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

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

Mark Schemes

Q1.

(a) Attempt to resolve **A** or **B** eg 430 × cos35° or T_B × cos12° ✔

360 (N) ✔

If no other mark given, allow 430 × sin35° = T_B × sin12° to give 1190 N for 1 mark.

2

(b) Substitution of *F* and *A* into Young modulus or stress equation ✔

4.4×10^{-2} (m) ✔

Condone POT error for Young modulus

2

(c) Angle of **A** decreases or angle of **B** increases ✔

Accept references to 35^o or 12^o

Any correct application of trig or geometry to the situation

*(*eg $T_B/T_A = \cos\theta_A/\cos\theta_B$ so as θ_A decreases, $\cos\theta_A$ increases, $\cos\theta_B$ decreases, so T_B/T_A increases)

OR

eventually θ_B will equal 35º, θ_A = 12º so forces will be reversed (as system is symmetrical)

OR

sum of vertical components remains unchanged and vertical component of tension becomes less as angle **A** decreases ✔

*Allow idea that more of the weight is supported by **B***

T_A decreases, following some relevant discussion ✔

3

(d) Greater rate occurs when pulses are shorter (in time)/less modal dispersion ✔

Allow reverse arguments

Smaller diameter (leads to less modal dispersion) means smaller range of path lengths ✔

Accept idea of fewer reflections

X is more suitable because narrower core leads to lower modal dispersion or reduced pulse

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broadening ✔

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Q2.

(a) Understanding that for coherence sources must have same frequency/wavelength AND constant phase difference. ✔

And that this achieved by both speakers being connected to same signal (generator). ✔

2

(b) The sound waves from the two speakers superpose (at a point) ✔

*Do **not** accept 'interfere' or 'superimpose' for 'superpose'*

Accept for MP1 waves adding together/combine at a point (e.g. point A) for 'superpose'.

Do not accept diagram.

At A (and B) the two waves are in phase/ have zero phase difference (and a maximum is produced) ✔

Moving away from A introduces a path difference/phase difference/waves are out of phase (and amplitude decreases) ✔

(Moving on towards B the waves move back in phase)

Award MP3 for formation of minimum/destructive interference due to (odd number of) half wavelength path difference/π/ 180^{o} phase difference/ antiphase.

3

(c) Clear evidence of use of Pythagoras ✔

Correct calculation of either length PB or QB ✔

PB = $(2.25^2 + (0.95 - 0.3/2)^2)^{½}$ = 2.39 m

QB = $(2.25^2 + (0.95 + 0.3/2)^2)^{½}$ = 2.50 m

(Path difference =) QB – PB either numerically or algebraically ✔

(= 0.11 (0.12) m)

If ws/D used to give 0.13 (m) reward with 1 mark

3

(d) (Path difference = one wavelength)

Use of speed = frequency × wavelength to give

Speed = 2960 × 0.12 = 360 m s^{-1} ✔

Working or equation must be seen.

Condone use of 0.10 m or 0.11 m or 0.127m or 0.13 m

0.10 gives 300 (296) m s^{-1}

0.11 gives 330 (325.6) m s^{-1}

0.127 gives 376 m s^{-1}

0.13 gives 380 (385) m s^{-1}

1

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(e) Wavelength (gradually) increases. ✔

So that path difference at C gets closer to one wavelength ✔

Alternative for MP2:

Separation of maxima (along line AB) increases ✔

(Amplitude of) sound will get larger/louder as waves move in phase (then smaller/quieter). ✔

Alternatives for MP3:

Maximum moves (from B) towards C so amplitude of sound gets larger/louder (then quieter).

OR

Maximum moves further along path/beyond C so amplitude of sound gets quieter ✔

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