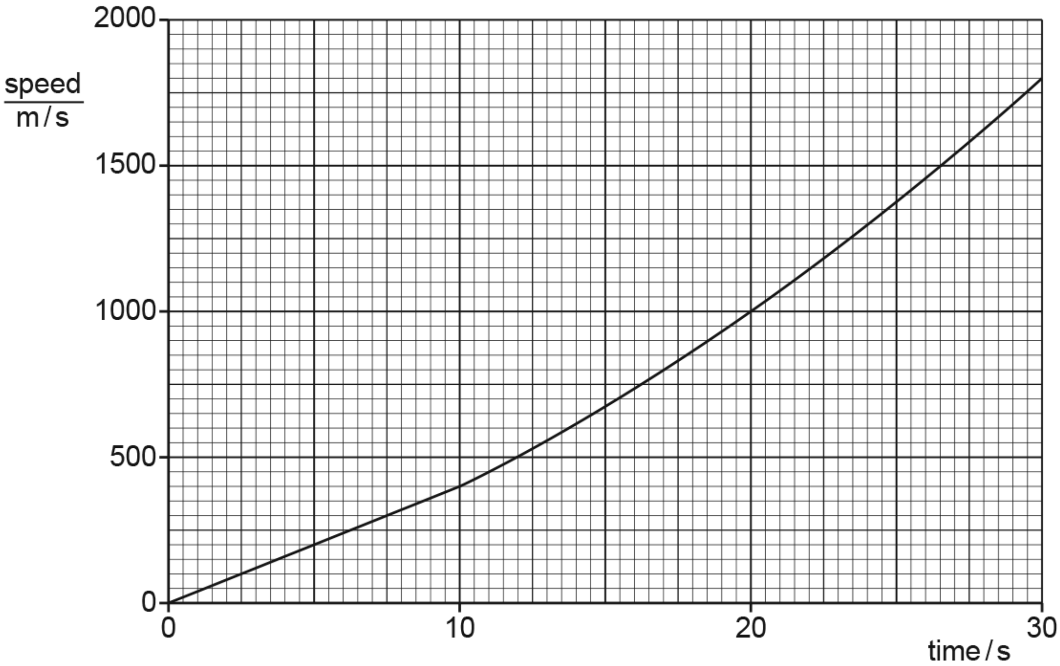

Fig. 1.2

(a) Describe how the acceleration of the rocket changes between time = 10 s and time = 30 s.

.... [1]

(b) By drawing a tangent to the graph, determine the acceleration of the rocket at time = 25 s.

acceleration = ... [2]

(c) Determine the distance travelled by the rocket between time = 0 and time = 10 s.

distance = ... [2]

Answer:

Question	Answer	Marks
(a)	(acceleration) increases	**B1**
(b)	tangent drawn at 25 s	**M1**
	78 to 82 m / s^2	**A1**
(c)	(distance =) area under graph (stated or correct area clearly shown on graph) OR (400 x 10) / 2 OR (b x h) ÷ 2	**C1**
	2000 m	**A1**

9. 0625_m20_qp_42 Q: 1

A rocket is launched vertically upwards from the ground. The rocket travels with uniform acceleration from rest. After 8.0 s, the speed of the rocket is 120 m / s.

(a) Calculate the acceleration of the rocket.

acceleration = ... [2]

(b) (i) On Fig. 1.1, draw the graph for the motion of the rocket in the first 8.0 s.

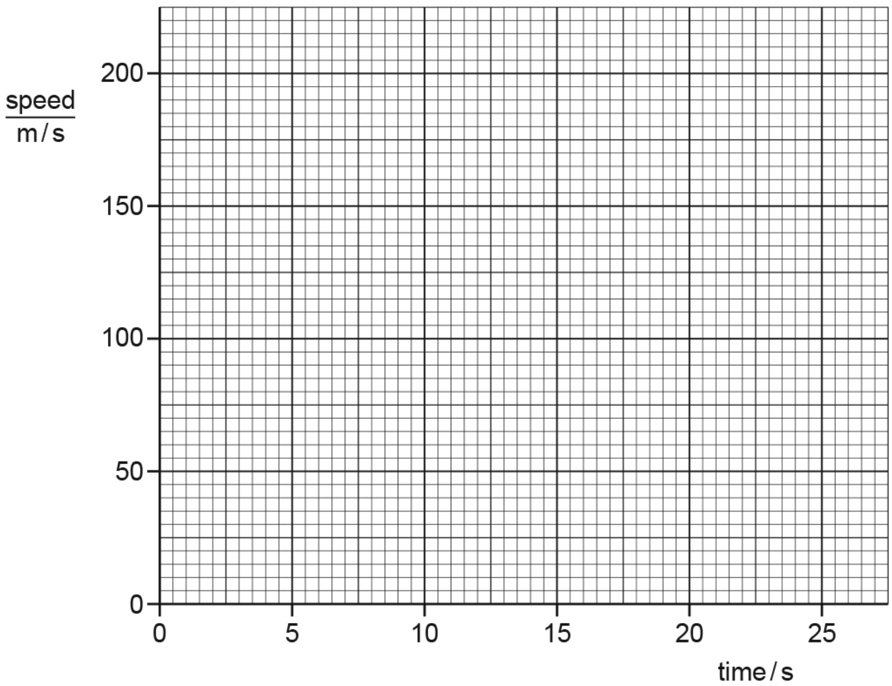

Fig. 1.1

[1]

(ii) Use the graph to determine the height of the rocket at 8.0 s.

height = ... [2]

(iii) From time = 8.0 s to time = 20.0 s, the rocket rises with increasing speed but with decreasing acceleration.

