**Design & Technology**

**AQA GCSE** Logo

Description automatically generated with low confidence

**Energy storage systems including batteries**

**Materials required for questions**

* Pencil
* Rubber
* Calculator

**Instructions**

* Use black ink or ball-point pen
* Try answer all questions
* Use the space provided to answer questions
* Calculators can be used if necessary
* For the multiple choice questions, circle your answer

**Advice**

* Marks for each question are in brackets
* Read each question fully
* Try to answer every question
* Don’t spend too much time on one question

**Good luck!**

**Q1.** Which of the following is part of a kinetic pumped storage system?

**A** Turbine

**B** Alkaline battery

**C** Photovoltaic cell

**Q2.** Water is pumped to the higher reservoir during low demand

**A** True

**B** False

**Q3.** What is a major limitation of pumped hydro storage?

**A** Requires flat terrain

**B** Needs specific geographic features (elevation + water)

**C** Cannot store large amounts of energy

**Q4.** Which battery type is typically non-rechargeable?

**A** Lithium-ion

**B** Lead-acid

**C** Alkaline

**Q5.** Explain how pumped hydro storage works and discuss one advantage and one limitation of this technology **(4 marks)**

**Q6.** Compare alkaline and lithium-ion batteries, giving one advantage of each for specific applications **(4 marks)**

**Answers**

**Q1**. A

**Q2**. A

**Q3**. B

**Q4**. C

**Q5**.

1. **Working Principle (2 marks):**
   * During periods of **low electricity demand** (or excess renewable generation), water is pumped **from a lower reservoir to an upper reservoir** using cheap/off-peak electricity.
   * During **peak demand**, water is released back downhill through **turbines** to generate electricity.
2. **Advantage (1 mark):**
   * Provides **large-scale energy storage** (GW-scale)
   * **Long lifespan** (50+ years)
   * **High efficiency** (70-85%)
3. **Limitation (1 mark):**
   * Requires **specific geography** (elevation difference + water source)
   * **High construction costs**
   * **Environmental impact** (flooding ecosystems)

**Q6**.

1. **Alkaline Battery Advantage (1 mark):**
   * **Low cost** (ideal for disposable devices like remote controls)
   * **Long shelf life** (leak-resistant, stable for years)
2. **Lithium-ion Battery Advantage (1 mark):**
   * **Rechargeable** (suitable for smartphones/laptops)
   * **High energy density** (compact size for EVs)
3. **Clear Comparison (2 marks):**
   * Award 1 mark for **identifying a key difference** (e.g., rechargeability, energy density).
   * Award 1 mark for **linking the advantage to a real-world application** (e.g., "Li-ion is better for EVs due to its rechargeability").