Activity 1F – Carbohydrate testing

The Department for Education is conducting a review of the primary and secondary National Curriculum. The links below relate to the statutory programmes of study for science in the National Curriculum, 2007 and specific sections of common science qualifications offered in UK schools.

Key stage 3

1.1 Scientific thinking

b. critically analysing and evaluating evidence from observations and experiments.

1.2 Applications and implications of science

a. exploring how the creative application of scientific ideas can bring about technological developments and consequent changes in the way people think and behave.

2.1 Practical and enquiry skills

Pupils should be able to:

- use a range of scientific methods and techniques to develop and test ideas and explanations
- assess risk and work safely in the laboratory, field and workplace
- plan and carry out practical and investigative activities, both individually and in groups.

3.1 Energy, electricity and forces

a. energy can be transferred usefully, stored, or dissipated, but cannot be created or destroyed

3.2 Chemical and material behaviour

c. elements and compounds show characteristic chemical properties and patterns in their behaviour.

3.4 The environment, Earth and universe

c. human activity and natural processes can lead to changes in the environment.

Key stage 4

1 How science works

1.1 Data, evidence, theories and explanations Pupils should be taught:

- a. how scientific data can be collected and analysed
- b. how interpretation of data, using creative thought, provides evidence to test ideas and develop theories
- c. how explanations of many phenomena can be developed using scientific theories, models and ideas

1.2 Practical and enquiry skills Pupils should be taught to:

- a. plan to test a scientific idea, answer a scientific question, or solve a scientific problem
- b. collect data from primary or secondary sources, including using ICT sources and tools
- c. work accurately and safely, individually and with others, when collecting first-hand data
- d. evaluate methods of collection of data and consider their validity and reliability as evidence.

1.3 Communication skills Pupils should be taught to:

- a. recall, analyse, interpret, apply and question scientific information or ideas
- b. use both qualitative and quantitative approaches

1.4 Applications and implications of science Pupils should be taught:

- a. about the use of contemporary scientific and technological developments and their benefits, drawbacks and risks
- b. to consider how and why decisions about science and technology are made, including those that raise ethical issues, and about the social, economic and environmental effects of such decisions
- 2.2 Chemical and material behaviour In their study of science, the following should be covered:
- a. chemical change takes place by the rearrangement of atoms in substances
- b. there are patterns in the chemical reactions between substances
- c. new materials are made from natural resources by chemical reactions
- d. the properties of a material determine its uses.





- 2.3 Energy, electricity and radiations In their study of science, the following should be covered:
- a. energy transfers can be measured and their efficiency calculated, which is important in considering the economic costs and environmental effects of energy use
- c. radiations, including ionising radiations, can transfer energy
- 2.4 Environment, Earth and universe In their study of science, the following should be covered:
- a. the effects of human activity on the environment can be assessed using living and non-living indicators
- b. the surface and the atmosphere of the Earth have changed since the Earth's origin and are changing at present

AQA Chemistry and Science GCSE

Unit C1.4 Crude oil and Fuels C1.4.3 Hydrocarbon fuels

e) Biofuels, including biodiesel and ethanol, are produced from plant material. There are economic, ethical and environmental issues surrounding their use.

C1.5 Other useful substances from crude oil

evaluate the advantages and disadvantages of making ethanol from renewable and non-renewable sources. **Additional guidance:**

Candidates should be able to compare the environmental impact of producing ethanol from renewable and non-renewable sources.

C1.5.3 Ethanol

b) Ethanol can also be produced by fermentation with yeast, using renewable resources. This can be represented by: sugar → carbon dioxide + ethanol

AQA Science B GCSE

3.4.2.3 Generation and distribution of electricity

Candidates need to:

- 1. Define the terms renewable and non-renewable in the context of energy sources.
- 2. Know that fossil fuels (natural gas, oil and coal) release energy when they are burned, which can be used to generate electricity for our homes.
- 3. Explain how nuclear fuels and renewable energy sources (wind, solar, hydroelectric, wave, tidal, biomass and geothermal) may be used as alternatives to fossil fuels.
- 5. Explain the problems of using nuclear fuels (problems of radioactive emissions, disposal of waste) and of using renewable energy sources (unreliability and possible effects on the environment).

