

## AQA (GCSE Notes)

### Chapter 5: Energy Changes

- Q1. What happens to the energy in the universe during a chemical reaction?
- Q2. Why do the products of an exothermic reaction have less energy than the reactants?
- Q3. What is an exothermic reaction?
- Q4. How does the temperature of the surroundings change during an exothermic reaction?
- Q5. Give two examples of exothermic reactions.
- Q6. Name two everyday items that use exothermic reactions.
- Q7. What is an endothermic reaction?
- Q8. How does the temperature of the surroundings change during an endothermic reaction?
- Q9. Give an example of an endothermic reaction.
- Q10. Why does the temperature of the surroundings decrease in an endothermic reaction?
- Q11. What is the role of energy in an endothermic reaction?
- Q12. Why are sports injury packs based on endothermic reactions?
- Q13. What kind of energy transfer occurs in a neutralisation reaction?
- Q14. What kind of energy transfer occurs in a thermal decomposition reaction?
- Q15. How can you identify whether a reaction is exothermic or endothermic by measuring temperature?
- Q16. Why do some reactions warm up the surroundings?
- Q17. Why do some reactions cool down the surroundings?
- Q18. What type of reaction occurs in self-heating cans?
- Q19. What can you measure to determine if a reaction is exothermic or endothermic?
- Q20. What is the minimum amount of energy needed for a reaction to take place?

- Q21.** What is activation energy?
- Q22.** Why is activation energy needed for a reaction to start?
- Q23.** What does a reaction profile show?
- Q24.** How can reaction profiles help identify if a reaction is exothermic?
- Q25.** How can reaction profiles help identify if a reaction is endothermic?
- Q26.** What does the curved line in a reaction profile represent?
- Q27.** In a reaction profile, what does the peak represent?
- Q28.** How is the activation energy shown in a reaction profile?
- Q29.** How is the overall energy change shown in a reaction profile?
- Q30.** What is meant by the term 'overall energy change' in a chemical reaction?
- Q31.** What are the relative energy levels of reactants and products in an exothermic reaction?
- Q32.** What are the relative energy levels of reactants and products in an endothermic reaction?
- Q33.** Why is it useful to draw reaction profiles?
- Q34.** What is the purpose of conducting experiments to measure temperature change in reactions?
- Q35.** How can dissolving a substance in water help investigate energy changes?
- Q36.** Why is it important to control variables in a temperature change experiment?
- Q37.** What variables could affect the temperature change in a reaction between acid and metal?
- Q38.** How would you set up an experiment to investigate temperature change during neutralisation?
- Q39.** What observations would show a displacement reaction is exothermic?
- Q40.** How would you measure the temperature change in a reaction safely?
- Q41.** Why is it important to repeat the experiment when measuring temperature changes?
- Q42.** What is the significance of comparing temperature changes in different reactions?
- Q43.** How does the reaction between citric acid and sodium hydrogencarbonate demonstrate an endothermic process?



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- Q44.** What conclusion can be drawn if the temperature rises after a reaction?
- Q45.** What conclusion can be drawn if the temperature drops after a reaction?
- Q46.** How would you identify the activation energy from a reaction profile diagram?
- Q47.** What would a reaction profile look like for a highly exothermic reaction?
- Q48.** What would a reaction profile look like for a reaction with high activation energy?
- Q49.** Why might a reaction with high activation energy not happen at room temperature?
- Q50.** How does temperature influence whether a reaction will occur or not?
- Q51.** What happens to energy when bonds in the reactants are broken during a chemical reaction?
- Q52.** Why is energy released when new bonds are formed in the products?
- Q53.** How can bond energies be used to calculate the energy change in a chemical reaction?
- Q54.** What is meant by the term "overall energy change" in a chemical reaction?
- Q55.** In an exothermic reaction, which is greater: energy released or energy needed?
- Q56.** In an endothermic reaction, which is greater: energy needed or energy released?
- Q57.** What kind of energy change occurs when the bonds formed in products release more energy than the energy required to break reactant bonds?
- Q58.** How does bond breaking affect the energy profile of a reaction?
- Q59.** What does a positive energy change mean in a chemical reaction?
- Q60.** What does a negative energy change indicate in terms of exothermic or endothermic?
- Q61.** Describe how you would calculate the energy change of a reaction using bond energies.
- Q62.** Why is it important to consider both bond breaking and bond forming when calculating energy changes?
- Q63.** What is the significance of bond energy values in predicting reaction types?
- Q64.** How can bond energy calculations help identify whether a reaction is exothermic or endothermic?
- Q65.** If more energy is released in forming bonds than is absorbed in breaking them, what type of reaction is it?



