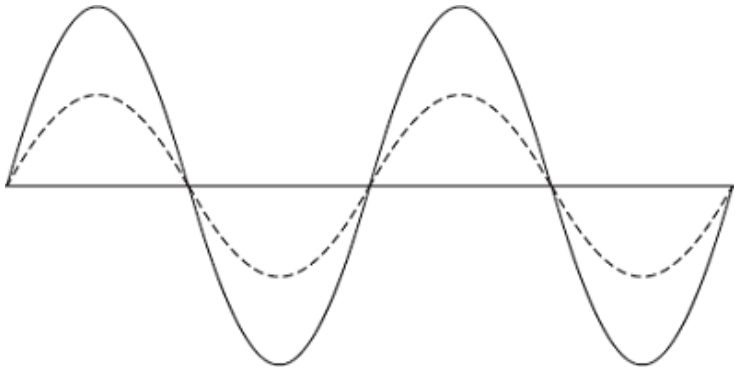
Foundation Waves Mini Assessment

34 minutes

34 marks

Q1. (a) **Diagram 1** shows two waves.

Diagram 1



(i) Name **one** wave quantity that is the same for the two waves.

.....

(1)

(ii) Name **one** wave quantity that is different for the two waves.

.....

(1)

(iii) The waves in **Diagram 1** are transverse.

Which **one** of the following types of wave is **not** a transverse wave?

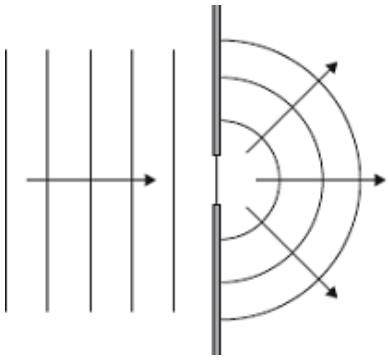
Draw a ring around the correct answer.

gamma rays **sound** **visible light**

(1)

(b) **Diagram 2** shows water waves in a ripple tank moving towards and passing through a gap in a barrier.

Diagram 2



(i) The water waves spread out after passing through the gap in the barrier.

What name is given to the process causing the waves to spread out?

.....

(1)

(ii) Every second, 8 waves pass through the gap in the barrier. The waves have a wavelength of 0.015 metres.

Calculate the speed of the water waves and give the unit.

Use the correct equation from the Physics Equations Sheet.

.....

.....

.....

Speed = ...

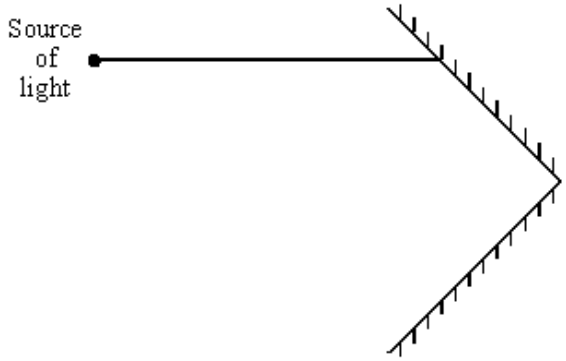
(3)

(Total 7 marks)

Q2. (a) The diagram shows two mirrors at right angles to each other. A ray of light shines onto one mirror as shown.

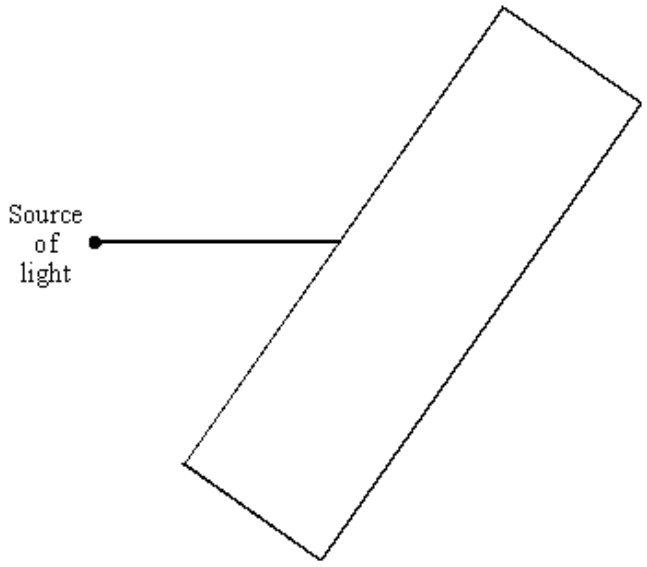
Carefully draw the path of the ray which is reflected from both mirrors.

Draw an arrow on the ray to show the direction of the light.



(3)

(b) Light can also be made to change direction as it passes into and out from a block of glass. Complete the ray diagram below.