Within this context, candidates should be able to use scientific data and evidence to discuss, evaluate or suggest implications of the following:

- the environmental impact over time of energy production by comparing the advantages and disadvantages of using alternative energy sources
- the economic impact of using alternative energy sources

AQA Biology and Science GCSE

B1.5.1 Energy in biomass

a) Radiation from the Sun is the source of energy for most communities of living organisms. Green plants and algae absorb a small amount of the light that reaches them. The transfer from light energy to chemical energy occurs during photosynthesis. This energy is stored in the substances that make up the cells of the plants.

B1.6.2 The carbon cycle

- a) The constant cycling of carbon is called the carbon cycle.
- In the carbon cycle:
- carbon dioxide is removed from the environment by green plants and algae for photosynthesis
- the carbon from the carbon dioxide is used to make carbohydrates, fats and proteins, which make up the body of plants and algae





when green plants and algae respire, some of this carbon becomes carbon dioxide and is released into the atmosphere

AQA Environmental Science GCSE

A2.4 What alternative energy technologies are available?

Scientists have developed alternative technologies to harness energy from sources other than fossil fuels. Environmental scientists use their knowledge to assess these alternatives for their efficiency and potential environmental impact.

Scientists have also developed methods of electricity generation from renewable resources that may be used instead of fossil fuels.

Candidates should know and understand that:

- renewable energy resources are usually sustainable:
- not depleted by use including wind power
- capable of rapid replacement including biofuels
- most renewable energy resources:
- use kinetic energy to turn generators, which produce electricity (exceptions include solar water heating, photovoltaics, geothermal and biofuels)
- usually need larger areas than thermal power stations to yield the same amount of energy
- may be unreliable or cannot provide a constant supply of energy
- may detract from the appearance of a land/seascape (A1)
- may affect wildlife populations or habitat (B1)

Agricultural scientists have developed plant crops, together with the use of animal and plant waste to produce renewable biofuels.

Candidates should know and understand that:

- biofuels, eg biogas, bioethanol, biodiesel, are also renewable and can:
 - be burned to produce heat but release carbon dioxide
 - be used as vehicle fuel
 - be 'carbon neutral' or 'green' as carbon dioxide taken out of the air by photosynthesis when energy crops grow is returned when the fuel is burnt so that no extra is added to the atmosphere (B2)

 - be a waste product eg from sewage plants, poultry farms (A1)
 be environmentally damaging when land is cleared, and biodiversity (B1)and food-producing farmland are lost (A1)
 - have a lower energy density than fossil fuel

Environmental scientists use their knowledge of chemistry, physics and biology to consider both the advantages and disadvantages of various energy resources. They consider a number of factors before making conclusions and recommendations.

Candidates should be able to:

- describe: biofuels
- · in terms of:
 - efficiency
 - -predictability
 - intermittency
 - –energy denšity
 - potential environmental impact including:
 - -emissions to air/water
 - -mining/quarrying land take
 - -disturbance to sediment patterns/water flow
 - -hazardous waste
 - -disruption of wildlife
 - -noise/radio disturbance
 - loss of landscape value

Opportunities to investigate using scientific knowledge and skills:

- the amount of energy produced by different vegetable oils/alcohols
- the rise in temperature in a compost heap over time
- public attitudes towards different energy producing technologies





OCR Physics and Science A 21st Century GCSE

Module P3: Sustainable energy, P3.1 How much energy do we use?

2. recall the main primary energy sources that humans use: fossil fuels (oil, gas, coal), nuclear fuels, biofuels, wind, waves, and radiation from the Sun

OCR Biology B Gateway GCSE

Module B6: Beyond the Microscope Item B6d: Biofuels

Assessable learning outcomes both tiers: standard demand

Describe different methods of transferring energy from biomass, to include:

- burning fast growing trees
- · fermenting biomass using bacteria or yeast.

