A-Level Physics: **w25 11**

Question 29 (Answer: **D**)

- Every particle of a stationary wave oscillates with the same frequency, so A and C are wrong.
- The amplitude varies with position between the nodes and antinodes, so B need not hold.
- Within one loop – between the same pair of nodes – all the particles move together, so P and Q stay in phase.

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Question 30 (Answer: **C**)

- An antinode is where the two waves always reinforce, giving the largest oscillation.
- So it is defined by the stationary wave having maximum amplitude there.
- A node is the opposite – a point of permanent zero amplitude.

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Question 29 (Answer: **C**)

- On a wire fixed at both ends the number of antinodes is the harmonic number.
- Two antinodes means f is the second harmonic.
- Tripling the frequency gives the sixth harmonic, so six antinodes.

A-Level Physics: **w25 24**

4(a)	when two (or more) waves meet
	(resultant) displacement equals the sum of the displacements of the (two separate) waves
4(b)(i)	the incident and reflected waves superpose
	(the waves superpose so that the resultant) amplitude is maximum at an antinode
	(the waves superpose so that the resultant) amplitude is minimum / zero at a node
4(b)(ii)	$c = f\lambda$
	$f = (3.00 \times 10^8) / 0.026$ $= 1.2 \times 10^{10}$ Hz
4(b)(iii)	microwave
4(b)(iv)	distance = 0.026 / 4 $= 6.5 \times 10^{-3}$ m

A-Level Physics: **s25 11**

Question 29 (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 31 (Answer: **A**)

- A tube closed at one end holds a quarter of a wavelength at its lowest frequency.
- $\lambda = v/f = 330/820 = 0.402$ m.
- $L = \lambda/4 = 0.101$ m, about 10 cm; B would be the open-open case.

Question 24 (Answer: **C**)

- Adjacent antinodes are half a wavelength apart, so $\lambda = 2 \times 6.0 = 12$ cm.
- $f = c/\lambda = 3.0 \times 10^8/0.12$.
- $= 2.5 \times 10^9$ Hz $= 2.5$ GHz; D takes the 6.0 cm as a whole wavelength.

Question 30 (Answer: **D**)

- A stationary wave forms only when the two waves travel in *opposite* directions.
- So "the same direction" is not merely unnecessary – it is the opposite of the requirement.
- Same type, same wavelength and same period are all genuine conditions.

Question 25 (Answer: **A**)

- A pipe open at both ends fits a whole number of half-wavelengths: $L = n\lambda/2$.
- So $\lambda = 2L/n = 200/n$ cm, giving 200, 100, 66.7, 50 cm, and so on.
- 50 cm is the $n = 4$ case; none of the other options divides 200 cm exactly.

4(a)	(micro)wave (from the transmitter) reflects (at metal/sheet)
	The incident and reflected waves superpose
	(resultant) amplitude is maximum at an antinode
	(resultant) amplitude is minimum/zero at a node
4(b)(i)	$\lambda = c / f$ $= 3 \times 10^8 / 6.3 \times 10^9$
	$= 0.048$ m
4(b)(ii)	distance PQ = ¼λ $= 0.048 / 4$ $= 0.012$ m
4(b)(iii)	(Distance QR is the) same (as PQ) and one of: • Distance (between maxima / minima) does not depend on intensity • distance depends only on wavelength • wavelength is unchanged / constant