

# Knowledge Revision

## AQA Entry Level Certificate in Science

### Biology Topic 2 – Environment, Evolution and Inheritance

You **need to master** and be able to recall the facts so that you can make progress and complete the external assignments to the best of your ability.

You can use Google or revision guides to help you. You can email me any questions or use Zoom if you'd like some immediate face to face help.

You will need to use Zoom when we complete the assignments.

Email: [jdixon@desc.herts.sch.uk](mailto:jdixon@desc.herts.sch.uk)

Zoom:

- Download 'Zoom' app
- Sign up for an account
- Select 'Meet & Chat' on the bottom bar
- Select 'Join' – blue + symbol at the top of the screen
- Enter meeting ID: **960 412 5303**

Name .....

## B2.1 Photosynthesis

KEY LEARNING POINTS – Assess as you go!

	R	A	G
The Sun is the ultimate source of energy for all living organisms.			
Green plants and algae take in carbon dioxide and water and use them to make glucose and oxygen. This reaction is called photosynthesis and can only take place in light.  Carbon dioxide + Water → Glucose (sugar) + Oxygen			
Leaves contain a green pigment called chlorophyll; this absorbs the light needed for photosynthesis.			
Green plants are the only organisms able to take in carbon dioxide. They reduce the level of carbon dioxide in the atmosphere.			
Carbon from the carbon dioxide is changed into carbohydrates like glucose, fats and proteins. These are needed to allow plants and algae to grow.			

### Essential Questions

1. Where does the carbon dioxide needed for photosynthesis come from?
2. Where does the water needed for photosynthesis come from?
3. What happens to the rate of photosynthesis during the night?
4. What do plants use the glucose produced by photosynthesis for?

### CORE

**Describe** an experiment you could carry out to prove that a plant is photosynthesising.

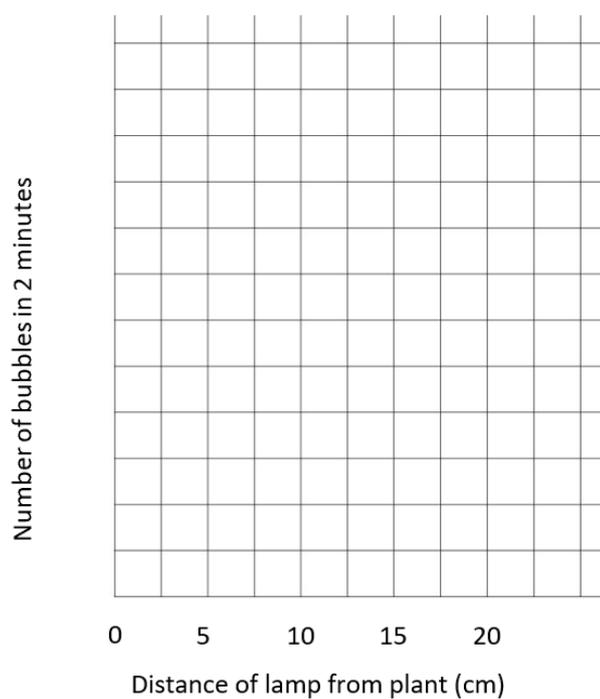
**Describe** data could you collect to investigate how changing the amount of light (light intensity) affects the rate of photosynthesis.

Your teacher might show you some practical work to give you some ideas to build on.

### EXTEND

- **Plot** the data onto the line graph. You will need to add a scale to the vertical axis.

Distance of lamp from plant (cm)	Number of gas bubbles produced in 2 minutes
0	60
5	15
10	4
15	1
20	0



- **Add** a line of best fit.
- **Describe** the pattern between the distance of the lamp from the plant and the number of bubbles produced.

You should be able to give definitions for the following words:

Key word	Definition
Algae	
Carbon dioxide	
Chlorophyll	
Organism	
Photosynthesis	
Producer	
Radiation	

## B2.2 Adaptations

KEY LEARNING POINTS – Assess as you go!

	R	A	G
The place where an organism lives is called its habitat.			
Animals and plants have adaptations (special features) to help them survive in the conditions of their habitat.			
Cacti are desert plants with adaptations to help them survive high temperatures and lack of water.			
Polar bears live in the Arctic and have adaptations to help them survive cold temperatures.			

