

MARK SCHEME

GCSE

PHYSICS

AQA - COMBINED SCIENCE

P6 - TEST 6

WAVES

Advanced

Mark schemes

1.

(i) 0.5

1

(ii) wave speed = frequency \times wavelength

accept $v = f \times \lambda$

accept s for v

accept $m/s = Hz \times m$

accept



providing subsequent method correct

1

(iii) 15.2 km

both numerical answer and unit are required for both marks

numerical answer and unit must be consistent

allow 1 mark for 15.2 with incorrect or no unit

allow 2 marks for an answer of 1.52 km if the answer to (b)(i) was given as 5

r 1 mark for correct transformation

or 1 mark for correct use of speed = distance/time

unit on its own gains no credit

2

[4]

2.

(a) changes the sound wave(s)

to a varying **or** changing (electric) potential difference **or** p.d. **or** voltage
or current **or** to an irregular alternating current or a.c. **or** transfers
 sound energy to electrical energy (1) mark is vibrations **or** pulses **or** of
 sound **or** in air become electrical waves

do not credit just 'to electricity' or 'to a.c'

2

(b) (i) decrease **or** reduce the amplitude

accept less amplitude nothing else added

1

(ii) increase the frequency **or** decrease
 wavelength

accept higher frequency nothing else added

1

[4]

3.	(a) C or 0.18 mm	1
	(b) 0.6 (m)	
	<i>allow 1 mark for correct substitution and/or transformation or 1 mark for changing frequency to Hz</i>	
	<i>answer 600 gains 1 mark</i>	2
	(c) creates an alternating current	
	<i>accept 'ac' for alternating current</i>	
	<i>accept alternating voltage</i>	1
	with the same frequency as the radio wave	
	<i>accept signal for radio wave</i>	
	<i>accept it gets hotter for 1 mark provided no other marks scored</i>	1
	(d) X-rays cannot penetrate the atmosphere	
	<i>accept atmosphere stops X-rays</i>	
	<i>do not accept atmosphere in the way</i>	
	or	
	X-rays are absorbed (by the atmosphere) before reaching Earth	
	<i><u>ignore</u> explanations</i>	1
		[6]
4.	(a) 10^{-15} metres to 10^4 metres	1
	(b) (i) any one from:	
	• (TV / video / DVD) remote controls	
	<i>mobile phones is insufficient</i>	
	• (short range) data transmission	
	<i>accept specific example, eg linking computer peripherals</i>	
	• optical fibre (signals)	
	<i>do not accept Bluetooth</i>	1
	(ii) 0.17	
	<i>an answer 17 cm gains 3 marks</i>	
	<i>an answer given to more than 2 significant figures that rounds to 0.17 gains 2 marks</i>	
	<i>allow 1 mark for correct substitution, ie $3 \times 10^8 = 1.8 \times 10^9 \times \lambda$</i>	3

(c) (maybe) other factors involved

*accept a named 'sensible' factor, eg higher stress / sedentary lifestyle / overweight / smoking more / diet / hot office / age
not testing enough people is insufficient
unreliable data is insufficient*

1

[6]

5.

(a) any **two** from:

- (longitudinal) oscillations are parallel to the direction of energy transfer
- (transverse) oscillations are perpendicular / 90° to the direction of energy transfer

allow vibrations for oscillations

allow correct description of particle movement for oscillation

allow direction of wave for direction of energy transfer

- (longitudinal waves) show areas of compression and rarefaction

marks can be gained from correctly labelled diagrams

ignore references to need for a medium to travel through

2

(a) (i) reaction time

allow a description of reaction time

allow measuring the time

1

(as) time measured is very small

allow (as) sound travels quickly

1

(ii) 0.28(3)

an answer of 283(.3) gains 2 marks

allow correct substitution and unit conversion for 2 marks $340 = 1200 \lambda$ or $340 / 1200 = \lambda$ provided no subsequent step shown

allow correct substitution for 1 mark $340 = 1.2 \lambda$ or $340 / 1.2 = \lambda$ provided no subsequent step shown

provided no subsequent step shown

3

[7]

6.

(a) radio – 1500

ultra violet 3×10^{-8}

visible – 5×10^{-7}

X-rays – 1×10^{-11}

4

(b) $1 \times 10^{10}\text{Hz}$ 10^{10}HzOK
for 4 marks

else 1×10^{10}
for 3 marks

else $3 \times 10^8/0.03$
for 2 marks

else $v = \text{frequency} \times \text{wavelength}$ or $3 \times 10^8 = 0.03f$
 any answer with unit Hz scores 1, 2 or 3
for 1 mark

4

[8]

7.

(a) wave speed = frequency \times wavelength
allow $v = f\lambda$

1

(b)

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 necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	1-2
No relevant content	0
Indicative content <ul style="list-style-type: none"> • adjust the bar so that it just touches the surface of the water • adjust motor to produce low frequency wave • adjust the lamp until the pattern is seen clearly on the card underneath • place a metre rule at right angles to the waves • measure the length of a number of waves (minimum 3 waves) • divide the length by the number of waves to give wavelength • count the number of waves passing a point in a given time • divide the number of waves counted by the time to give the frequency 	

4

(c) light is reflected off the coin (and travels through the water)

allow correct ray on diagram

1

as the light leaves the water its speed increases

allow correct ray on diagram

1

(this causes) the light to refract in the direction of the eye

1

(d) in longitudinal waves oscillations are parallel to the direction of energy transfer

1

in transverse waves the oscillations are perpendicular to the direction of energy transfer

1

[10]

8.

(a) (i) frequency

1

wavelength

1

(ii) 10^{-15} to 10^4

1

(b) 2.0×10^5

*correct substitution of
 $3.0 \times 10^8 / 1500$ gains 1 mark*

2

Hz

1

(c) (i) (skin) burns

1

(ii) skin cancer / blindness

1

(d) (i) any **one** from:

- (detecting) bone fractures
- (detecting) dental problems
- treating cancer

1

(ii) any **one** from:

- affect photographic film
- absorbed by bone
- transmitted by soft tissue
- kill (cancer) cells

answer must link to answer given in (d)(i)

1

(iii) $9 / 36 = 0.25$
 $0.5 / 2 = 0.25$
 $4 / 16 = 0.25$

accept:

$$36 / 9 = 4$$

$$2 / 0.5 = 4$$

$$16 / 4 = 4$$

2

conclusion based on calculation

two calculations correct with a valid conclusion scores 2 marks

one correct calculation of k scores 1 mark

1

[13]