M1. (a) • 65

it is different from the angle of incidence **or** all the others are the same

*accept 'number 4' **or** 'the fourth'*

*accept 'it is not 60°' **or** 'it should be 60°'*

accept 'the angle of reflection and the angle of incidence should be the same'

accept 'it is 5° out'

accept 'they are not the same'

***both** the answer and the correct explanation are required for the mark*

award a mark for '60°' if the explanation is correct

'they go up in tens' is insufficient

'it does not fit the pattern' is insufficient

1 (L5)

(b) (i) • a number from 30 to 32

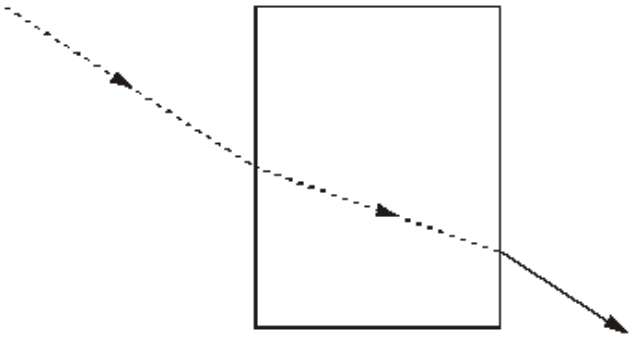
1 (L5)

(ii) • greater than

accept 'greater' or 'bigger'

1 (L5)

(c)



accept a continuous straight line that bends away from the normal

accept a line without an arrow

The ray need not be parallel to the incident ray

1 (L6)

[4]

M2. (a) point E

if more than one box is ticked award no mark

1

(b) continuous ray from point to eye

accept a ray coming either from point E

***or** from the answer to (a)*

1

straight lines to the mirrors at appropriate angles

*reflections must be at the surfaces of the mirrors and lines must **not** extend behind the mirrors*

the angle between the incident and the reflected rays should be approximately 90°

*this mark may be awarded even if the reflection from the second mirror to the eye is **not** given*

1

arrow anywhere along ray pointing from tree to eye

1

(c) any **one** from

- move bottom of periscope towards wall

  *accept 'tilt it' **or** 'change the angle'*

- make it upright

- lift it higher

  *accept 'move it up' **or** 'push periscope further over the wall'*

  *accept 'change angle of top mirror' **or** 'change angle of mirrors*

  *do **not** accept 'move it'*

1

[5]

M3. (a) any **one** from

- white light is a mixture of colours

- white light contains green light

1 (L7)

the green light passes through

*accept for two marks 'all the other colours are absorbed **or** filtered out'*

accept for two marks 'only the green light passes through'

1

(b) (i) red
because red light passes through the filter

***both** the colour and explanation are required for the mark*

1 (L7)

(ii) black

accept 'she cannot see it'

1 (L7)

any **one** from

- because red light will **not** pass through
- a green filter absorbs red light

accept 'only green light passes through'

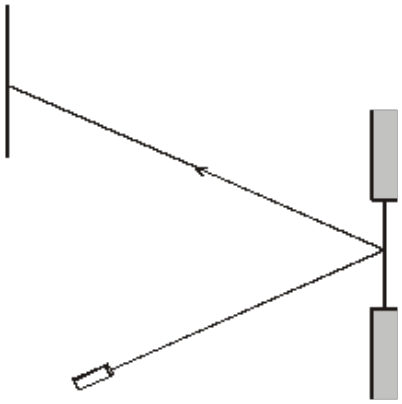
1

[5]

M4. (a) the angles of incidence and reflection must be equal

1 (L5)

the ray must be continuous and straight with an arrow in the correct direction



accept one arrow in the correct direction on either the incident or the reflected ray

the ray must hit the screen in the middle 2 cm

1 (L5)

(b) (i) any **one** from

- sound waves travel to the window **or** glass

accept 'sound travels to the window'

- vibrations pass through the air
- sound waves **or** vibrations hit the window

accept 'sound hits the window'

1 (L5)

(ii) the beam will vibrate **or** move **or** jump about

accept 'scatter' for vibrate

accept 'it would go to other places in the room'
accept 'it would go in different directions'
*accept 'it shakes' **or** 'it wobbles'*

*do **not** accept 'it is blurred'*

'it goes in a different direction' is insufficient

1 (L5)

(c) B ✓

if more than one box is ticked, award no mark

1 (L6)

[5]

M5. (a) (i) • A *and* C

letters may be in either order
***both** the letter and the correct explanation*
are required for the mark

their amplitudes are the same

accept 'the waves are the same height'

'the height of the waves' is insufficient

accept 'they are equally tall'

*'they are big **or** tall' is insufficient*
'taller waves are louder' is insufficient
*do **not** accept 'they are equally long'*

1 (L6)

(ii) • B *and* C

letters may be in either order
***both** the letter and the correct explanation*
are required for the mark

their frequencies are the same

accept 'the waves are the same distance apart'

'the distance apart of the waves' is insufficient
'the less spaced out the waves,
the higher the pitch' is insufficient

accept 'the wave lengths are the same'

