KayScience Combined Science Tuition (9-1)

GCSE *Combined* Physics

Weeks 9-12

Online Tuition
Exam Question Workbook

***g on Earth* = 9.8 N/kg**

1. What is the difference between **mass** and **weight**.

2. An object on Earth has a mass of 72 kg.
   Calculate the weight of the object.

2. An object on Earth has a mass of 22 kg.
   Calculate the weight of the object.

4. A 100 kg astronaut on The Moon has a weight of 160 N.
   Calculate the gravitational field strength on The Moon.

5. The astronaut from question 4 is now on Earth.
   Calculate the new weight of the astronaut.

6. The astronaut in question 4 is now on Mars. They now have a weight of 370 N.
   Calculate the gravitational field strength on Mars.

7. The 100 kg astronaut picks up a 15 kg rock.
   Calculate the new combined weight of the astronaut and the rock on Mars.

8. The 100 kg astronaut holds the 15 kg rock and picks up a second rock.
   The weight of the astronaut and the two rocks is 444 N.
   Calculate the mass of the new second rock on Mars.

1. A car driver sees a hazard in the road and brakes to stop their car.

The stopping distance of a car is the thinking distance plus the braking distance.

a) What is meant by the ***braking distance***?

.....

a) What is meant by ***thinking distance***?

.....

2. The braking distance of a car depends on the car's speed and the braking force.

a) State **one** other factor that affects braking distance.

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a) State **two** factors that affect thinking distance.

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3. A driver of a car sees a hazard on the road. The driver brakes to stop the car.

Explain the factors that affect the distance needed to stop a car in an emergency.

(6)

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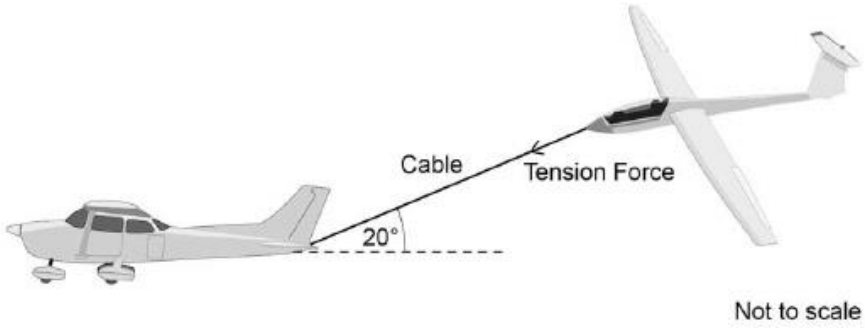
1. The image below shows the small aircraft being used to tow a glider.



The tension force in the cable can be resolved into a horizontal component and a vertical component.

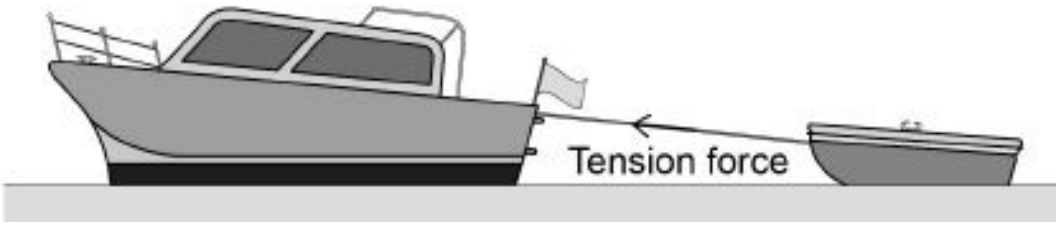
- The tension in the cable is 2000 N.
- The cable makes an angle of 20° with the horizontal.

Draw a vector diagram to determine the magnitude of the two components of the tension force in the cable.