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- Q66.** If a reaction absorbs more energy in breaking bonds than it releases in forming them, what type of reaction is it?
- Q67.** What are the typical units used when calculating bond energy changes?
- Q68.** Why are bond energies considered average values?
- Q69.** Give a reason why the calculated energy change may differ from experimental results.
- Q70.** How does the strength of chemical bonds relate to the energy required to break them?
- Q71.** How does the number of bonds broken or formed affect the total energy change?
- Q72.** How would you explain the energy changes involved in a neutralisation reaction?
- Q73.** What energy change would you expect in a combustion reaction and why?
- Q74.** Why do stronger bonds usually require more energy to break?
- Q75.** What information do you need to calculate the energy transferred in a chemical reaction?
- Q76.** What is the purpose of using bond energies in energy change calculations?
- Q77.** How does the energy needed to break a triple bond compare to a single bond?
- Q78.** Why might a chemical reaction with a positive energy change feel cold to the touch?
- Q79.** Describe what happens to energy during the breaking of O=O bonds in a reaction.
- Q80.** How do different elements affect the bond energy values in compounds?
- Q81.** What type of bond energy data is used for polyatomic molecules?
- Q82.** How would you identify whether a reaction has high or low activation energy using bond energies?
- Q83.** Can bond energy values help in designing energy-efficient reactions? Explain how.
- Q84.** What does a large overall energy change suggest about a reaction?
- Q85.** In a reaction where energy change is zero, what can you say about the bond energies of reactants and products?
- Q86.** How does the conservation of energy apply to chemical reactions involving bond energies?
- Q87.** Why might experimental temperature change data not exactly match bond energy calculations?



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- Q88.** What assumptions are made when using bond energy values in calculations?
- Q89.** How can bond energies be used to compare the stability of two chemical reactions?
- Q90.** What safety precautions should be taken when conducting experiments involving exothermic reactions?
- Q91.** Describe a method to calculate the energy change of a reaction using bond energy data for  $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$ .
- Q92.** What conclusion can you draw if bond energy calculations predict an exothermic reaction but no reaction occurs?
- Q93.** What factors other than bond energies can affect whether a chemical reaction occurs?
- Q94.** How might bond energy calculations differ for reactions in solution versus gas phase?
- Q95.** What are the limitations of using bond energy values for reactions with intermediate steps?
- Q96.** Why is it useful to understand energy changes in everyday chemical reactions like cooking or combustion?
- Q97.** How can energy profile diagrams be supported with bond energy data?
- Q98.** What role does enthalpy play in bond energy calculations?
- Q99.** In what situations would bond energy calculations be most accurate?
- Q100.** Why might two reactions with similar bond energy changes differ in reaction rates?
- Q101.** What is a simple cell and how can it be constructed using two different metals and an electrolyte?
- Q102.** Why does the voltage of a cell depend on the type of metal used for the electrodes?
- Q103.** How does the choice of electrolyte affect the voltage of a cell?
- Q104.** What happens at the electrodes in a simple electrochemical cell?
- Q105.** Explain why using metals with a greater difference in reactivity produces a higher voltage in a cell.
- Q106.** What is the function of the electrolyte in a simple cell?
- Q107.** Describe what is meant by a non-rechargeable battery.



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- Q108.** Why do chemical reactions in a non-rechargeable cell eventually stop?
- Q109.** What are alkaline batteries and why are they classed as non-rechargeable?
- Q110.** Describe what happens during the recharging of a rechargeable battery.
- Q111.** Why can rechargeable batteries be used multiple times?
- Q112.** What is the role of an external electrical current in recharging a cell?
- Q113.** What are the advantages of using rechargeable batteries over non-rechargeable ones?
- Q114.** Why is it important to use batteries with care, especially those containing liquids?
- Q115.** How can you safely test a simple cell in the classroom?
- Q116.** What precautions should be taken when handling electrolytes during experiments?
- Q117.** Why is it important to compare the voltage of different metal combinations in cells?
- Q118.** How can data on metal reactivity be used to predict the voltage of a cell?
- Q119.** What evidence from an experiment would show that one metal is more reactive than another?
- Q120.** Describe a method for testing the voltage produced by different metal pairs in a cell.
- Q121.** What is meant by connecting cells in series?
- Q122.** How does connecting cells in series affect the overall voltage?
- Q123.** What might happen if you connect cells in the wrong way in a circuit?
- Q124.** How can you increase the voltage output of a battery using simple cells?
- Q125.** Why do batteries eventually run out of energy?
- Q126.** What does it mean when a battery is said to be 'flat'?
- Q127.** What factors can affect how long a battery lasts?
- Q128.** How can the reactivity series help in designing more efficient cells?
- Q129.** Why is it important to evaluate the environmental impact of different types of batteries?
- Q130.** How do different combinations of metals influence the energy output of a cell?
- Q131.** What is the purpose of using two different metals in a cell rather than two of the same metal?

