Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic: Waves

Merit Minds
www.merit-minds.com
Exam Preparation and Free Resources

Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Mark Schemes

Q1.

(a) path difference for two waves ✔
Allow 'waves travel different distances'
Condone out of phase

gives rise to a phase difference ✔
if phase and path confused only give 1 for first 2 marks

Destructive interference occurs ✔
allow explanation of interference

3

(b) (Path difference =) 0.056 m ✔

Path difference = 2λ or wavelength = 0.028 m ✔e

Use of $f=c/\lambda$ so f = 11(10.7) × 10^9 Hz ✔
Allow 2 max for 5.4 × 10^9 Hz or 2.7 × 10^9 Hz
Allow ecf

3

(c) Intensity decreases with distance ✔

One wave travels further than the other ✔

Amplitudes/intensities of the waves at the minimum points are not equal ✔
Or "do not cancel out"

max 2

(d) The signal decreases/becomes zero ✔

The waves transmitted are polarised ✔

zero when detector at 90° to the transmitting aerial/direction of polarisation of wave ✔

max 3

[11]

Q2.

(a) Period = 0.2×10^{-14} (s) read off

OR

Recognisable T substituted into $T = 1 / f$ ✔

An acceptable subject (period, time for one cycle, one cycle, T, etc.)
Allow non-standard symbol with unit seen on time.
Allow this subtraction of two times seen in $f = 1/T$

Use of $T = 1 / f$ and $c = f\lambda$ ✔

OR

Use of $\lambda = cT$

Use of here is:
Subject must be seen with substitutions or rearranged equations with $f = 1/T$ and $\lambda = c/f$
Condone power 10 error here
Condone lack of subject in vertical working where rearranged equation with appropriate subject seen at heading of column

$6(.0) \times 10^{-7}$ (m) ✔

Number must be expressed as 6×10^{-7} or 600×10^{-9}
or equivalent not enough to see only nano prefix.

3

(b) (Determines a fraction of cycle)

$\frac{0.04}{0.2}$ or $\frac{2}{10}$ or $\frac{1}{5}$ or 0.2 or $\frac{1.2(\times 10^{-7})}{6(\times 10^{-7})}$ or 0.2λ seen ✔

Condone their fraction × 2π or their decimal × 2π
For 1st mark

$2\pi/5$ OR $0.4\ \pi$

OR

1.26 or 1.3 ✔

Allow $8\pi/5$ OR $1.6\ \pi$
OR
5.03 or 5.0

2

(c) (Distance =) $3 \times 10^{-7} \times 2.37 \times 10^{5}$ seen

OR

(Distance =) 0.07(11) (m) seen ✔

Subs into $s = \frac{1}{2}\ at^2$ ✔

Condone error in sub for s where formula has been otherwise correctly

manipulated with a (or g) as subject

<u>9.88</u> (3 sf only) ✔

Alternative:

1st mark *average speed* = $\frac{3 \times 10 - 7 \times 2.37 \times 105}{0.12}$

2nd mark $a = \frac{2 \times \text{their average speed}}{0.12}$

3rd mark *9.88*

3

(d) Draws a tangent to the curve at approximately

t = 120 ms <u>and</u> attempts a gradient calculation ✔

Tangent must be a straight line that touches curve and divergent from curve before 90 ms and after 150 ms

(Gradient =) 1.2 (range 1.1 to 1.3) ✔

Allow 1.2 × 10^{-3} (range 1.1 × 10^{-3} to 1.3 × 10^{-3}) ✔

Ignore units on answer line

2nd mark is dependent on 1st mark

Max 1 mark for correct answer in range where tangent satisfies above conditions but doesn't quite touch curve (half-square tolerance)

First alternative:

1st mark

Use of v = u +at with sub for a = 9.88 or 9.875 ***and*** *t=0.12*

2nd mark

1.2 or 1.19 or 1.185 ***only***

Second alternative:

1st mark

Use of s = 1/2at^2 and ds/dt = at with sub for a = 9.88 or 9.875 ***and*** *t = 0.12*

2nd mark

1.2 or 1.19 or 1.185 ***only***

2

(e) (instantaneous) Velocity (of the mirror) or (instantaneous) speed (of the mirror) ✔

Ignore any units quoted

Do not allow:

Average speed / constant speed

1

[11]