

Please write clearly in block capitals.

F

Centre number

Candidate
number

Surname

Forename(s)

Candidate signature

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Foundation Tier Physics Paper 2

Practice Paper Series – Set 1

Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator
- the Physics Equations Sheet (printed at the back of this booklet).

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.
- Do not write outside the box around each page or on blank pages.
- 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 marks for questions are shown in brackets.
- The maximum mark for this paper is 70.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering question 08.4 you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully developed
 - shows how the points that you make are related or follow on from each other where appropriate.

For Examiner's Use

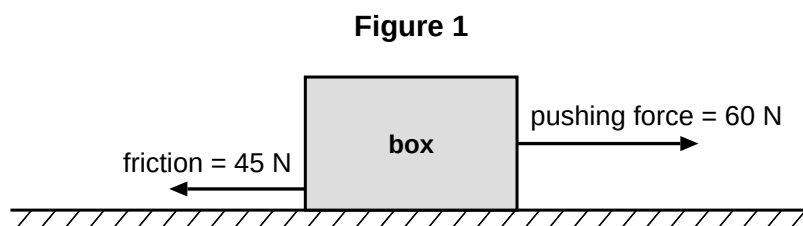
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

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sciencegcse.co.uk | Practice Paper Series – Set 1 | SGC/S1/P/2F

0 1 A student pushes a box across a floor.

Figure 1 shows the horizontal forces acting on the box.



0 1 . 1 Friction is a contact force.

[1 mark]

Which of these forces is a **non-contact** force?

Tick (✓) **one** box.

Air resistance

☐

Normal contact force

☐

Tension

☐

Weight

☐

0 1 . 2 The mass of the box is 15 kg.

[2 marks]

Calculate the weight of the box.

gravitational field strength = 9.8 N/kg

Weight = ... N

0 1 . 3 Determine the size **and** the direction of the resultant force on the box.

[2 marks]

Use **Figure 1**.

Size of resultant force = ... N

Direction of resultant force:

0 1 . 4 The student pushes the box a distance of 4.0 m.

[2 marks]

Calculate the work done by the 60 N pushing force.

Work done = ... J

Do not write outside the box

0 1 . 5

Work is done against friction as the box moves across the floor.

[1 mark]

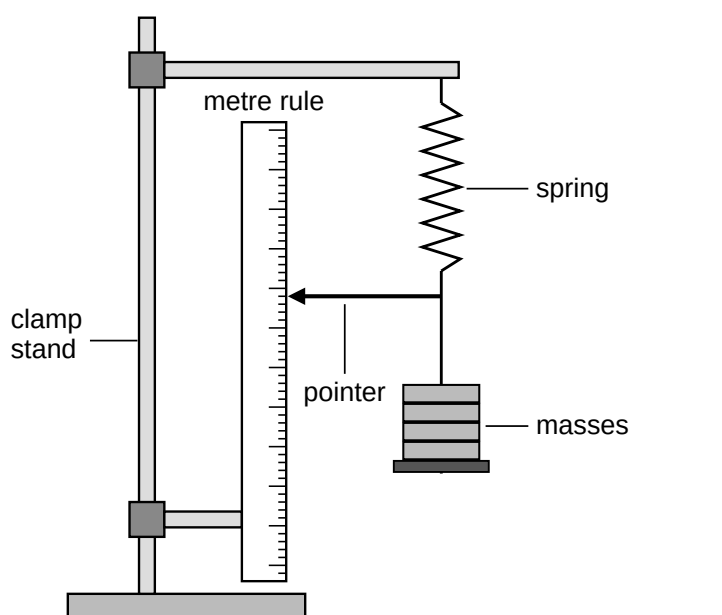
What happens to the temperature of the bottom of the box?

0 2

A student investigated how the extension of a spring depends on the force applied to the spring.

Figure 2 shows the equipment used.

Figure 2



0 2 . 1

The student read the position of the pointer on the metre rule.

[1 mark]

Why should the student's eye be level with the pointer when taking each reading?

0 2 . 2

When the force on the spring was 2.0 N, the extension of the spring was 0.050 m.