Magnitude of the horizontal component = _____ N

Magnitude of the vertical component = _____ N

1. The image below shows a boat pulling a smaller boat.



The tension force in the tow rope causes a horizontal force forwards and a vertical force upwards on the smaller boat

- The horizontal force forwards = 150 N
- The vertical force upwards = 50 N

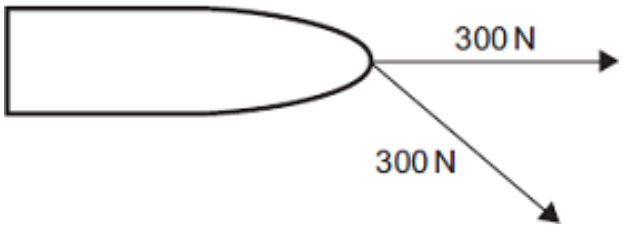
Draw a vector diagram to determine the magnitude of the tension force in the tow rope and the direction of the force this causes on the dinghy.

1. Two fisherman come to help pull a boat. Each fisherman uses their boat to pull with a force of 300 N, as shown in the diagram below.

   The diagram below is drawn to scale.

   Add to **Diagram 2** to show the single force that has the same effect as the two 300 N forces.

   Determine the value of this resultant force.

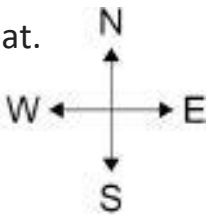


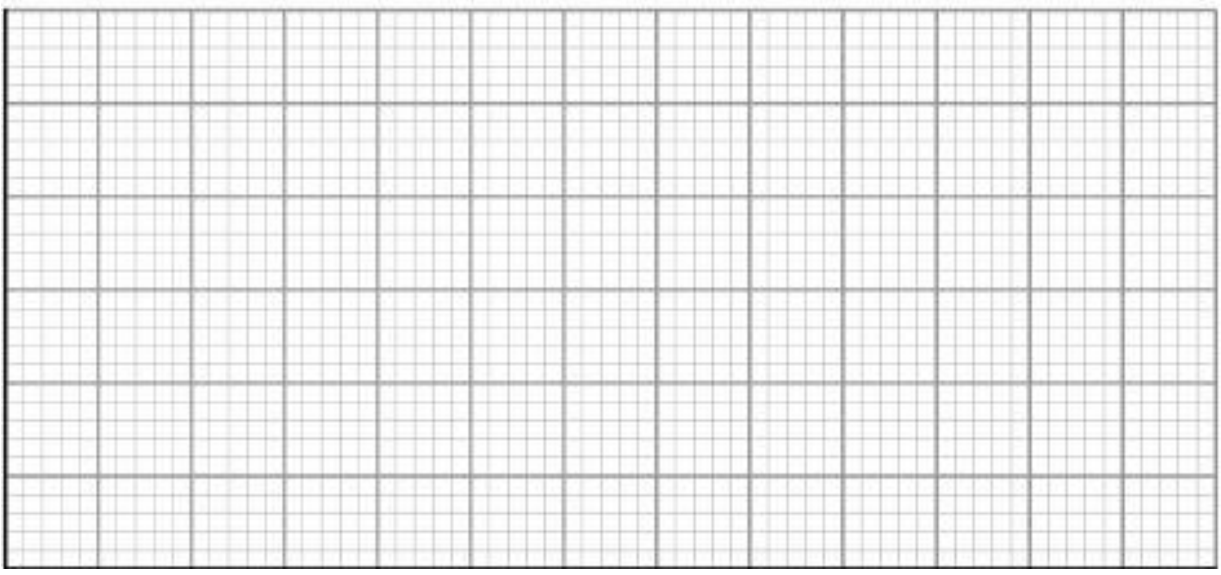
2. A boat moves through the sea.

   - There is a 3000 N force to the west on the boat.
   - There is a 1000 N force to the south on the boat.

   Determine the magnitude and direction of the resultant force on the boat.