From time = 20.0 s to time = 25.0 s, the rocket has a constant speed of less than 200 m / s.

On Fig. 1.1, draw the graph for this motion. [3]

[Total: 8]

Answer:

(a)	(a=)Δv / Δt in any form OR (a=)Δv / Δt OR (a)=120 / 8	C1
	(a) = 15 m / s^2	A1
(b)(i)	straight line from (0,0) to (8,120)	B1
(b)(ii)	(h = A =) ½ × 120 × 8	C1
	(h=) 480 m	A1
(b)(iii)	rising curve from 8 s to 20 s	B1
	decreasing gradient from 8 s to 20 s	B1
	horizontal from 20 s to 25 s AND below 200 m / s, AND above 120 m / s	B1

10. 0625_s20_qp_42 Q: 1

Fig. 1.1 shows the speed–time graph of a person on a journey.

On the journey, he walks and then waits for a bus. He then travels by bus. He gets off the bus and waits for two minutes. He then walks again. His journey takes 74 minutes.

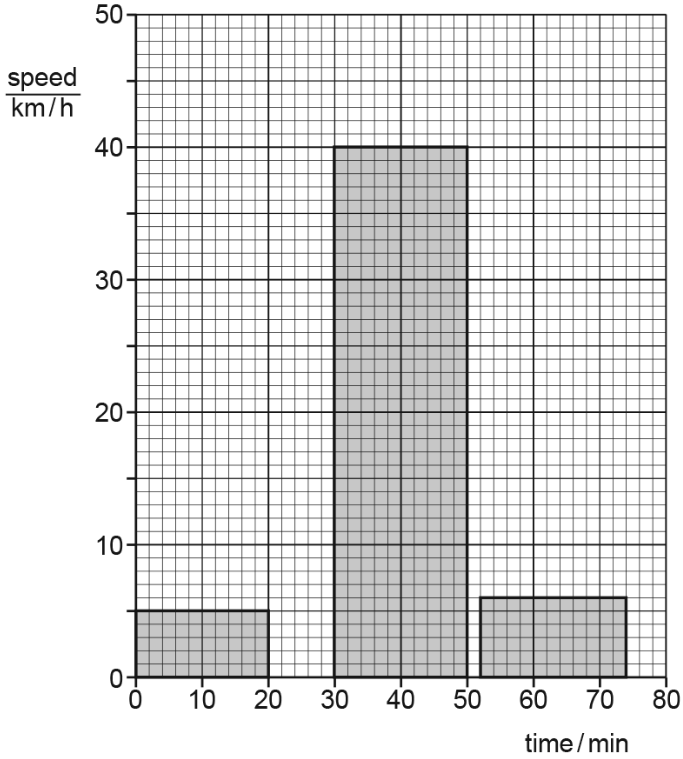

Fig. 1.1

(a) For the whole journey calculate:

(i) the distance travelled

distance = ... [3]

(ii) the average speed.

average speed = ... [2]

(b) State and explain which feature of a speed–time graph shows acceleration.

....

.... [2]

(c) State and explain the acceleration of the person at time = 40 minutes.

....

.... [2]

[Total: 9]

Answer:

(a)(i)	s = vt in any form OR (s =) vt OR relates distance to area (under graph)	**C1**
	any **one** of: 5 × 20 / 60 OR 40 × 20 / 60 OR 6 × 22 / 60	**C1**
	(s = 1.667 + 13.333 + 2.2 =) 17 km	**A1**
(a)(ii)	average speed = candidate's (i) / time	**C1**
	(average speed = 17 × 60 / 74 =) 14 km / h	**A1**
(b)	gradient	**B1**
	(gradient =) change of speed / time	**B1**
(c)	0	**B1**
	(constant) gradient = 0 OR speed constant	**B1**

11. 0625_s20_qp_43 Q: 1

(a) Define *acceleration*.

....

.... [1]

(b) Fig. 1.1 shows two speed–time graphs, A and B, and two distance–time graphs, C and D.

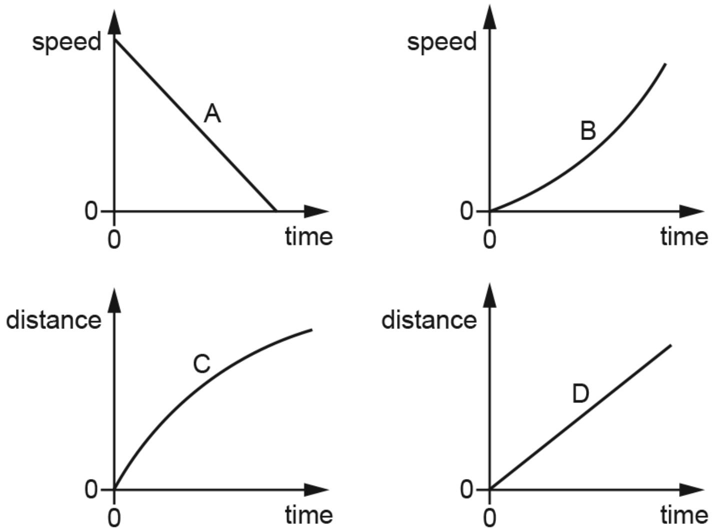

Fig. 1.1

Describe the motion shown by:

(i) graph A ....

.... [2]

(ii) graph B ....