[2 marks]

Calculate the spring constant of the spring.

Spring constant = ... N/m

Do not write outside the box

- 02.3** Calculate the elastic potential energy stored in the spring when the extension was 0.050 m. [2 marks]

Use your answer to **02.2**.

Elastic potential energy = ... J

The student increased the force on the spring by adding masses.

The student measured the extension of the spring for each force.

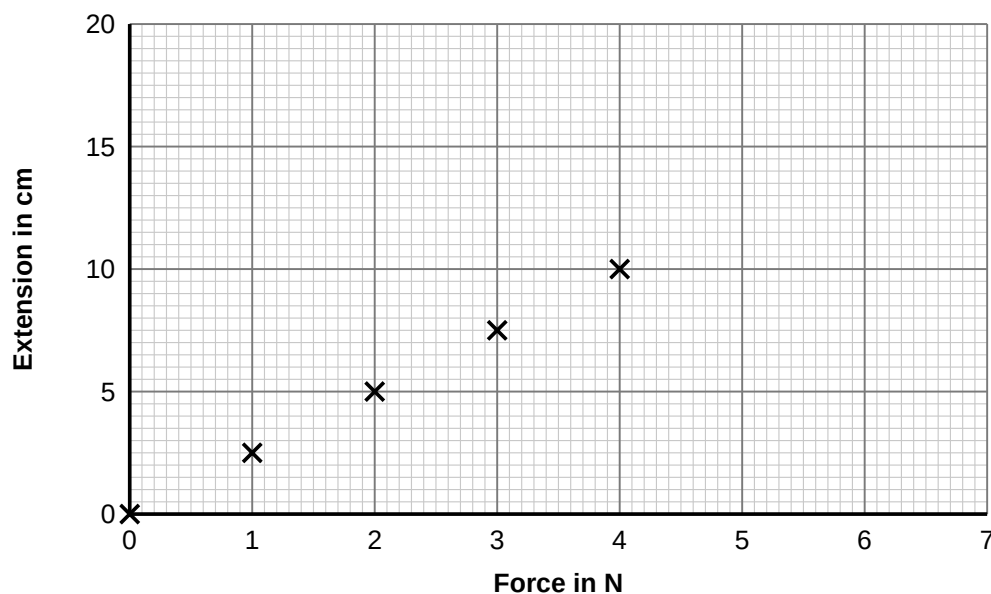
Table 1 shows the results.

Table 1

Force in N	0	1.0	2.0	3.0	4.0	5.0	6.0
Extension in cm	0	2.5	5.0	7.5	10.0	13.5	18.0

Some of the results have been plotted on **Figure 3**.

Figure 3



Do not write outside the box

- 02.4** Plot the **two** remaining results from **Table 1** on **Figure 3**. [2 marks]

- 02.5** Draw a line of best fit on **Figure 3**. [1 mark]

- 02.6** The spring was stretched beyond its limit of proportionality. [1 mark]

Determine the force at the limit of proportionality.

Use **Figure 3**.