   Draw a vector diagram of these forces to scale on **Figure 2**





Magnitude of resultant force = _____ N

Direction of resultant force = _____ °

1. Define a transverse wave.

(2)

2. Define a longitudinal wave.

(2)

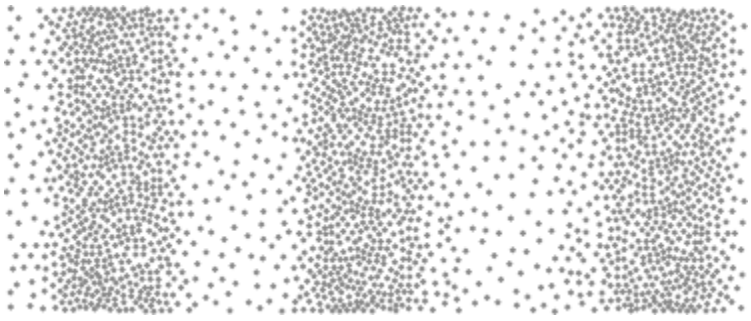
3. Describe the difference between transverse waves and longitudinal waves.

(3)

4. Compare light waves and sound waves

(4)

5. The diagram below shows the disturbance of air molecules in the path of a sound wave at one point in time.

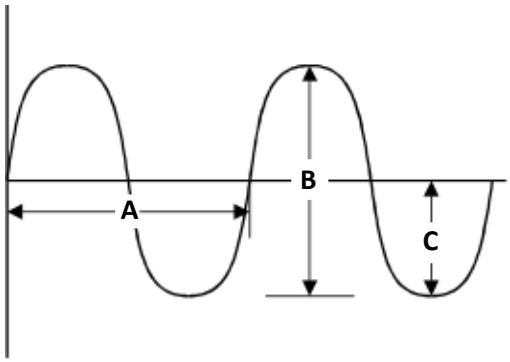


a) Label the diagram with the letter **X**, in an area of rarefaction.

b) Label the diagram with the letter **X**, in an area of compression.

c) Label one complete wavelength

1. The diagram shows a wave pattern.



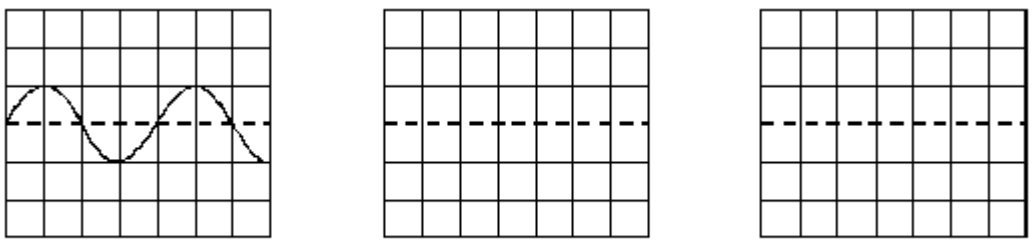
a) Which letter represents the ***wavelength***?

.....

a) Which letter represents the ***amplitude***?

.....

2. Diagram **A** shows a trace on an oscilloscope screen.

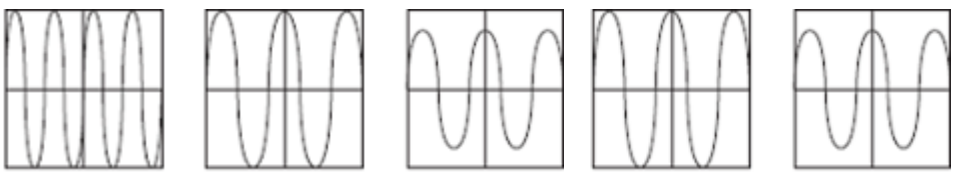


A **B** **C**

a) Draw a trace on diagram **B** which has a lower frequency than in diagram **A**

a) Draw a trace on diagram **C** which has a smaller amplitude than in diagram **C**.

3. The diagrams below show five traces, **1**, **2**, **3**, **4** and **5**, on the oscilloscope. All the traces are drawn to the same scale.



1 2 3 4 5

a) Diagrams __ , __ and __ have the same amplitude.

b) Diagrams __ , __ and __ have the same frequency.

1. The period of the sound waves produced by a motor is 0.0083 seconds.
   Calculate the **frequency** of the sound waves.

2. Wind made a sign swing forwards and backwards like a pendulum. The frequency of oscillations of the sign was 2 Hz. Calculate the **periodic time** for the sign.

