Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____
I declare this is my own work.

GCSE
COMBINED SCIENCE: TRILOGY

F

Foundation Tier
Physics Paper 2F

Monday 16 June 2025 Morning Time allowed: 1 hour 15 minutes

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

Materials
For this paper you must have:
- a protractor
- a ruler
- a scientific calculator
- the Physics Equations Sheet (enclosed).

Instructions
- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information
- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

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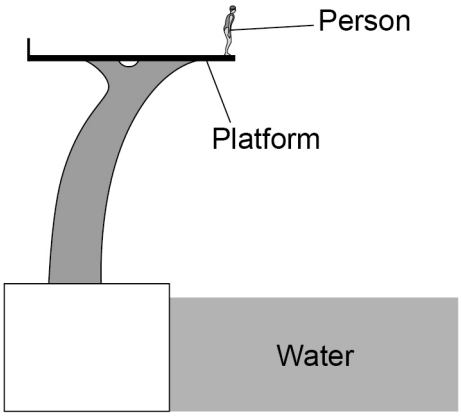
0 1 **Figure 1** shows a person about to dive from a high platform into a pool of water.

Figure 1



0 1 . 1 The person dived from the platform into the water.

The time taken between the person leaving the platform and entering the water was measured by four people.

The measurements were:

2.1 s 1.9 s 1.3 s 2.0 s

Which measurement is anomalous?

[1 mark]

Tick (✓) **one** box.

2.1 s ☐

1.9 s ☐

1.3 s ☐

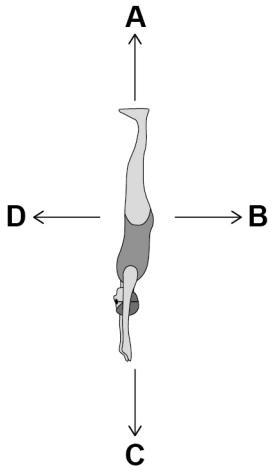
2.0 s ☐

Do not write outside the box

0 1 . 2 Air resistance acted on the person during the dive.

Figure 2 shows the person moving vertically downwards.

Figure 2



Which arrow on **Figure 2** shows the direction of the air resistance acting on the person?

[1 mark]

Tick (✓) **one** box.

A ☐

B ☐

C ☐

D ☐

Question 1 continues on the next page

Do not write outside the box

0 1 . 3 Air resistance is a contact force.

Which force is also a contact force?

[1 mark]

Tick (✓) **one** box.

Friction ☐

Gravitational force ☐

Magnetic force ☐

0 1 . 4 What happened to the size of the air resistance force as the speed of the person increased?

[1 mark]

_____

_____

0 1 . 5 After entering the water, the person decelerated for a time of 0.35 s.

The deceleration of the person was 60 m/s^2.

Calculate the change in velocity of the person.

Use the equation:

change in velocity = deceleration × time

[2 marks]

_____

_____

_____

Change in velocity = _____ m/s

Do not write outside the box

0 1 . 6 The mass of the person was 75 kg.

Calculate the resultant force on the person when the deceleration was 60 m/s^2.

Use the equation:

resultant force = mass × deceleration

[2 marks]

Resultant force = _____ N

8

Turn over for the next question

Do not write outside the box

0 2 Food colouring can be used to change the colour of water.

A student investigated how the colour of water affects the time taken for the water to cool.

This is the method used.