Force = ... N

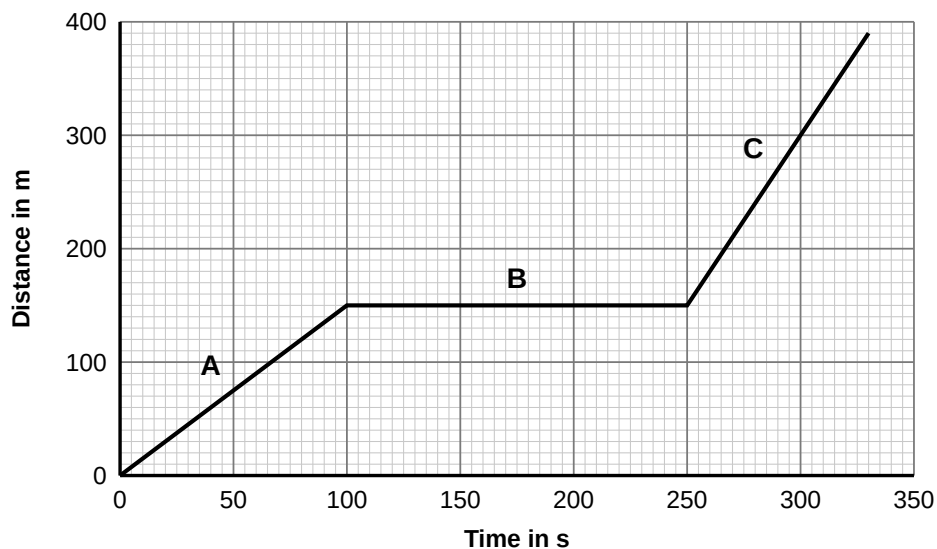
03

A student travelled from her home to a park.

Figure 4 shows the distance–time graph for her journey.

The graph has three sections, **A**, **B** and **C**.

Figure 4



03.1

Which section of the graph shows that the student was stationary?

[1 mark]

Section

03.2

Calculate the speed of the student in section **A**.

[2 marks]

Use **Figure 4**.

Speed = ... m/s

03.3

In which section of the graph was the student moving fastest?

[2 marks]

Give a reason for your answer.

Section

.....
.....

Question 3 continues on the next page

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03.4

Explain the difference between speed and velocity.

[2 marks]

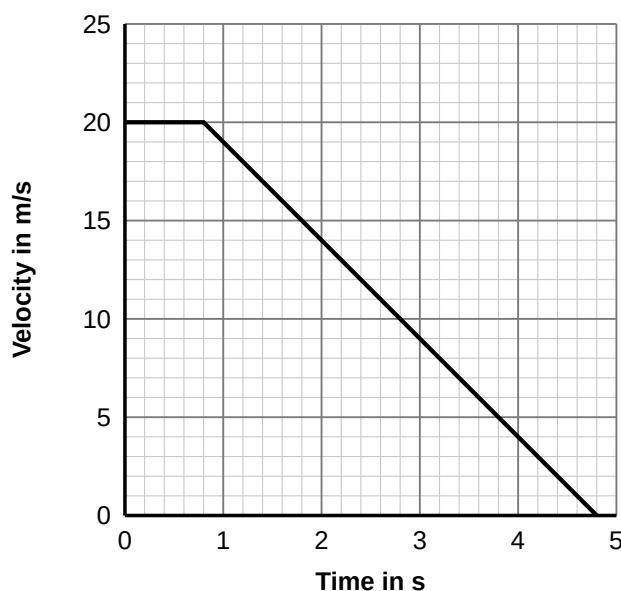
04

A car is travelling along a straight, level road.

The driver sees a hazard and applies the brakes.

Figure 5 shows how the velocity of the car changes from the moment the driver sees the hazard until the car stops.

Figure 5



04.1

Determine the reaction time of the driver.

[1 mark]

Use **Figure 5**.

Reaction time = ... s

04.2

The distance the car travels during the driver's reaction time is the thinking distance.

[2 marks]

Calculate the thinking distance.

Use **Figure 5** and your answer to **04.1**.

Thinking distance = ... m

Do not write outside the box

- 0 4 . 3** Calculate the deceleration of the car while it is braking. [2 marks]
Use **Figure 5**.

Deceleration = ... m/s^2

- 0 4 . 4** Give **two** factors that would increase the braking distance of the car. [2 marks]

1

2

- 0 4 . 5** When the brakes are applied, the temperature of the brakes increases. [2 marks]
Explain why.

.....

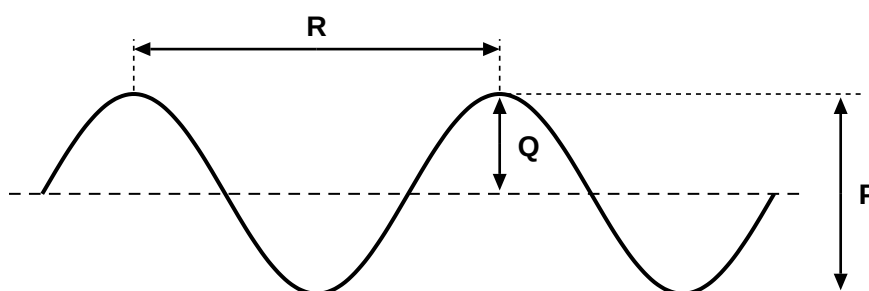
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- 0 5** A student used a ripple tank to investigate water waves.
Figure 6 shows a cross-section through the water waves at one instant.

