IGCSE 0625

PHYSICS

TOPICAL PAPER 4

2016 - 2023

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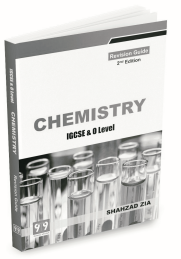

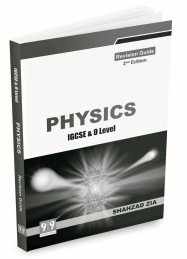

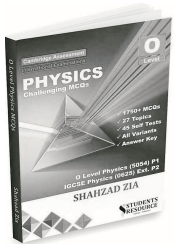

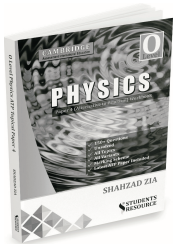

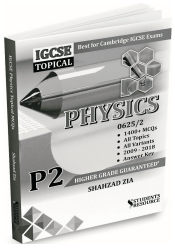

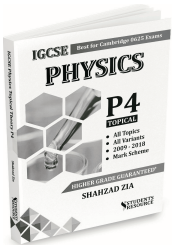

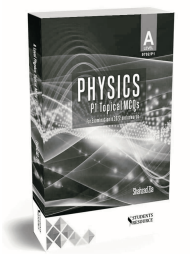

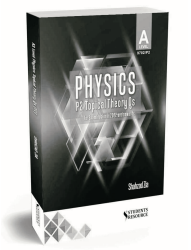

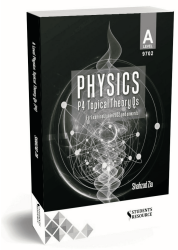

Preface

This book, **IGCSE Physics P4 (Theory)** provides a thorough practice and revision for all topics included in IGCSE Physics (0625) syllabus.

It has been an established fact that the questions from past papers provide the students with the best practice. They are able to apply what they have learnt and, therefore, can judge their knowledge of the subject.

This book contains more than **300 Questions** segregated into **6 chapters** and these 5 chapters are combination of **26 sub-topics** with reference selected from last 10 year past papers. The questions have been taken from **all variants** including **February/March session**.

They are arranged orderly, **Newer to Older** according to Latest **2023-25 Cambridge** Syllabus. **Mark Scheme** is provided at the end of every chapter.

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Acknowledgment

----------Write a Comment----------

Sir Shahzad Zia is a highly experienced and result oriented physics teacher, author, research writer and resource developer from Lahore, Pakistan. He has varied and rich experience of teaching in IGCSE and O/A Level Physics for Cambridge / AQA / Edexcel boards.

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Contents

Chapter 1

Motion,Forces and Energy

In this chapter

You will read the following topics:

IGCSE Physics Topical Paper 4

Shahzad Zia

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Topic 1.1: Physical Quantities and Measurement Techniques

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]

(F/M/2023/P42/Q.1)

2 Fig. 1.1 shows a balloon filled with helium gas.

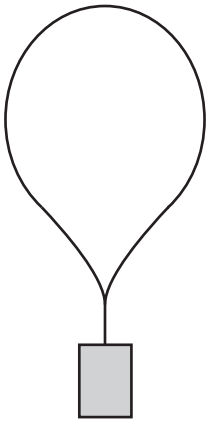

Fig. 1.1

The mass of the balloon is 120 kg.

(a) Calculate the weight of the balloon. Show your working.

weight = ... [1]

(b) The resultant force on the balloon is 54 N.

Show that the acceleration of the balloon is 0.45 m / s^2.

[2]

(c) The balloon accelerates upwards from rest at $0.45\,m/s^2$ for 8.0 s.
Calculate the velocity of the balloon after 8.0 s.

velocity = ... [2]

(d) Calculate the distance travelled by the balloon in the first 8.0 s.

distance = ... [2]

[Total: 7]

(M/J/2023/P43/Q.1)

3 **(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]

[Total: 6]

(O/N/2022/P42/Q.2)

Topic 1.2: Motion

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.