1. Put 200 cm^3 of hot water into a conical flask.

2. Add four drops of food colouring to the water.

3. Place a digital thermometer in the water.

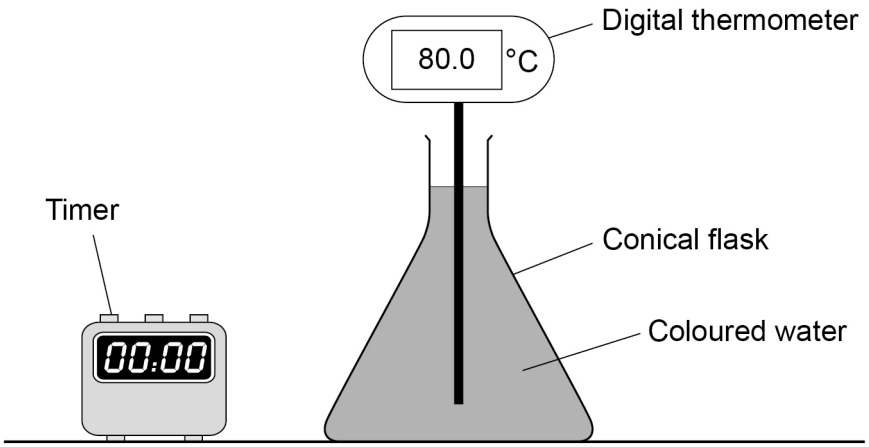
4. Start a timer when the temperature of the water is 80.0 °C.

5. Record the time taken for the water to cool to 65.0 °C.

6. Repeat steps 1 to 5 using different colours of food colouring.

Figure 3 shows the apparatus.

Figure 3



0 2 . 1 What was the independent variable in this investigation?

[1 mark]

Tick (✓) **one** box.

Colour of water ☐

Final temperature of water ☐

Volume of water ☐

Do not write outside the box

0 2 . 2 Which of the following was a control variable in this investigation?

[1 mark]

Tick (✓) **one** box.

Initial temperature of water ☐

Time taken for water to cool ☐

Type of thermometer used ☐

0 2 . 3 What equipment should have been used to make sure 200 cm^3 of water was put in the conical flask?

[1 mark]

Tick (✓) **one** box.

Beaker ☐

Measuring cylinder ☐

Metre rule ☐

0 2 . 4 The student also tested water with no food colouring.

The temperature of the water changed from 80.0 °C to 65.0 °C in a time of 5.0 minutes.

Calculate the average rate of change of temperature of the water.

Use the equation:

$$\text{average rate of change of temperature} = \frac{\text{change in temperature}}{\text{time taken}}$$

[2 marks]

_____

_____

_____

Average rate of change of temperature = _____ °C/minute

Turn over ►

Do not write outside the box

Table 1 shows the results for the different coloured water.

Table 1

Colour of water	Rate of change of temperature in °C/minute
Red	6.1
Yellow	5.0
Green	4.3
Blue	4.0
Violet	3.7

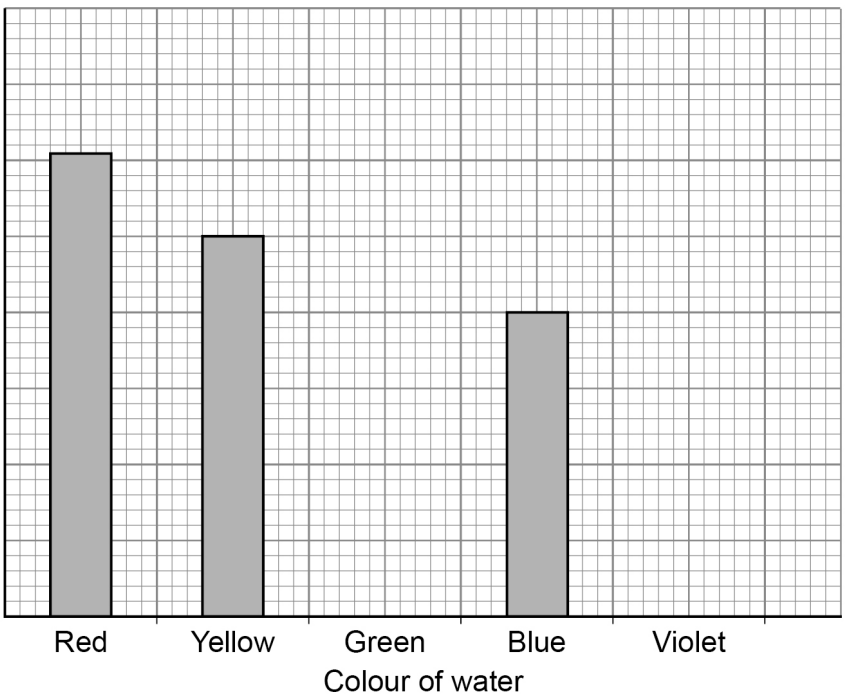
0 2 . 5 Complete **Figure 4**.