Figure 6



- 0 5 . 1** Which arrow, **P**, **Q** or **R**, shows the amplitude of the waves? [2 marks]
Which arrow shows the wavelength of the waves?

Amplitude

Wavelength

0 5 . 2 Water waves are transverse waves. [2 marks]

Describe the difference between a transverse wave and a longitudinal wave.

0 5 . 3 The student counted 30 waves passing a point in 10 seconds. [1 mark]

Determine the frequency of the waves.

Frequency = _____ Hz

0 5 . 4 The wavelength of the waves was 0.040 m. [2 marks]

Calculate the speed of the waves.

Use your answer to **05.3**.

Wave speed = _____ m/s

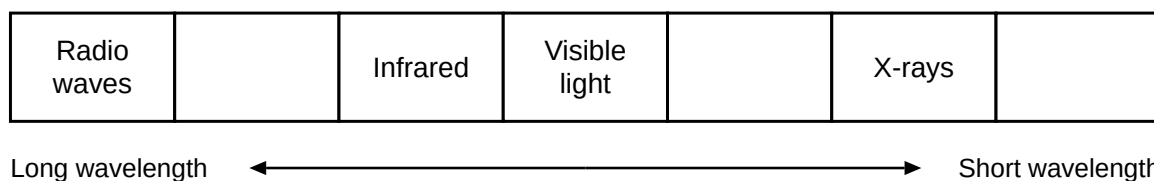
0 5 . 5 To find the wavelength, the student measured the total length of 10 waves and then divided this length by 10. [1 mark]

Suggest why this gives a more accurate value for the wavelength than measuring the length of one wave.

Turn over for the next question

- 0 6** **Figure 7** shows the electromagnetic spectrum.
Some of the names are missing.

Figure 7



- 0 6 . 1** Complete **Figure 7**. [2 marks]

Use words from the box.

gamma rays microwaves sound waves ultraviolet

- 0 6 . 2** Which statement about electromagnetic waves is correct? [1 mark]

Tick (✓) **one** box.

- | | |
|---|--------------------------|
| They are all longitudinal waves. | ☐ |
| They all have the same wavelength. | ☐ |
| They all need a medium to travel through. | ☐ |
| They all travel at the same speed through a vacuum. | ☐ |

- 0 6 . 3** Electromagnetic waves have many uses. [2 marks]

Draw **one** line from each use to the type of electromagnetic wave used.

Use	Type of electromagnetic wave
Electrical heaters	Infrared
Sun tanning	Radio waves
Television and radio broadcasts	Ultraviolet
	Visible light

- 0 6 . 4** Ultraviolet waves can be harmful to the human body. [1 mark]

Give **one** harmful effect of ultraviolet waves on the human body.

.....

.....

A student investigated how the type of surface affects the infrared radiation emitted by a can of hot water.

She poured 200 cm^3 of hot water at 80°C into each of four metal cans with different outside surfaces. After 10 minutes she measured the temperature of the water in each can.

Table 2 shows the results.

Table 2

Surface of the can	Temperature of the water after 10 minutes in $^\circ\text{C}$
Matt black	52
Matt white	55
Shiny black	57
Shiny silver	66

06.5 Which surface was the best emitter of infrared radiation? [2 marks]

Give a reason for your answer.

Surface

.....

06.6 Give **one** other variable that the student should have controlled. [1 mark]

.....

07 **Figure 8** shows a bar magnet.

Figure 8



07.1 Draw the magnetic field pattern around the bar magnet on **Figure 8**. [2 marks]

Show the direction of the magnetic field.

Do not write outside the box

07.2

A compass contains a small needle that can turn freely.

[2 marks]

Explain why the needle of a compass points north when there are no magnets near it.