3. A pendulum swings with a frequency of 0.80 Hz.
   Calculate the **periodic time** of the pendulum.

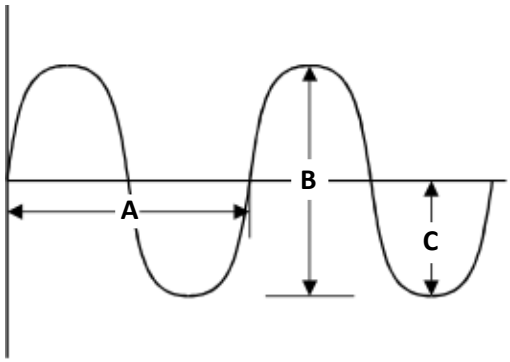
4. The period of a wave is 12 milliseconds.
   Calculate the **frequency** of the wave.

5. 12 waves pass an observer in 4 seconds.
   Calculate the **time period** of the wave.

6. 30 waves pass an observer in 2 minutes.
   Calculate the **time period** of the wave.

7. Signals transmitted as an electromagnetic wave have a wavelength of 0.125 m and a wave speed of 3×10^8 m/s. Calculate the **time period** of the wave.

1. The diagram shows a wave pattern.



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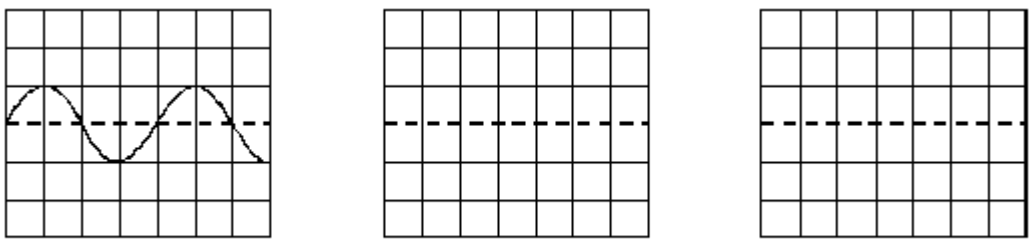

A **B** **C**

a) Draw a trace on diagram **B** which has a lower frequency than in diagram **A**

a) Draw a trace on diagram **C** which has a smaller amplitude than in diagram **C**.

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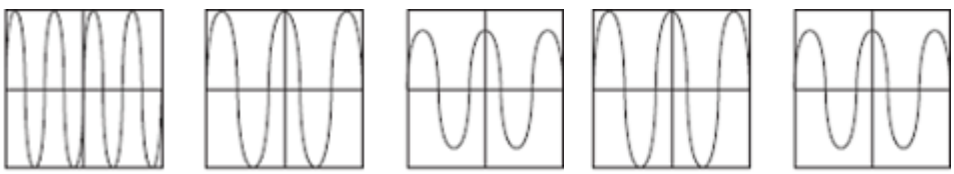
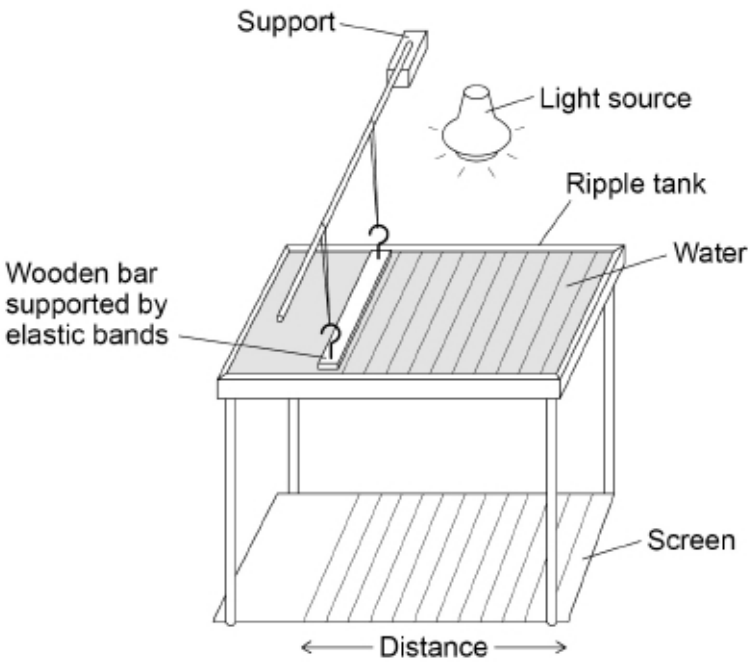


1 2 3 4 5

a) Diagrams __ , __ and __ have the same amplitude.

b) Diagrams __ , __ and __ have the same frequency.

