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

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Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

Q1.

(a) attempts to calculate energy stored during 2.6 hr period

OR

attempts to calculate average output power during 12 hr period using their energy stored $_1$ ✔

Correctly rounded answer gains both marks. (Calculator value is = 2.16666667)

For $_1$ ✔ stored energy = 93.6 kJ

For $_1$ ✔ condone use of t in hours. (2.6 hr = 9360 s; 12 hr = 43200 s)

2.2 (W) $_2$ ✔

If no other mark given, award 1 mark for calculating charge transfer during 2.6 hr period as 18.7 kC

2

(b) Max 2 from: ✔ ✔

microwaves are transverse; sound are longitudinal;

microwaves have higher frequency than sound;

microwaves can be polarised but sound can't;

microwaves can travel through a vacuum but sound can't/requires a medium **OR** sound are mechanical waves but microwaves are EM waves

Apply list principle. Do not allow reference to applications e.g. cooking food.

For first point, allow weak descriptions in terms of parallel and perpendicular oscillations/vibrations with direction of energy transfer.

2

(c) fixed/constant phase difference $_1$ ✔

same frequency $_2$ ✔

For $_1$ ✔ do not accept "in phase" or fixed path difference.

For $_2$ ✔ condone "same wavelength".

Ignore reference to other features e.g. amplitude or type of wave.

2

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(d) evaluates **AM** from $\mathbf{AM}^2 = 8.00^2 + 0.34^2$

OR evaluates **BM** from $\mathbf{BM}^2 = 8.00^2 + 2.14^2$ ✔

8.28 − 8.01 = 0.27 (m) ✔

No credit for using double-slit equation.

*Expect 8.01 (m) for **AM** and 8.28 (m) for **BM***

2

(e) statement that path difference = $\lambda/2$ **OR** uses wavelength = 2 × their **part (d)** answer $_1$ ✔

Evaluates $\frac{340}{\text{correct } \lambda} \text{ (Hz)}$ $_2$ ✔

For $_1$ ✔ expect to see 0.54 or 0.60 m for wavelength

*For $_2$ ✔ expect 570 Hz (from 0.3 m) **OR** 630 Hz (from 0.27 m) **OR** 620 Hz (from 0.274 m).*

If no other mark given, allow 1130 Hz or 1260 Hz. for 1 mark.

No credit for using double-slit equation.

2

[10]

Q2.

(a) One wavelength✔

Accept λ

1

(b) Light from slits overlap / undergo diffraction✔

Path difference is a whole number of wavelengths

Or

Arrive at screen in phase / zero phase difference ✔

(Meet and) undergo superposition / waves superpose✔

*If no other mark awarded allow **one** mark for:*

interfere constructively / Produces reinforcement / produces constructive interference

3

(c) Pointer **A** and CD ✔

Condone:

smallest wavelength and greatest slit spacing

(Smallest) angular spread for each order (θ_{min}) is given by $\sin \theta_{(min)} = \frac{n\lambda}{d}$

OR

Greatest number of maxima is given by $n_{max} = \frac{d}{\lambda}$ ✔

***Max 1 mark for**:*

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An argument that links spacing to slit width and its effect on diffraction.

2

(d) use of $n\lambda = d \sin\theta$ ✔

For example, where:

$n = 1$, $\lambda = 6.36 \times 10^{-7}$ m and $d = 1.6 \times 10^{-6}$ m ($\theta = 23°$)

or

$n = 2$, $\lambda = 6.36 \times 10^{-7}$ m and $d = 1.6 \times 10^{-6}$ m ($\theta = 53°$)

use of $\tan\theta = r / 15$

or

adds θ_2 and θ_1 and compares to 90°

or

adds θ_2 and θ_2 and compares to 90°

or

adds θ_1 and θ_1 and compares to 90°✔

Allow use of $\tan\theta = r / 15$

for any combination of θ, r and 15 where unknown has been made subject.

No, can see 4 (bright spots)✔

$\theta = 45°$ and 3 bright spots therefore yes is a maximum of max 2 marks

Allow use of $n = \frac{d}{\lambda}$ where they have reached a conclusion for 1 mark maximum.

3

[9]

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