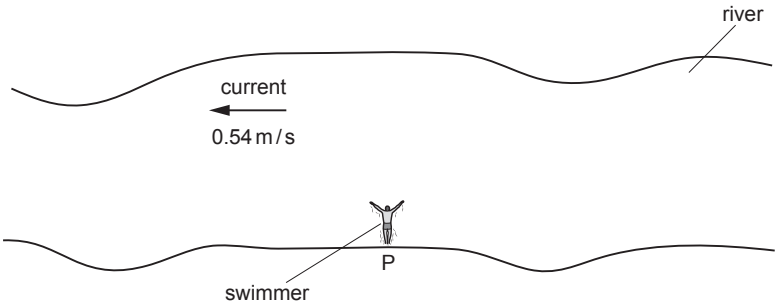

Fig. 1.1 (not to scale)

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]

[Total: 9]

(M/J/2023/P41/Q.1)

2 An aeroplane accelerates along a horizontal runway before take-off.
The aeroplane accelerates for 35 s. The speed of the aeroplane when it takes off is 72 m / s.

Fig. 1.1 shows how the speed of the aeroplane varies between time t = 0 and t = 35 s.

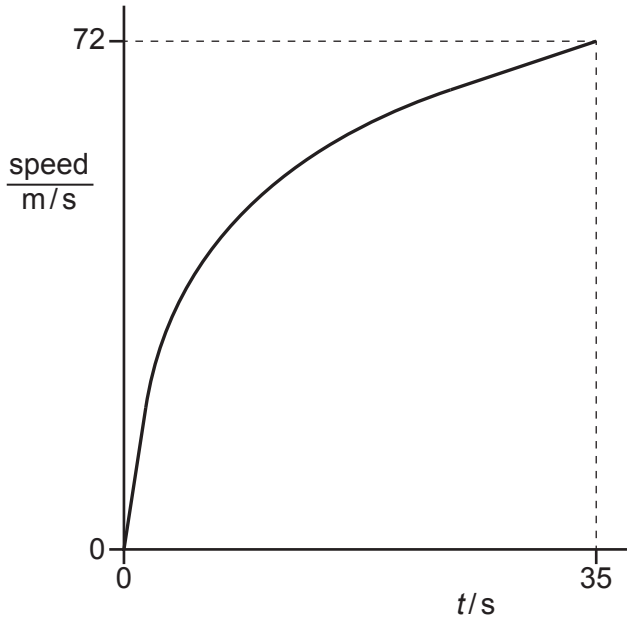

Fig. 1.1

(a) Define acceleration.

.....

..... [1]

(b) **(i)** Calculate the average acceleration of the aeroplane between t = 0 and t = 35 s.

acceleration = ... [1]

(ii) The combined mass of the aeroplane, its passengers and its fuel on take-off is 1.1×10^5 kg.

Calculate the average resultant force on the aeroplane between t = 0 and t = 35 s.

force = ... [2]

(iii) The force provided by the engines of the aeroplane is constant.

Give **one** possible explanation for the change in acceleration of the aeroplane between $t = 0$ and $t = 35$ s.

.....

..... [1]

(iv) On Fig. 1.2, sketch a graph to show how the acceleration of the aircraft varies between $t = 0$ and $t = 35$ s.

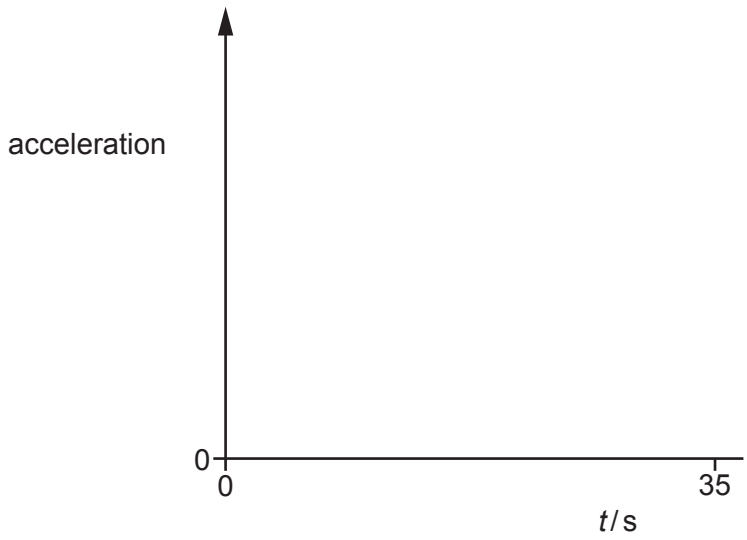

Fig. 1.2

[3]

[Total: 8]

(O/N/2022/P43/Q.1)

3 A car of mass *m* is travelling along a straight, horizontal road at a constant speed *v*.
At time *t* = 0, the driver of the car sees an obstruction in the road ahead of the car and applies the brakes.