The students want to determine the wave speed of water waves in the ripple tank.



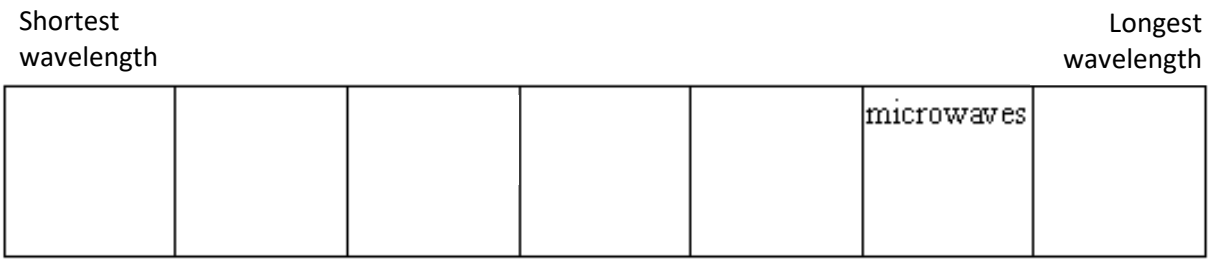
1. Describe how equipment in the image above can be used to measure the wavelength, frequency and speed of a water wave.

1. What are **two** properties of **all** electromagnetic waves?

Property	Tick (✓)
All electromagnetic waves are longitudinal.	
All electromagnetic waves are transverse.	
All electromagnetic waves are mechanical.	
All electromagnetic waves have the same speed in a vacuum.	
All electromagnetic waves have the same frequency.	

2. The diagram shows some of the kinds of waves in the electromagnetic spectrum.

a) Complete the empty boxes on the diagram.



Which electromagnetic wave (or waves)...

a) is used to send a signal to a satellite in space.

.....

b) is used to communicate with a submarine under the water.

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c) is used to broadcast television programmes around the world.

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d) is the wave with the shortest wavelength?

.....

e) are ionising? (state more than one electromagnetic wave)

.....

f) is used to detect broken bones.

.....

g) is the wave with the longest wavelength.

.....

h) is the wave with the lowest frequency.

.....

i) is used to sterilise medical equipment and kill cancer cells.

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1. Explain how microwaves and visible light are used in communications.

[4 marks]

2. Radiographers use X-rays to produce images of bones inside the body. Explain why X-rays can be used to produce images of the bones inside the body.

[2 marks]

3. Describe how microwaves and radio waves are transmitted around the world.

[4 marks]

4. Compare the dangers of infrared radiation with x-ray, ultraviolet & gamma radiation.

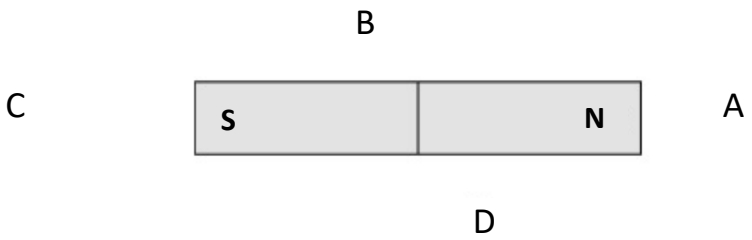
[4 marks]

1. Describe how the radio waves reaching the car aerial produce signals in the electrical circuit of the car radio.

[3 marks]

2. Explain how electrical signals in the transmitter produce a signal in the receiver.

[3 marks]



1. Which letter shows the position where the magnetic field around the bar magnet is strongest?

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2. Describe how two bar magnets can be used to demonstrate a force of attraction and a force of repulsion.