.... [2]

(iii) graph C ....

.... [1]

(iv) graph D. ....

.... [1]

[Total: 7]

Answer:

(a)	rate of change of velocity OR change in speed per unit time / s	**B1**
(b)(i)	deceleration	**C1**
	constant deceleration	**A1**
(b)(ii)	acceleration	**C1**
	increasing acceleration	**A1**
(b)(iii)	decreasing speed / velocity OR deceleration	**B1**
(b)(iv)	constant speed	**B1**

12. 0625_m19_qp_42 Q: 1

(a) Define *acceleration*.

.... [1]

(b) Fig. 1.1 shows the distance-time graph for the journey of a cyclist.

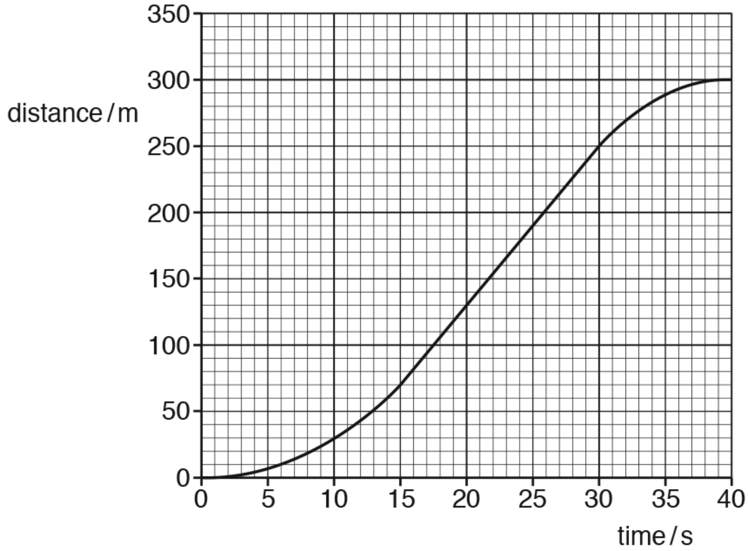

Fig. 1.1

(i) Describe the motion of the cyclist in the time between:

1. time = 0 and time = 15 s

....

2. time = 15 s and time = 30 s

....

3. time = 30 s and time = 40 s.

....
[3]

(ii) Calculate, for the 40 s journey:

1. the average speed

average speed = ... [2]

2. the maximum speed.

maximum speed = ... [2]

[Total: 8]

Answer:

(a)	Rate of change of speed OR change of speed / time OR $\Delta v / t$ OR $(v - u) / t$	**B1**
(b)(i)	**1** Acceleration OR increasing speed OR going faster	**B1**
	2 Constant speed OR steady speed	**B1**
	3 Deceleration OR decreasing speed OR slowing down	**B1**
(b)(ii)	**1** Total distance / total time OR 300 / 40	**C1**
	7.5 m / s	**A1**
	2 Change of distance / change of time OR (250 – 70) / (30 – 15) OR 180 / 15	**C1**
	12 m / s	**A1**

13. 0625_s19_qp_42 Q: 1

A bus is travelling between points A and D. There are bus stops at A, B, C and D but the bus does not stop at B and C. Fig. 1.1 is a speed-time graph for the bus.

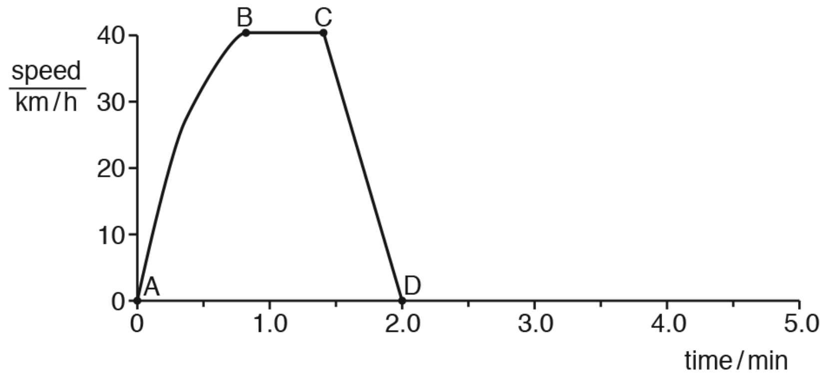

Fig. 1.1

(a) Describe the motion of the bus between each of the bus stops. Select the appropriate description from the list below.

constant acceleration **decreasing acceleration**

increasing acceleration **moving backwards at constant speed**

moving forwards at constant speed **stationary**

1. between A and B ....

2. between B and C ....

3. between C and D ....

[3]

(b) The average speed of the bus between A and D is 23 km / h.

Calculate the distance between A and D.

distance = ... [3]

(c) The bus stops at D for 1 min and then travels at a constant acceleration for 30 seconds.

On Fig. 1.1, sketch a possible graph for this additional motion. Label X when the bus starts to accelerate and label Y for 30 seconds later. [3]

[Total: 9]

Answer:

(a)	(A and B) decreasing acceleration	**B1**
	(B and C) moving forwards at constant speed	**B1**
	(C and D) constant acceleration	**B1**
(b)	(average) speed = distance/time OR $v = s/t$ in any form OR (s =) (average) speed × time OR $v \times t$ OR area under graph stated or used	**C1**
	(s =) 23 × 2/60	**C1**
	0.77 km round candidates response to 2 sfs	**A1**
(c)	horizontal line starting at t = 2.0 min AND at speed = 0 for 1 minute	**B1**
	line of constant positive gradient starting at t >= 2.0 min NOT wrong labels X OR Y	**B1**
	for 30 seconds line continuously rising	**B1**

14. 0625_s19_qp_43 Q: 1

Fig. 1.1 shows a distance-time graph for a cyclist travelling between points P and V on a straight road.

