Name of the Student:_____
Max. Marks : 27 Marks **Time : 27 Minutes**

Mark Schemes

Q1.

(a) **Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.

5–6

Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.

3–4

Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1–2

No relevant content

0

Indicative content

Some indicative content could be indicated within a labelled diagram

- place a glass block on a piece of paper
- draw around the glass block
- use the ray box to shine a ray of light through the glass block
- mark the ray of light entering the glass block
- mark the ray of light emerging from the glass block
- join the points to show the path of the complete ray through the block
- and draw a normal line at 90 degrees to the surface
- use a protractor to measure the angle of incidence
- use a protractor to measure the angle of refraction
- use a ray box to shine a ray of light at a range of different angles (of incidence)
- increase the angle of incidence in 10 degree intervals
- from an angle of incidence of 10 degrees to an angle of incidence of 80 degrees

Methods involving mirrors and reflection score zero

(b) angle of incidence in degrees / ° on *x*-axis **and** angle of refraction in degrees / ° on *y*-axis

1

all points plotted correctly

*allow **1** mark if 3 or 4 points plotted correctly*

allow tolerance of half a small square

2

curved line of best fit

allow line of best fit from their incorrectly plotted points

1

(c) normal drawn at 90° at the point where the incident ray strikes the mirror

1

straight line drawn with a ruler **and** angle of incidence = angle of reflection

ignore any arrows

1

(d) (the protractor drawn on the paper means you) do not have to move the mirror (to measure the angles)

allow do not have to mark the position of the rays of light

allow protractor does not need to be repositioned

1

(so) more likely to record the correct angle of incidence and/or reflection

allow reducing random error

allow more accurate

1

ray in method A does not diverge

allow the ray in method A is thin(ner)

1

(making it) easier to judge the centre (position) of the ray

allow more accurate if not already awarded

allow converse answers in terms of method B being worse than method A

1

[16]

Q2.

(a) metre rule

allow metre ruler

allow tape measure

do not accept ruler

do not accept metre stick

1

(b) (wave) speed = frequency × wavelength

allow $v = f \lambda$

1

(c)

*an answer of 44 (m/s) scores **3** marks*

80 cm = 0.8 m

1

$v = 55 \times 0.8$

this mark may be awarded if wavelength is incorrectly or not converted

1

v = 44 (m/s)

allow correct calculation using an incorrectly or not converted wavelength

*an answer of 4400 (m/s) scores **2** marks*

1

(d) move the (wooden) bridge

1

to the right

dependent on 1st mp being scored

1

OR

change the mass/weight (on the string) scores **1** mark

add more masses/weights (to the string) scores both marks

(e) **Level 2**: The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.

3–4

Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1–2

No relevant content

0

Indicative content

add or take away masses from the string (ignore any stated values)

adjust frequency using the signal generator and/or move the wooden bridge

observe a steady / stationary pattern measure the wavelength

calculate wave speed from frequency and wavelength

a Level 1 answer should include a way of changing tension a complete Level 2 answer would include either changing frequency and/or moving the bridge

[11]