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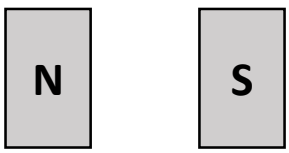
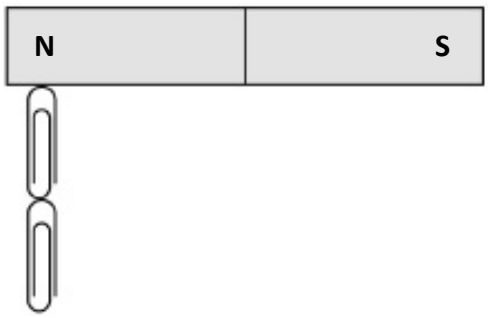
3. Draw on the diagram below the magnetic field pattern between the two facing poles.



The image below shows some paper clips that are attracted to a permanent magnet.

4. Label the north and south poles of the two magnetised paper clips below.

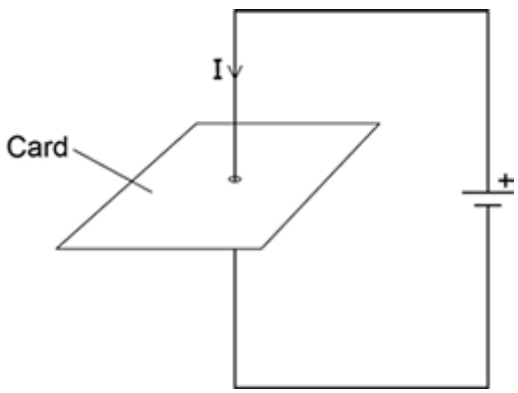
4. Draw the magnetic field lines produced by the magnetic below



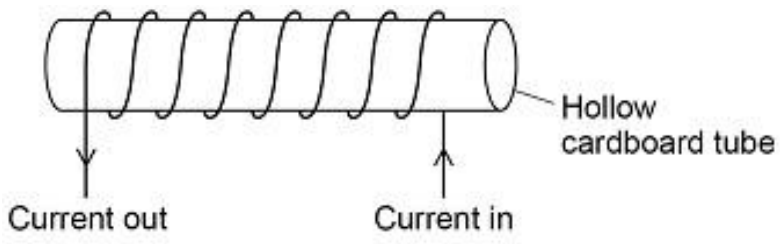
1. The circle below represents a straight wire carrying a current. The cross shows that the current is into the plane of the paper. Complete the image below to show the magnetic field pattern around the wire.

2. The direction of the current is reversed.
What happens to the direction of the lines in the magnetic field pattern?

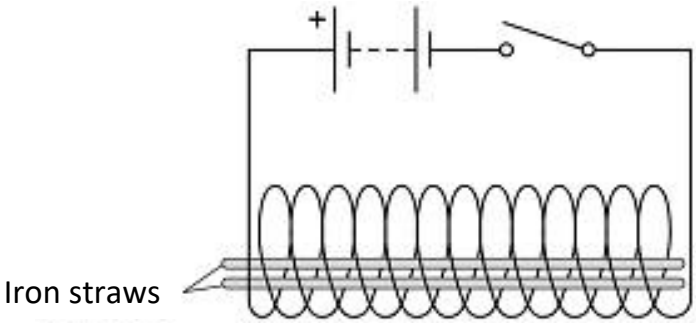
3. The image below shows a straight wire passing through a piece of paper. A current is passing down through the wire.
Draw the magnetic field lines on the card below and describe how you could show that a magnetic field has been produced around the wire.



1. The image below shows a solenoid.
   Draw the magnetic field of the solenoid on the image below.



The image below shows two iron rods placed inside a solenoid.



2. Explain why the iron rods move apart when the switch is closed.

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3. State one way in which the magnetic field in the image above can be increased.

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1. A relay switch can be operated by an electromagnet. This type of switch is used in a car starter motor circuit.
   Explain how turning the ignition key makes a current flow in the starter motor.

2. A door lock controlled by an electromagnet can be opened from a flat inside a building. Explain how the door is unlocked when the switch is closed.