Given data, evaluate different methods of transferring energy from biomass.

Describe the advantages of using biofuels, to include:

- alternative sources to fossil fuels
- no increase in greenhouse gas levels
- no particulates produced.

Recall that a mixture of petrol and alcohol:

- is called gasohol
- is used for cars in countries such as Brazil.

Assessable learning outcomes Higher Tier only: high demand

Explain why the burning of biofuels does not cause a net increase in greenhouse gas levels if:

- they are burnt at the same rate as the biomass is being produced
- areas of land are not cleared of other vegetation in order to grow crops for biofuels.

Explain how, in some areas, the use of large areas of land to produce biofuels is resulting in:

- habitat loss
- · extinction of species.

Understand why gasohol is more economically viable in countries that have ample sugar cane and small oil reserves.

OCR Biology and Additional Science B Gateway GCSE

Module B4: It's A Green World Item B4b: Photosynthesis

Assessable learning outcomes both tiers: standard demand

Describe the conversion of glucose and starch to other substances in plants and their use:

glucose for energy (respiration)

Edexcel Chemistry and Science GCSE

Unit C3: Chemistry in Action Topic 5 Organic chemistry

5.7 Evaluate the factors which are relevant to the choice of method used in the manufacture of ethanol, including:

a the relative availability of sugar cane or sugar beet and crude oil

b the quality of the final product and whether it needs further processing

Edexcel Biology GCSE

Unit B3: Using Biology Topic 3 Biotechnology

3.19 Demonstrate an understanding of the advantages and disadvantages of replacing fossil fuels with biofuels, including the facts that biofuels are renewable and that their production uses carbon dioxide but that growing the crops to make them requires land and may affect the availability of land for growing food.

SQA Standard Grade Science





Topic 3: Energy and its Uses Renewable Sources of Energy

1 Fossil fuels and nuclear fuels are non-renewable, but waves, wind, hydroelectricity and the sun are renewable sources of energy.

2 As the stocks of fossil fuels are depleted these alternative sources of energy will become more important.

Credit Level

3 Other renewable sources of energy include sugar alcohol and geothermal heat.

In sugar-growing countries, sugar can be fermented into alcohol which can be used as a fuel.

4 There are advantages and disadvantages in the use of each alternative or renewable energy source, to include: cost, the technology involved, visual pollution, and reliability of the energy source.

Cambridge 21st Century science iGCSE

Module C3: Food matters C3.1 What is the difference between intensive and organic farming?

- 1. Recall that many chemicals in living things are natural polymers (limited to carbohydrates and proteins)
- 2. recall that cellulose, starch and sugars are carbohydrates made from the elements carbon, hydrogen and oxygen

Cambridge Biology iGCSE (with significant similarity to Coordinated and Combined Science iGCSE) Section II: Organisation and maintenance of the organism

6. Nutrition

List the chemical elements that make up:

- carbohydrates
- Describe the synthesis of large molecules from smaller basic units, i.e.
- simple sugars to starch and glycogen

Describe tests for:

- starch (iodine solution)
- reducing sugars (Benedict's solution)

Cambridge Chemistry iGCSE (with significant similarity to Physical science, Coordinated and Combined Science iGCSE)

2.2 (b) Methods of purification

• Describe methods of purification by the use of a suitable solvent, filtration, crystallisation, distillation

14.8 Macromolecules 14.8 (b) Natural macromolecules

- Describe complex carbohydrates in terms of a large number of sugar units, considered as HO OH, "joined together by condensation polymerisation
- Describe the acid hydrolysis of complex carbohydrates (e.g. starch) to give simple sugars
- Describe the fermentation of simple sugars to produce ethanol (and carbon dioxide)

Cambridge Physics iGCSE (with significant similarity to Coordinated and Combined Science iGCSE)

