9 Accelerating charges with voltage – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	**Write it 3 times** (English)
electric potential energy	

Recall

In Part A you met potential and voltage. Now use voltage to give charges energy:

- A voltage can speed up a charged particle.
- This is how old TV tubes and electron microscopes work.

Each idea has a worked example before the Practice.

New ideas

1 Electric potential energy

Two charges have **electric potential energy** stored in their arrangement – like a stretched spring stores energy.

2 Energy from voltage

A charge released across a voltage speeds up, turning electric energy into kinetic energy:

$$qV = \tfrac{1}{2}mv^2.$$

3 A worked example

Worked example. A charge of 2.0 C falls through 10 V, gaining $qV = 2.0 \times 10 = 20$ J of kinetic energy.

■ 4 Conservation of energy

This is just energy conservation for charges: the electric potential energy lost equals the kinetic energy gained.

Watch out: a **positive** charge gains energy moving from high to low potential (downhill), while a **negative** charge gains energy moving the opposite way. The sign of the charge decides which way is "downhill".

Practice

Try these in order. The methods are all above.

2.1 State what electric potential energy is stored in. [1]

2.2 A charge of 3.0 C falls through 5.0 V. Find the kinetic energy it gains. [2]

2.3 A charge of 0.20 C is accelerated through 50 V. Find the energy gained. [2]

2.4 State the energy conversion when a charge is accelerated through a voltage. [2]

2.5 State which way a positive charge must move to gain energy. [1]