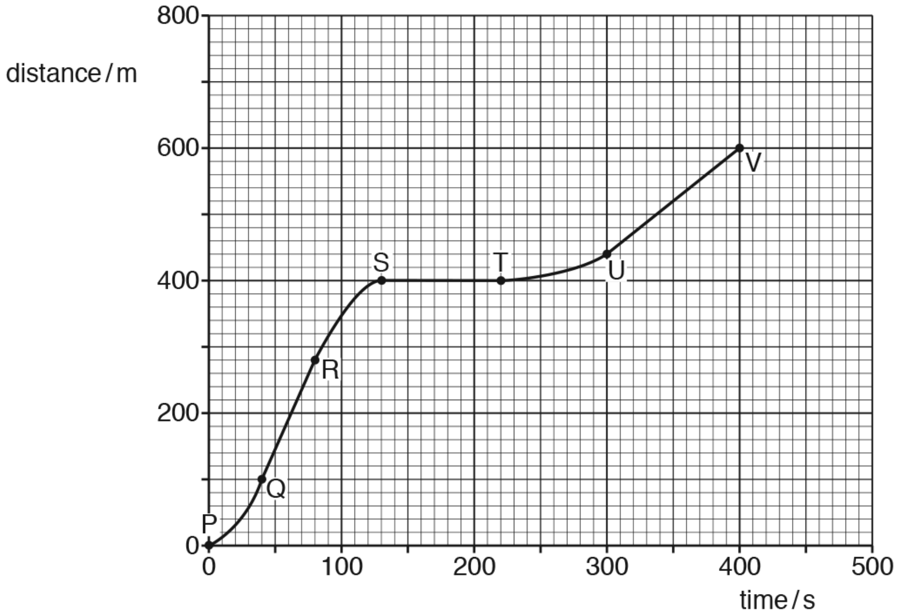

Fig. 1.1

(a) Describe the motion between:

Q and R ....

R and S ....

S and T. ....
[3]

(b) Calculate the speed between U and V.

speed = ... [2]

(c) After point V, the straight road continues down a steep hill. The cyclist travels down the steep hill. He does not apply the brakes and all resistive forces can be ignored.

On Fig. 1.1, sketch a possible motion for the cyclist after V. [1]

[Total: 6]

Answer:

(a)(i)	constant velocity / speed	**B1**
(a)(ii)	deceleration / negative acceleration	**B1**
(a)(iii)	Stationary	**B1**
(b)	v = gradient OR $\frac{\text{distance}}{\text{time}}$ OR $\frac{160}{100}$ OR evidence of use of gradient	**C1**
	(*v* =) 1.6 m/s	**A1**
(c)	line curves upwards with increasing gradient NOT vertical	**B1**

15. 0625_m18_qp_42 Q: 1

(a) Define *acceleration*.

.... [1]

(b) Fig. 1.1 shows the speed-time axes for the graph of the motion of a car.

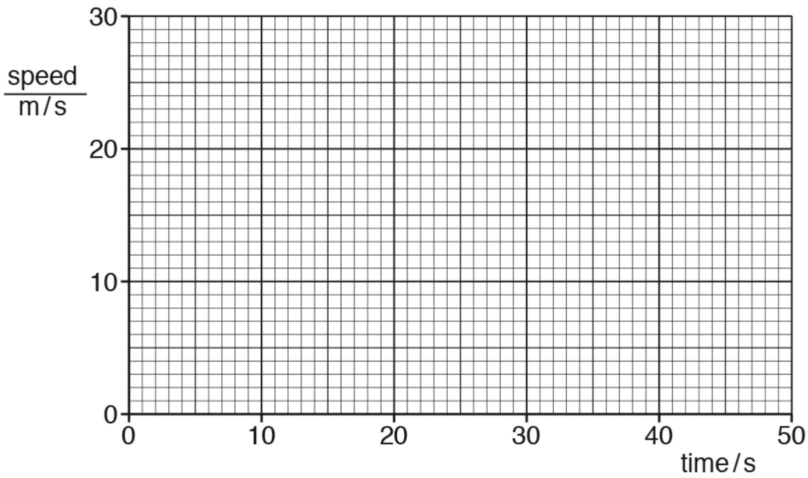

Fig. 1.1

(i) The car starts from rest.

From time = 0 to time = 15 s, the car has a constant acceleration to a speed of 28 m/s.

From time = 15 s to time = 32 s, the car has a constant speed of 28 m/s.

From time = 32 s, the car has a constant deceleration of 2.0 m/s^2 until it comes to rest.

On Fig. 1.1, draw the graph, using the space below for any calculations.

[5]

(ii) From time = 15 s to time = 32 s, the path of the car is part of a circle.

For this motion, state

1. the direction of the resultant force on the car,

....

2. what happens to the velocity of the car.

....
[2]

[Total: 8]

Answer:

(a)	Rate of change of velocity OR change of velocity / time OR change of velocity over time OR (v – u)/t	**B1**
(b)(i)	Straight line from origin to (15, 28)	**B1**
	Horizontal line {from (15, 28)} to (32, 28)	**B1**
	a = (v – u) / t OR (t =) (v – u) / a OR (0 – 28) / 2.0	**C1**
	= 14 (s)	**C1**
	Straight line from (32, 28) to (46, 0)	**A1**
(b)(ii)	**1** Towards the centre of the circle / inwards	**B1**
	2 Velocity is (continually) changing its direction	**B1**

16. 0625_s18_qp_41 Q: 1

Fig. 1.1 shows the speed-time graph for a vehicle accelerating from rest.