- 1. General physics 1.6 Energy, work and power 1.6 (b) Energy resources
- Distinguish between renewable and non-renewable sources of energy
- Give advantages and disadvantages of each method in terms of cost, reliability, scale and environmental impact





Key stage 5

AQA Biology A-level

Unit 1 BIOL1 Biology and disease

3.1.3 Biological molecules such as carbohydrates and proteins are often polymers and are based on a small number of chemical elements. Monosaccharides are the basic molecular units (monomers) of which carbohydrates are composed. The structure of α -glucose and the linking of α -glucose by glycosidic bonds formed by condensation to form maltose and starch. Sucrose is a disaccharide formed by condensation of glucose and fructose. Lactose is a disaccharide formed by condensation of glucose and galactose. Biochemical tests using Benedict's reagent for reducing sugars and non-reducing sugars. lodine/potassium iodide solution for starch.

OCR Biology A-level

3.2 AS Unit F212: Molecules, Biodiversity, Food and Health Module 1 Biological Molecules

Candidates should be able to:

- (j) describe, with the aid of diagrams, the molecular structure of alpha-glucose as an example of a monosaccharide carbohydrate;
- (k) state the structural difference between alpha- and beta-glucose;
- (I) describe, with the aid of diagrams, the formation and breakage of glycosidic bonds in the synthesis and hydrolysis of a disaccharide (maltose) and a polysaccharide (amylose);
- (m) compare and contrast the structure and functions of starch (amylose) and cellulose;
- (o) explain how the structures of glucose, starch (amylose), glycogen and cellulose molecules relate to their functions in living organisms;
- (r) describe how to carry out chemical tests to identify the presence of the following molecules: protein (biuret test), reducing and non-reducing sugars (Benedict's test), starch (iodine solution) and lipids (emulsion test);
- (s) describe how the concentration of glucose in a solution may be determined using colorimetry

OCR Chemistry B Salters A-level

Unit F331: Chemistry for Life Developing Fuels Applications

(x) understand the benefits and risks associated with using fossil fuels and alternative fuels (biofuels, hydrogen, nuclear) and discuss the choices involved in making decisions about ensuring a sustainable energy supply.

AQA Environmental Studies A-level

A2 Unit 3 - ENVS3 Energy Resources and Environmental Pollution 3.3.1 Energy

Renewable energy resources

Examples should be used to illustrate the factors affecting the ease of use of renewable energy resources and therefore their likely use in the future

Energy density: biofuels have medium energy densities

Ease of storage: Energy can be stored as potential energy of water in reservoirs and chemical energy in biofuels

Future energy supplies New technologies

New technologies may increase the amount of energy available for use by

- increasing the amount of energy available from existing energy resources
- · allowing new resources to be exploited

Atmospheric pollution

incomplete combustion of fossil fuels and biofuels





AQA Science in Society A-level

Unit 1 AS Exploring key scientific issues 3.1.3 Transport issues

Technical ways of reducing the impact of transport on local air quality and on greenhouse gases. The advantages and disadvantages of different fuels, to include: fossil fuels, bio-fuels, fuel cells and hydrogen.

Fuels are valuable because they are concentrated sources of energy. There is a finite amount of fossil fuel (coal, oil, natural gas) on Earth. Other energy sources (wind, wave, biomass such as wood) are renewable. They can be replaced in the same sort of time scale as they are used.

Unit 3 A2 Exploring key scientific issues 3.3.5 Energy futures The context

The context for this topic is the challenge of reconciling the growing demand for energy resources worldwide, especially the demand for electricity, with the policy imperative to cut down the emission of carbon dioxide and other greenhouse gases. People want the benefits of a readily available supply of electricity but must balance this against the cost of each method of generation and its environmental impact.

Renewable sources of energy are naturally and continually replenished; they include wind, solar power, geothermal, hydropower, and various forms of biomass.

Alternative method

The Department for Education is conducting a review of the primary and secondary National Curriculum. The links below relate to the statutory programmes of study for science in the National Curriculum, 2007 and specific sections of common science qualifications offered in UK schools.

