

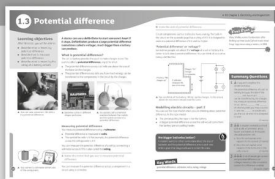
1.3 Potential difference

Physics KS3 NC link:

- potential difference, measured in volts
- battery and bulb ratings.

Working Scientifically NC link:

- use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety.



Band	Outcome	Question	Checkpoint Activity
Developing	State the unit of potential difference (Level 4).	B	Main, Plenary 1
	Name the equipment used to measure potential difference (Level 3).	A, 1	Main, Plenary 1
	Describe the effect of a larger potential difference (Level 4).	1	Main
Secure	Use appropriate equipment to measure potential difference (Level 4).		Main
	Describe what is meant by potential difference (Level 5).	B, 1	Starter 1, Starter 2, Plenary 1
	Describe how to measure potential difference (Level 5).	A, 1	Main
	Describe what is meant by the rating of a battery or bulb (Level 6).	1	Main
Extending	Set up a simple circuit and use appropriate equipment to measure potential difference (Level 6).		Main
	Explain the difference between potential difference and current (Level 7).	3	Plenary 2
	Explain why potential difference is measured in parallel (Level 7).		Starter 1, Starter 2, Main, Plenary 1
	Predict the effect of changing the rating of a battery or bulb in a circuit (Level 7).	2	Plenary 1
	Set up and measure potential difference across various components in a circuit (Level 7).		Main

Maths
Students show understanding of number scales and relative sizes when ranking items in order of p.d. and when recording voltage readings on analogue voltmeters.
They use the correct units when measuring in the practical activity.

Literacy
Students use scientific key terms in the discussions of analogies, models, and their practical results.

APP
Students plan an experiment to investigate the relationship between battery size and p.d. in the student-book activity (AF4).

Key Words
potential difference, voltmeter, volts, rating, voltage

Answers from the student book

In-text questions	A voltmeter B volt
Activity	Are bigger batteries better? Plan should include how to measure the size of the batteries, decision on diameter/weight/volume, use of voltmeter to measure the potential difference across the battery, collect a selection of different batteries, measure the 'size' and potential difference, record results in a table, plot the correct graph type.

Summary Questions	<p>1 push, energy, voltmeter, rating, rating (5 marks)</p> <p>2a The potential difference is bigger because the extra cell supplies more energy. (2 marks)</p> <p>b The buzzer would not work, the cells cancel out. (2 marks)</p> <p>3 6 mark question. Example answers: Charges flow when you connect a cell or battery. The charges are already in the wires/component. The battery pushes the charges. The size of the push is related to the potential difference. The charges flowing per second are the current. You measure the current with an ammeter. You measure the potential difference with a voltmeter.</p>
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Starter	Support/Extension	Resources
<p>Comparing potential difference (10 min) Hand round five to six battery-powered items, and show images of appliances, including their operating potential difference (p.d.). Explain that p.d. indicates energy used by the equipment, and is measured in volts. Group items as battery operated (mainly low p.d.) or mains operated (mainly high p.d.), and rank all items from the lowest to the highest p.d. It is useful at this stage to use only the term potential difference, and not voltage, to avoid confusing students with additional terminology.</p> <p>Looking at potential difference (10 min) Introduce sources of p.d. (e.g., lightning, power lines, railway lines). Explain that in each case a different amount of energy is used, which is linked to p.d. The interactive resource can then be used to link the operating p.d. with objects.</p>	<p>Support: Provide cards with the p.d. written on the back of each item. Students place the images on a number line.</p> <p>Extension: Students suggest dangers of high p.d., and understand that high current is the cause of fatalities.</p>	<p>Interactive: Looking at potential difference</p>
Main	Support/Extension	Resources
<p>Investigating potential difference (40 min) Set up a simple circuit to demonstrate the position of the voltmeter in a circuit. Emphasise the difference between an ammeter (connected in series) and a voltmeter (connected in parallel). It is important to refer to p.d. across components, rather than inside each component. Students set up simple circuits to investigate p.d. in a range of different circuits, and answer the questions on their activity sheet. At the end of the experiment, ensure students understand the conclusions: p.d. is shared between components (depending on the component's resistance). The p.d. across the battery is the same as the sum of the p.d. across all the components in a series circuit.</p>	<p>Support: Provide enlarged circuit diagrams on A3 or A4 paper for students to place components on before linking them with wires. A support sheet is also available with suggested combinations of components to investigate in a results table.</p>	<p>Activity: Investigating potential difference</p> <p>Skill sheet: Recording results</p>
Plenary	Support/Extension	Resources
<p>Rope model for potential difference (10 min) Explain that energy is transferred through the circuit from cells to components. As soon as the circuit is complete, energy is transferred in all parts of the circuit at the same time, by charge. Revisit the rope model for current, and change the analogy to that for p.d. Details can be found in the student book.</p> <p>Comparing current and voltage (5 min) Students list similarities and differences between current and voltage, for example, how they are measured, their value in different parts of a series circuit, and what they are.</p>	<p>Extension: Students can explain the effect of changing things in this circuit, offering limitations and improvements to this model.</p> <p>Support: Give students a list of statements describing current or p.d. for them to group.</p>	
Homework	Support/Extension	Resources
<p>Students prepare a list of at least 10 pieces of electrical equipment used at home and the voltage supplied, either from batteries or the mains (230 V). Students should get parental permission to move/unplug equipment.</p>	<p>Extension: Students should rank these in order of p.d., and suggest why this is the case.</p>	