AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



MARK SCHEME

4.6.2 ELECTROMAGNETIC WAVES (PACK 4)

SCORE	PERCENTAGE
/59	%

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Q1.

(a) **D**

1

(b) **C**

1

(c) **B**

1

[3]

Q2.

(a) (i) more turns **or** waves per second

*accept spinning **or** turning **or** faster*

1

(ii) less time spent cutting field lines

*accept shorter time in field **or** when the frequency increases (the wavelength decreases)*

1

(iii) more energy given

accept more KE put in
accept a higher voltage produced
do not credit more power

1

(b) more coils

1

more powerful magnets

accept put in better bearings
*do not credit reduce friction **or** add soft iron core*

1

[5]

Q3.

(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

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(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]

Q4.

(i) (incident) ray along the normal

or *(incident) ray at 90° (to the surface)*

1

(ii) (A) total internal reflection

all three words required do not credit total internal refraction

1

(B) **EITHER**

angle of incidence is greater than the critical angle

or *angle of incidence is greater than 42°*

2

OR

angle of incidence is 45°

1

[4]

Q5.

(i) (wave) speed = frequency × wavelength

or *any correctly transposed version*

accept $v = f \times \lambda$

or *transposed version*

accept $m/s = 1 / s \times m$

or *transposed version*

or 

but only if subsequently used correctly

1

(i) 325

1

metres per second

or *m / s* ***or*** *0.325 km/s for 2 marks*

1

[3]

Q6.

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makes things look bigger/clearer/nearer M used for small objects;
or to see things better T used for distant objects

magnifies **or** makes it bigger

'it' = image of object; bigger for M;
inverted/upsidedown/ other way up smaller for T

any seven for 1 mark each

[7]

Q7.

idea that X-rays cause mutations

gains 1 mark

but X-rays can cause/increase chance of mutations

gains 2 marks

mutations usually harmful/produce abnormal growth
serious effect on growing foetus/rapidly growing cells

each for 1 mark

[4]

Q8.

(a) gamma rays above x-rays

for 1 mark

(b) upper radio wave boundary correct (10^{-1}m) (± 1mm)

for 1 mark

(c) visible radiation/light

- within the middle third of a wavelength band
- in the correct wavelength range (10^{-6} – 10^{-7}m)

each for 1 mark

(d) ultraviolet between *visible radiation and X-rays

for 1 mark

(e) microwaves above *radio waves and below *infra red
(*not necessarily immediately)

for 1 mark

(f) between 10^{8}Hz + 10^{7}Hz and nearer to 10^{8}Hz than to 10^{7}Hz

gains 1 mark

[7]

Q9.

(a) line (from fish) to complete ray to eye

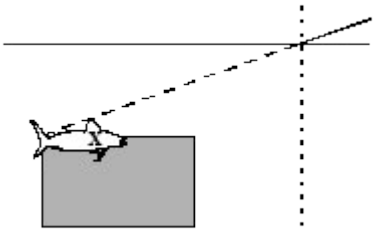
[mark awarded even if begins outside the box]

[credit only if fish shown to left of normal]

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- fish within the region shown or X or start of ray

  (i. e. not necessarily directly below x) each for 1 mark



2

(b) bent/refracted/deviated/speeded up

for 1 mark

1

[3]

Q10.

(a) (i) a horizontal distance indicated and labelled

gains 1 mark

but
horizontal distance indicated between identical points on adjacent waves (to within 3-4mm) and labelled

gains 2 marks

2

(ii) peak ↔ trough indicated*

gains 1 mark

but
peak / trough ↔ mean indicated*

(to within 1-2mm either end)*

gains 2 marks
(allow 1 mark if both lines unlabelled or 2 marks if both lines accurately drawn and unlabelled)

2

(b)
- 1.5
- hertz / Hz **or** (waves / cycles) per second

for 1 mark each
(do not allow wavelength / hertz per second)

2

[6]

Q11.

(a) ray shown refracted (to rhs or along normal)

gains 1 mark

but
ray shown refracted away from normal

gains 2 marks

2

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(b) *idea that*
travels at a different speed
gains 1 mark

(*allow* refracted / travels slower in air / air is less dense) (*do not allow* bent)

but
travels more quickly in air
gains 2 marks

2

[4]

Q12.

X-rays { infrared radiation } { radio waves }

for 1 mark each

[3]

Q13.

- Q is louder
- Q is higher (pitch/note but <u>not</u> frequency)
  [if loudness and pitch both mentioned but direction wrong / absent credit 1 mark]
- louder because bigger amplitude/height
- higher pitch because higher frequency/shorter wavelength/waves closer together
- factor of 2 mentioned w.r.t either
  (NB converse answer for P)
  each • for 1 mark

[5]

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