(2)
(Total 5 marks)

Q3. In the diagram below, a frog sits on a rock in a pond.

(a) Complete the following sentences by drawing a ring around the correct line in the box.

(i) The frog can see its image in the pond because the surface of the pond acts

like a | concave / convex / plane | mirror.

(1)

(ii) Draw a ring around each of **two** words from the box below to describe the image in the pond.

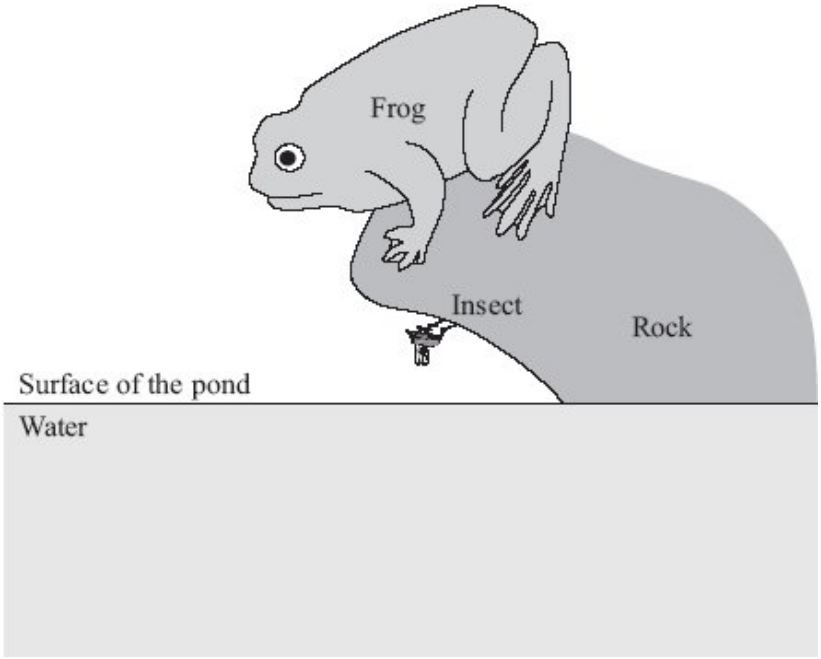
bigger	**inverted**	**real**	**smaller**	**upright**	**virtual**

(2)

(b) There is an insect underneath the rock.

Use a ruler to draw rays of light on the diagram to show how the frog uses reflection to see the insect.

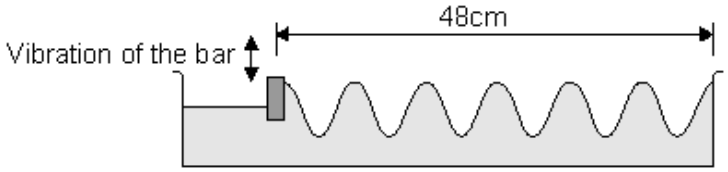
Mark the direction of the rays.



(3)
(Total 6 marks)

Q4. Water waves can be made by vibrating a wooden bar up and down in a tray of water.

The bar moves up and down at a frequency of 5 hertz.



(a) Calculate the speed, in cm/s, of the water waves.

Write down the equation you use and then show clearly how you work out your answer.

.....

.....

.....

.....

.....

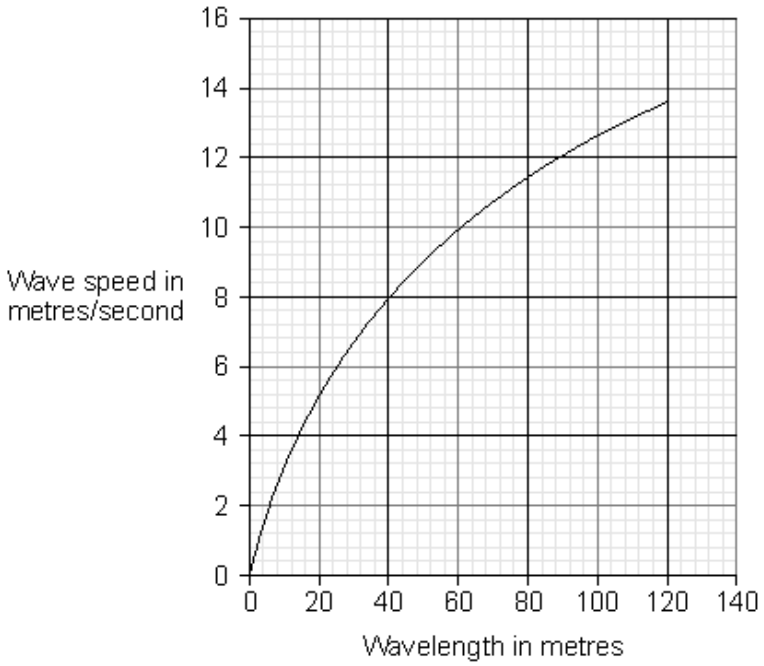
.....

