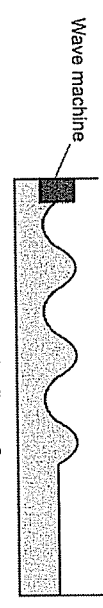


General properties of waves

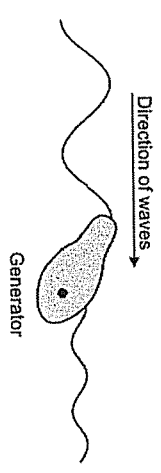
1. (a) A swimming pool has a wave making machine. The diagram shows the water wave pattern for 3 seconds.



- (i) How many water waves are shown in the diagram? (1)
- (ii) What is the frequency of the water waves? (1)
- (iii) Which one of the units below is used to measure frequency? Underline your answer.
hertz joule watt (1)

- (b) The diagram shows the direction of the waves across the pool. The waves reflect off the side of the pool. Draw a line on the diagram to show the direction of the waves after they hit the side of the pool.
-

- (c) The swimming pool is used to test a model of an electricly generator. The waves make the floating generator move up and down. This energy is transferred to electricity.



- In the following sentence, cross out the two lines that are wrong in the box.
- The diagram shows that the amplitude of the waves
 gets larger as the waves pass the generator.
 stays the same gets smaller (1)
- (Total 5 marks)

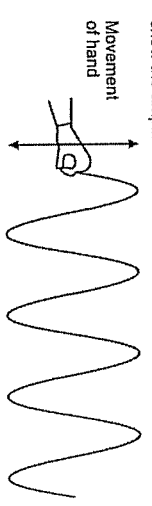
2. Radio waves, ultra-violet, visible light and X-rays are all types of electromagnetic radiation. Choose wavelengths from the list below to complete the table.
- 3×10^{-8} m 1×10^{-11} m 5×10^{-7} m 1500 m

TYPE OF RADIATION	WAVELENGTH (m)
Radio waves	
Ultra-violet	
Visible light	
X-rays	

- (b) Microwaves are another type of electromagnetic radiation. Calculate the frequency of microwaves of wavelength 3 cm. (The velocity of electromagnetic waves is 3×10^8 m/s.)
 (4)

3. The diagram shows a wave travelling along a rope.

- (a) On the diagram:
 (i) show the wavelength and label it W;
 (ii) show the amplitude and label it A.

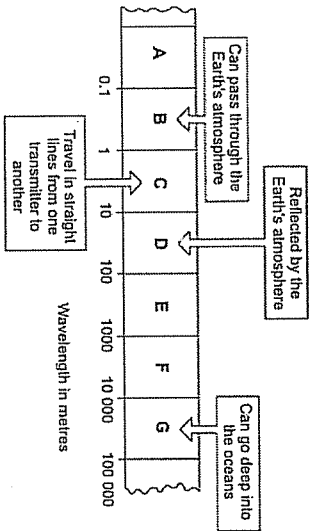


- (b) The wavelength of the wave is 0.1 m. Its frequency is 2 Hz. Calculate the speed of the wave. Show clearly how you work out your answer and give the unit.
 (2)

- Speed of wave (3)
- (Total 5 marks)

Reflection

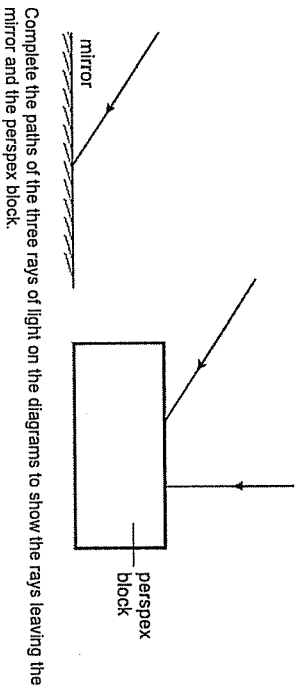
1. The diagram shows a small part of the electromagnetic spectrum divided into seven sections. The different properties of the waves in each section make them useful in different ways.



The waves in which section, A, B, C, D, E, F or G, are:

- (a) used to send a signal to a satellite in space (1)
- (b) used to communicate with a submarine under the water (1)
- (c) used by a radio station to broadcast programmes around the world (1)
- (d) the waves with the shortest wavelength? (1)
- (Total 4 marks)

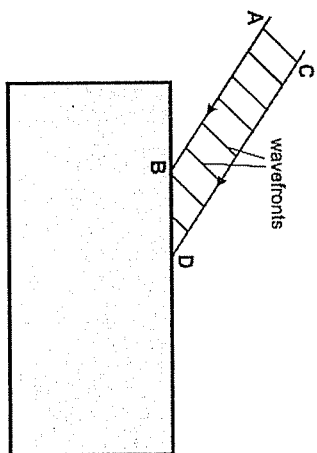
2. (a) The diagrams below show rays of light striking a mirror and a perspex block.



Complete the paths of the three rays of light on the diagrams to show the rays leaving the mirror and the perspex block.

(4)

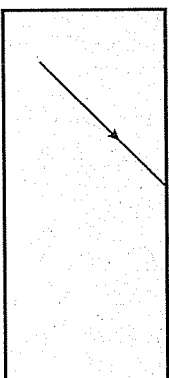
- (b) The diagram below shows a beam of light striking a perspex block.



- (i) Continue the paths of the rays AB and CD inside the perspex block.
(ii) Draw the wavefronts of the beam of light in the perspex.
(iii) Explain why the beam behaves in the way you have shown.

(7)

- (c) The diagram below shows a ray of light striking a perspex-air surface from inside the perspex. The critical angle is 45° .



Draw the path of the ray after it reaches the perspex-air boundary.

(Total 13 marks) (2)

3. (a) Some scientists think that there is a link between using a mobile phone and some types of illness. Other scientists disagree. They say that the evidence is limited and unreliable.
(i) Suggest what scientists could do to show a link between using a mobile phone and illness.

(1)

(ii) How could scientists improve the reliability of the evidence?

.....
.....
(1)

(iii) Complete the following passage by drawing a ring around the word in the box that is correct.
There has been little or no experimental research into the health of children who use mobile phones. This is partly because of the

economic issues involved in using children in scientific research.
environmental ethical

(1)

(b) Before being sold, new mobile phones must be tested and given a SAR value. The SAR value is a measure of the energy absorbed by the head while a mobile phone is being used. The table gives the SAR value for three mobile phones made by different companies. To be sold in the UK, a mobile phone must have a SAR value lower than 2.0 W/kg.

Mobile phone	SAR value in W/kg
J	0.18
K	0.86
L	1.40

(i) All companies use the same test to measure a SAR value. Why is using the same test important?

.....
.....
(1)

(ii) Would the companies that make the mobile phones, J, K and L, be correct to claim that these three phones are totally safe to use?
Answer yes or no
Give a reason for your answer.

.....
.....
(1)

(c) Devices designed to protect a mobile phone user from microwave radiation are now available. Why is it important that these devices are tested by scientists who are not working for the company that makes the devices?

.....
.....
(1)
(Total 6 marks)