

Highsted Knowledge Organiser, Science, Term 5, Year 8: Genes

What I need to know

Graphing variation
Inheritance
Genetics
Adaptations
Natural Selection
Evidence for evolution
Extinction
Human reproductive system
Embryo development

Key Vocabulary:

adaptation, egg cell, embryo, fertilisation, foetus, gamete, ovulation, placenta, puberty, sperm cell, allele, chromosome, competition, DNA, evolution, extinct, fossil, gene, mutation, natural selection

Challenge question:

Does our environment or our genetics have a greater control over who we are?

Suggested reading:

www.kerboodle.com
<https://www.bbc.co.uk/bitesize/topics/zpffr82>

Variation

- The differences in characteristics of living things is known as **variation**
- There is a large amount of variation between different **species**, but within species many more characteristics are shared
- Even though two organisms may look the same, they will always have variation between them

Inherited variation	Environmental variation
<ul style="list-style-type: none"> Is anything that comes directly from your parents, anything that you inherit Examples can include lobe less or lobed ear lobes and eye colour 	<ul style="list-style-type: none"> Is any type of variation that is caused by your surroundings Factors that can cause environmental variation include diet, education and lifestyle

- Environmental factors can also impact inherited factors, for example a poor diet can affect height or your exposure to the sun can affect skin tone
- Characteristics which are inherited and not affected by environmental variation include natural eye colour, blood group and genetic diseases

Adaptations

- Adaptations** are characteristics which organisms have developed to best survive in their surroundings
- Organisms with the best suited adaptations can breed and pass these on
- Those who are not best adapted will die out and not be able to pass on their genes

Reproductive systems

both of these supply nutrients for the sperm

scrotum - keeps the testes outside the body where the temperature is a few degrees cooler and better for development of sperm

The menstrual cycle

- The **menstrual cycle** is the process in which an egg is released from an ovary and leaves through the vagina
- Day 1: blood from the uterus lining leaves through the vagina, which is known as a **period**
- Day 5: the bleeding stops and the uterus lining starts to re-grow
- Day 14: an egg is released from one of the ovaries during **ovulation**
- If the egg is **fertilised** then the menstrual cycle stops until the baby is born

Fertilisation, implantation and gestation

- Egg cells and sperm cells are also called **gametes**, and each contains half the genetic information needed to form a complete organism.

Egg cells

An egg is released by the ovaries every month
The egg cell is moved along the oviduct towards the uterus by **cilia**

Sperm cells

Sperm cells are produced in the testicles/testes
Sperm are mixed with nutrients and fluid from the glands to form **semen**
During sexual intercourse a man will release semen into the vagina (**ejaculation**)

If a sperm meets the egg **fertilisation** may happen
The fertilised egg may then **implant** in the uterus lining and form an **embryo** (ball of cells)

- During **gestation** the developing **foetus** needs nutrients from the mother, these are passed through the **placenta** which is connected to the fetus by the **umbilical cord**
- Nutrients are passed from the mother to the baby and waste products are passed back from the baby to the mother
- The baby is protected from bumps to the mother by the **amniotic sac** which acts as a shock absorber

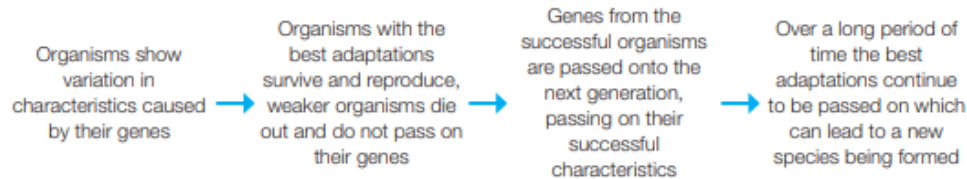
Length	Developmental Stage
Just a dot	1 week - cells beginning to specialise
3 mm long	4 weeks - spine and brain forming, heart beating
3 cm long	9 weeks - tiny movements, lips and cheeks sense touch, eyes and ears forming
7 cm long	12 weeks - fetus uses its muscles to kick, suck, swallow, and practise breathing

Adolescence

- Adolescence** is the process in which a child changes into an adult, it involves both physical and emotional changes
- The physical changes alone in this time are known as **puberty**, these are caused by **sex hormones**

Natural selection

- Scientists believe that the organisms which we see on Earth today have gradually developed over millions of years, this is known as **evolution**
- Charles Darwin came up with the concept of **natural selection**, he said that only the best adapted animals will survive to pass on their **genes**, weaker animals will die out



- One example of natural selection can be seen in giraffes, only the giraffes with the longest necks would be able to eat from trees, the ones with shorter necks would not be able to eat and die out
- This would mean that only the gene for long necks would be passed on, leading to all giraffes having long necks

Extinction

- A species will become **extinct** when all of a species die out
- The **fossil record** shows us that animals have existed in the past which have now become extinct
- Extinction can be caused by:
 - Changes to the environment
 - Destruction of habitat
 - New diseases
 - Introduction of new predators
 - Increased **competition**
- When a species becomes extinct, the variety of species within an ecosystem is reduced, this is also known as a reduction in **biodiversity**
- The more diverse a **population** is, the more likely they are to survive environmental changes

Punnet squares

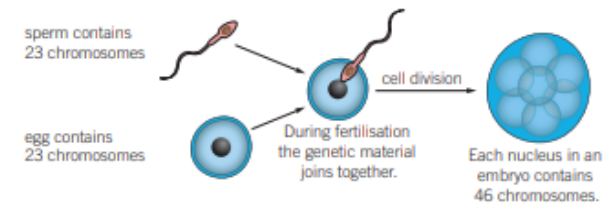
		Possible alleles from father	
		B (dominant allele for brown eyes)	b (recessive allele for blue eyes)
Possible alleles from mother	b (recessive allele for blue eyes)	Bb Offspring will have brown eyes as B is dominant	bb Offspring will have blue eyes as both alleles are recessive
	B (dominant allele for blue eyes)	Bb Offspring will have brown eyes as B is dominant	bb Offspring will have blue eyes as both alleles are recessive