You should:

- label the *y*-axis
- add a scale to the *y*-axis
- draw bars for the green water and the violet water.

[3 marks]

Figure 4



Do not write outside the box

0 2 . 6 In the visible spectrum, orange light is between red light and yellow light.

Estimate the rate of change of temperature if orange food colouring was used.

Use **Table 1**.

[1 mark]

Estimated rate of change of temperature = _____ °C/minute

0 2 . 7 Complete the sentence.

Choose the answer from the box.

[1 mark]

infrared	**ultraviolet**	**x-rays**

The results show that the colour of the water affects the rate at which the water emits _____.

0 2 . 8 Complete the sentence.

Choose the answer from the box.

[1 mark]

energy	**rarefactions**	**temperature**

The water in each conical flask cools down because the electromagnetic radiation emitted by the water transfers _____.

11

Turn over for the next question

Do not write outside the box

0 3 A student went on a cycling journey that lasted for three days.

The student recorded information about the journey using a cycling app on a mobile phone.

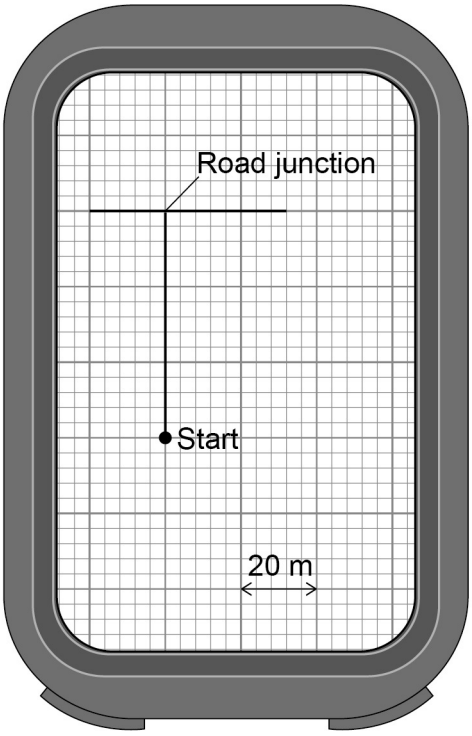
0 3 . 1 At the start of the journey, the student travelled along a straight road to a road junction.

A map on the cycling app showed the road.

Figure 5 shows the map.

The scale of the map is 1 cm **:** 20 m

Figure 5



Do not write outside the box

Calculate the distance travelled by the student between the start and the road junction.

Use **Figure 5**.

[2 marks]

Distance travelled = _____ m

0 3 . 2 The bicycle had a mass of 15 kg.

gravitational field strength = 9.8 N/kg

Calculate the weight of the bicycle.

Use the equation:

weight = mass × gravitational field strength

[2 marks]

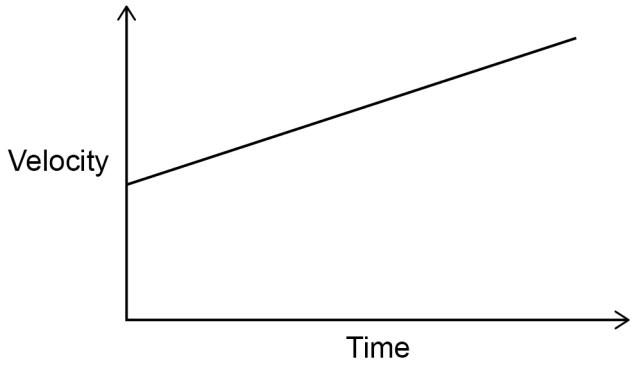
Weight = _____ N

Question 3 continues on the next page

Do not write outside the box

0 3 . 3 **Figure 6** shows a velocity–time graph for a downhill part of the journey.

Figure 6



The gradient of the graph represents acceleration.