Key stage 3

1.1 Scientific thinking

b. critically analysing and evaluating evidence from observations and experiments.

1.2 Applications and implications of science

a. exploring how the creative application of scientific ideas can bring about technological developments and consequent changes in the way people think and behave.

2.1 Practical and enquiry skills

Pupils should be able to:

- use a range of scientific methods and techniques to develop and test ideas and explanations
- assess risk and work safely in the laboratory, field and workplace
- plan and carry out practical and investigative activities, both individually and in groups.

3.1 Energy, electricity and forces

a. energy can be transferred usefully, stored, or dissipated, but cannot be created or destroyed

3.2 Chemical and material behaviour

c. elements and compounds show characteristic chemical properties and patterns in their behaviour.

3.4 The environment, Earth and universe

c. human activity and natural processes can lead to changes in the environment.

Key stage 4

1 How science works

- **1.1 Data, evidence, theories and explanations** Pupils should be taught:
- a. how scientific data can be collected and analysed
- b. how interpretation of data, using creative thought, provides evidence to test ideas and develop theories





- c. how explanations of many phenomena can be developed using scientific theories, models and ideas
- **1.2 Practical and enquiry skills** Pupils should be taught to:
- a. plan to test a scientific idea, answer a scientific question, or solve a scientific problem
- b. collect data from primary or secondary sources, including using ICT sources and tools
- c. work accurately and safely, individually and with others, when collecting first-hand data
- d. evaluate methods of collection of data and consider their validity and reliability as evidence.
- 1.3 Communication skills Pupils should be taught to:
- a. recall, analyse, interpret, apply and question scientific information or ideas
- b. use both qualitative and quantitative approaches
- **1.4 Applications and implications of science** Pupils should be taught:
- a. about the use of contemporary scientific and technological developments and their benefits, drawbacks and risks
- b. to consider how and why decisions about science and technology are made, including those that raise ethical issues, and about the social, economic and environmental effects of such decisions
- **2.2 Chemical and material behaviour** In their study of science, the following should be covered:
- a. chemical change takes place by the rearrangement of atoms in substances
- b. there are patterns in the chemical reactions between substances
- c. new materials are made from natural resources by chemical reactions
- d. the properties of a material determine its uses.
- 2.3 Energy, electricity and radiations In their study of science, the following should be covered:
- a. energy transfers can be measured and their efficiency calculated, which is important in considering the economic costs and environmental effects of energy use
- c. radiations, including ionising radiations, can transfer energy
- 2.4 Environment, Earth and universe In their study of science, the following should be covered:
- a. the effects of human activity on the environment can be assessed using living and non-living indicators
- b. the surface and the atmosphere of the Earth have changed since the Earth's origin and are changing at present

AQA Chemistry and Science GCSE

Unit C1.4 Crude oil and Fuels C1.4.3 Hydrocarbon fuels

e) Biofuels, including biodiesel and ethanol, are produced from plant material. There are economic, ethical and environmental issues surrounding their use.

C1.5 Other useful substances from crude oil

evaluate the advantages and disadvantages of making ethanol from renewable and non-renewable sources. **Additional guidance:**

Candidates should be able to compare the environmental impact of producing ethanol from renewable and non-renewable sources.

C1.5.3 Ethanol

b) Ethanol can also be produced by fermentation with yeast, using renewable resources. This can be represented by: sugar \rightarrow carbon dioxide + ethanol

AQA Science B GCSE

3.4.2.3 Generation and distribution of electricity

Candidates need to:

- 1. Define the terms renewable and non-renewable in the context of energy sources.
- 2. Know that fossil fuels (natural gas, oil and coal) release energy when they are burned, which can be used to generate electricity for our homes.
- 3. Explain how nuclear fuels and renewable energy sources (wind, solar, hydroelectric, wave, tidal, biomass and geothermal) may be used as alternatives to fossil fuels.
- 5. Explain the problems of using nuclear fuels (problems of radioactive emissions, disposal of waste) and of using renewable energy sources (unreliability and possible effects on the environment).