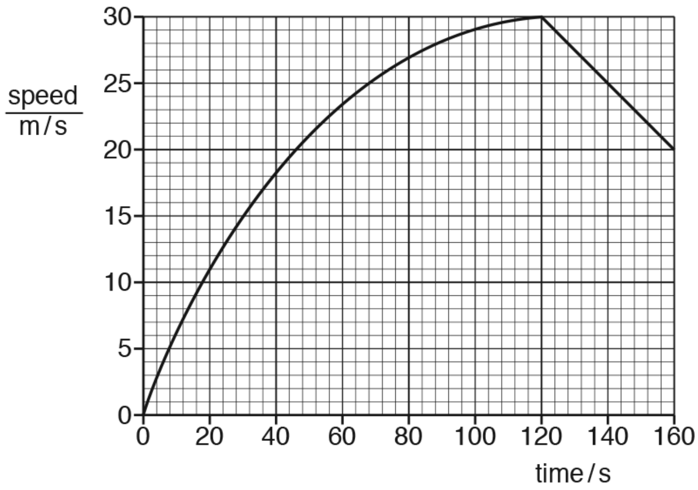

Fig. 1.1

(a) Calculate the acceleration of the vehicle at time = 30 s.

acceleration = ... [2]

(b) Without further calculation, state how the acceleration at time = 100 s compares to the acceleration at time = 10 s. Suggest, in terms of force, a reason why any change has taken place.

....

....

.... [3]

(c) Determine the distance travelled by the vehicle between time = 120 s and time = 160 s.

distance = ... [3]

[Total: 8]

Answer:

(a)	Mention of gradient of graph at t = 30 s **OR** tangent drawn at t = 30 s and triangle drawn	**1**
	Acceleration in range 0.30 to 0.45 m/s^2	**1**
(b)	Acceleration less/at a slower rate	**1**
	Less driving force **OR** greater resistive force/friction/air resistance/drag	**1**
	Resultant force less	**1**
(c)	Area under graph	**1**
	Distance = (20 × 40) + (½ × 40 × 10) **OR** ½ × (30 + 20) × 40	**1**
	1000 m	**1**

17. 0625_s18_qp_42 Q: 1

(a) Fig. 1.1 shows the axes of a distance-time graph for an object moving in a straight line.

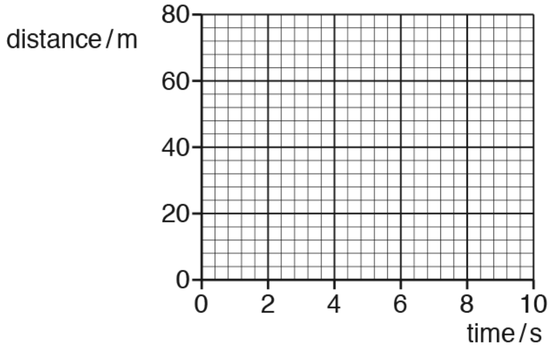

Fig. 1.1

(i) **1.** On Fig. 1.1, draw between time = 0 and time = 10 s, the graph for an object moving with a constant speed of 5.0 m / s. Start your graph at distance = 0 m.

2. State the property of the graph that represents speed.

.... [2]

(ii) Between time = 10 s and time = 20 s the object accelerates. The speed at time = 20 s is 9.0 m / s.

Calculate the average acceleration between time = 10 s and time = 20 s.

acceleration = ... [2]

(b) Fig. 1.2 shows the axes of a speed-time graph for a different object.

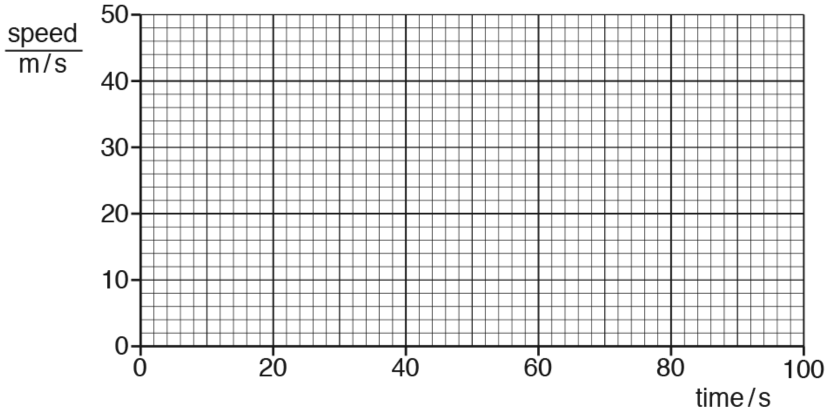

Fig. 1.2

(i) The object has an initial speed of 50 m/s and decelerates uniformly at 0.35 m/s^2 for 100 s.