The car does **not** begin to decelerate at *t* = 0.

(a) Explain what is meant by deceleration.

.....

..... [2]

(b) Suggest **one** reason why the car does **not** begin to decelerate at *t* = 0.

..... [1]

(c) Fig. 1.1 is the distance–time graph for the car from *t* = 0.

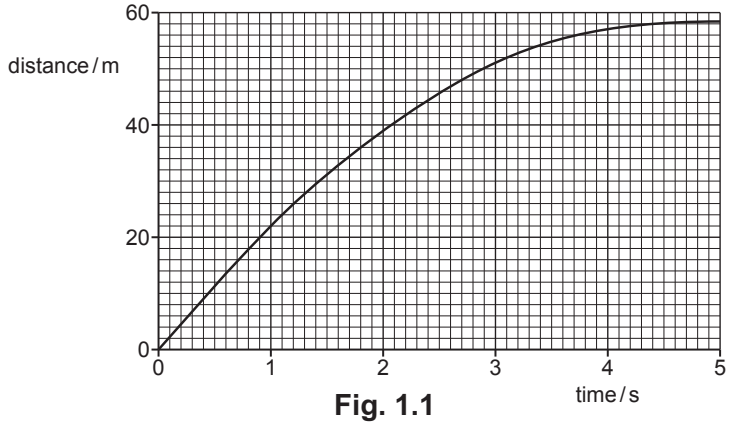

Fig. 1.1

(i) State the property of a distance–time graph that corresponds to speed.

..... [1]

(ii) Using Fig. 1.1, determine the initial speed *v* of the car.

v = ... [2]

(d) When the car is decelerating, there is a constant resistive force *F* on the car due to the brakes.
The deceleration of the car is greater than $\frac{F}{m}$ and is **not** constant.
Explain why:

(i) the deceleration of the car is greater than $\frac{F}{m}$

..... [1]

(ii) the deceleration is **not** constant.

.....

..... [2]

[Total: 9]
(M/J/2022/P41/Q.1)

4 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.