How does **Figure 6** show that the acceleration was constant?

[1 mark]

_____

_____

0 3 . 4 As the student accelerated downhill, the forward force on the student was 250 N.

The work done by the forward force was 4500 J.

Calculate the distance travelled as the student accelerated downhill.

Use the equation:

$$\text{distance travelled} = \frac{\text{work done}}{\text{force}}$$

[2 marks]

_____

_____

_____

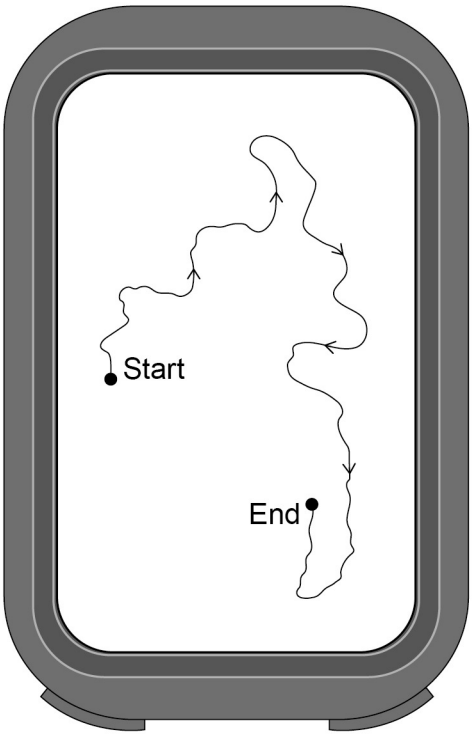
Distance travelled = _____ m

Do not write outside the box

0 3 . 5 Most of the roads on the journey were not straight.

Figure 7 shows a map of the route taken for the whole journey.

Figure 7



The line in **Figure 7** represents the total distance travelled when the student reached the end of the journey.

How does the total distance travelled compare with the magnitude of the displacement of the student from the start?

[1 mark]

Tick (✓) **one** box.

Total distance travelled is less than the displacement. ☐

Total distance travelled is equal to the displacement. ☐

Total distance travelled is greater than the displacement. ☐

Do not write outside the box

0 3 . 6 Why is distance a scalar quantity?

[1 mark]

Tick (✓) **one** box.

Distance has direction only. ☐

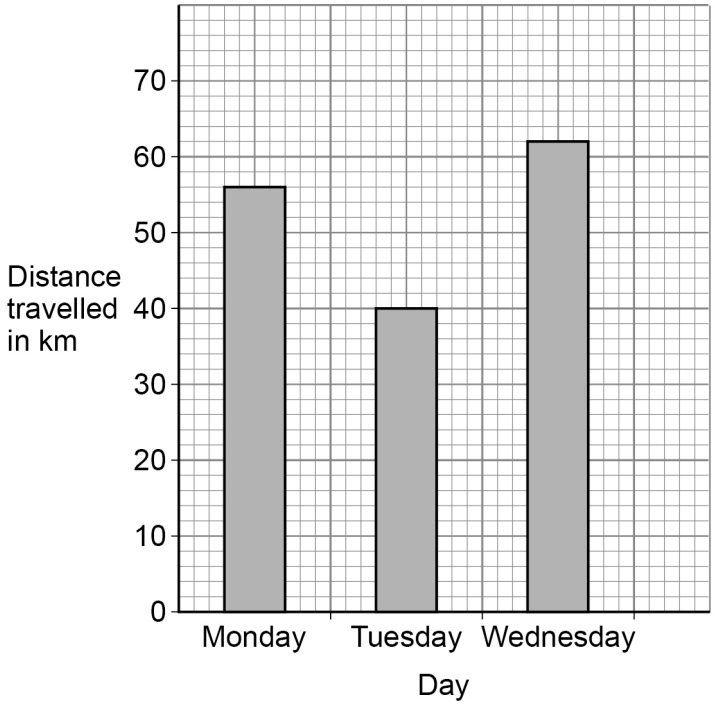
Distance has magnitude only. ☐

Distance has direction and magnitude. ☐

Do not write outside the box

0 3 . 7 **Figure 8** shows the distance travelled by the student each day.

