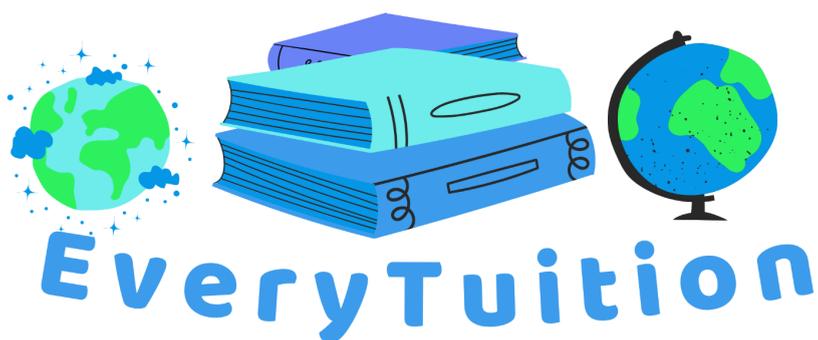


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# Chemistry Topic 5 AQA Exam Questions: Energy Change

Exam Questions/Mock Exam Questions



**Questions For Foundation, Higher, and Triple Science ([scroll down for questions for higher and triple science only](#)):**

(It would still be recommended to answer the foundation tier questions for triple science and higher tier to ensure you have good understanding).

**Q1.**

Jack investigates the temperature change when magnesium reacts with hydrochloric acid.

(a) Is this reaction exothermic or endothermic?

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[1]

(b) Explain how Jack could measure the temperature change safely.

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[2]

[Total: 3 marks]

**Q2.**

Tom is studying energy transfers in reactions.

(a) What is meant by the term exothermic reaction?

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[2]

(b) Give one everyday example of an exothermic reaction.

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[1]

[Total: 3 marks]

**Q3.**

Harry is learning about endothermic reactions.

(a) What happens to energy in an endothermic reaction?

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[1]

(b) Give one everyday example of an endothermic reaction.

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[1]

[Total: 2 marks]

**Q4.**

Ben investigates temperature changes in neutralisation reactions.

(a) Is the neutralisation of hydrochloric acid with sodium hydroxide usually exothermic or endothermic?

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[1]

(b) Describe how Ben could record the temperature change.

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[2]

[Total: 3 marks]

**Q5.**

Daniel uses a thermometer to study a reaction.

(a) Why is it important to use a polystyrene cup instead of a glass beaker in this experiment?

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[2]

(b) Explain how this improves the accuracy of the results.

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[2]

[Total: 4 marks]

**Q6.**

Oliver is revising bond energies.

(a) What must happen to bonds in the reactants for a reaction to take place?

---

[1]

(b) Is energy released or absorbed when bonds are broken?

---

[1]

(c) Is energy released or absorbed when new bonds are formed?

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[1]

[Total: 3 marks]

**Q7.**

Ethan is comparing exothermic and endothermic reactions.

(a) State one way to recognise an exothermic reaction by temperature change.

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[1]

(b) State one way to recognise an endothermic reaction by temperature change.

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[1]

(c) Which type of reaction is photosynthesis?

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[1]

[Total: 3 marks]

**Q8.**

Sam studies chemical hand warmers.

(a) Are hand warmers an example of an exothermic or endothermic reaction?

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[1]

(b) Explain why they are useful in cold weather.

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[2]

[Total: 3 marks]

**Q9.**

Charlie looks at cold packs used for sports injuries.

(a) Are cold packs an example of an exothermic or endothermic reaction?

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[1]

(b) Explain why they are useful for injuries.

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[2]

[Total: 3 marks]

**Q10.**

Noah carries out an experiment measuring the energy change of a neutralisation reaction.

(a) Suggest one piece of equipment Noah needs to measure the temperature.

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[1]

(b) Explain why it is important to measure the temperature before and after the reaction.

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[2]

[Total: 3 marks]

**Q11.**

William is learning about reaction profiles.