On Fig. 1.2, draw the graph to represent the motion of the object. [2]

(ii) Calculate the distance travelled by the object from time = 0 to time = 100 s.

distance = ...[3]

[Total: 9]

Answer:

(a)(i)	**1** straight line from (0,0) to (10,50)	**1**
	2 gradient/slope	**1**
(a)(ii)	$a = \Delta v \div \Delta t$ in any form **OR** (a=) $\Delta v \div \Delta t$ **OR** (a =) (9–5) ÷ 10 **OR** 4 ÷ 10	**1**
	(a =) 0.40 m / s^2	**1**
(b)(i)	straight line down from any point on y-axis to any speed at 100 s	**1**
	from (0,50) to (100,15)	**1**
(b)(ii)	uses area <u>under</u> graph **OR** av speed × time **OR** $s=ut + ½at^2$ **OR** $v^2=u^2 + 2as$	**1**
	100 × (50 + 15) ÷ 2 **OR** 100 × 15 + ½ (100 × 35) **OR** 5000 – ½ × 0.35 × 100^2	**1**
	3300 m	**1**

18. 0625_s18_qp_43 Q: 1

There is no atmosphere on the Moon.

A space probe is launched from the surface of the Moon. Fig. 1.1 shows the speed-time graph of the space probe.

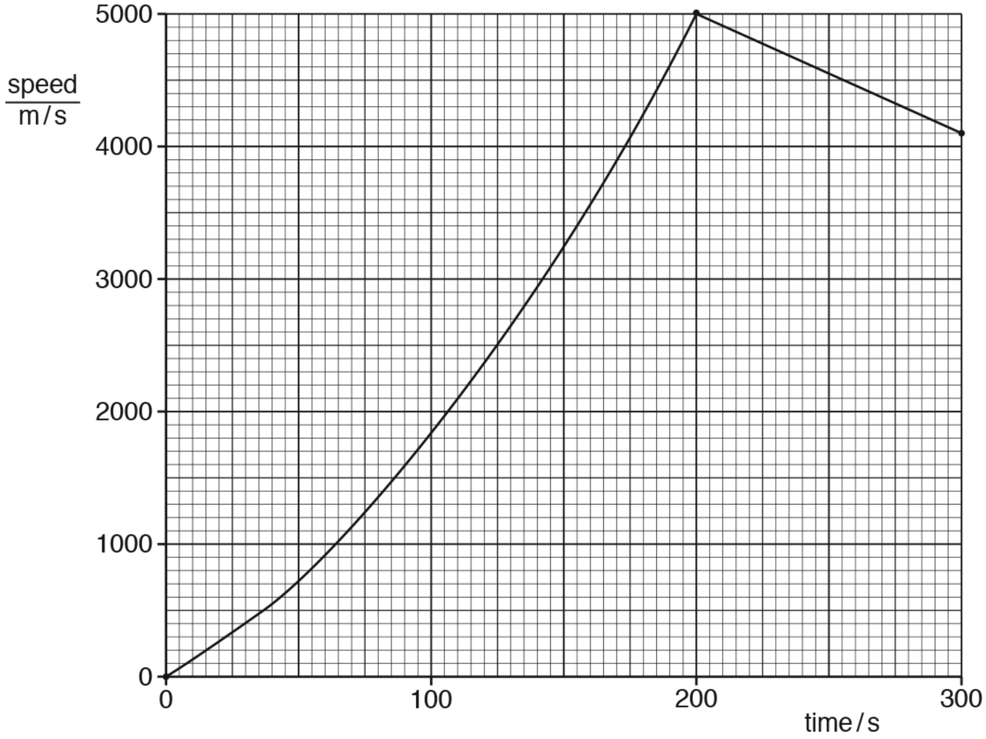

Fig. 1.1

(a) Determine the acceleration of the space probe at time = 0.

acceleration = ...[3]

(b) Between time = 0 and time = 150 s, the acceleration of the space probe changes.

(i) Without calculation, state how the graph shows this.

....

....[1]

(ii) During this time, the thrust exerted on the space probe by the motor remains constant.

State one possible reason why the acceleration changes in the way shown by Fig. 1.1.

....

....[1]

(c) Calculate the distance travelled by the space probe from time = 200 s to time = 300 s.

distance = ...[3]

[Total: 8]

Answer:

(a)	tangent on graph **OR** gradient **OR** (a =) $\Delta v \div \Delta t$ or $(v - u) \div t$	**C1**
	accept gradient increases; **not** gradient decreases	**C1**
	values from tangent or line 13 to 14 m / s^2	**A1**
(b)(i)	gradient changes **OR** graph is curved	**B1**
(b)(ii)	mass of space rocket decreases **OR** gravitational field strength decreases	**B1**
(c)	area under graph **OR** (distance =) average speed × time	**C1**
	4550 × 100 **OR** (4100 + 5000) ÷ 2 × 100	**C1**
	$4.5/4.55/4.6 \times 10^5$ m	**A1**

19. 0625_w18_qp_43 Q: 1

Fig. 1.1 is the distance-time graph for a moving car.

