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

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Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Mark Schemes

Q1.

(a) $n_1 > n_2$ ✓

Allow correct reference to 'optical density'

(incident) angle > critical angle (allow θ_c not 'c')
OR critical angle must be exceeded ✓

Allow $n_A > n_B$
*Do not allow: 'angle **passes** the critical angle'*

2

(b)

$\left(n_s = \frac{c}{c_s}\right)$

$\left(c_A = \frac{c}{n_A} = \right) \frac{3.00 \times 10^8}{1.80}$ ✓

For second mark, don't allow 1.6×10^8
Allow 1.66×10^8 or 1.70×10^8
Allow $1.6. \times 10^8$

(= 1.667×10^8) = 1.67×10^8 (ms^{-1}) ✓

2

(c) $\sin 72 = 1.80 \sin\theta$ ✓

$\left(\sin\theta = \frac{\sin 72}{1.80} = \frac{0.9510565}{1.8} = 0.52836 \right)$

Correct answer on its own gets both marks

θ = 31.895 = 31.9 correct answer >= 2sf seen ✓

Do not allow 31 for second mark
Allow 31.8 − 32

2

(d) $1.80 \sin\theta_c = 1.40$ **OR** $\sin\theta_c = \frac{1.40}{1.80}$
$\theta_c = 51.058 = 51.1\ ^\circ$ ✓ (accept 51)

Correct answer on its own gets both marks
Don't accept 50 by itself

2

OR = 0.778 ✓

(e) (i) 22 + their (c) (22 + 31.9 = 53.9)
53.9 > (51.1) critical angle ✓ ✓

If c + 22 < d then TIR expected

If c + 22 > d then REFRACTION expected

OR

$c + 22_c$) ✓ ecf from (c) and (d)
angle less than critical angle ✓

Allow max 1 for 'TIR because angle > critical angle' only if their d > c + 22

2

(ii) TIR angle correct ✓
ecf from e(i) for refraction answer

Tolerance: horizontal line from normal on the right / horizontal line from top of lower arrow.
If ei not answered then ecf (d). If ei and d not answered then ecf c

1

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Q.2

(a) (i) oscillates / vibrates ✓

(allow goes up and down / side to side / etc, repeatedly, continuously, etc)

about equilibrium position / perpendicularly to central line ✓

2

(ii) X and Y: antiphase / 180 (degrees out of phase) / π (radians out of phase) ✓

X and Z: in phase / zero (degrees) / 2π (radians) ✓

2

(b) (i) $v = f\lambda$

= 780 x 0.32 / 2 or **780 x 0.16 OR 780 x 320 / 2** or **780 x 160** ✓

THIS IS AN INDEPENDENT MARK

= 124.8 ✓ ($m\ s^{-1}$) correct 4 sig fig answer must be seen

2

(ii) ¼ cycle ✓

$T = 1 / 780$ OR $= 1.28 \times 10^{-3}$ ✓

$0.25 \times 1.28 \times 10^{-3}$

$= 3.2 \times 10^{-4}$ (s) ✓

Allow correct alternative approach using distance of 0.04m ✓

travelled by progressive wave in ¼ cycle divided by speed.

0.04 /125 ✓ $= 3.2 \times 10^{-4}$ (s) ✓

3

(c) (i) antinode ✓

1

(ii) 2 x 0.240

= 0.48 m ✓ '480m' gets 1 mark out of 2

2

(iii) ($f = v/\lambda$ = 124.8 or 125 / 0.48) = **260** (Hz) ecf from cii ✓

1

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