Gleniffer High School

National 5

“A – Team”

Past Papers

Waves Homework

Mr Downie 2022

DATA SHEET

Speed of light in materials

Material	*Speed* in $m\,s^{-1}$
Air	$3{\cdot}0 \times 10^8$
Carbon dioxide	$3{\cdot}0 \times 10^8$
Diamond	$1{\cdot}2 \times 10^8$
Glass	$2{\cdot}0 \times 10^8$
Glycerol	$2{\cdot}1 \times 10^8$
Water	$2{\cdot}3 \times 10^8$

Gravitational field strengths

	Gravitational field strength on the surface in $N\,kg^{-1}$
Earth	9·8
Jupiter	23
Mars	3·7
Mercury	3·7
Moon	1·6
Neptune	11
Saturn	9·0
Sun	270
Uranus	8·7
Venus	8·9

Specific latent heat of fusion of materials

Material	*Specific latent heat of fusion* in $J\,kg^{-1}$
Alcohol	$0{\cdot}99 \times 10^5$
Aluminium	$3{\cdot}95 \times 10^5$
Carbon Dioxide	$1{\cdot}80 \times 10^5$
Copper	$2{\cdot}05 \times 10^5$
Iron	$2{\cdot}67 \times 10^5$
Lead	$0{\cdot}25 \times 10^5$
Water	$3{\cdot}34 \times 10^5$

Specific latent heat of vaporisation of materials

Material	*Specific latent heat of vaporisation* in $J\,kg^{-1}$
Alcohol	$11{\cdot}2 \times 10^5$
Carbon Dioxide	$3{\cdot}77 \times 10^5$
Glycerol	$8{\cdot}30 \times 10^5$
Turpentine	$2{\cdot}90 \times 10^5$
Water	$22{\cdot}6 \times 10^5$

Speed of sound in materials

Material	*Speed* in $m\,s^{-1}$
Aluminium	5200
Air	340
Bone	4100
Carbon dioxide	270
Glycerol	1900
Muscle	1600
Steel	5200
Tissue	1500
Water	1500

Specific heat capacity of materials

Material	*Specific heat capacity* in $J\,kg^{-1}\,°C^{-1}$
Alcohol	2350
Aluminium	902
Copper	386
Glass	500
Ice	2100
Iron	480
Lead	128
Oil	2130
Water	4180

Melting and boiling points of materials

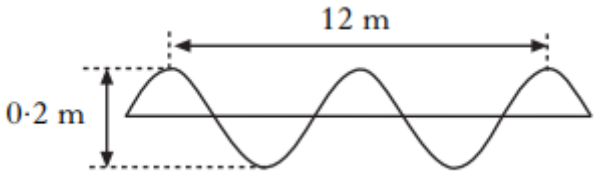
Material	*Melting point* in °C	*Boiling point* in °C
Alcohol	−98	65
Aluminium	660	2470
Copper	1077	2567
Glycerol	18	290
Lead	328	1737
Iron	1537	2737

Radiation weighting factors

Type of radiation	*Radiation weighting factor*
alpha	20
beta	1
fast neutrons	10
gamma	1
slow neutrons	3

Waves One

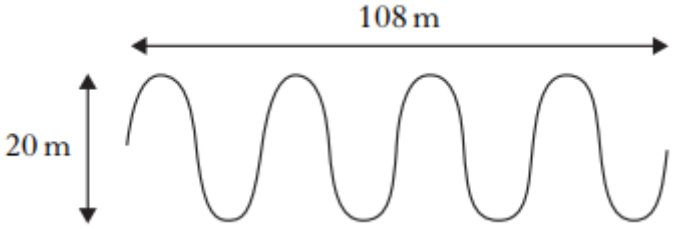
1. The following diagram shows a wave.



Which row in the table gives the wavelength and amplitude of the wave?

	Wavelength (m)	Amplitude (m)
A	4	0.2
B	6	0.1
C	6	0.2
D	12	0.1
E	12	0.2

2. The diagram gives information about a wave.



The time taken for the waves to travel 108 m is 0.5 s.

A student makes the following statements about the waves.

I The wavelength of the waves is 27 m.

II The amplitude of the waves is 20 m.

III The frequency of the waves is 8 Hz.

Which of the statements is/are correct?