(a) On a reaction profile, what does the y-axis usually represent?

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[1]

(b) On a reaction profile, what does the difference between reactants and products show?

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[2]

[Total: 3 marks]

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**Q12.**

Alex studies bond energies.

(a) Is energy absorbed or released when bonds in reactants are broken?

---

[1]

(b) Is energy absorbed or released when bonds in products are formed?

---

[1]

(c) Explain how bond breaking and bond making relate to exothermic reactions.

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[2]

[Total: 4 marks]

**Q13.**

Jacob investigates the energy change in dissolving salts.

(a) Some salts dissolve exothermically, others endothermically. Explain what this means.

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[2]

(b) Suggest how Jacob could measure the energy change when dissolving a salt.

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[2]

[Total: 4 marks]

**Q14.**

James draws reaction profiles.

(a) How can you tell from a reaction profile that a reaction is exothermic?

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[2]

(b) How can you tell from a reaction profile that a reaction is endothermic?

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[2]

[Total: 4 marks]

**Q15.**

Luke is planning an experiment to measure the temperature change of an acid-base reaction.

In your answer, include:

- the apparatus he would use
- how he would carry out the experiment
- the measurements he would take

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[6]

[Total: 6 marks]

**Higher Tier**

**Q16.**

Jack measures the temperature change when sodium hydroxide reacts with hydrochloric acid.

(a) Is this reaction exothermic or endothermic?

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[1]

(b) Explain how Jack could improve the accuracy of the temperature measurement.

---

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[2]

[Total: 3 marks]

**Q17.**

Tom investigates bond breaking and bond making.

(a) Is energy absorbed or released when chemical bonds are broken?

---

[1]

(b) Is energy absorbed or released when chemical bonds are formed?

---

[1]

(c) Explain how the balance between these two processes determines if a reaction is exothermic.

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[2]

[Total: 4 marks]

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**Q18.**

Harry is studying reaction profiles.

(a) On a reaction profile, what does the difference in energy between the reactants and products represent?

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[2]

(b) How can you tell from a reaction profile if a reaction is endothermic?

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[2]

[Total: 4 marks]

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**Q19.**

Ben uses bond energy values to calculate energy changes.

(a) State the equation for energy change in terms of bonds broken and bonds formed.

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[2]

(b) Explain why bond energy calculations only give approximate values.

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[2]

[Total: 4 marks]

**Q20.**

Daniel is comparing exothermic and endothermic reactions.

(a) Explain how the energy level of products compares with the energy level of reactants in an exothermic reaction.

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[2]

(b) Explain how the energy level of products compares with the energy level of reactants in an endothermic reaction.

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[2]

[Total: 4 marks]

**Q21.**

Oliver studies fuel combustion.

(a) Write a balanced symbol equation for the complete combustion of methane.

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[2]

(b) Explain why combustion reactions are exothermic.

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[2]

[Total: 4 marks]

**Q22.**

Ethan investigates neutralisation.

(a) Write the ionic equation for the neutralisation of hydrochloric acid with sodium hydroxide.

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[2]

(b) Explain why neutralisation is always exothermic.

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[2]

[Total: 4 marks]

**Q23.**

Sam tests a chemical hand warmer.

(a) Explain why a hand warmer is an example of an exothermic process.

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[2]

(b) Suggest one advantage and one disadvantage of using disposable hand warmers.

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[2]

[Total: 4 marks]

**Q24.**

Charlie looks at chemical cold packs.

(a) Explain why cold packs are examples of endothermic processes.

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[2]

(b) Suggest one use of cold packs in everyday life.

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[1]

[Total: 3 marks]

**Q25.**

Noah is comparing reaction profiles.

Draw a reaction profile for an exothermic reaction. Label the following:

- reactants,
- products,
- activation energy,
- overall energy change.

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[4]

[Total: 4 marks]

**Q26.**

William compares exothermic and endothermic reactions.