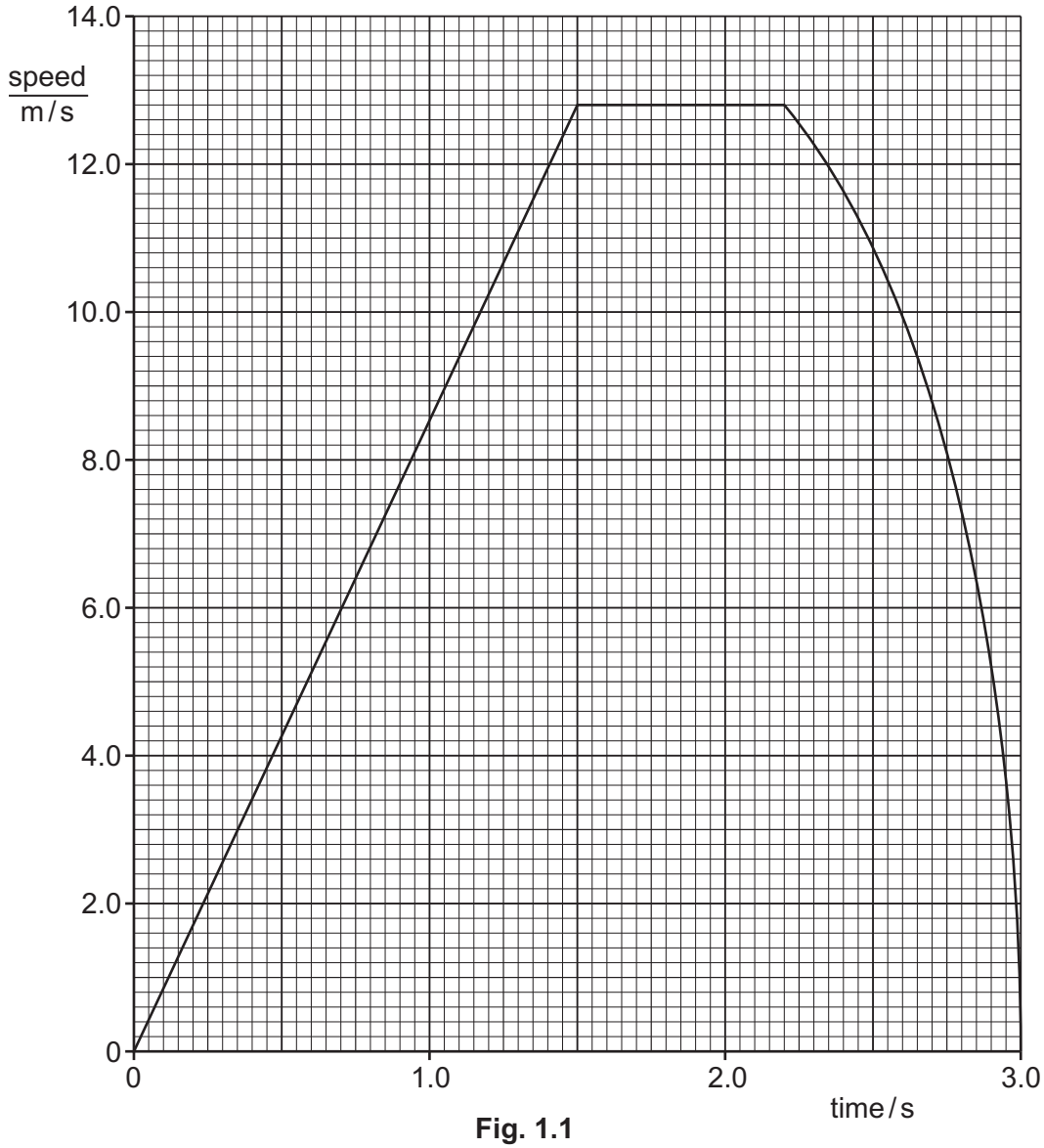

Fig. 1.1

(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]

[Total: 8]

(F/M/2022/P42/Q.1)

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

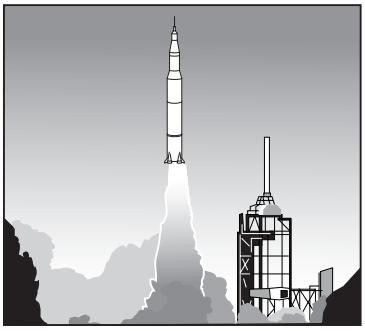

Fig. 1.1

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

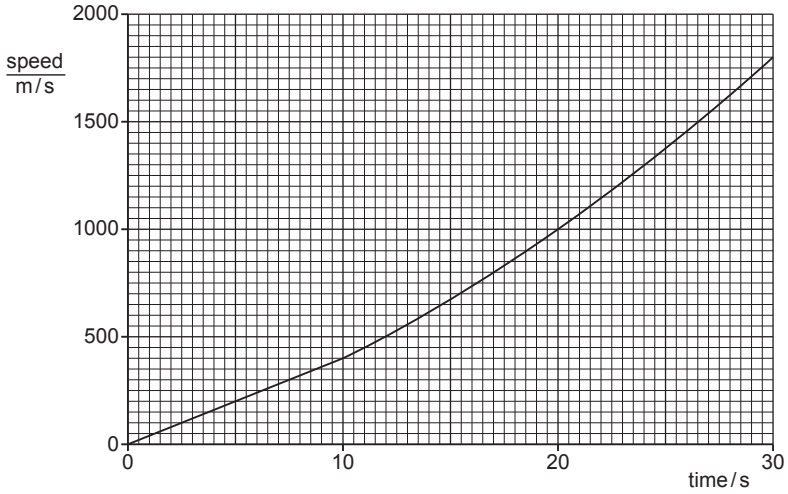

Fig. 1.2

(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]

[Total: 5]

(O/N/2021/P42/Q.1)

6 A car travels at constant speed v on a horizontal, straight road. The driver sees an obstacle on the road ahead.

(a) The distance travelled in the time between the driver seeing the obstruction and applying the brakes is the thinking distance.