Figure 8



Calculate the total distance travelled by the student.

Use **Figure 8**.

[2 marks]

Total distance travelled = _____ km

11

Turn over for the next question

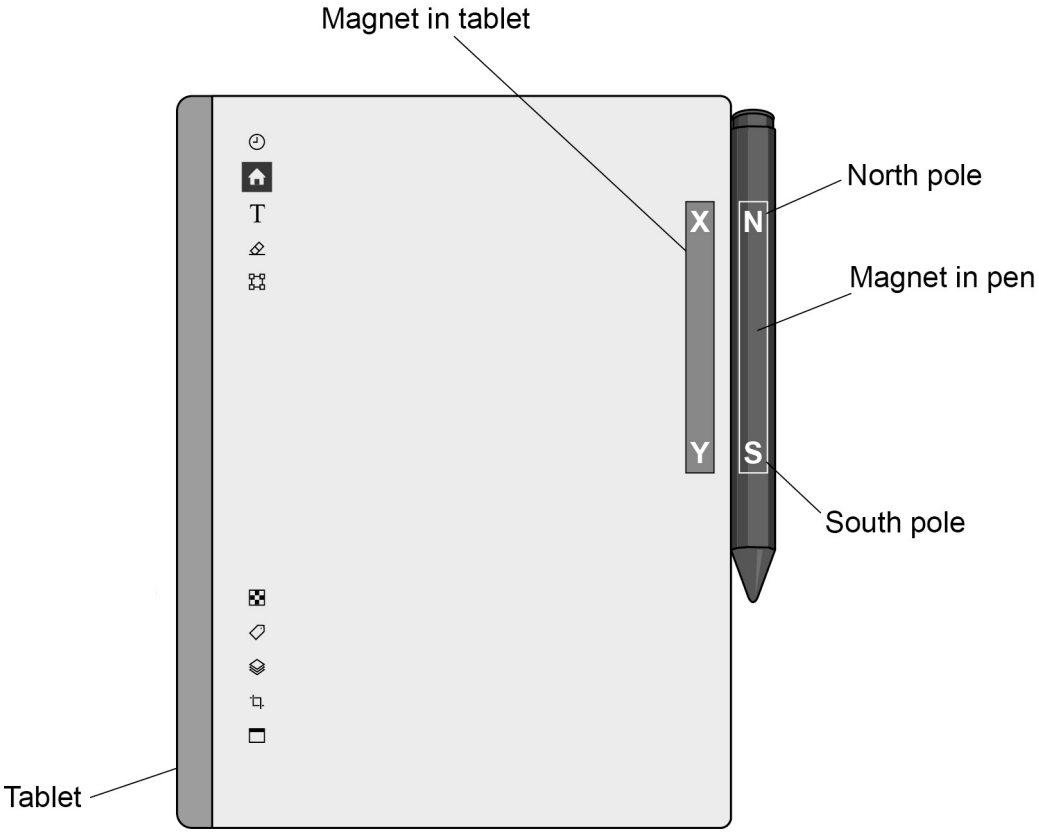
Do not write outside the box

0 4 A student uses a special pen to write notes on an electronic tablet.

There is a bar magnet inside the pen and a bar magnet inside the tablet.

Figure 9 shows the pen and tablet being held together by the magnets.

Figure 9



Do not write outside the box

0 4 . 1 The bar magnets in the tablet and pen attract each other.

What name is given to pole **X** and to pole **Y** in **Figure 9**?

Give the reason for your answer.

[2 marks]

Pole **X** _____

Pole **Y** _____

Reason _____

_____

Question 4 continues on the next page

Do not write outside the box

A student investigated the maximum distance from where the pen moves back to the tablet.

This is the method used.