(a) Give one example of an exothermic reaction.

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[1]

(b) Give one example of an endothermic reaction.

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[1]

(c) Explain the difference between energy changes in these two reactions.

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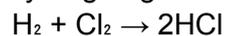
[2]

[Total: 4 marks]

**Q27.**

Alex is working with bond energies.

Hydrogen gas reacts with chlorine gas:



Bond energies: H–H = 436 kJ/mol, Cl–Cl = 242 kJ/mol, H–Cl = 431 kJ/mol.

(a) Calculate the energy change for the reaction.

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[3]

(b) State whether the reaction is exothermic or endothermic.

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[1]

[Total: 4 marks]

**Q28.**

Jacob is testing acids and alkalis.

(a) State the general ionic equation for a neutralisation reaction.

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[2]

(b) Explain why this type of reaction is exothermic.

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[2]

[Total: 4 marks]

**Q29.**

James investigates dissolving salts.

(a) Explain why dissolving ammonium nitrate is endothermic.

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[2]

(b) Suggest how James could measure the energy change in this process.

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[2]

[Total: 4 marks]

**Q30.**

Luke plans an experiment to measure the temperature change when hydrochloric acid reacts with magnesium.

In your answer, include:

- the apparatus he would use
- how he would carry out the experiment
- the measurements he would take

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[6]

[Total: 6 marks]

**Q31.**

Jack investigates why some reactions need a spark to start.

(a) Define activation energy.

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[2]

(b) Explain why exothermic reactions still need activation energy.

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[2]

[Total: 4 marks]

**Q32.**

Tom looks at energy changes in respiration and photosynthesis.

(a) Is respiration exothermic or endothermic?

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[1]

(b) Is photosynthesis exothermic or endothermic?

---

[1]

(c) Explain how the energy changes in these two processes are related.

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[2]

[Total: 4 marks]

**Q33.**

Harry draws a reaction profile for an endothermic reaction.

(a) Draw the reaction profile and label: reactants, products, activation energy, and overall energy change.

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[4]

(b) Explain why the products are at a higher energy level than the reactants.

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[2]

[Total: 6 marks]

**Q34.**

Ben investigates hydrogen fuel cells.

(a) Write the word equation for the reaction in a hydrogen fuel cell.

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[2]

(b) Explain why the reaction in a hydrogen fuel cell is exothermic.

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[2]

[Total: 4 marks]

**Q35.**

Daniel compares chemical batteries and hydrogen fuel cells.

Evaluate the advantages and disadvantages of using hydrogen fuel cells compared with rechargeable batteries.

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[6]

[Total: 6 marks]

**Q36.**

Oliver investigates catalysts.

(a) Draw a reaction profile to show how a catalyst lowers activation energy.

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[2]

(b) Explain why catalysts do not affect the overall energy change of a reaction.

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[2]

[Total: 4 marks]

**Q37.**

Ethan compares two reactions.

Reaction A: temperature rises

Reaction B: temperature falls

(a) Which is exothermic, A or B?

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[1]

(b) Explain why the other reaction is endothermic.

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[2]

[Total: 3 marks]

**Q38.**

Sam is testing fuels.

(a) State the equation used to calculate energy released from fuel combustion.

---

[2]

(b) Explain how heat loss to the surroundings can reduce accuracy in this experiment.

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[2]

[Total: 4 marks]

**Q39.**

Charlie is studying exothermic processes.

Give two examples of everyday exothermic reactions.

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[2]

[Total: 2 marks]

**Q40.**

Noah investigates energy transfer in a neutralisation reaction.

Plan an experiment to measure the energy released. Include:

- apparatus used
- how the experiment is carried out
- the measurements taken

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[6]

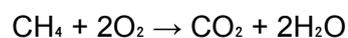
[Total: 6 marks]

# Triple Science

## Q41.

William studies bond energy calculations.

