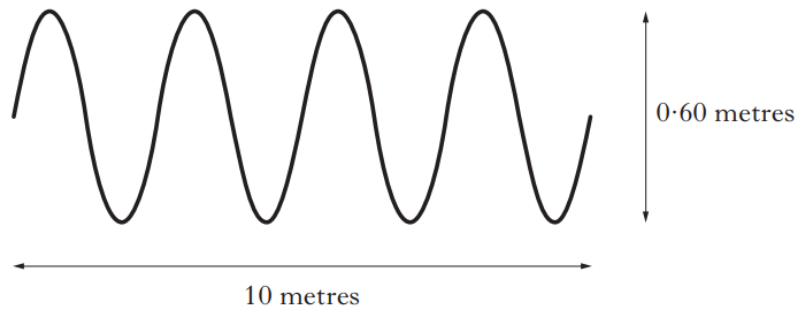


## S3 Physics Homework Exercises

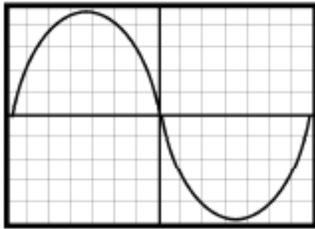
### Waves and Radiation - Homework 1

1. A teacher is carrying out a demonstration using a slinky spring to show some properties of waves. A simplified diagram of the wave produced is shown below.

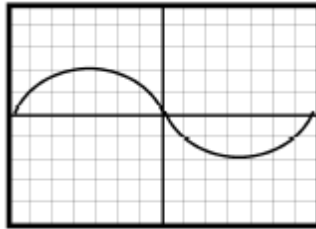


- a) State the amplitude of the wave. (1)
- b) State the wavelength of the wave. (1)
- c) The diagram shows the number of waves produced in 2 seconds. Calculate the frequency of the waves. (3)
2. A student makes the following statements about waves. State whether each of these statements is true or false.
- A: In a transverse wave, the particles vibrate parallel to the direction of travel of the wave.
- B: Light waves and water waves are both transverse waves.
- C: Sound waves are longitudinal waves. (3)
3. What is the speed of sound in air? (1)
4. A person shouts in a cave. It takes 1.5 seconds for the person to hear their echo.
- a) Calculate the distance the sound wave travelled. (3)
- b) What is the distance between the person and the back of the cave? (1)

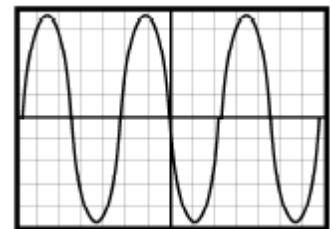
5. Which wave term can be defined as “the bending of a wave around an obstacle or the bending of a wave between gaps in obstacles.”? (1)
6. Use the CRO traces below to answer the following questions. (3)
- Which two traces display the same amplitude?
  - Which two traces display sounds with the same frequency?
  - True or False. Trace C is three times louder than the other two traces.



Trace A



Trace B



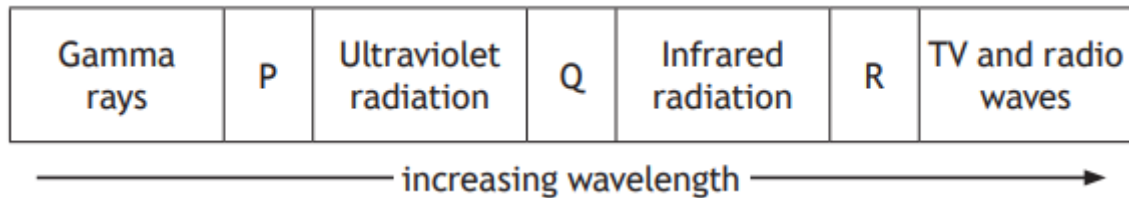
Trace C

- d) The frequency of the wave in trace A is 0.4 Hz. Calculate the period of this wave. (3)

