A-Level Physics: **w25 11**

Question 30 (Answer: **A**)

- The largest possible diffraction angle is $90°$, where $\sin\theta = 1$.
- So $n_{\max} = d/\lambda = (2.5 \times 10^{-6})/(550 \times 10^{-9}) = 4.5$.
- The order has to be a whole number, so the highest one produced is the 4th.

A-Level Physics: **w25 12**

Question 29 (Answer: **A**)

- In $n\lambda = d\sin\theta$, d is the spacing between adjacent slits of the grating.
- The distance from the grating to the screen does not appear in the equation at all.
- The other three symbols are described correctly.

A-Level Physics: **w25 14**

Question 30 (Answer: **B**)

- $d = 1/400$ mm $= 2.5 \times 10^{-6}$ m, so $n_{\max} = d/\lambda = 3.57$ – the third order.
- Maxima appear on *both* sides at orders 1, 2 and 3, plus the straight-through zero order.
- Total $= 2 \times 3 + 1 = 7$.

A-Level Physics: **s25 11**

Question 30 (Answer: **D**)

- $d = 1/450$ mm $= 2.22 \times 10^{-6}$ m.
- $\sin\theta = n\lambda/d = 2(680 \times 10^{-9})/(2.22 \times 10^{-6}) = 0.612$.
- $\theta = 37.7°$, which rounds to $38°$.

A-Level Physics: **s25 12**

Question 29 (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 $\lambda = 3.33 \times 10^{-6}/G$.

A-Level Physics: **s25 14**

Question 28 (Answer: **B**)

- $d = 1/5000$ cm $= 2.0 \times 10^{-6}$ m.
- $n\lambda = d\sin\theta$, so $2\lambda = (2.0 \times 10^{-6})(0.5) = 1.0 \times 10^{-6}$.
- $\lambda = 5.0 \times 10^{-7}$ m; A forgets to divide by the order.

A-Level Physics: **s25 23**

6(a)	wave passes (through) an aperture and spreads **or** wave passes (by / through / around) an edge and spreads
6(b)(i)	$v = f\lambda$
	$f = 3.00 \times 10^8 / 720 \times 10^{-9}$ $= 4.2 \times 10^{14}$ Hz
6(b)(ii)	$d = n\lambda / \sin\theta$
	$d = (2 \times 720 \times 10^{-9}) / \sin 26$
	$(= 3.3 \times 10^{-6}$ m) number of lines per m $= 1 / (3.3 \times 10^{-6})$ $= 3.0 \times 10^5$ m^{-1}
6(b)(iii)	$\lambda \times 3 = 720 \times 2$ **or** $\frac{1}{3.0\times10^5}\sin 26 = 3\lambda$
	$\lambda = 480$ nm

A-Level Physics: **m25 12**

Question 29 (Answer: **C**)

- $d = 1/400$ mm $= 2.50 \times 10^{-6}$ m.
- $\sin\theta_2 = 2\lambda/d = 0.4536$ gives $\theta_2 = 27.0°$; $\sin\theta_3 = 0.6804$ gives $\theta_3 = 42.9°$.
- The angle *between* them is $42.9 - 27.0 = 15.9°$; D is simply θ_2 itself.