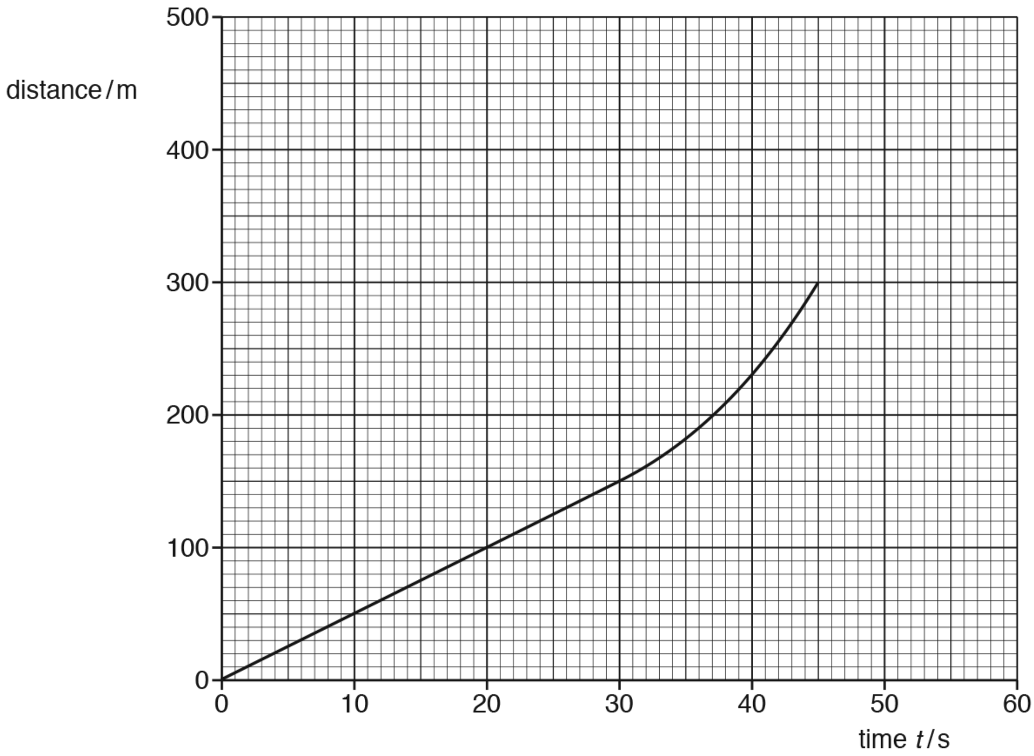

Fig. 1.1

(a) On Fig. 1.1, mark a point P where the acceleration of the car is zero. [1]

(b) Determine:

(i) the speed of the car at time $t = 15\,s$

speed = ...[2]

(ii) the average speed of the car between time $t = 30\,s$ and time $t = 45\,s$.

average speed = ...[2]

(c) At time $t = 45\,s$, the car starts to decelerate. At time $t = 55\,s$ and at a distance of 400 m from the starting point, the car stops. It then remains stationary for 5.0 s.

On Fig. 1.1, draw a possible continuation of the distance-time graph. [3]

[Total: 8]

Answer:

(a)	P marked on line between t = 0 s and t = 30 s	**B1**
(b)(i)	(v =) gradient **or** 150 / 30 **or** appropriate division using other points	**C1**
	5.0 m / s	**A1**
(b)(ii)	(v =) x / t **or** (300 – 150) / (45 – 30) **or** 150 / 15	**C1**
	10 m / s	**A1**
(c)	gradient decreasing	**B1**
	smooth transition to horizontal **and** line not too thick	**B1**
	horizontal to (60 s, 400 m)	**B1**

20. 0625_s17_qp_41 Q: 1

Fig. 1.1 is the speed-time graph for an ice skater.

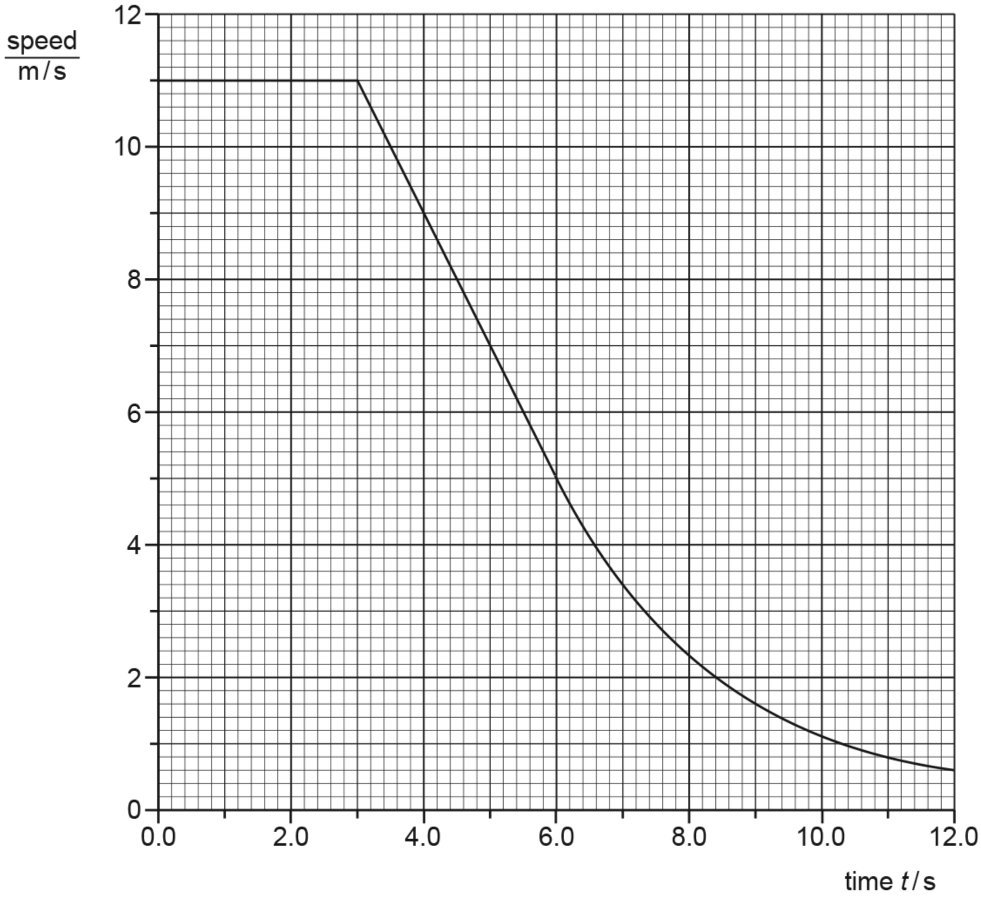

Fig. 1.1

(a) Explain what is meant by *deceleration*.