07.3

A magnet can be a permanent magnet or an induced magnet.

[2 marks]

Give **two** differences between a permanent magnet and an induced magnet.

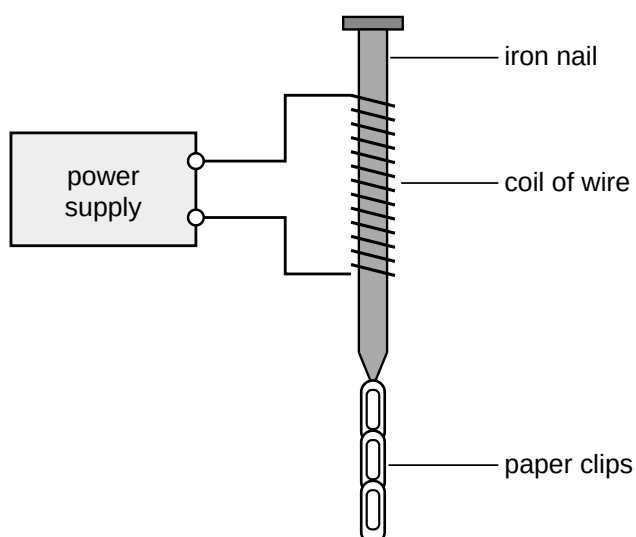
1

2

A student made an electromagnet by wrapping a coil of insulated wire around an iron nail.

Figure 9 shows the electromagnet.

Figure 9



Question 7 continues on the next page

The student investigated how the number of turns on the coil affects the number of paper clips the electromagnet can pick up.

Table 3 shows the results.

Table 3

Number of turns on the coil	10	20	30	40	50
Number of paper clips picked up	4	7	11	14	16

- 07.4** Describe the relationship between the number of turns on the coil and the number of paper clips picked up. [1 mark]

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.....

- 07.5** Give **one** other way the student could increase the strength of the electromagnet. [1 mark]

.....

- 07.6** Electromagnets are used on cranes to lift and move scrap iron and steel. [1 mark]

Suggest why an electromagnet is used on the crane rather than a permanent magnet.

.....

.....

- 08** A student investigated the motion of a trolley on a bench.

- 08.1** At the start of the investigation, the trolley was stationary on the bench. [1 mark]
Which statement is correct?

Tick (✓) **one** box.

There are no forces acting on the trolley.

☐

The resultant force on the trolley is zero.

☐

The trolley does not have any weight.

☐

The weight of the trolley is greater than the force from the bench.

☐

- 08.2** The trolley exerts a force of 4.9 N downwards on the bench. [2 marks]
Give the size **and** the direction of the force that the bench exerts on the trolley.

Size of force = ... N

Direction of force:

Do not write outside the box

08.3

The student then used a string to pull the trolley along the bench.

[2 marks]

The resultant force on the trolley was 1.2 N.

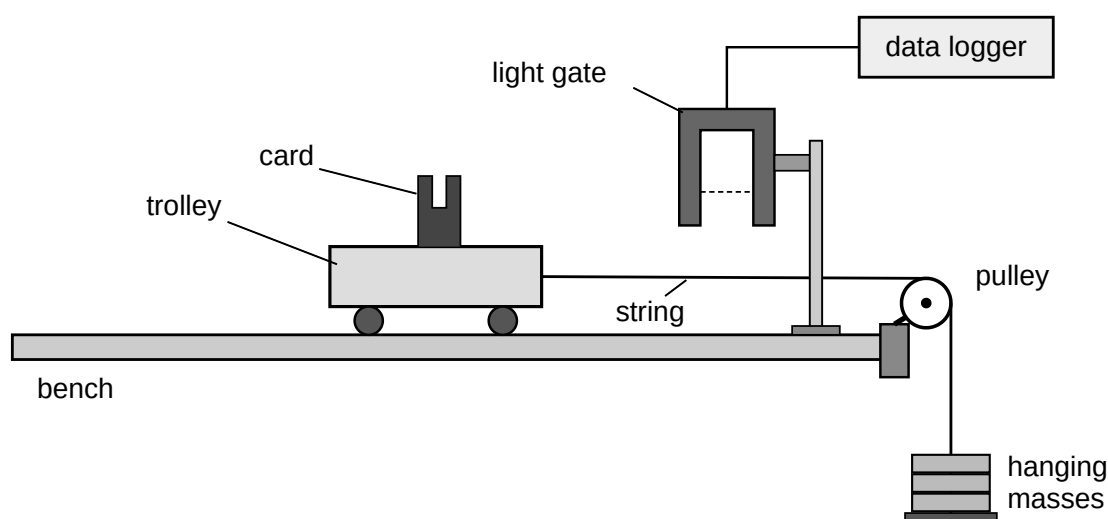
The mass of the trolley was 0.50 kg.

