Q1.(2018)

a)

B

b)

upright

virtual

c)

image height = 9.5(mm)

object height = 24(mm)

magnification = $\frac{9.5}{24}$

or

$\frac{\text{their image height}}{\text{their object height}}$

magnification = 0.4

or

$\frac{\text{their image height}}{\text{their object height}}$

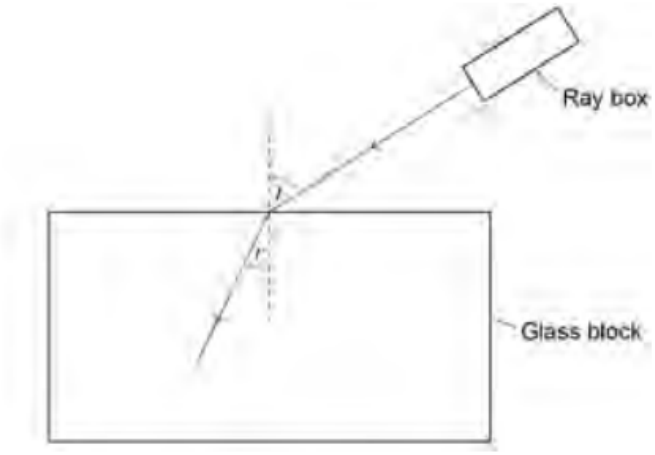
correctly calculated

d)

decrease

Q2.(2019)

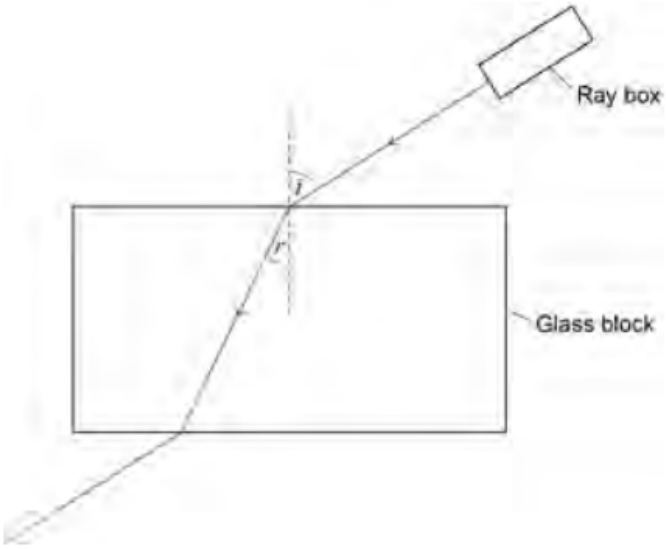
a)



b)

58 (degrees)

c)



d)

Random

e)

25

f)

less than

g)

there is no data/results outside of that range

h)

light would not pass through an opaque block
or
light will pass through a transparent block

i)

The angles of incidence tested

Q3.(2019)

a)

focal length

b)

one correct line drawn from the top of the object, passing through the lens and crossing or meeting given line

inverted image drawn at the correct position and length

c)

similarity
(both are) diminished

difference
concave is virtual and convex is real
or
concave is upright and convex is inverted

d)

$$6.0 = \frac{9.0}{\text{object height}}$$

$$\text{object height} = \frac{9.0}{6.0}$$

object height = 1.5 (mm)

Q4.(2021)

a)

convex

b)

image height = 0.8 (cm)
and
object height = 2 (.0 cm)

c)

$$\text{magnification} = \frac{0.8\ (\text{cm})}{2\ (.0\ \text{cm})}$$

magnification = 0.4(0)

d)

inverted

real

e)

black

green

Q5.(2022)

A)

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

all points plotted correctly

curved line of best fit

C)

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

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

Q6.(2022)

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

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

ray in method A does not diverge

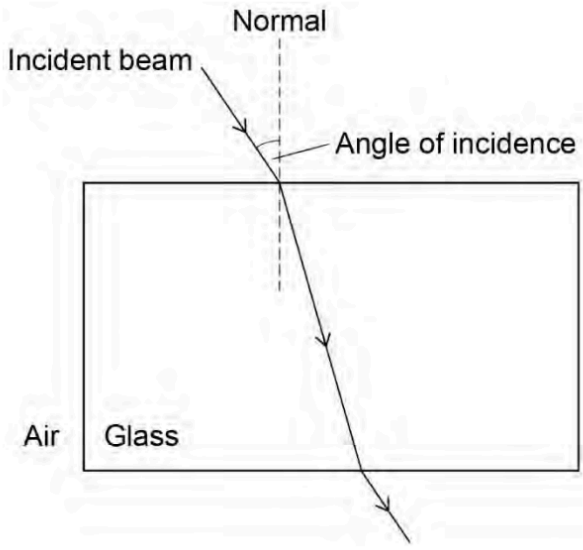
(making it) easier to judge the centre (position) of the ray

Q7.(2023)

a)

it is harder to judge where the centre of the beam is

b)



c)

1 degree

d)

33 (°)

e)

absorbed

f)

wave speed = frequency × wavelength

or

$v = f\lambda$

g)

$3.0 \times 10^{8} = 4.0 \times 10^{14} \times \lambda$

$$\lambda = \frac{3.0 \times 10^{8}}{4.0 \times 10^{14}}$$

$\lambda = 7.5 \times 10^{-7}$ (m)

Q8.(2023)

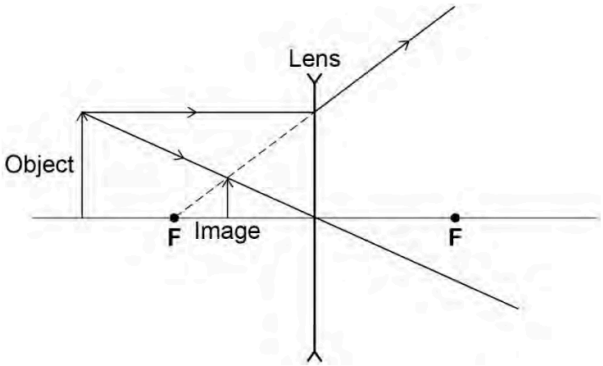
a)

principal focus

b)

ray through the centre of the lens

image in correct position and with correct orientation



c)

upright

virtual

d)

$$3.5 = \frac{\text{image height}}{1.6}$$

image height = 3.5 × 1.6

image height = 5.6 (mm)

Q9.(2024)

a)

1 (°)

Q9.b)(2024)

- 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 60 degrees

Methods involving mirrors and reflection score zero

c)

points plotted correctly

curve drawn passing through points

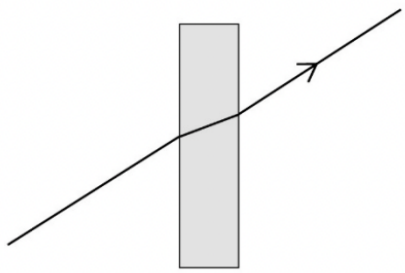
d)

the line curves

Q10.(2024)

a)

normal drawn

ray reflected so i = r

Q10.b)(2024)