1. Place the edge of the tablet at 0 cm on a ruler.

2. Place the pen 0.5 cm away from the tablet.

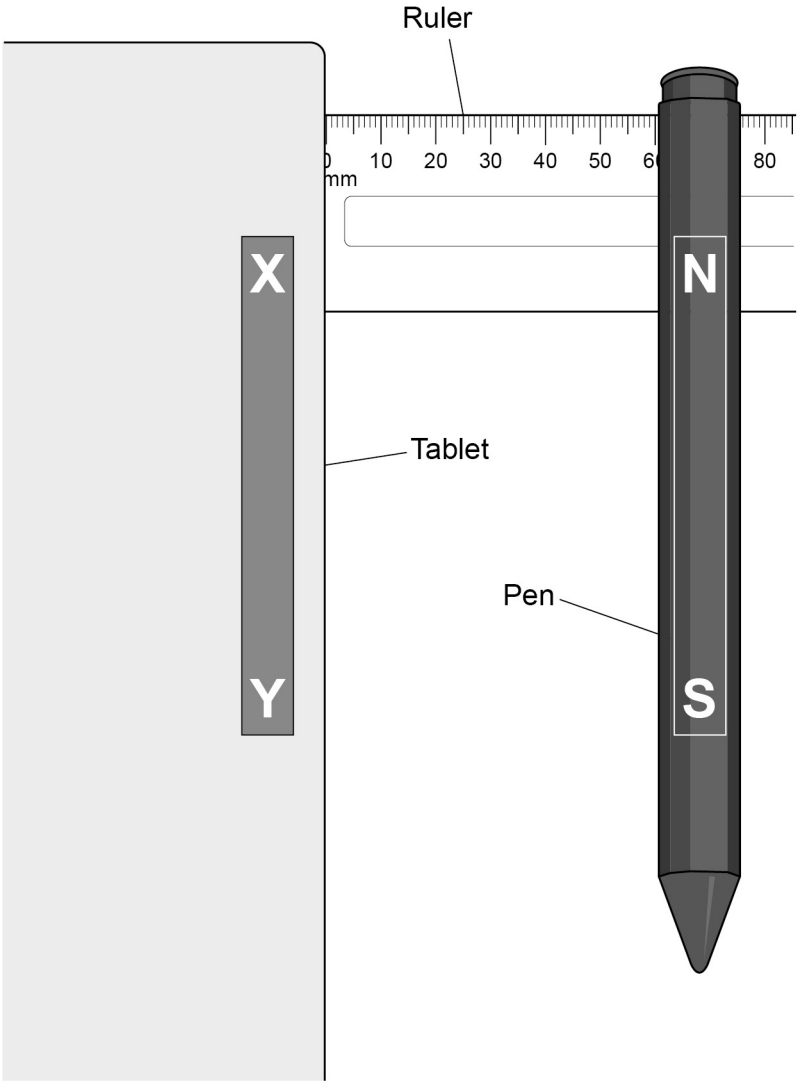
3. Release the pen.

4. If the pen moves to the tablet, repeat steps 2, 3 and 4 using a greater distance.

5. Record the greatest distance from where the pen moves back to the tablet.

Figure 10 shows the apparatus.

Figure 10



Do not write outside the box

The student repeated the investigation.

The distances recorded by the student were:

4.0 cm 3.5 cm 4.0 cm 3.5 cm 4.5 cm

0 4 . 2 What was the range of distances recorded by the student?

[1 mark]

Range = from _____ to _____ cm

0 4 . 3 Calculate the mean of the distances recorded by the student.

[2 marks]

_____

_____

_____

Mean distance = _____ cm

0 4 . 4 Complete the sentence.

Choose the answer from the box.

[1 mark]

random errors	**systematic errors**	**zero errors**

Repeating and calculating a mean reduces the effect

of _____.

Turn over ►

Do not write outside the box

0 4 . 5 Describe how the size of the magnetic force on the pen changed as the pen was moved away from the tablet.

[1 mark]

_____

_____

0 4 . 6 What material could the magnet in the pen be made of?

[1 mark]

Tick (✓) **one** box.