Explain why the thinking distance is directly proportional to v.

.....

..... [1]

(b) When the brakes are applied, the car decelerates uniformly to rest. The frictional force applied by the brakes is constant. The distance travelled between first applying the brakes and the car stopping is the braking distance.

Explain why the braking distance is proportional to v^2.

.....

.....

.....

..... [3]

(c) The car is travelling at 22 m / s.

(i) The thinking distance is 15 m.

Calculate the time taken to travel the thinking distance.

time = ... [2]

(ii) The car has a mass of 1400 kg. The time taken for the car to stop after the brakes are applied is 2.1 s.

Calculate the force required to stop the car in this time.

force = ... [2]

[Total: 8]

(M/J/2021/P43/Q.3)

7 A skydiver of mass 76 kg is falling vertically in still air. At time $t = 0$, the skydiver opens his parachute.

Fig. 1.1 is the speed–time graph for the skydiver from $t = 0$.

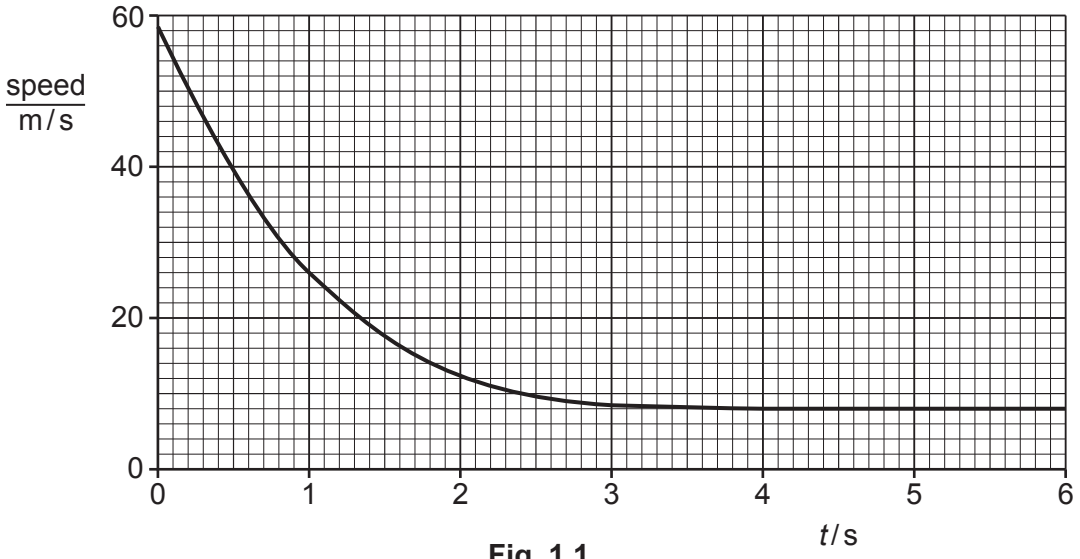

Fig. 1.1

(a) Using Fig. 1.1, determine:

(i) the deceleration of the skydiver immediately after the parachute opens

deceleration = ... [2]

(ii) the force due to air resistance acting on the skydiver immediately after the parachute opens.

force = ... [3]

(b) Explain, in terms of the forces acting on the skydiver, his motion between $t = 0$ and $t = 6.0$ s.

.....

.....

.....

..... [3]

(c) Explain why opening the parachute cannot reduce the speed of the skydiver to zero.

.....

.....

..... [2]

[Total: 10]

(M/J/2021/P41/Q.1)

8 **(a)** Fig. 1.1 shows a trolley travelling down a ramp.