### Essential Questions

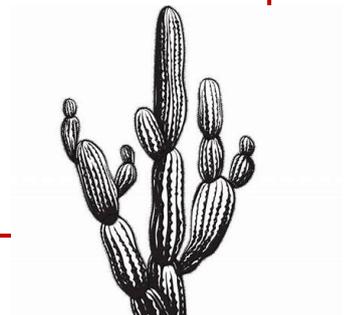
1. Think of a wild animal that you know lots about.
  - a. Where does it live?
  - b. What conditions do they have to cope with i.e. temperature, water availability, food supply, daylength etc.?
  - c. What adaptations does this animal have? You must give at least two, e.g. a polar bear has a layer of fat under its skin
  - d. How does each adaptation help the animal survive? For the polar bear the layer of fat acts as insulation to help the animal stay warm.

### CORE

Plants have adaptations as well as animals.

Cacti live in deserts.

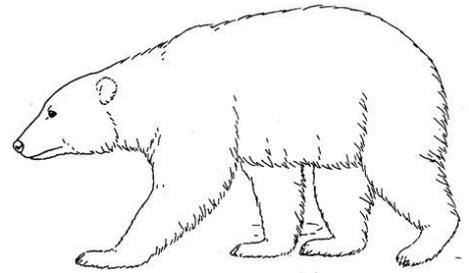
- a. What environmental conditions do cacti have to deal with?
- b. Why do cacti have spines instead of leaves?
- c. How are cacti adapted to get water?
- d. How do cacti grow?



**EXTEND**

Polar bears live in the Arctic and have to cope with extreme cold, snow and hard to get food. How are polar bears adapted to:

- a. Survive cold conditions?
- b. Hunt prey such as seal?



You should be able to give definitions for the following words:

Key word	Definition
Adapted	
Habitat	
Survival	

## B2.3 Food chains and webs

KEY LEARNING POINTS – Assess as you go!

	R	A	G
All food chains start with a green plant known as a producer.			
The last organism in a food chain will be a large predator.			
Food chains link together to make food webs showing how energy is transferred between species.			
Energy is lost from each stage of a food chain.			

### Essential Questions

1. All energy comes from the Sun. How does energy from the Sun transfer to the green plant that acts as a producer in the food chain?
2. This is an example of a food chain:

Lettuce → Snail → Blackbird → Owl

- a. Which organism is the producer?
- b. What is a herbivore? Which organism in the food chain is the herbivore?
- c. What is a carnivore? Which organisms in the food chain are carnivores?
- d. What is a consumer?
- e. What does the arrow in the food chain represent?

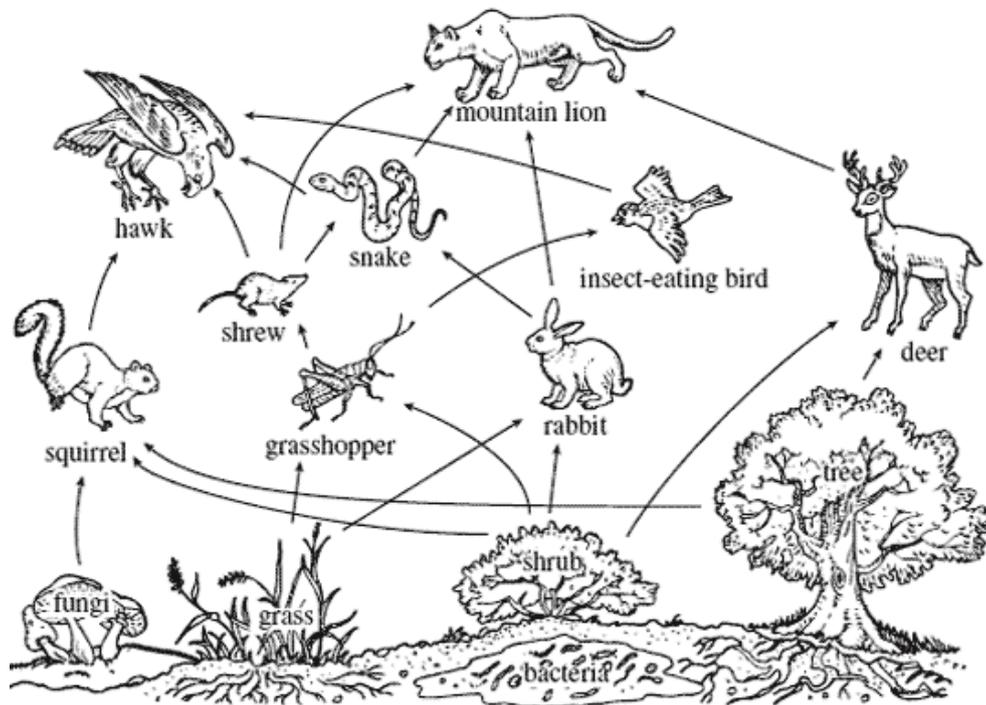
### CORE

**Write** your own food chain with four organisms.

**Label** the organisms – producer, herbivore, carnivore, primary consumer and secondary consumer.

EXTEND

Food chains can be linked together to make a food web:



