

Name:

Class:



Americium-241 decays by emitting alpha radiation to form neptunium (Np).

i. Complete the balanced symbol equation for the decay.



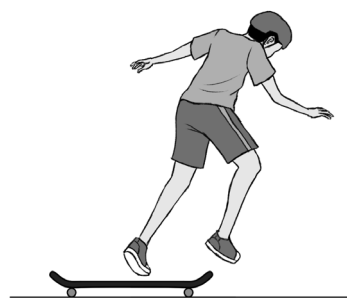
ii. The half-life of americium-241 is 432 years.

Explain what is meant by half-life.

The time it takes for the count rate (activity) from a sample to halve, OR the time for half of the unstable nuclei in a sample to decay.

The figure below shows a skateboarder jumping forwards off his skateboard.

The skateboard is stationary at the moment the skateboarder jumps.



i. The skateboard moves backwards as the skateboarder jumps forwards.

Explain, using the idea of momentum, why the skateboard moves backwards.

An explanation to include the following:

- Momentum before (jumping) = momentum after (jumping).
- After (jumping) skateboarder has momentum (forwards) so skateboard must have (equal) momentum (backwards).

ii. The mass of the skateboard is 1.8 kg and the mass of the skateboarder is 42 kg.

Calculate the velocity at which the skateboard moves backwards if the skateboarder jumps forwards at a velocity of 0.3 m/s.

$$\text{Momentum} = \text{mass} \times \text{velocity}$$

$$\text{Momentum} = 42 \times 0.3$$

$$\text{Momentum} = 12.6 \text{ kg m/s}$$

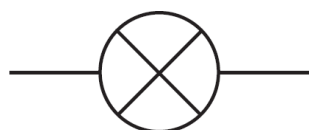
$$\text{Velocity} = \text{Momentum} \div \text{mass}$$

$$\text{Velocity} = 12.6 \div 1.8$$

$$\text{Velocity} = 7 \text{ m/s}$$

$$\text{Velocity} = \mathbf{7 \text{ m/s}}$$

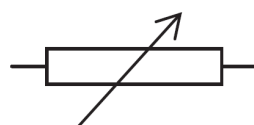
Identify the following electrical components from their symbols.



Lamp



Cell



Variable resistor



Fixed resistor