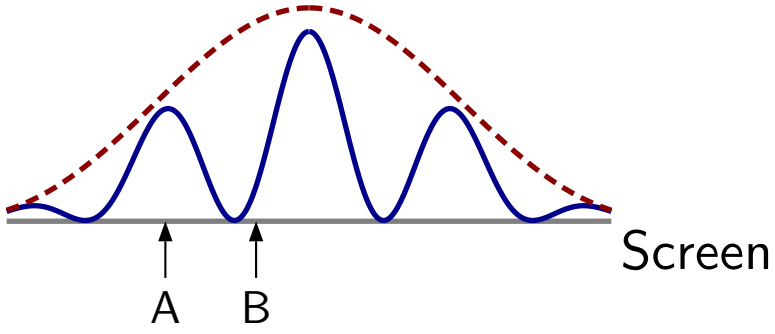
Question 1

Many neutrons are fired toward a barrier/slit arrangement and arrive at a screen. The probability distribution for arrival at various locations depends on the barrier/slit arrangement. A double slit produces the solid dark blue probability distribution. A single slit produces the dashed dark red distribution.



Which of the following is true?

1. Single slit $\Rightarrow$ more arrive at A than B.
   Double slit $\Rightarrow$ more arrive at A than B.
2. Single slit $\Rightarrow$ more arrive at B than A.
   Double slit $\Rightarrow$ more arrive at A than B.
3. Single slit $\Rightarrow$ more arrive at B than A.
   Double slit $\Rightarrow$ more arrive at B than A.
4. Single slit $\Rightarrow$ more arrive at A than B.
   Double slit $\Rightarrow$ more arrive at B than A.

Question 2

In general the energy levels for a particle in a box are described by $n = 1, 2, 3, \ldots$ with energies

$$E_n = \frac{h^2}{8mL^2}\, n^2.$$

For a particular particle in a box the mass and box length are such that the energies are

$$E_n = 1.00\,\text{eV}\, n^2.$$

The particle undergoes a jump from a higher to lower state.

Let λ_4 be the wavelength of the light emitted in a jump from $n = 4 \to n = 3$ and λ_2 be the wavelength of the light emitted in a jump from $n = 2 \to n = 1$. Which of the following is true?

1. $\lambda_4 = \lambda_2$.
2. $\lambda_4 > \lambda_2$.
3. $\lambda_4 < \lambda_2$.

Question 3

Consider a hydrogen atom. In a particular situation, the electron is known to be in a state where $l = 2$.

Which of the following are possible values for n?

1. Only $n = 1$.
2. Only $n = 2$.
3. Only $n = 3$.
4. Any of $n = 1, 2$.
5. Any of $n = 2, 3, 4, \ldots$.
6. Any of $n = 3, 4, 5, \ldots$.