- Which animals are the top carnivores?
- Name two animals that are herbivores.
- Name two animals that are secondary consumers.
- What would happen to the number of shrews if all the grasshoppers died out?
- What would happen to the snake population if all the rabbits died from a disease?

You should be able to give definitions for the following words:

Key word	Definition
Consumer	
Ecosystem	
Food chain	
Food web	
Producer	

## B2.4 Decomposition and recycling

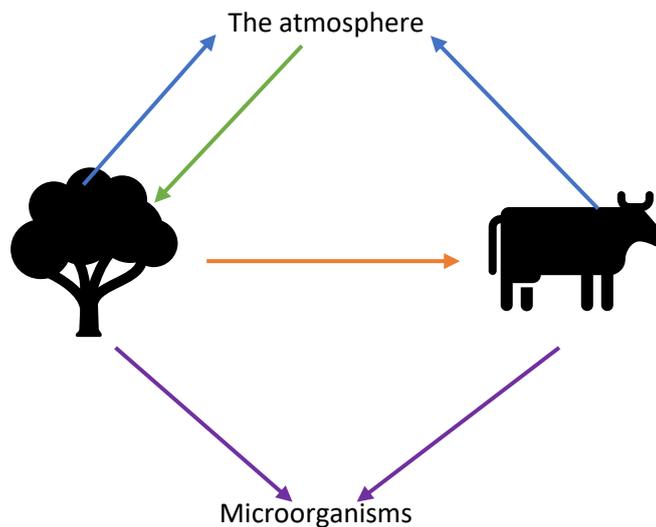
KEY LEARNING POINTS – Assess as you go!

	R	A	G
When organisms die, they decay; this is an essential part of food chains / webs and recycles materials such as carbon and nitrogen.			
Microorganisms bring about decay and release carbon as carbon dioxide back into the atmosphere.			
The carbon dioxide released by microorganisms is used by plants for photosynthesis.			

### Essential Questions

- Carbon needs to be cycled through nature.
  - Which organisms remove carbon dioxide from the atmosphere?
  - Which process removes carbon dioxide from the atmosphere?
  - What process do all living organisms carry out that puts carbon dioxide into the atmosphere?
- Complete this simple carbon cycle using the following words to label the arrows. You can use each word more than once.

Respiration      Photosynthesis      Feeding      Decay



- Microorganisms decay dead plants and animals. What are the best conditions for this?  
**Suggest** experiments you could do to find out if microorganisms work best in hot or cold conditions and in wet or dry conditions.

### CORE

After a lawn is cut Freddie puts all the grass clippings into a compost heap. After two days Freddie notices that the compost heap is getting warmer. **Suggest** what is happening inside the compost heap to cause this?

### EXTEND

To create a stable community processes that remove nutrients or materials, such as carbon, are balanced by processes that return the nutrients / materials. Using the diagram of the carbon cycle **explain** how carbon is balanced in the environment.

What might happen if carbon / carbon dioxide becomes unbalanced, i.e. if there is:

- a. Too much in the environment?
- b. Too little in the environment?

You should be able to give definitions for the following words:

Key word	Definition
Carbon cycle	
Decay	
Environment	
Microorganism	

## B2.5 Competition

KEY LEARNING POINTS – Assess as you go!

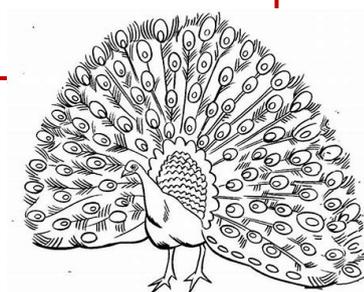
	R	A	G
Plants compete with each other for resources they need to grow such as sunlight, space and water.			
Animals compete with each other for things they need to survive and reproduce, such as territory, mates, food and water.			
Competition can be between individuals of the same species, e.g. red deer stags competing for mates, or between different species e.g. red and grey squirrels competing for food.			