Within this context, candidates should be able to use scientific data and evidence to discuss,





evaluate or suggest implications of the following:

- the environmental impact over time of energy production by comparing the advantages and disadvantages of using alternative energy sources
- the economic impact of using alternative energy sources

AQA Biology and Science GCSE

B1.5.1 Energy in biomass

a) Radiation from the Sun is the source of energy for most communities of living organisms. Green plants and algae absorb a small amount of the light that reaches them. The transfer from light energy to chemical energy occurs during photosynthesis. This energy is stored in the substances that make up the cells of the plants.

B1.6.2 The carbon cycle

a) The constant cycling of carbon is called the carbon cycle.

In the carbon cycle:

- carbon dioxide is removed from the environment by green plants and algae for photosynthesis
- the carbon from the carbon dioxide is used to make carbohydrates, fats and proteins, which make up the body of plants and algae
- when green plants and algae respire, some of this carbon becomes carbon dioxide and is released into the atmosphere

AQA Environmental Science GCSE

A2.4 What alternative energy technologies are available?

Scientists have developed alternative technologies to harness energy from sources other than fossil fuels. Environmental scientists use their knowledge to assess these alternatives for their efficiency and potential environmental impact.

Scientists have also developed methods of electricity generation from renewable resources that may be used instead of fossil fuels.

Candidates should know and understand that:

- renewable energy resources are usually sustainable:
- not depleted by use including wind power
- capable of rapid replacement including biofuels
- most renewable energy resources:
- use kinetic energy to turn generators, which produce electricity (exceptions include solar water heating, photovoltaics, geothermal and biofuels)
- · usually need larger areas than thermal power stations to yield the same amount of energy
- may be unreliable or cannot provide a constant supply of energy
- may detract from the appearance of a land/seascape (A1)
- may affect wildlife populations or habitat (B1)

Agricultural scientists have developed plant crops, together with the use of animal and plant waste to produce renewable biofuels.

Candidates should know and understand that:

- biofuels, eg biogas, bioethanol, biodiesel, are also renewable and can:
 - be burned to produce heat but release carbon dioxide
 - be used as vehicle fuel
 - be 'carbon neutral' or 'green' as carbon dioxide taken out of the air by photosynthesis when energy crops grow is returned when the fuel is burnt so that no extra is added to the atmosphere (B2)

 - be a waste product eg from sewage plants, poultry farms (A1)
 be environmentally damaging when land is cleared, and biodiversity (B1) and food-producing farmland are lost (A1)
 - have a lower energy density than fossil fuel

Environmental scientists use their knowledge of chemistry, physics and biology to consider both the advantages and disadvantages of various energy resources. They consider a number of factors before making conclusions and recommendations.





Candidates should be able to:

- describe: biofuels
- in terms of:
 - efficiency
 - -predictability
 - -intermittency
 - –energy density
 - potential environmental impact including:
 - —emissions to air/water
 - -mining/quarrying land take
 - -disturbance to sediment patterns/water flow
 - -hazardous waste
 - -disruption of wildlife
 - -noise/radio disturbance
 - loss of landscape value

- Opportunities to investigate using scientific knowledge and skills:
 the amount of energy produced by different vegetable oils/alcohols
- the rise in temperature in a compost heap over time
- public attitudes towards different energy producing technologies

OCR Physics and Science A 21st Century GCSE

Module P3: Sustainable energy, P3.1 How much energy do we use?

2. recall the main primary energy sources that humans use: fossil fuels (oil, gas, coal), nuclear fuels, biofuels, wind, waves, and radiation from the Sun

OCR Biology B Gateway GCSE

Module B6: Beyond the Microscope Item B6d: Biofuels

Assessable learning outcomes both tiers: standard demand

Describe different methods of transferring energy from biomass, to include:

- · burning fast growing trees
- fermenting biomass using bacteria or yeast.

Given data, evaluate different methods of transferring energy from biomass.