Methane combusts according to the equation:



Bond energies (kJ/mol): C–H = 412, O=O = 498, C=O = 805, O–H = 463.

Calculate the overall energy change for the reaction.

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[5]

[Total: 5 marks]

## Q42.

Alex investigates activation energy.

(a) Define activation energy.

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[2]

(b) Draw a reaction profile to show activation energy for an exothermic reaction.

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[2]

[Total: 4 marks]

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## Q43.

Jacob studies electrolysis in hydrogen fuel cells.

(a) Write the half equation for hydrogen at the anode.

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[2]

(b) Write the half equation for oxygen at the cathode.

---

[2]

(c) Combine them to give the overall equation.

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[1]

[Total: 5 marks]

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**Q44.**

James is comparing energy storage.

(a) Give one advantage of hydrogen fuel cells compared to rechargeable batteries.

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[1]

(b) Give one disadvantage.

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[1]

(c) Explain why hydrogen fuel cells are considered more environmentally friendly.

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[2]

[Total: 4 marks]

**Q45.**

Luke investigates reversible reactions.

(a) Explain why thermal decomposition of ammonium chloride is endothermic in the forward direction.

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[2]

(b) Explain why it is exothermic in the reverse direction.

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[2]

[Total: 4 marks]

**Q46.**

Jack draws reaction profiles.

(a) Draw a reaction profile for an endothermic reaction and label activation energy.

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[2]

(b) Explain why catalysts do not change the overall energy change of a reaction.

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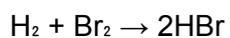
[2]

[Total: 4 marks]

**Q47.**

Tom measures bond energy changes.

The reaction is:



Bond energies (kJ/mol): H–H = 436, Br–Br = 193, H–Br = 366.

Calculate the overall energy change.

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[3]

[Total: 3 marks]

**Q48.**

Harry is investigating catalysts in fuel cells.

(a) Explain why platinum is used as a catalyst in fuel cells.

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[2]

(b) State one disadvantage of using platinum.

---

[1]

[Total: 3 marks]

**Q49.**

Ben studies photosynthesis.

(a) Explain why photosynthesis is an endothermic process.

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[2]

(b) Write the balanced symbol equation for photosynthesis.

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[2]

[Total: 4 marks]

**Q50.**

Daniel looks at energy changes in reversible reactions.

(a) Explain why if the forward reaction is exothermic, the reverse is endothermic.

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[2]

(b) Draw a reaction profile for a reversible exothermic reaction.

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[2]

[Total: 4 marks]

**Q51.**

Oliver calculates energy from fuel combustion.

Ethanol is burned to heat water.

Energy = mass of water  $\times$  4.2  $\times$  temperature change

Water mass = 200 g, temperature rise = 15 °C.

Calculate the energy released.

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[3]

[Total: 3 marks]

**Q52.**

Ethan compares energy transfers.

(a) Why do exothermic reactions often release energy as heat and light?

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[2]

(b) Give one example of a reaction that releases both.

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[1]

[Total: 3 marks]

**Q53.**

Sam evaluates hydrogen as a fuel.

(a) Give one reason why hydrogen is considered renewable.

---

[1]

(b) Give one safety issue with using hydrogen as a fuel.

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[1]

(c) Explain why hydrogen has a higher energy density per gram than many other fuels.

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[2]

[Total: 4 marks]

**Q54.**

Charlie compares experimental energy results.

(a) Explain why less energy is usually measured in school experiments than expected from data tables.

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[2]

(b) Suggest one method to reduce this error.

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[2]

[Total: 4 marks]

**Q55.**

Noah designs an investigation into exothermic and endothermic reactions.

Plan an experiment to compare the temperature changes in the neutralisation of hydrochloric acid with sodium hydroxide, and the dissolution of ammonium nitrate. Include:

- apparatus used
- method
- safety precautions
- measurements taken

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[6]

[Total: 6 marks]