

Self-test questions

Topic 12

1 Light, incident on a metallic surface, causes electrons to be emitted. It is suggested that the following changes will increase the energy of the emitted electrons:

- I increasing the intensity of the light
- II increasing the frequency of the light
- III increasing the work function of the surface

Which change or changes will actually increase the energy of the electrons?

- A I only
- B II only
- C III only
- D I and III

2 Light of frequency f is incident on a photosurface. The work function of the photosurface is ϕ . What is the critical frequency for this photosurface?

- A $hf - \phi$
- B $\frac{h}{\phi}$
- C $\frac{\phi}{h}$
- D $f - \frac{\phi}{h}$

3 An electron is confined within a region of linear size L . What is an **estimate** of the electron's kinetic energy?

- A $\frac{mL^2}{h^2}$
- B $\frac{h^2}{mL^2}$
- C $\frac{mc^2}{hL}$
- D $\frac{hL}{mc^2}$

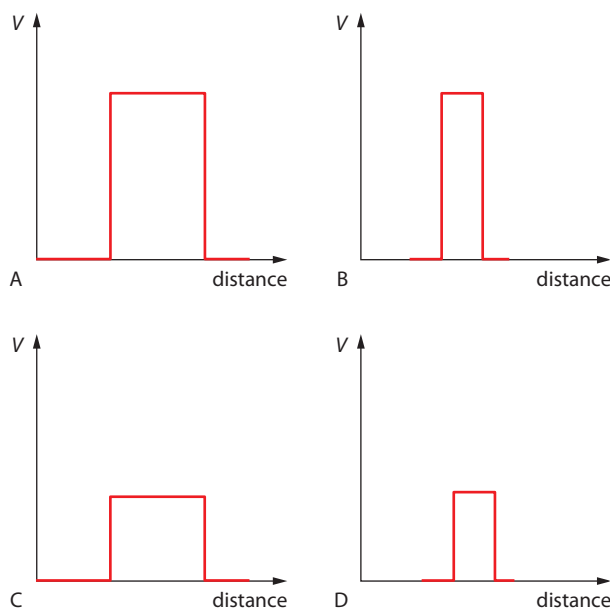
4 Evidence for de Broglie hypothesis comes from:

- A diffraction experiments with electrons and neutrons
- B alpha particle scattering experiments
- C the existence of nuclear energy levels
- D the existence of isotopes

5 An alpha particle and a proton have the same de Broglie wavelength. What is an approximate value of the ratio $\frac{v_p}{v_\alpha}$ of the speed of the proton to that of the alpha?