*'they are the same length **or** thickness **or** width' is insufficient*

accept 'there are the same number of waves'

1 (L6)

(iii) • its pitch becomes higher

accept 'the frequency gets higher'

'it gets higher' is insufficient
'it becomes high' is insufficient

1 (L6)

(b) • any number between 4.5 and 7.5 *hours* (inclusive)

1 (L5)

(c) any **one** from

- it vibrates with a greater amplitude

  accept 'it moves more'

- it has larger vibrations

  accept 'burst ear drum'

  'it vibrates harder' and 'it vibrates more' are insufficient responses
  *do **not** accept 'it vibrates faster'*

1 (L5)

[5]

M6. (a) (i) Paul, James, Sylvia

accept 'light'; 'vibration'; 'sound'

answers must be in the correct order
***all three** answers in the correct order are required for the mark*

1 (L7)

(ii) 3

accept '$\frac{1020}{340}$'

1 (L7)

(b) (i) the energy **or** the sound is more spread out

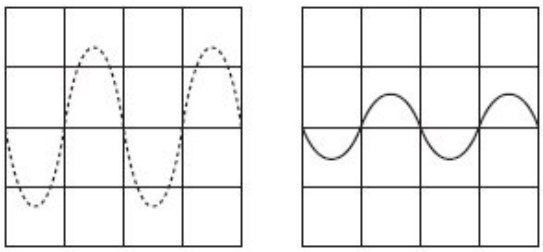
accept 'some of the sound is absorbed by the air'

accept 'the amplitude decreases'

'vibrations decrease' is insufficient

1 (L7)

(ii)



award one mark for a wave with a smaller amplitude

award one mark for a wave with the same frequency

award the marks for a wave with the correct amplitude and frequency but which is not centred

*on the middle line of the grid **or** which is not in phase with the drawn wave*

the marks may be awarded for a wave drawn on Sylvia's grid

2 (L7)

[5]

M7. (a) B

1 (L5)

(b) (i) A and C

accept 'lift and weight'

answers may be in either order
***both** letters are required for the mark*

1 (L5)

(ii) D *and* B

accept A and C

answers may be in either order
***both** letters are required for the mark*

1 (L5)

(c) (i) • Force D is greater than force B. ✓

if more than one box is ticked, award no mark

1 (L6)

(ii) • Force A is greater than force C. ✓

if more than one box is ticked, award no mark

1 (L6)

[5]

M8. (a) (i) any **two** from

- gravity **or** weight
- friction
- reaction

  accept 'upthrust'
- air resistance

  accept 'drag'

  *do **not** accept 'centrifugal force'*
  ***or** 'centripetal force' **or** 'g- force'*

2 (L6)

(ii) any **one** from

- constant speed
- steady speed
- it stays the same

  *accept 'it is the same' **or** 'it does not change'*

1 (L6)

(b) friction is less

*'it is smoother' **or** 'it is slippery' are insufficient*

1 (L5)

(c) it increases

accept 'he goes more quickly'

1 (L6)

because there is less air resistance **or** friction

*accept 'he is streamlined **or** aerodynamic'*

1 (L6)

[6]

M9. (a) (i) • distance from the (top of the) balloon to the ceiling

*accept 'distance' **or** 'height to ceiling **or** roof'*

and

time for the balloon to rise to the ceiling **or** roof

accept 'time'

***both** answers are required for the mark*
the answers can be in either order
'height (of ceiling)' is insufficient as this implies the distance from the floor
'how high it goes' is insufficient
'metres' is insufficient
'seconds' is insufficient

1 (L7)

(ii) • divide the distance by the time

*accept '$\frac{distance}{time}$' **or** '$\frac{d}{t}$'*

*'how many metres it travelled per minute **or** second' is insufficient*

accept '$\frac{height}{time}$' if height is given in part (i)

'm/s' is insufficient

accept 'distance over time'

'$\frac{metres}{seconds}$' is insufficient

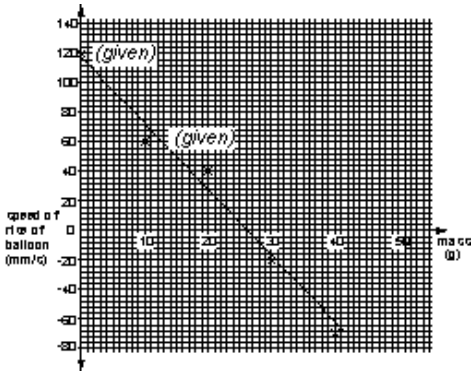
1 (L7)

(b) (i) any **one** from

- the negative numbers
- the –20 **and/or** the –70

1 (L7)

(ii) • all **three** points plotted correctly as shown below



accept points plotted within ± ½ small square of the correct answer

1 (L6)

• an appropriate line of best fit as shown above

accept a line of best fit consistent with the plotted points

1 (L7)

(iii) • 26 *g*

accept the x axis intercept ± 1 small square from the line of best fit drawn

1 (L7)

[6]