⑥

b) For $x > L$, there is no discontinuity in $V(x)$ at which reflection of part of the wave-function could occur. ✓ Therefore for waves approaching from the left there will be only waves travelling in the +ve x-direction for $x \geq L$ ie ✓
$\psi_c = C_1 \exp(ik_c x)$ and $C_2 = 0$
In this situation we also have no source of particles to the right of the step, which also implies $C_2 = 0$.

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c) At $x = -L$
$\psi_A = \psi_B$

ie $\psi_A = A_1 e^{\frac{i\pi}{2L} \times L} + A_2 e^{-\frac{i\pi}{2L} \times L} = B_1 e^{\frac{i \times 3\pi}{2L} \times L} + B_2 e^{-\frac{i3\pi}{2L} \times L} = \psi_B$

$(-A_1 + A_2) i = (B_1 - B_2) i \Rightarrow A_2 - A_1 = B_1 - B_2$ ✓

and $\frac{d\psi_A}{dx} = \frac{d\psi_B}{dx}$

$\left(\frac{\pi i}{2L} \times -A_1 - \frac{\pi i}{2L} \times A_2\right) i = \left(\frac{3\pi i}{2L} B_1 + \frac{3\pi i}{2L} B_2\right) i$

$\frac{\pi A_1}{2L} + \frac{\pi A_2}{2L} = -\frac{3\pi}{2L} B_1 - \frac{3\pi}{2L} B_2$

$A_1 + A_2 = -3B_1 - 3B_2$ ✓

At $x = L$

$\psi_B = \psi_C$

$\psi_B = B_1 e^{\frac{i \times 3\pi}{2L} \times L} + B_2 e^{-\frac{i \times 3\pi}{2L} \times L} = C_1 e^{\frac{i\pi}{2L} \times L}$

$(-B_1 + B_2) i = C_1 i \Rightarrow -B_1 + B_2 = C_1$ ✓

and $\frac{d\psi_B}{dx} = \frac{d\psi_C}{dx}$

$\left(\frac{3\pi i}{2L} \times -B_1 - \frac{3\pi i}{2L} B_2\right) i = \frac{\pi i}{2L} C_1 \times i$

$\frac{3\pi}{2L} B_1 + \frac{3\pi}{2L} B_2 = -\frac{\pi}{2L} C_1$