.....

Wave speed = ... cm/s

(3)

(b) The graph shows how the speed of deep ocean waves depends on the wavelength of the waves.



Use the graph to predict a speed for waves with a wavelength of 140 m.

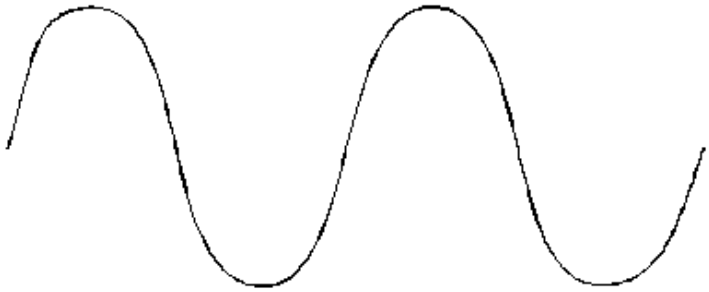
Show clearly how you have used the graph to work out your answer.

Speed of waves = ... m/s

(2)

(Total 5 marks)

Q5. (a) On the wave drawn below, mark the amplitude and wavelength.



(2)

(b) A wave is said to have a frequency of 25 Hz.

Explain what the term *frequency* means.

.....

.....

.....

(1)

(c) From the electromagnetic spectrum, give the name and use of a radiation of lower frequency than light.

Name .....

Use .....

(2)

(Total 5 marks)

Q6. (a) Mobile phones send *digital* signals using electromagnetic waves.

(i) Which **one** of the following types of electromagnetic wave is used to carry information between masts in a mobile phone network?

Draw a ring around your answer.

light	**microwave**	**radio**

(1)

(b) Some people worry that using a mobile phone may be bad for their health.

Look at this information taken from a recent newspaper article.

- Scientists in Sweden found that the regular use of a mobile phone increases the risk of a cancerous growth between the ear and the brain.
- Some people who use mobile phones for a long time complain of headaches and tiredness. The same effect has not been noticed in laboratory tests.
- There is no reliable evidence to link using mobile phones with ill health.
- The waves from a mobile phone are not strong enough to cause long-term heat damage to cells in the body.

(i) Complete the following sentence by drawing a ring around the word in the box that is correct.

The evidence from different scientists doing the same investigation is reliable if

all the scientists get | different / identical / random | results.

(1)

(ii) What information in the article supports the idea that mobile phones are bad for your health?

.....

.....

.....

.....

(2)

(iii) Some scientists say that using a mobile phone is totally safe.

What information in the article supports this view?

.....

.....

.....

.....

(2)

(Total 6 marks)

M1. (a) (i) wavelength

accept frequency
accept speed

1

(ii) amplitude

accept energy
height is insufficient

1

(iii) sound

1

(b) (i) diffraction

accept diffract
a description is insufficient

1

(ii) 0.12

*allow **1** mark for correct substitution, ie 8 × 0.015 provided no subsequent step shown*

2

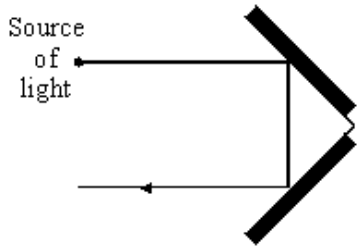
metre per second **or** m/s **or** metre/second

*do **not** accept mps*
units must be consistent with numerical answers

1

[7]

M2. (a) first reflection vertically down to the fourth hatch line or just to the left of it reaching mirror (must come from incident ray given)



1

second reflection back parallel to incident ray must be linked to first part of ray

1

appropriate arrow on a part of the ray (may be given if lines wrong)

(must come from source of light)

maximum of one mark to be lost for poor diagrams not using a ruler for straight lines

first time you come across wavy line, it is penalised

1

(b) ray in block bent downwards, not beyond the normal

do not credit if exactly on normal

1

emergent ray parallel to incident ray

do not credit a continuation of the line straight through the block
these are independent

1

[5]