### Essential Questions

1. What do plants need water and sunlight for?
2. Why do crops produce smaller yields in weedy fields?
3. In some parts of Australia there is a species of rat that is introduced and larger and needs more food than the native Australian species. It often beats the native species to food.  
**Predict** the long-term outcome for the native species.

### CORE

Male peacocks need to compete with each other to get a mate. **Describe** how do they do this?



### EXTEND

A student carries out a survey of the number of daisy plants in different areas on the school field. She places a line called a transect across a 100 m stretch. The line starts underneath some trees and works onto open field. Every 10 m she places a quadrat (this is a 1 m<sup>2</sup> square) and carefully counts the number of daisy plants inside it.

Here are the results:

<i>Distance (m)</i>	<i>Number of daisy plants</i>	<i>Distance (m)</i>	<i>Number of daisy plants</i>
0	1	60	23
10	1	70	32
20	5	80	25
30	14	90	30
40	15	100	28
50	22		

- What pattern can you see in the results?
- **Suggest** a reason for this pattern?
- What errors could the student have made when they were collecting their results? **Suggest** reasons to improve the data collection.

You should be able to give definitions for the following words:

Key word	Definition
Competition	
Nutrients	
Plants	
Territory	

## B2.6 Environmental changes

KEY LEARNING POINTS – Assess as you go!

	R	A	G
All living organisms are affected by other living and non-living things in their habitats.			
Living factors are called biotic factors and include other plants, animals (predator and prey) and microorganisms.			
Non-living factors are called abiotic factors and include rainfall, light intensity, temperature, soil pH etc.			
Changes in the environment might be extreme or long-lasting and can lead to problems in surviving. If they cannot survive a species may become extinct.			

### Essential Questions

1. Look at your garden or the school playing field or a local park. **List** all the abiotic (non-living) things you can see and that you think will affect the plants and animals living there.
2. What does it mean if a species goes extinct?
3. What causes animal and plant species to go extinct?

#### CORE

**Suggest** what might happen if the environmental conditions of an area change? You might think about what has happened when rainforests are cut down.

#### EXTEND

**Design** an investigation into the abiotic factors in your garden / school field.

Include information about how you could compare three different areas for the soil temperature, light intensity and soil moisture.

You should be able to give definitions for the following words:

Key word	Definition
Abiotic	
Biotic	
Extinct	
Environment	

## B2.7 Pollution and human population

KEY LEARNING POINTS – Assess as you go!

	R	A	G
Pollutants are man-made substances that cause damage to the environment.			
Water can be polluted by sewage (water from bathing, toilet and the sink); fertiliser and toxic chemicals.			
Air pollution can come from burning fossil fuels and car exhaust fumes. Polluting gases include carbon dioxide and sulfur dioxide which causes acid rain.			
Other chemicals such as pesticides (kill pests) and herbicides (kill plants) add to water and land pollution.			
There are more people on the planet than ever before, and the population is growing. This means greater use of resources and greater waste production.			

### Essential Questions

1. What are non-renewable resources?
2. What human activities reduce the amount of land available for plants and animals?
3. What human activities pollute the environment? Which part of the environment is polluted?
4. What is sewage?
5. What environmental problems does burning fossil fuels cause?
6. Coal contains sulfur impurities. When coal burns the sulfur reacts with oxygen in the air to form sulfur dioxide. How does this lead to acid rain?
7. What problems does acid rain cause?

### CORE

**Suggest** alternatives to human activities that are less polluting, for example for transport, dealing with sewage, heating homes and generating electricity.

### EXTEND

1. To get rid of rubbish produced at home it could be sent to landfill and buried or burnt. Which one do you recommend and why?
2. **Design an experiment to evaluate** the air pollution away your school. One possible technique is to use discs waxed with Vaseline to collect the air pollution or collect leaf samples and wipe them with cotton buds to compare the difference.

Make predictions about the pollution levels in different locations.

You should be able to give definitions for the following words:

Key word	Definition
Acid rain	
Deforestation	
Environment	
Herbicide	
Landfill site	
Pesticide	
Pollution	
Sewage	
Toxic	

## B2.8 Evolution, natural selection and artificial selection

KEY LEARNING POINTS – Assess as you go!

