

Name:

Class:



The kinetic energy of a cyclist is 4200 J. The mass of the cyclist is 75 kg.
Calculate the velocity of this cyclist. Give your answer to **three** significant figures.

$$E = \frac{1}{2}(m) \times v^2 \quad 4200 = \frac{1}{2}(75) \times v^2$$

$$v^2 = 4200 \div 37.5$$

$$v = \sqrt{112}$$

$$\text{Velocity} = \mathbf{10.6 \text{ m/s}}$$

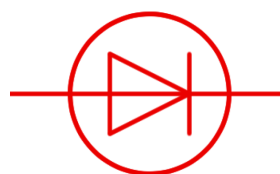
The speed of a water wave is 2.5 m/s.
The frequency of the wave is 0.70 Hz.
Calculate the wavelength of the wave.

$$\text{Wavelength} = \text{velocity} \div \text{frequency}$$

$$\text{Wavelength} = 2.5 \div 0.70$$

$$\text{Wavelength} = \mathbf{3.6 \text{ m}}$$

In the space below draw the electrical symbol for a diode.



Alpha (α), beta (β) and gamma (γ) are three types of radioactive emissions.

i. Which statement describes all of these radioactive emissions?

A ionising and emitted by stable nuclei

B ionising and emitted by unstable nuclei

C neutral and emitted by stable nuclei

D neutral and emitted by unstable nuclei

ii. Fluorine-19 is a stable isotope of the element fluorine.

The element fluorine also has several radioactive isotopes.

Describe **one similarity** and **one difference** between the numbers of particles in one nucleus of fluorine-19 and one nucleus of a radioactive isotope of fluorine.

Similarity: same number of protons. Accept same atomic number.

Difference: different number of neutrons. Accept different mass number.

iii. Radium-223 is a radioactive substance. Radium-223 is an alpha emitter. The half-life of radium-223 is 11 days. A radioactive source contains 1.7×10^{23} nuclei of radium-223. Calculate the number of radium-223 nuclei remaining in the source after 33 days.

33 days is 3 half-lives

$$(1.7 \times 10^{23}) \times 0.5^3 = 2.125 \times 10^{22}$$

$$\text{number of radium-223 nuclei remaining} = \mathbf{2.125 \times 10^{22}}$$