Describe the advantages of using biofuels, to include:

- alternative sources to fossil fuels
- no increase in greenhouse gas levels
- · no particulates produced.

Recall that a mixture of petrol and alcohol:

- · is called gasohol
- is used for cars in countries such as Brazil.

Assessable learning outcomes Higher Tier only: high demand

Explain why the burning of biofuels does not cause a net increase in greenhouse gas levels if:

- they are burnt at the same rate as the biomass is being produced
- areas of land are not cleared of other vegetation in order to grow crops for biofuels.

Explain how, in some areas, the use of large areas of land to produce biofuels is resulting in:

- habitat loss
- · extinction of species.

Understand why gasohol is more economically viable in countries that have ample sugar cane and small oil reserves.

OCR Biology and Additional Science B Gateway GCSE

Module B4: It's A Green World Item B4b: Photosynthesis

Assessable learning outcomes both tiers: standard demand

Describe the conversion of glucose and starch to other substances in plants and their use:

glucose for energy (respiration)





Edexcel Chemistry and Science GCSE

Unit C3: Chemistry in Action Topic 5 Organic chemistry

5.7 Evaluate the factors which are relevant to the choice of method used in the manufacture of ethanol, including:

a the relative availability of sugar cane or sugar beet and crude oil

b the quality of the final product and whether it needs further processing

Edexcel Biology GCSE

Unit B3: Using Biology Topic 3 Biotechnology

3.19 Demonstrate an understanding of the advantages and disadvantages of replacing fossil fuels with biofuels, including the facts that biofuels are renewable and that their production uses carbon dioxide but that growing the crops to make them requires land and may affect the availability of land for growing food.

SQA Standard Grade Science

Topic 3: Energy and its Uses Renewable Sources of Energy

1 Fossil fuels and nuclear fuels are non-renewable, but waves, wind, hydroelectricity and the sun are renewable sources of energy.

2 As the stocks of fossil fuels are depleted these alternative sources of energy will become more important.

Credit Level

3 Other renewable sources of energy include sugar alcohol and geothermal heat.

In sugar-growing countries, sugar can be fermented into alcohol which can be used as a fuel.

4 There are advantages and disadvantages in the use of each alternative or renewable energy source, to include: cost, the technology involved, visual pollution, and reliability of the energy source.

SQA Standard Grade Biology

Prescribed practical activity: testing for reducing sugars and starch

SQA Access Chemistry

Prescribed practical activity: testing for starch

SQA Intermediate Chemistry

Prescribed practical activity: testing for sugars and starch

SQA Standard Grade Chemistry

Topic 15: Carbohydrates and Related Substances

Cambridge 21st Century science iGCSE

Module C3: Food matters C3.1 What is the difference between intensive and organic farming?

- 1. Recall that many chemicals in living things are natural polymers (limited to carbohydrates and proteins)
- 2. recall that cellulose, starch and sugars are carbohydrates made from the elements carbon, hydrogen and oxygen

Cambridge Biology iGCSE (with significant similarity to Coordinated and Combined Science iGCSE)

Section II: Organisation and maintenance of the organism 6. Nutrition

List the chemical elements that make up:

- carbohydrates
- Describe the synthesis of large molecules from smaller basic units, i.e.
- simple sugars to starch and glycogen

Describe tests for:

- starch (iodine solution)
- reducing sugars (Benedict's solution)





Cambridge Chemistry iGCSE (with significant similarity to Physical science, Coordinated and Combined Science iGCSE)

2.2 (b) Methods of purification

- Describe methods of purification by the use of a suitable solvent, filtration, crystallisation, distillation 14.8 Macromolecules 14.8 (b) Natural macromolecules
- Describe complex carbohydrates in terms of a large number of sugar units, considered as HO OH, "joined together by condensation polymerisation
- Describe the acid hydrolysis of complex carbohydrates (e.g. starch) to give simple sugars
- Describe the fermentation of simple sugars to produce ethanol (and carbon dioxide)