Aluminium ☐

Copper ☐

Steel ☐

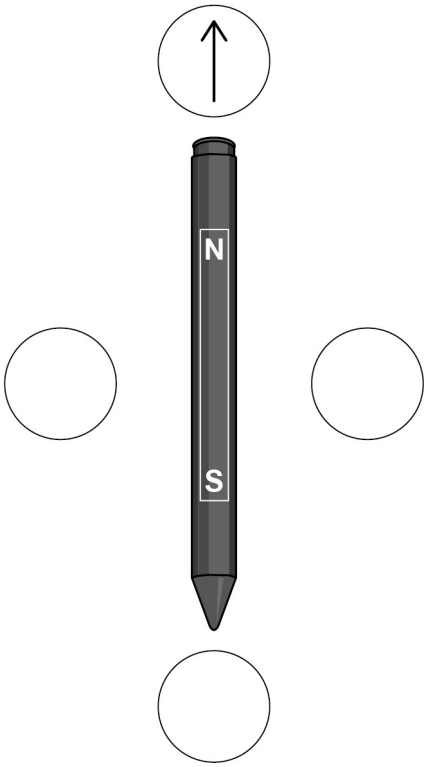
Zinc ☐

Do not write outside the box

0 4 . 7 The student used four plotting compasses to show the magnetic field pattern around the pen.

Figure 11 shows the pen and the outline of the plotting compasses.

Figure 11



Draw one arrow inside **each** compass on **Figure 11** to show which direction the compass needle points.

One arrow has been drawn for you.

[2 marks]

10

Turn over for the next question

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DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

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0 5 Some homes are connected to the internet using satellites.

Electromagnetic waves are used to transmit data between Earth and the satellites.

0 5 . 1 Which electromagnetic waves are used to transfer data between Earth and satellites?

[1 mark]

Tick (✓) **one** box.

- Gamma rays ☐
- Microwaves ☐
- Ultraviolet ☐
- Visible light ☐

0 5 . 2 Which of the following electromagnetic waves has the greatest frequency?

[1 mark]

Tick (✓) **one** box.

- Gamma rays ☐
- Microwaves ☐
- Ultraviolet ☐
- Visible light ☐

Question 5 continues on the next page

Do not write outside the box

0 5 . 3 What is meant by the 'period of a wave'?

[1 mark]

Tick (✓) **one** box.

The distance travelled by a wave in one second ☐

The number of waves passing a fixed point each second ☐

The time taken for one wave to pass a fixed point ☐

0 5 . 4 Data is transmitted to the satellites by electromagnetic waves with a frequency of 48 GHz.

Calculate the period of waves with a frequency of 48 GHz.

Use the Physics Equations Sheet.

Choose the unit from the box.

[4 marks]

J	**N/kg**	**s**

Period = _____ Unit _____

Do not write outside the box

0 5 . 5 The satellites receive and transmit data using electromagnetic waves with different frequencies.

Give **one** property that is the same for electromagnetic waves with different frequencies.

[1 mark]

_____

_____

0 5 . 6 Most homes are connected to the internet using cables.

Suggest **one** reason why homes in some areas of the UK are connected to the internet by satellites.

[1 mark]

_____

_____

_____

9

Turn over for the next question

Do not write outside the box

0 6 In a dog-sled race, a team of dogs pull on a rope attached to a sled.

Figure 12 shows a dog-sled team.

Figure 12

Use the Physics Equations Sheet to answer questions **06.1** and **06.2**.

0 6 . 1 What equation links distance travelled, speed and time?

[1 mark]

Tick (✓) **one** box.

distance travelled = speed × time ☐

speed = time × distance travelled ☐

time = distance travelled × speed ☐

Do not write outside the box

0 6 . 2 The longest dog-sled race in the world covers a distance of 1 500 000 m.

One team finished the race in a time of 670 000 s.

Calculate the average speed of this team during the race.

[3 marks]

Average speed = _____ m/s

0 6 . 3 At the start of the race, 6 dogs pulled on the rope.

The average forward force on the sled from **each** dog was 370 N.

The backwards force on the sled from friction was 520 N.

Calculate the resultant force on the sled.