- A 2
- B 4
- C $\frac{1}{2}$
- D $\frac{1}{4}$

6 In which of the following potential barriers would the probability of tunneling for protons be the greatest?

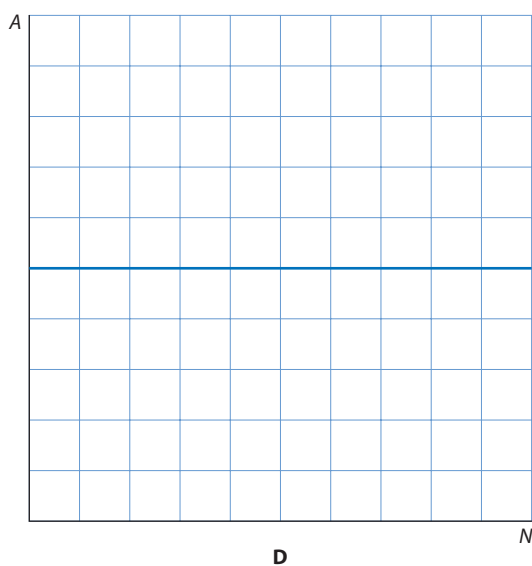
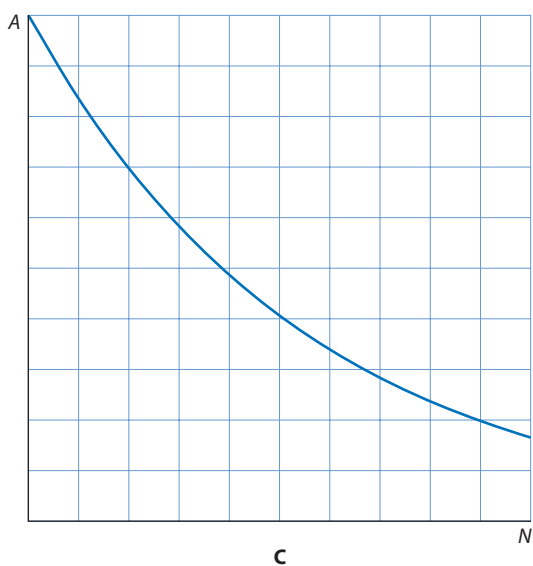
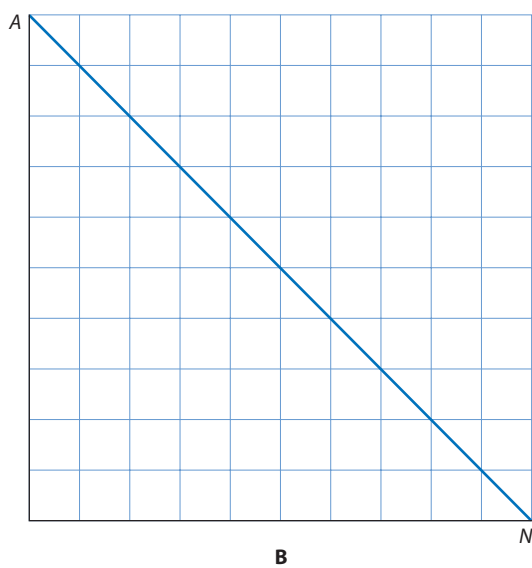
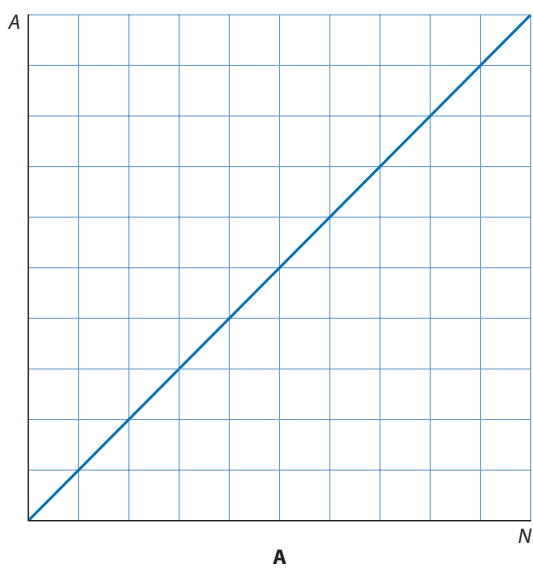


- A
- B
- C
- D

7 At high energies, deviations from Rutherford scattering are observed because:

- A the de Broglie wavelength of the alpha particles increases
 - B the de Broglie wavelength of the alpha particles decreases
 - C the weak nuclear force starts to act on the alpha particles
 - D the strong nuclear force starts to act on the alpha particles
- 8 Which of the following is a correct statement about nuclei?
- A they have the same binding energy
 - B they have the same binding energy per nucleon
 - C they have the same density
 - D they have the same ratio of neutrons to protons

- 9 The activity of a radioactive sample is A and, at that time, the number of radioactive nuclei present is N . Which graph shows the correct variation of A with N ?



- A
- B
- C
- D

- 10 An electron and a positron at rest annihilate. What is the best estimate of the wavelength of one of the photons produced?

- A $\frac{h}{mc}$
- B $\frac{h}{mc^2}$
- C $\frac{mc}{h}$
- D $\frac{mc^2}{h}$