## Waves and Radiation - Homework 2

1. What is the speed of waves in the electromagnetic spectrum? (1)

2. The following diagram shows the members of the electromagnetic spectrum.

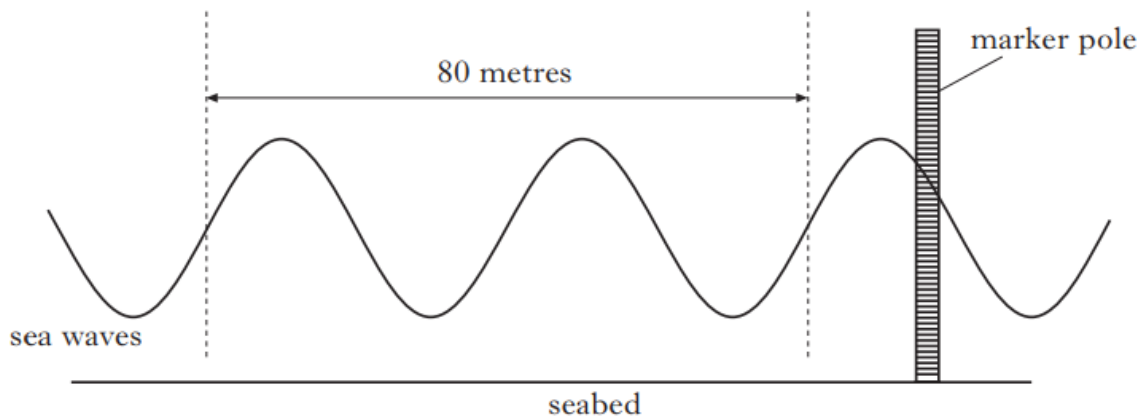


a) State the missing members of the electromagnetic spectrum.  
b) Which has the highest frequency: P, Q, or R?  
c) State a detector of infrared radiation. (3)

3. List the following colours in order of increasing wavelength: red, blue and green. (1)

4. State an industrial or medical application for the following members of the electromagnetic spectrum.  
a) Gamma rays  
b) Ultraviolet radiation  
c) Infrared radiation  
d) TV and radio waves (2)

5. A surfer rides the waves near a beach. The diagram below shows a wave some distance from the beach.



- a) Using the information from the diagram, calculate the wavelength of the wave. (1)
- b) The time between one crest and the next crest passing the marker pole is 5 seconds. Calculate the speed of the wave. (3)
- c) Calculate the frequency of the wave. (3)
6. An infrared detector picks up a signal of frequency  $3.33 \times 10^{14}$  Hz and wavelength  $9 \times 10^{-7}$  m. Calculate the speed of this signal. (3)
7. A sunbed uses ultraviolet rays with a wavelength  $3.75 \times 10^{-7}$  m. Calculate the frequency of these ultraviolet rays. (3)

### Waves and Radiation – Homework 3

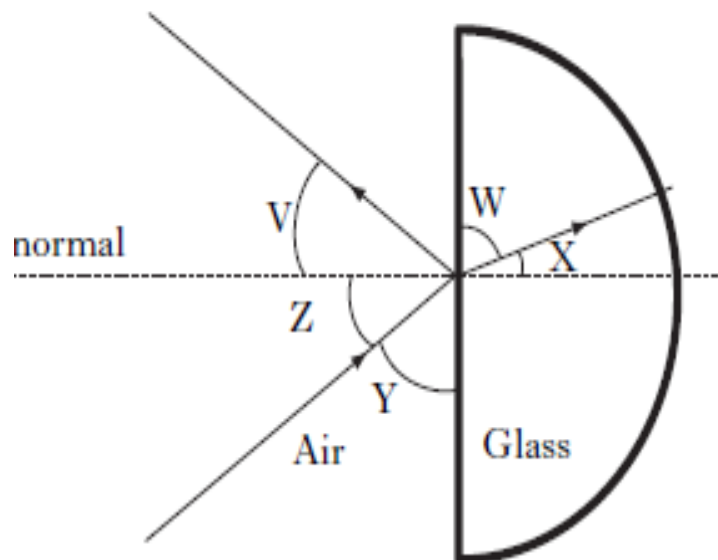
1. Copy and complete the following sentences.

Refraction is the change in \_\_\_\_\_ of a wave that happens when the wave changes from one material to another.

When light enters glass from air it will (slow down / speed up). This will cause the light to change direction and move (towards / away from) the normal line.