	R	A	G
Charles Darwin suggested the theory of evolution that all living organisms evolved from simpler ones.	Red	Yellow	Green
Organisms that are best adapted to their habitats are more likely to survive and reproduce. This is called natural selection.	Red	Yellow	Green
Humans will breed plants or animals based on the features they want – this is called artificial selection.	Red	Yellow	Green
Fossils provide evidence for evolution.	Red	Yellow	Green
Fossils form from the remains of plants and animals.	Red	Yellow	Green

### Essential Questions

1. What is evolution?
2. Natural selection can be shown by the example of the peppered moth. There are two versions – a black one and a white one.



(AQA teacher guide)

- a. Which version of the moth is more likely to survive in polluted areas? Why?
  - b. Why is this an example of natural selection?
3. What is a fossil?
  4. How do fossils form?

### CORE

With artificial selection humans breed a trait they want to improve in the organism. **Suggest** what features have been artificially selected for in:

- a. Horses?
- b. Cows?
- c. Wheat?
- d. Domestic dogs?

### EXTEND

Find out more about the peppered moth.

- **Create** a storyboard to describe the changes in the population before, during and after the Industrial Revolution.
- **Explain** how the peppered moth demonstrates 'survival of the fittest'.

You should be able to give definitions for the following words:

Key word	Definition
Evolution	
Extinct	
Fossils	
Selective breeding	
Theory	

## B2.9 Sexual and asexual reproduction

KEY LEARNING POINTS – Assess as you go!

	R	A	G
There are two types of reproduction; sexual and asexual.			
Sexual reproduction involves two parents with the joining together of the nuclei from a female and male sex cell. The offspring are different to the parents – they have variation.			
Asexual reproduction involves only one parent and no sex cells. The offspring is identical to the parent, i.e. it is a clone.			

### Essential Questions

1. **Complete** the table to **compare** sexual and asexual reproduction.

	<i>Sexual reproduction</i>	<i>Asexual reproduction</i>
How many parents?		
Is the offspring identical to or different from the parent(s)?		
Advantages		
Disadvantages		

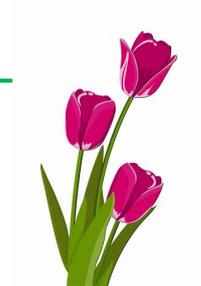
2. What are the sex cells for:
  - a. Animals?
  - b. Plants?
3. What is passed on from parent(s) to offspring that determines what the offspring looks like?
4. Give two examples of asexual reproduction.

### CORE

**Explain** why do all living organisms need to reproduce? If you are not sure of your answer think about what would happen if a species stopped breeding.

EXTEND

**Describe** and **compare** fertilisation in humans / mammals with fertilisation in plants such as tulips and primroses.



You should be able to give definitions for the following words:

Key word	Definition
Asexual reproduction	
Characteristics	
Clone	
Cutting	
Gene	
Offspring	
Sexual reproduction	
Variety	

## B2.10 Human genetics

KEY LEARNING POINTS – Assess as you go!

	R	A	G
Inside plant and animal cells a nucleus that has two roles: 1. Control cell activities 2. Contain genetic material, called DNA.			
DNA is contained in chromosomes.			
Every human body cell has 23 pairs of chromosomes. i.e. 46 in total.			
A section of DNA is called a gene. Each gene controls a physical feature (characteristic).			
One pair of chromosomes determines your gender - XX for female and XY for male.			
Humans use genetic engineering to cut a useful gene from one organism and transfer it into the nucleus of a cell from another organism.			

### Essential Questions

1. **Describe** the simple structure of a human cell. To do this you could **draw and label** a simple cell.
2. What do genes do?
3. How many chromosomes are found in a human egg and human sperm cell? Think carefully about your answer and remember that nuclei from these two cells join together at fertilisation.

### CORE

**Complete** the sentences:

The genetic material of a cell is located inside a \_\_\_\_\_. The DNA is found on structures called \_\_\_\_\_. A section of DNA that codes for a characteristic is called a \_\_\_\_\_. All body cells contain \_\_ of these structures.

EXTEND

1. **Describe** the basic principles of genetic engineering.
2. **Evaluate** the risks and benefits of genetic engineering.

You should be able to give definitions for the following words:

Key words	Definition
Characteristics	
Chromosomes	
DNA	
Gene	
Genetic engineering	
Plasmid	