Genetic modification

- Genetic modification** is the process which scientists can use in order to alter the genes of an organism
- Examples of this include altering cotton to produce higher yields, altering bacteria genes to produce medicines and altering crops to produce their own insecticides

Inheritance

- Characteristics** are passed along from parents to their offspring
- Half of the genetic information comes from each parent, this is passed on through the sex cells in the process of fertilisation

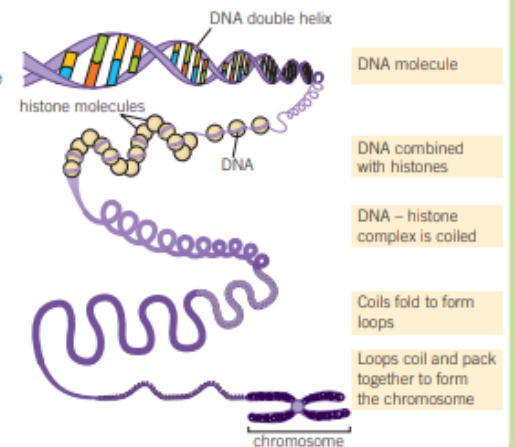


- DNA** is the material which contains all of this genetic information

DNA – in the shape of a double helix

Genes – a section of DNA which hold the information for a particular characteristic

Chromosomes – long strands of DNA which hold many genes, humans have 46 of these in the nucleus of cells



Genetics

- For every characteristic an organism will have two **alleles**, this is two different genes which can code for the same characteristic, one is inherited from each parent
- Dominant** alleles will cause the characteristic to be displayed even if they are with another allele, this is represented by a capital letter
- Recessive** alleles will not be displayed as characteristics unless there are two of the same allele, they are the characteristic least likely to be shown, this is represented by a small letter
- We can predict the inheritance of characteristics using a **Punnet square**



Highsted Knowledge Organiser, Science, Term 6, Year 8: Scientific Enquiry

What I need to know

The scientific enquiry process

Challenge question:

How is the scientific method useful in understanding how the world works?

Suggested reading:

www.kerboodle.com

<https://www.bbc.co.uk/bitesize/topics/zsg6m39>

Key words and definitions

Bar chart/column graph- A graph or chart that displays the values of categories.

Categoric- A variable that has values that are words.

Conclusion- What you write down to say what you have found out during an investigation.

Confidence- How sure you are of your conclusion based on the data.

Continuous (variable)- Has values that can be any number.

Control group- Those that are not exposed to the factor being tested.

Control measure- An action taken to remove the hazard or to reduce the exposure to it.

Control variable- One that remains unchanged or is held constant to stop it affecting the dependent variable.

Correlation- A relationship between variables where one increases or decreases as the other increases.

Data- Words or numbers that you obtain when you make observations or measurements.

Dependent variable- What you measure or observe in an investigation when you change the independent variable.

Discontinuous (variable)- Has values that are words or discrete numbers.

Discrete- A variable that can only have whole-number values.

Evaluate- To discuss the quality of data collected during an investigation and suggest improvements to the method.

Evidence- Information (measurements, observations, facts, or conclusions) that scientists use to develop or check theories, or evaluate claims.

Experimental error- Variations in measurements, owing to the method, measurement techniques, or the instrument.

Fair test (enquiry)- An experiment to find out how one variable affects another, while all other variables are kept constant.

Hazard- A situation that presents a threat to people.

Hypothesis- An explanation you can test that includes a reason and a 'science idea'.

Independent variable- What you change in an investigation to see how it affects the dependent variable.

Interval- The gap between the values of the independent variable.

Investigation- An experiment or set of experiments designed to produce data to answer a scientific question or test a theory.

Line graph- A graph that shows the relationship between two continuous variables.



Line of best-fit- A straight or curved line drawn to show the pattern of data points that travels through or very close to as many of the points plotted as possible.

Linear relationship- When two variables are graphed and show a straight line that goes through the origin, and they can be called directly proportional.

Mean- An average of a set of data, calculated by adding all the values and dividing by the number of values.

Observation- Information gathered by your senses.

Observation enquiry- An experiment to find out about things that change over time.

Outlier/anomaly- A piece of data that does not fit the pattern.

Pattern seeking enquiry- An experiment to find out if there is a correlation between variables.

Pie chart- A chart that shows the proportions or percentages that make up a whole.

Plan- A description of how you will use equipment to collect valid data to answer a scientific question.

Precise- This describes a set of repeat measurements that are close together.

Prediction- A statement that says what you think will happen in an experiment.

Random error- Occurs when the same quantity is measured and inconsistent values obtained.

Range- The maximum and minimum values of a variable

Real difference- There is a real difference between two means if their ranges do not overlap much.

Repeatable- When repeat readings are close together.

Risk- How likely something is to be harmful.

Risk assessment- A description of how you will make it less likely that people will be injured, or equipment damaged, and what to do if this happens.

Sampling- The collection of a small amount of data about a population that is used to make estimates about the whole population.

Scatter graph- Shows the independent variable vs dependent variable.

Scientific enquiries- Different ways to investigate including observation over time, fair test and pattern seeking.

Spread- The difference between the highest and lowest measurements of a set of repeat measurements.

Systematic error- Arises from an inaccuracy in the system and gives rise to errors of the same value.

Variable- A factor that can be changed, measured and controlled.