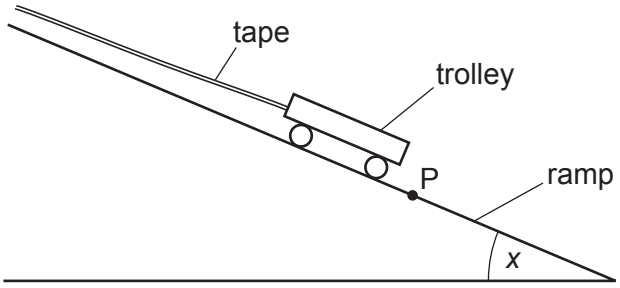

Fig. 1.1

The trolley has a piece of paper tape attached to it. The tape passes through a machine which makes a dot on the tape every 0.02 s.
Fig. 1.2 shows a section of the tape.

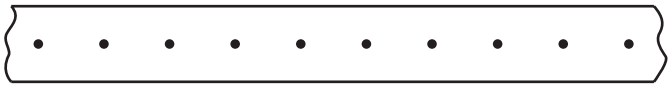

Fig. 1.2

(i) State how the dots on the tape show that the trolley was moving with constant speed.

..... [1]

(ii) When the trolley reaches the point P, the ramp is tilted so that the angle *x* is greater.
Describe and explain the change in motion of the trolley.

description .....

.....

explanation .....

.....
[2]

(b) Another trolley is released from the top of the ramp.
Fig. 1.3 shows the speed–time graph for this trolley.

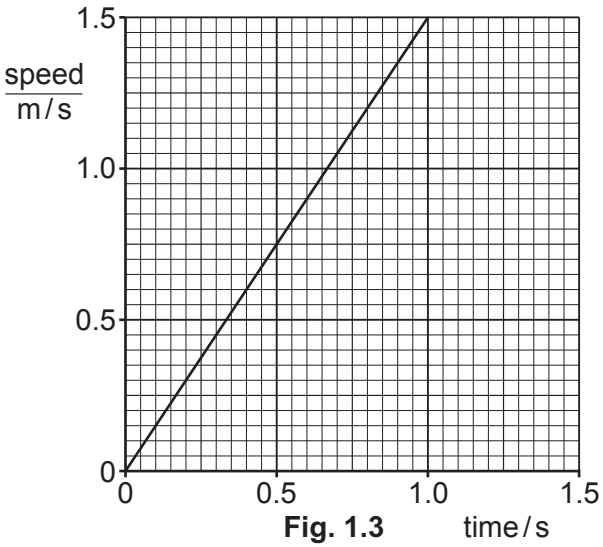

Fig. 1.3

Using Fig. 1.3, calculate the distance travelled by the trolley in the first 0.5 s.

distance = ... [2]

(c) Fig. 1.4 shows a metal ball at rest in a tube of liquid.

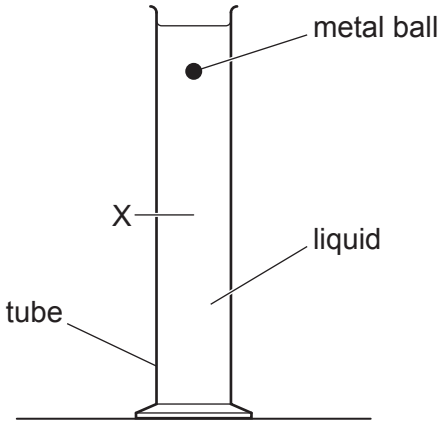

Fig. 1.4

The ball is released and reaches terminal velocity at point X.
Explain the motion of the ball as it falls from rest until it reaches point X.
Use ideas of force and acceleration in your answer.

.....

.....

.....

.....

..... [3]

[Total: 8]

(O/N/2020/P42/Q.1)

9 A sky-diver jumps out of a hot-air balloon, which is 4000 m above the ground. At time = 30 s, she opens her parachute.

Fig. 1.1 is the speed-time graph of her fall.

