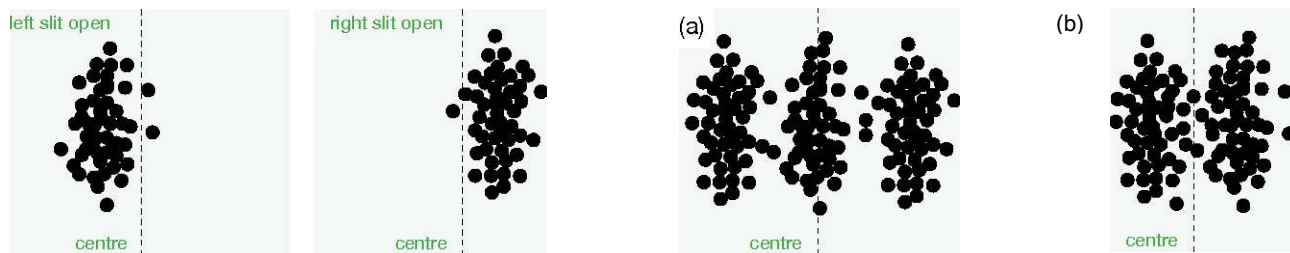


$$\Delta x = \frac{\lambda L}{d} \quad \lambda = \frac{h}{p} = \frac{h}{mv} \quad E = hf \quad V = \frac{E_Q}{q} \quad E_K = \frac{1}{2}mv^2 = \frac{p^2}{2m}$$

$$m_e = 9.11 \times 10^{-31} \text{ kg} \quad c = 3.00 \times 10^8 \text{ m/s} \quad h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s} \quad q_e = 1.602 \times 10^{-19} \text{ C} \quad 1 \text{ amu} = 1.6605 \times 10^{-27} \text{ kg}$$

01. Tennis balls are sent toward two slits. The distributions of the marks they make on the wall on the other side of the barrier when one slit is open are below.

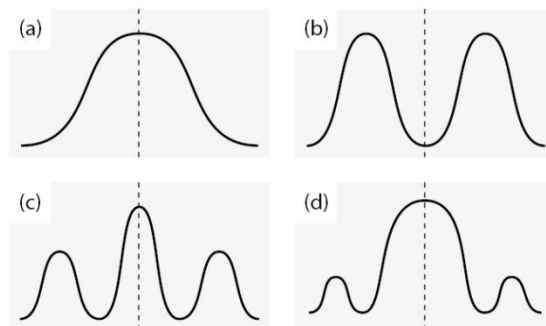
Which distribution would you expect to see if both slits are open at the same time?



02. Which statement correctly describes how waves behave when they occupy the same location at the same time?

- (a) A crest overlapping with a crest will constructively interfere to produce a minima.
- (b) A crest overlapping with a trough will constructively interfere to produce a minima.
- (c) A trough overlapping with a trough will constructively interfere to produce a maxima.
- (d) A trough overlapping with a trough will destructively interfere to produce a maxima.

03. A water wave passes through two slits. Which pattern best matches the amplitude of the resulting wave?



04. Classical particles are different from classical waves because classical particles

- (a) are spread out and generate an interference pattern in the double-slit experiment.
- (b) are localized and generate an interference pattern in the double-slit experiment.
- (c) are localized and generate a distribution that is the sum of each single-slit distribution.
- (d) are spread out and generate a distribution that is the sum of each single-slit distribution.

05. The video shows the interference of light of a single colour. What would you expect if white light were used?

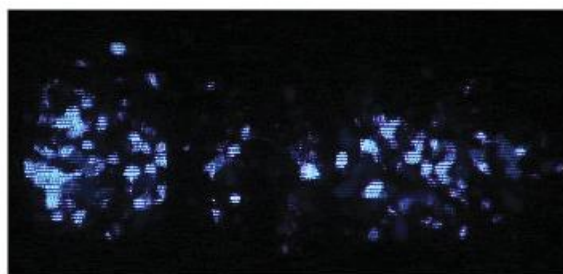
- (a) bands of white light and darkness
- (b) bands of different colours of light and darkness
- (c) a white central maxima and alternating bands of different colours of light and darkness on either side
- (d) no interference pattern

06. To better understand the double-slit experiment, it was important to send electrons through one slit at a time because

- (a) the detector needed time to reset in order to detect the next electron.
- (b) the slits were too narrow to allow two electrons to pass at the same time.
- (c) this prevented the electrons from interacting with one another.
- (d) time is needed to generate more electrons.

07. In the double-slit experiment, electrons

- (a) behave like waves and behave like particles.
- (b) split in half and go through both slits simultaneously.
- (c) behave like particles, but are waves.
- (d) are both waves and particles at the same time.



Actual image from the electron double-slit experiment

08. You get sunburn from ultraviolet light but not from visible light. This is because UV photons have a greater

- (a) mass.
- (b) frequency.
- (c) speed.
- (d) wavelength.