Cambridge Physics iGCSE (with significant similarity to Coordinated and Combined Science iGCSE)

- 1. General physics 1.6 Energy, work and power 1.6 (b) Energy resources
- Distinguish between renewable and non-renewable sources of energy
- Give advantages and disadvantages of each method in terms of cost, reliability, scale and environmental impact

Key stage 5

AQA Biology A-level

Unit 1 BIOL1 Biology and disease

3.1.3 Biological molecules such as carbohydrates and proteins are often polymers and are based on a small number of chemical elements. Monosaccharides are the basic molecular units (monomers) of which carbohydrates are composed. The structure of α -glucose and the linking of α -glucose by glycosidic bonds formed by condensation to form maltose and starch. Sucrose is a disaccharide formed by condensation of glucose and fructose. Lactose is a disaccharide formed by condensation of glucose and galactose. Biochemical tests using Benedict's reagent for reducing sugars and non-reducing sugars. lodine/potassium iodide solution for starch.

OCR Biology A-level

3.2 AS Unit F212: Molecules, Biodiversity, Food and Health Module 1 Biological Molecules Candidates should be able to:

- (j) describe, with the aid of diagrams, the molecular structure of alpha-glucose as an example of a monosaccharide carbohydrate;
- (k) state the structural difference between alpha- and beta-glucose;
- (I) describe, with the aid of diagrams, the formation and breakage of glycosidic bonds in the synthesis and hydrolysis of a disaccharide (maltose) and a polysaccharide (amylose);
- (m) compare and contrast the structure and functions of starch (amylose) and cellulose;
- (o) explain how the structures of glucose, starch (amylose), glycogen and cellulose molecules relate to their functions in living organisms;
- (r) describe how to carry out chemical tests to identify the presence of the following molecules: protein (biuret test), reducing and non-reducing sugars (Benedict's test), starch (iodine solution) and lipids (emulsion test);
- (s) describe how the concentration of glucose in a solution may be determined using colorimetry

OCR Chemistry B Salters A-level

Unit F331: Chemistry for Life Developing Fuels

Applications

(x) understand the benefits and risks associated with using fossil fuels and alternative fuels (biofuels, hydrogen, nuclear) and discuss the choices involved in making decisions about ensuring a sustainable energy supply.





AQA Environmental Studies A-level

A2 Unit 3 - ENVS3 Energy Resources and Environmental Pollution 3.3.1 Energy

Renewable energy resources

Examples should be used to illustrate the factors affecting the ease of use of renewable energy resources and therefore their likely use in the future

Energy density: biofuels have medium energy densities

Ease of storage: Energy can be stored as potential energy of water in reservoirs and chemical energy in biofuels

Future energy supplies New technologies

New technologies may increase the amount of energy available for use by

- increasing the amount of energy available from existing energy resources
- · allowing new resources to be exploited

Atmospheric pollution

• incomplete combustion of fossil fuels and biofuels

AQA Science in Society A-level

Unit 1 AS Exploring key scientific issues 3.1.3 Transport issues

Technical ways of reducing the impact of transport on local air quality and on greenhouse gases. The advantages and disadvantages of different fuels, to include: fossil fuels, bio-fuels, fuel cells and hydrogen.

Fuels are valuable because they are concentrated sources of energy. There is a finite amount of fossil fuel (coal, oil, natural gas) on Earth. Other energy sources (wind, wave, biomass such as wood) are renewable. They can be replaced in the same sort of time scale as they are used.

Unit 3 A2 Exploring key scientific issues 3.3.5 Energy futures The context

The context for this topic is the challenge of reconciling the growing demand for energy resources worldwide, especially the demand for electricity, with the policy imperative to cut down the emission of carbon dioxide and other greenhouse gases. People want the benefits of a readily available supply of electricity but must balance this against the cost of each method of generation and its environmental impact.

Renewable sources of energy are naturally and continually replenished; they include wind, solar power, geothermal, hydropower, and various forms of biomass.