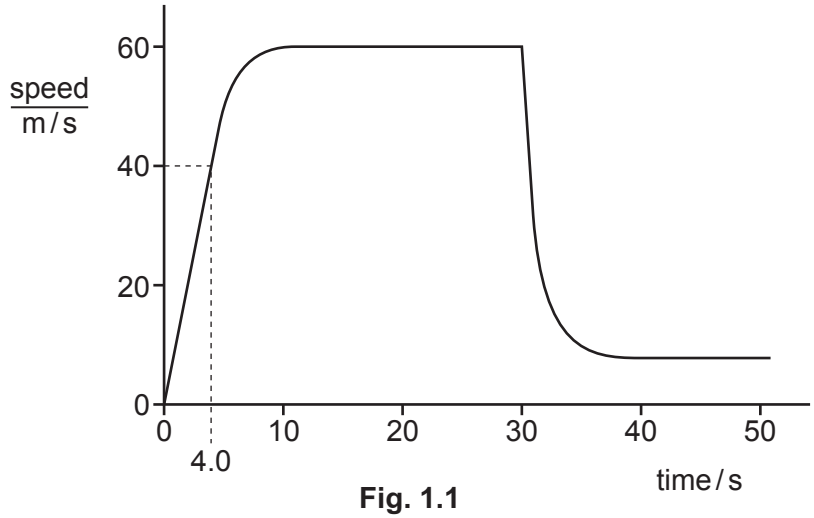

Fig. 1.1

(a) (i) Label with the letter X the point on the graph where the sky-diver opens her parachute. [1]

(ii) Label with the letters Y and Z the **two** parts of the graph where the sky-diver falls at terminal velocity. [1]

(b) Describe, in terms of the forces acting on the sky-diver, her motion between leaving the balloon and opening her parachute.

.....

.....

.....

.....

.....

..... [4]

(c) Calculate the average speed of the sky-diver in the first 4.0 s of her fall.

average speed = ... [2]

[Total: 8]

(O/N/2020/P42/Q.1)

10 **(a)** Define *acceleration*.

.....

..... [1]

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

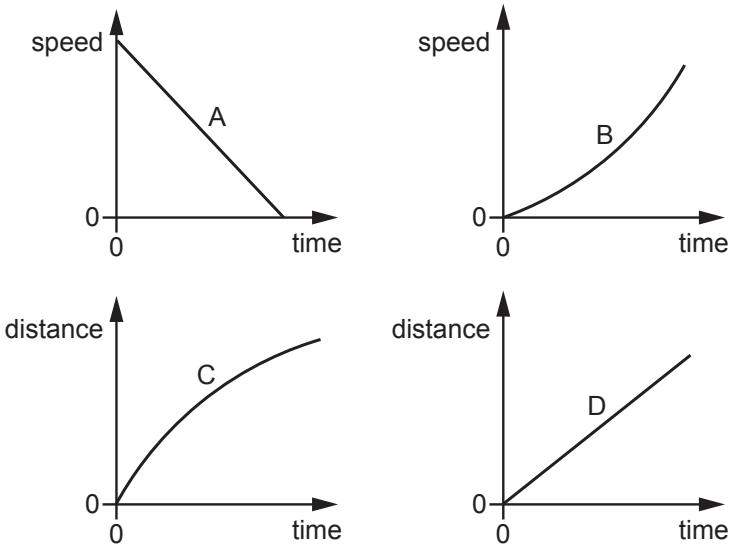

Fig. 1.1

Describe the motion shown by:

(i) graph A .....

..... [2]

(ii) graph B .....

..... [2]

(iii) graph C .....

..... [1]

(iv) graph D. .....

..... [1]

(M/J/2020/P43/Q.1)

11 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.

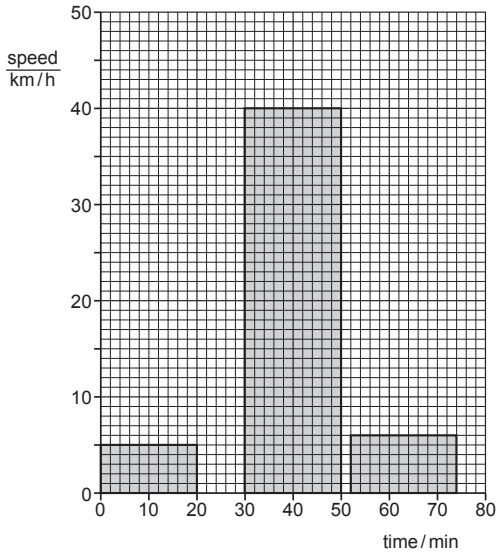

Fig. 1.1

(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]

(M/J/2020/P42/Q.1)

12 An aeroplane of mass 2.5×10^5 kg lands with a speed of 62 m/s, on a horizontal runway at time $t = 0$. The aeroplane decelerates uniformly as it travels along the runway in a straight line until it reaches a speed of 6.0 m/s at $t = 35$ s.