**Q132.** Why does the flow of electrons only occur when the two metals have different reactivities?

**Q133.** What is meant by the term 'cell voltage'?

**Q134.** What practical uses are there for batteries made from multiple simple cells?

**Q135.** Why might one battery be better suited to a device than another?

**Q136.** How would you set up an experiment to compare different cells safely?

**Q137.** What could cause errors when measuring the voltage of a cell?

**Q138.** Why must we handle battery chemicals with care?

**Q139.** What are some safety risks when using or making electrochemical cells?

**Q140.** Why do rechargeable batteries have a limited number of charge cycles?

**Q141.** How can temperature affect the performance of a battery?

**Q142.** What is the environmental advantage of using rechargeable batteries?

**Q143.** How is the energy transfer in a battery different from that in a mains-powered circuit?

**Q144.** Why is it important to interpret data correctly when evaluating metal combinations?

**Q145.** What can voltage measurements tell you about the reactivity of two metals?

**Q146.** Why should you never short-circuit a battery?

**Q147.** In a classroom setup, how can students safely dispose of used battery chemicals?

**Q148.** How does the internal resistance of a cell affect its voltage output?

**Q149.** Why is it useful to understand how cells and batteries work in everyday life?

**Q150.** What would you expect to happen if the electrolyte in a cell dries up or leaks?

**Q151.** What is the role of hydrogen in a hydrogen fuel cell?

**Q152.** What is the role of oxygen in a hydrogen fuel cell?

**Q153.** How does a hydrogen fuel cell generate electricity?

**Q154.** What is the overall chemical reaction in a hydrogen fuel cell?

**Q155.** How is water formed in a hydrogen fuel cell?



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- Q156.** Why is hydrogen described as being oxidised in the fuel cell?
- Q157.** What happens to the electrons from hydrogen during the reaction?
- Q158.** How is the potential difference created in a hydrogen fuel cell?
- Q159.** How are fuel cells different from rechargeable batteries?
- Q160.** Why do hydrogen fuel cells not need recharging like batteries?
- Q161.** What are the environmental advantages of using hydrogen fuel cells?
- Q162.** What are the environmental disadvantages of using hydrogen fuel cells?
- Q163.** Why is it important to evaluate the source of hydrogen used in fuel cells?
- Q164.** What problems could arise from storing and transporting hydrogen fuel?
- Q165.** How do hydrogen fuel cells perform in vehicles compared to traditional petrol engines?
- Q166.** Why are fuel cells used in some spacecraft and submarines?
- Q167.** How is hydrogen gas usually produced for fuel cells?
- Q168.** What are the limitations of using electrolysis to produce hydrogen for fuel cells?
- Q169.** What role do catalysts play in hydrogen fuel cells?
- Q170.** Why must a hydrogen fuel cell have a membrane?
- Q171.** What is the purpose of the electrolyte in a hydrogen fuel cell?
- Q172.** Why are hydrogen fuel cells considered more efficient than combustion engines?
- Q173.** How does temperature affect the efficiency of hydrogen fuel cells?
- Q174.** How does the size of the electrodes affect the performance of a fuel cell?
- Q175.** What safety precautions are needed when using hydrogen as a fuel?
- Q176.** In what ways are rechargeable cells more practical than hydrogen fuel cells?
- Q177.** In what ways are hydrogen fuel cells more practical than rechargeable batteries?
- Q178.** What factors affect the lifetime of a hydrogen fuel cell?
- Q179.** How can the cost of using hydrogen fuel cells be reduced?



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- Q180.** Why is the infrastructure for hydrogen refuelling limited?
- Q181.** What are the half-equations at the electrodes in a hydrogen fuel cell?
- Q182.** How do you balance the half-equation for hydrogen oxidation in a fuel cell?
- Q183.** What happens at the positive electrode in a hydrogen fuel cell?
- Q184.** What happens at the negative electrode in a hydrogen fuel cell?
- Q185.** What ions move through the electrolyte in a hydrogen fuel cell?
- Q186.** Why are fuel cells described as redox reactions?
- Q187.** What is the difference between the anode and cathode in a hydrogen fuel cell?
- Q188.** Why is a constant fuel supply needed for a hydrogen fuel cell to keep working?
- Q189.** Why can hydrogen fuel cells be used in remote or off-grid locations?
- Q190.** What happens to the energy in the chemical bonds of hydrogen in a fuel cell?
- Q191.** Why is the use of hydrogen fuel cells in cars still limited?
- Q192.** How can the purity of hydrogen affect the operation of a fuel cell?
- Q193.** Why is it important that hydrogen fuel cells produce no carbon dioxide?
- Q194.** What is one reason hydrogen fuel cells are considered sustainable?
- Q195.** How does the design of the electrodes affect the efficiency of a hydrogen fuel cell?
- Q196.** What kind of emissions are produced by hydrogen fuel cells?
- Q197.** Why is the production of hydrogen from fossil fuels less environmentally friendly?
- Q198.** How do hydrogen fuel cells compare with lithium-ion batteries in terms of weight?
- Q199.** Why might cold temperatures affect hydrogen fuel cell vehicles?
- Q200.** What challenges must be overcome before hydrogen fuel cells can replace petrol engines?