A I only

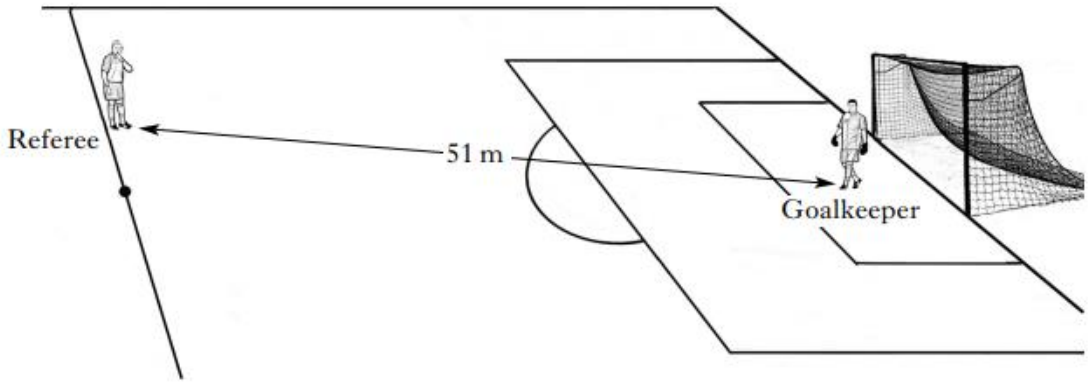
B II only

C I and III only

D II and III only

E I, II, and III

3. At the kick-off in a football match, during the World Cup Finals, the referee blows their whistle. The whistle produces sound waves.



a) The sound waves from the whistle travel at 340 ms^{-1}. Calculate the time taken for the sound waves to reach the goalkeeper.

3

b)

i) Are sound waves transverse or longitudinal?

1

ii) Describe two differences between transverse and longitudinal waves.

2

iii) What is transferred by waves?

1

Waves Two

1. A water wave is an example of a transverse wave. When water waves travel, the particles of the water

A move continuously towards the source

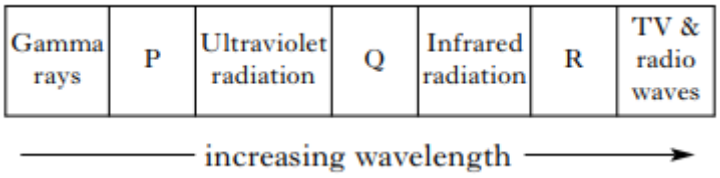
B move continuously away from the source

C vibrate at random

D vibrate along the wave direction

E vibrate at 90° to the wave direction

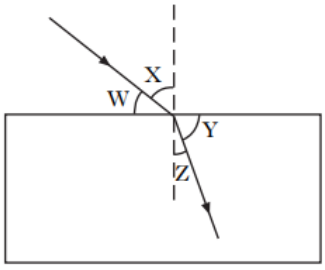
2. The diagram shows members of the electromagnetic spectrum in order of increasing wavelength.



Which row in the table identifies the radiations represented by the letters P, Q, and R?

	P	Q	R
A	X-rays	visible light	microwaves
B	X-rays	microwaves	visible light
C	microwaves	visible light	X-rays
D	visible light	microwaves	X-rays
E	visible light	X-rays	microwaves

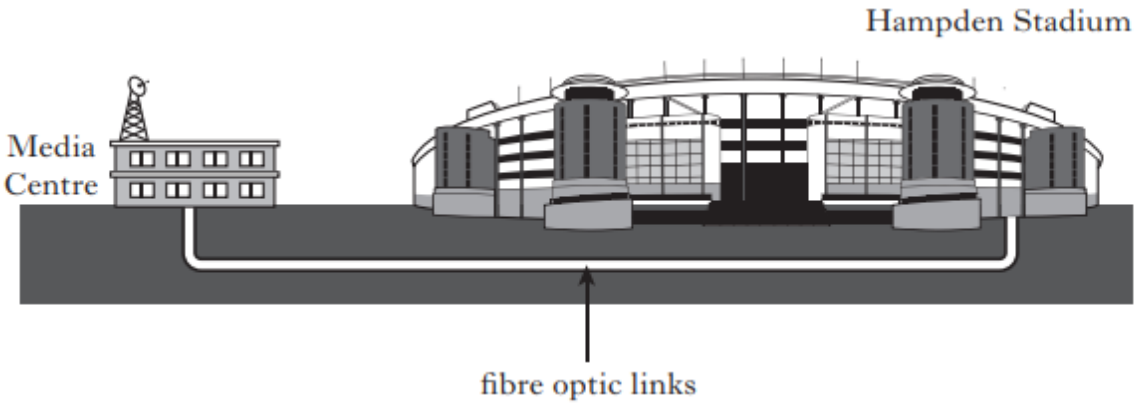
3. A ray of light passes from air into a glass block as shown.



Which row in the table shows the angle of incidence and the angle of refraction?

	Angle of incidence	Angle of refraction
A	W	Z
B	W	Y
C	X	Z
D	X	Y
E	Z	X

4. For the European Football Champoinship games in Glasgow, fibre optic links were used to carry signals from Hampden Stadium to the media centre.



a) Stewards directing spectators used mobile phones for communication with each other.

i) One mobile phone used microwaves of frequency 1200 MHz. Calculate the wavelength of these microwaves.

3

ii) Another mobile phone operated at with a frequency of 1800 MHz. The signals from each phone travel the same distance. How does the time taken for the signals from the second phone compare with the signals from the first phone?

Justify your answer.

2