(a) Calculate:

(i) the deceleration of the aeroplane in the 35 s after it lands

deceleration = ... [2]

(ii) the resultant force acting on the aeroplane as it decelerates

force = ... [2]

(iii) the momentum of the aeroplane when its speed is 6.0 m/s.

momentum = ... [2]

(b) At $t = 35$ s, the aeroplane stops decelerating and moves along the runway at a constant speed of 6.0 m/s for a further 15 s.

On Fig. 1.1, sketch the shape of the graph for the distance travelled by the aeroplane along the runway between $t = 0$ and $t = 50$ s. You are **not** required to calculate distance values.

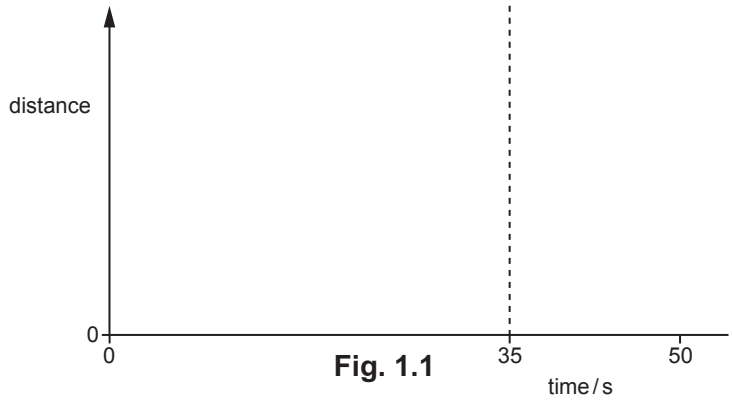

Fig. 1.1

[3]

(c) As the aeroplane decelerates, its kinetic energy decreases.

Suggest what happens to this energy.

.....

..... [1]

(M/J/2020/P41/Q.1)

13 A car accelerates from rest at time $t = 0$ to its maximum speed.
Fig. 1.1 is the speed-time graph for the first 25 s of its motion.

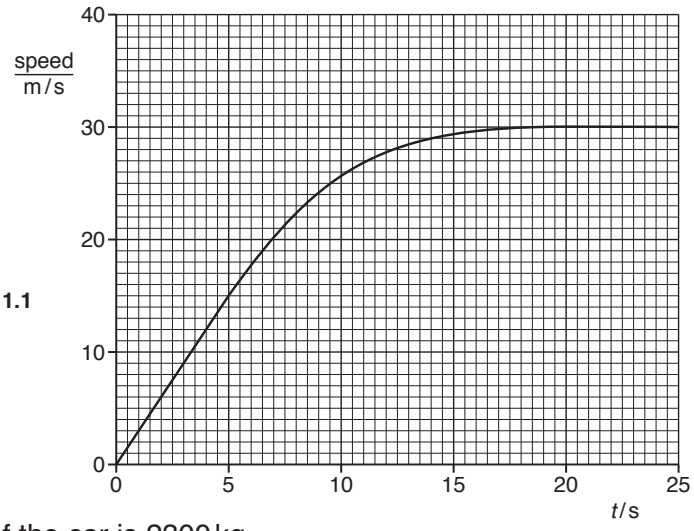

Fig. 1.1

(a) The mass of the car is 2300 kg.
For the time between $t = 0$ and $t = 5.0$ s, determine:

(i) the acceleration of the car

acceleration = ... [2]

(ii) the resultant force acting on the car.

resultant force = ... [2]

(b) Describe the motion of the car between $t = 10$ s and $t = 15$ s. Explain how Fig. 1.1 shows this.

.....

.....

..... [3]

(c) Between $t = 10$ s and $t = 15$ s, the force exerted on the car due to the engine remains constant.
Suggest and explain why the car moves in the way shown by Fig. 1.1.

.....

..... [2]

(O/N/2019/P41/Q.1)