Calculate the acceleration of the trolley.

Acceleration = _____ m/s^2

Figure 10 shows the equipment the student used to investigate the acceleration of the trolley.

Figure 10



Do not write outside the box

08.4

The student then investigated how the mass of the trolley affects the acceleration of the trolley.

[6 marks]

The light gate and data logger can be used to measure the acceleration of the trolley.

Plan an investigation the student could do using the equipment in **Figure 10**.

Your plan should include how the student would make the investigation a fair test.

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This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

END OF QUESTIONS

Write the question numbers in the left-hand margin.

[illegible]

There are no more questions in this paper. Original practice paper © sciencegcse.co.uk – free to use for non-commercial education. Not an AQA paper.

Physics Equations Sheet

GCSE Combined Science: Trilogy – Practice Paper Series, Set 1

You may use these equations in your answers. HT = Higher Tier only equations. The equations are those listed in the AQA specification; this sheet is provided by sciencegcse.co.uk and is not an AQA document.

	Word equation	Symbol equation
1	kinetic energy = $0.5 \times \text{mass} \times (\text{speed})^2$	$E_k = \frac{1}{2} m v^2$
2	elastic potential energy = $0.5 \times \text{spring constant} \times (\text{extension})^2$	$E_e = \frac{1}{2} k e^2$
3	gravitational potential energy = mass $\times$ gravitational field strength $\times$ height	$E_p = m g h$
4	change in thermal energy = mass $\times$ specific heat capacity $\times$ temperature change	$\Delta E = m c \Delta \theta$
5	power = energy transferred $\div$ time	$P = E / t$
6	power = work done $\div$ time	$P = W / t$
7	efficiency = useful output energy transfer $\div$ total input energy transfer efficiency = useful power output $\div$ total power input	
8	charge flow = current $\times$ time	$Q = I t$
9	potential difference = current $\times$ resistance	$V = I R$
10	power = potential difference $\times$ current	$P = V I$
11	power = (current) $^2 \times$ resistance	$P = I^2 R$
12	energy transferred = power $\times$ time	$E = P t$
13	energy transferred = charge flow $\times$ potential difference	$E = Q V$
14 HT	potential difference across primary coil $\times$ current in primary coil = potential difference across secondary coil $\times$ current in secondary coil	$V_p I_p = V_s I_s$
15	density = mass $\div$ volume	$\rho = m / V$
16	thermal energy for a change of state = mass $\times$ specific latent heat	$E = m L$
17	weight = mass $\times$ gravitational field strength	$W = m g$
18	work done = force $\times$ distance (along the line of action of the force)	$W = F s$
19	force applied to a spring = spring constant $\times$ extension	$F = k e$
20	distance travelled = speed $\times$ time	$s = v t$
21	acceleration = change in velocity $\div$ time taken	$a = \Delta v / t$
22	(final velocity) ^{2} – (initial velocity) ^{2} = $2 \times$ acceleration $\times$ distance	$v^2 - u^2 = 2 a s$
23	resultant force = mass $\times$ acceleration	$F = m a$
24 HT	momentum = mass $\times$ velocity	$p = m v$
25	period = $1 \div$ frequency	$T = 1 / f$
26	wave speed = frequency $\times$ wavelength	$v = f \lambda$
27 HT	force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density $\times$ current $\times$ length	$F = B I l$