M3. (a) (i) plane

accept any unambiguous indication

1

(ii) inverted

1

virtual

accept any unambiguous indication

1

(b) reflection takes place at the surface of the pond and angle of incidence = angle of reflection

as judged by eye

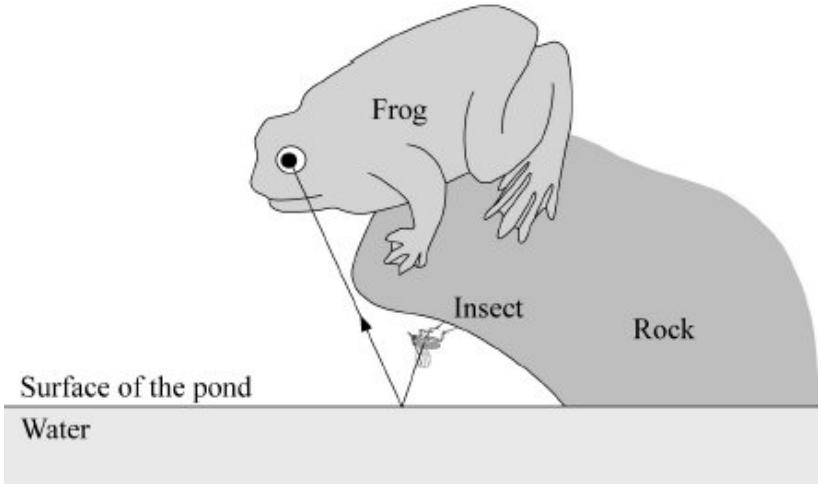
1

reflected ray is a straight line to frog's eye through the air

1

correct direction arrow **either** from insect **or** to frog's eye

only one arrow essential but
*do **not** accept if either arrow contradicted example of a fully correct response*



1

[6]

M4. (a) 40 (cm/s)

correct answer

an answer 0.4 m/s gains full credit

if answer is incorrect

*allow **1** mark for correct wavelength λ = 8 cm*

or

*allow **2** marks for correct substitution into the correct equation, ie. V = 5 × 8*

or

*allow **2** marks for clearly stated wrong wavelength correctly substituted into correct equation and correctly calculated, ie*

λ = 16 cm/s

V = 5 × 16

= 80

3

(b) line extended following pattern

1

14 m/s

accept their numerical value, if not 14, provided the first mark has been awarded

1

[5]

M5. (a) amplitude marked as approximately half a wave height

great precision is not required

1

wavelength marked as a trough to trough distance **or** a peak to peak distance

accept an equivalent repeat distance anywhere on the wave

1

(b) the number of waves each second

accept cycles per second accept 25 waves pass each second

1

(c) any **pair** from

microwave	cooking **or** communication **or** mobile phone
radio	communication **or** entertainment
infra-red	cooking **or** heating **or** remote control **or** security **or** night sights **or** thermal imaging

accept sensible specific uses

2

[5]

M6. (a) (i) microwave

1

(b) (i) identical

1

(ii) • increased risk of cancerous growth (between ear and brain)

1

• complaints of headaches and tiredness

1

(iii) any **two** from:

• tests in a laboratory did not give effects of tiredness or headaches

• waves not strong enough to cause long term heat damage to cells

• evidence to link mobile phones and ill health is not reliable

2

[6]

E1. (a) (i) Fewer than half of the students produced a correct response for this question. A common answer that gained no mark was simply “length”.

(ii) Again fewer than half of the students gained the mark for this question. A common answer that gained no mark was simply “height”.

(iii) Responses were divided almost equally between the correct answer “sound” and the incorrect answer “visible light”.

(b) (i) Many students left this question unattempted. There were very many wrong answers, the most popular being “refraction” and “distillation”.

(ii) Most students were able to calculate the value of 0.12 correctly, but many either forgot to add the unit or chose the wrong unit. The abbreviation mps was also common, but did not gain any credit.

E2. In spite of the fact that the front of the examination paper stated that a ruler was required, many candidates did not use one for this question, and thus ran the risk of losing marks for a poor line being drawn. A few candidates showed the ray passing straight through the mirror in part (a), whilst many candidates were very careless with the reflected rays. Rays that clearly did not obey the ‘equal angles’ rule could not score marks. The vast majority of candidates however did appreciate that the rays come *from* the source of light rather than go towards it.

Refraction in part (b) was even less well known. Although most candidates appreciated that there would be some change of direction, and that the light would emerge parallel to the incident ray, the most common response was to show the ray inside the block travelling along the normal.

E3. (a) (i)(ii) Most candidates knew that the surface of a pond acts like a plane mirror but only a small minority chose both of the words ‘inverted’ and ‘virtual’ to describe the image in the pond. Many candidates chose one of these words correctly.

(b) This was rarely answered correctly for three marks. Common errors were;

- to show reflection taking place other than at the surface of the water
- to show the direction of light from the frog to the insect.

E5. Part (a) was well answered but with a few peak-to-trough amplitudes. Part (b) was well answered.

E6. In part (a)(i), the correct answer of microwaves was given by only about 50% of candidates.

In part (b)(i) most candidates were aware of the need for identical results to confirm the reliability of an investigation. Although parts (b)(ii) and (b)(iii) were both worth two marks the vast majority of candidates were satisfied, in each part, to supply only one piece of information from the newspaper article. For this reason most candidates scored only one mark for each part.