(3)

2. The diagram below shows what happens to a ray of light when it strikes a glass block.



- a) Which letter represent the angle of incidence?  
b) Which letter represents the angle of refraction?

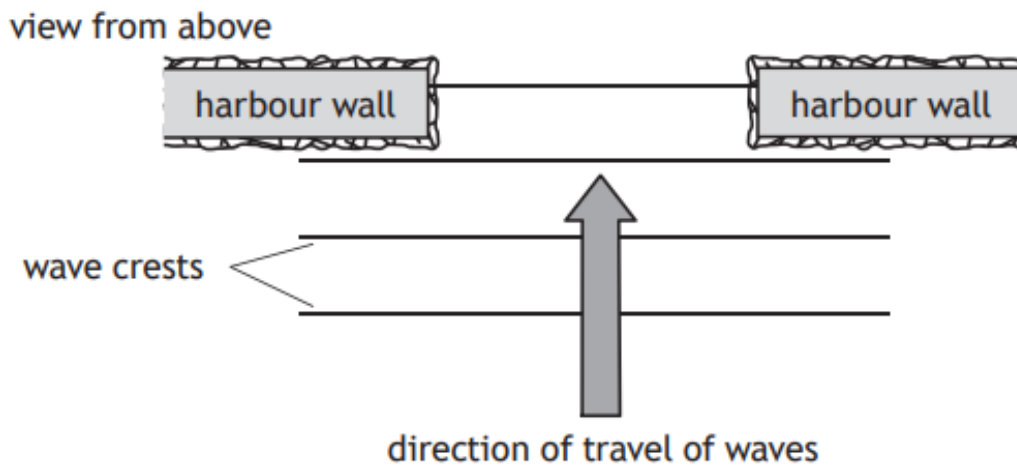
(2)

3. A student makes the following statements about diffraction. State whether each of these statements is true or false.

- A: Diffraction occurs when waves pass from one medium into another.  
B: Waves with a longer wavelength diffract more than waves with a shorter wavelength.  
C: Microwaves diffract more than radio waves.

(3)

4. A student observes water waves entering a harbour. Waves travel towards the entrance of the harbour as shown. Copy and complete the diagram showing the pattern of wave crests inside the harbour.



(2)

\_\_\_\_\_  
(10)

## Waves and Radiation - Homework 4

1. Complete the following table:

Particle	Location	Charge
(a)	In the nucleus	No charge
Proton	(b)	Positive
Electron	Orbiting the nucleus	(c)

(3)

2. Complete the following table:

Type	Description	Absorbed by
(a)	Helium nucleus	Thin paper
Beta	Fast moving electron	(b)
(c)	(d)	Thick lead

(4)

3. Name the nuclear radiation found in smoke alarms.

(1)

4. What is ionisation?

(1)

5. Describe what is meant by

- a) nuclear fission
- b) nuclear fusion.

(2)

6. Match the following quantities with their units.

Quantity	Unit
Absorbed Dose	Becquerel
Activity	Gray
Equivalent Dose	Sievert

(3)

7. State a source of background radiation.

(1)

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(15)

## Waves and Radiation – Homework 5

1. A student makes the following statements about the activity of a radioactive source. State whether each of these statements is true or false.  
A: The activity decreases with time.  
B: The activity is measured in becquerels.  
C: The activity is the number of decays per second. (3)
2. In a radioactive source 18,000 atoms decay in a time of 3 minutes. Calculate the activity of the source. (3)
3. A sample of tissue has a mass of 0.05kg. The tissue is exposed to radiation and absorbs 0.1J of energy in 2 minutes. Calculate the absorbed dose taken in by the tissue. (3)
4. What does the risk of biological harm from an exposure to radiation depend on? (3)
5. What effect does over exposure to nuclear radiation have on living cells? (1)
6. An accident in the nuclear industry exposes a worker to an absorbed dose of 300  $\mu\text{Gy}$  from a radiation with a weighting factor of 20. Calculate the equivalent dose from this exposure. (3)
7. What is meant by the term "half-life"? (1)
8. A radioactive source has a half-life of 4 days. The source has an activity of 40kBq at the start of the experiment. Calculate the activity of the sample after 16 days. (3)

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(20)