[2 marks]

Resultant force = _____ N

Question 6 continues on the next page

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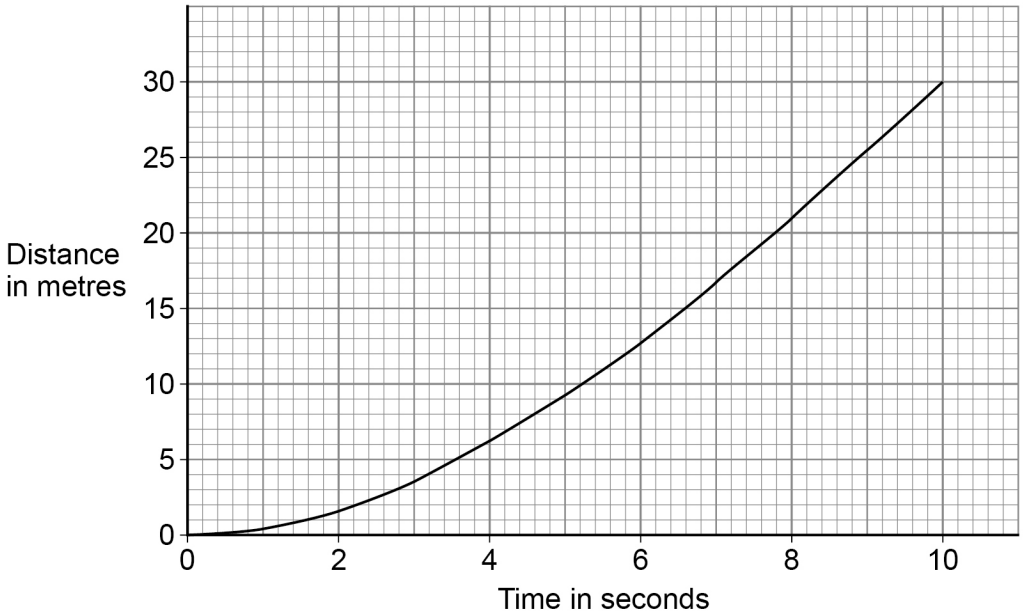
Figure 13 shows a distance–time graph for the sled at the start of the race.

Figure 13



0 6 . 4 What does the gradient of the graph in **Figure 13** represent?

[1 mark]

Do not write outside the box

0 6 . 5 Later in the race, the sled moved at a constant speed along a flat, horizontal path.

What was the relationship between the size of the horizontal forces acting when the sled moved at a constant speed?

[1 mark]

Tick (✓) **one** box.

friction + air resistance < pull of the rope on the sled ☐

friction + air resistance = pull of the rope on the sled ☐

friction + air resistance > pull of the rope on the sled ☐

0 6 . 6 The rope exerted a force on the sled when the sled was moving.

What is the Newton's Third Law pair to the force of the rope on the sled?

[1 mark]

Tick (✓) **one** box.

The force of friction on the sled ☐

The force of the dogs on the rope ☐

The force of the sled on the rope ☐

9

Turn over for the next question

Do not write outside the box

0 7 The stopping distance of a car is affected by the condition of the brakes and tyres.

A car is being driven around a corner when the driver sees some roadworks.

0 7 . 1 The driver applies the brakes when the car is 24 m away from the roadworks.

The velocity of the car changes from 18 m/s to 0 m/s.

Calculate the constant deceleration needed to stop the car in a distance of 24 m.

Use the Physics Equations Sheet.

[3 marks]

Deceleration = _____ m/s^2

Do not write outside the box

0 7 . 2 As a safety measure, the speed limit on the road was reduced.

Explain how the safety of road users is affected by:

- the condition of the brakes and tyres
- reduced speed.

You should refer to thinking distance and braking distance.

[6 marks]

Extra space

Question 7 continues on the next page

Do not write outside the box

0 7 . 3 Two identical cars were driven along a straight, level road.

One car had a greater speed than the other car.

The driver of each car applied the brakes until the cars stopped.

Both cars travelled the same distance while braking.

Explain how braking from a greater speed affected the risk of the brakes overheating.

[3 marks]

_____

_____

_____

_____

_____

_____

12

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

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Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**
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