....[1]

(b) Use Fig. 1.1 to determine

(i) the distance travelled between times t = 3.0 s and t = 6.0 s,

distance = ...[2]

(ii) the deceleration between times t = 3.0 s and t = 6.0 s.

deceleration = ...[2]

(c) **(i)** State what happens to the size of the deceleration after time t = 6.0 s.

....

....[1]

(ii) State what happens to the resultant force on the skater after time t = 6.0 s.

....

....[1]

[Total: 7]

Answer:

(a)	decrease of velocity / speed OR slows / slowing down	**B1**
(b)(i)	Area under graph OR ½ (u +v)t OR ½ × (11 + 5) × 3 OR ½(6 × 3) OR (3 × 5)	**C1**
	24 m	**A1**
(b)(ii)	(a =) Δv / Δt OR (v – u) / t OR (5 – 11) / (6 – 3)	**C1**
	2.0 m / s^2	**A1**
(c)(i)	(deceleration) decreases	**B1**
(c)(ii)	(Resultant force) decreases	**B1**
	Total:	**7**

21. 0625_s17_qp_43 Q: 1

(a) Acceleration is a vector quantity.

Underline the **two** vector quantities in the list below.

energy **force** **frequency** **impulse** **mass** **refractive index**

[1]

(b) A car accelerates uniformly from rest at 2.2 m/s^2 for 3.0 s.

(i) Calculate the speed of the car at time *t* = 3.0 s.

speed = ...[2]

(ii) At time *t* = 3.0 s, it has travelled a distance of 9.9 m.

Calculate the average speed of the car during the first 3.0 s of the journey.

speed = ...[1]

(iii) On Fig. 1.1, sketch a distance-time graph for the first 3.0 s of the journey.

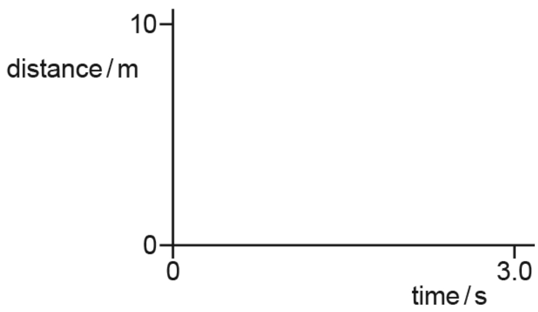

Fig. 1.1

[3]

[Total: 7]

Answer:

(a)	force **and** impulse underlined	**B1**
(b)(i)	(*v* =) *at* OR 2.2 × 3.0	**C1**
	6.6 m / s	**A1**
(b)(ii)	3.3 m / s	**B1**
(c)	curve/line starts at origin	**B1**
	initial gradient zero OR curve passing through (3.0, 9.9)	**B1**
	gradient increasing (with time)	**B1**
	Total:	**7**

1.3 Mass and weight

22. 0625_s17_qp_41 Q: 3

Fig. 3.1 shows remote sensing equipment on the surface of a distant planet.

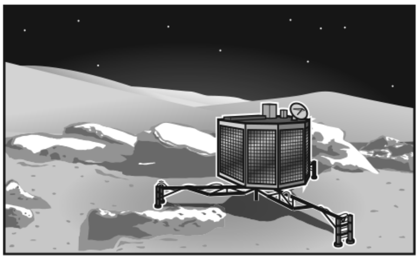

Fig. 3.1

(a) The mass of the equipment is 350 kg. The acceleration of free fall on the surface of this planet is 7.5 m/s^2.

(i) State what is meant by the term *weight*.

....

....[1]

(ii) Calculate the weight of the equipment on the planet.

weight = ...[2]

(b) The equipment releases a balloon from a point that is a small distance above the surface of the planet. The atmosphere at the surface of this planet has a density of 0.35 kg/m^3. The inflated balloon has a mass of 80 g and a volume of 0.30 m^3.

Make an appropriate calculation and then predict and explain the direction of any motion of the balloon. Show your working.

prediction ....

explanation ....

....

[4]

[Total: 7]

Answer:

(a)(i)	(Weight is) force/pull of gravity (acting on an object)	**B1**
(a)(ii)	Mass × acceleration due to gravity OR *mg* OR 350 × 7.5	**C1**
	2600 N	**A1**
(b)	(ρ =) *m* / *V* in any form	**C1**
	0.27 (kg / m^3) OR 270 (g / m^3)	**A1**
	Balloon moves/floats up	**B1**
	(Floats when) density of balloon less than density of atmosphere OR (sinks when) density of balloon greater than atmosphere	**B1**
	OR (ρ =) *m* / *V* in any form	**(C1)**
	110 g	**(A1)**
	Balloon rises	**(B1)**
	(Floats when) mass/weight of balloon less than mass/weight of atmosphere (of same volume as balloon) (Sinks when) mass/weight of balloon greater than mass/weight of atmosphere (of same volume as balloon)	**(B1)**
	Total:	**7**

1.4 Density