Revision Sheet

A-Level Physics · Unit 8 Superposition

10 vocabulary items · 21 marks of exam questions (6 questions)

Part 1 · Vocabulary review answer key. Section A wants the exact English spelling.

Question	Answer	Marks
1	superposition	1
2	stationary wave	1
3	node	1
4	antinode	1
5	diffraction	1
6	interference	1
7	slit	1
8	fringe	1
9	diffraction grating	1
10	waves	1

Question 11 (Answer: **B**)

- Coherent means the phase difference between the two waves stays constant in time.
- It need not be zero – a steady 180° is just as coherent, so D is too strict.
- Equal frequency is necessary but not sufficient, and equal intensity is not required at all.

Question 12 (Answer: **B**)

- Where the waves reinforce the amplitudes add: $2A + A/2 = 2.5A$.
- Where they cancel the amplitudes subtract: $2A - A/2 = 1.5A$.
- The ratio is $2.5A/1.5A = 5/3$.

Question 13 (Answer: **C**)

- Rearranging $n\lambda = d\sin\theta$ gives $n = (d/\lambda)\sin\theta$.
- So a graph of n against $\sin\theta$ has gradient $G = d/\lambda$, and $\lambda = d/G$.
- With 300 lines per mm, $d = 3.33 \times 10^{-6}$ m, so $\lambda = 3.33 \times 10^{-6}/G$.

Question 14 (Answer: **D**)

- Making the gap narrower increases the diffraction, so the wave spreads more beyond the barrier.
- The frequency and the water depth are unchanged, so the wavelength is the same on both sides.
- The right diagram therefore keeps the wavefront spacing and curves the fronts more.

15(a)	(when two or more) waves meet / overlap (at a point)
	(resultant) displacement is sum of the individual displacements
15(b)(i)	Fringe width, $x = 3.2 \times 10^{-2} / 8$ $= 4.0 \times 10^{-3}$ (m)
	$D = ax / \lambda$ $= (4.0 \times 10^{-3} \times 0.16 \times 10^{-3}) / 7.2 \times 10^{-7}$
	$= 0.89$ m
15(b)(ii)	Curved line with a negative gradient of decreasing magnitude throughout, from slit separation 0.04 mm to 0.16 mm
	Line of negative gradient ending at (0.16, 0.4), from slit separation 0.04 mm
	Line of negative gradient passing through (0.08, 0.8) <u>and</u> (0.04, 1.6)

16(a)	(when two or more) waves meet / overlap (at a point)
	(resultant) displacement is the sum of the individual displacements
16(b)	$\lambda = ax / D$
	$\lambda = [(0.65 \times 10^{-3}) \times (1.7 \times 10^{-3})] / 1.9$
	$\lambda = 5.8 \times 10^{-7}$ m
16(c)(i)	waves are out of phase by a quarter of a cycle / period **or** when one wave has maximum/minimum displacement, the other wave has zero displacement
16(c)(ii)	(statement 2 is) not correct (because) waves do not have phase difference of 180° / not in antiphase **or** one wave has some displacement when other has no displacement **or** the displacements of the waves are not always equal and opposite
16(d)	more diffraction (of light/waves by slits) **or** light/waves are more spread (by slits) **or** light/waves (from slits) have less intensity
	more (bright/dark) fringes **or** bright fringes are less bright / are dimmer / have lower intensity **or** no change to fringe spacing/separation/width