Key Stage 3 Computing and ICT.

All knowledge organisers are hosted in the ICT and Computing department website which can be accessed directly via the link http://exmouthcollege.moodle.webanywhere.co.uk/

Year 9

Effective digital working practices Knowledge Organiser
Data representation Knowledge Organiser
Block structured programming Knowledge Organiser
Software Knowledge Organiser
Hardware Knowledge Organiser
Boolean logic Knowledge Organiser
Text based programming Knowledge Organiser
Computational thinking Knowledge Organiser
Spreadsheets Knowledge Organiser
Networks and website design Knowledge Organiser
Computer Graphics Knowledge Organiser

Unit 1 Foundation Number

BIDMAS is the acronym to give the priority of operations:
Brackets, **Indices** (powers and roots), **Division** AND **Multiplication**, **Addition** AND **Subtraction**
Do anything in brackets first, then any indices, then, from left to right, and divisions or multiplications, then, from left to right, any additions or subtractions.
Video 211 - https://tinyurl.com/y98jn4wk

= means equals

≠ means not equals

≈ means roughly equals

A **function** is a rule that acts on a number. Eg) x2 (times 2)

An **inverse function** reverses the effect of a function

+ and – are inverse operations

x and ÷ are inverse operations

Key Points:

https://tinyurl.com/y7zu77l9

Squaring a number means multiplying it by itself. The result is a **square number**. Eg) $4^2 = 4 \times 4 = 16$ which is a square number
Video 226 - https://tinyurl.com/ya4v48rn
Cubing a number means multiplying it by itself twice. The result is a **cube number**. Eg) $4^3 = 4 \times 4 \times 4 = 64$ which is a cube number
Video 212 - https://tinyurl.com/ydd72o3d
The **square root** of a number is the number you must square to get the original number. It is the inverse of squaring. Eg) $\sqrt{16} = 4$
Video 228 - https://tinyurl.com/yc28q7lv
The **cube root** of a number is the number you must cube to get the original number. It is the inverse of cubing. Eg) $\sqrt[3]{64} = 4$
Video 214 - https://tinyurl.com/y9q9m7nb

A **prime number** has two factors, itself and 1. Eg) 2, 3, 5, 7, 11, 13, 17, 19, 23...
Video 225 - https://tinyurl.com/ybnk7z5n

To **multiply powers** of the same number, add the indices, e.g. $4^3 \times 4^8 = 4^{11}$
To **divide powers** of the same number, subtract the indices, e.g. $4^8 \div 4^3 = 4^5$
Video 174 - https://tinyurl.com/za9u7h2

Knowledge Check:

https://tinyurl.com/ya7obwjs

Rounding is where you approximate a number to make it more manageable.
If we round to decimal places, we get rid of all digits after the required decimal place. The final decimal place goes up by one if the first digit we ignore is 5 or more. Eg) 4.597 = 4.6 (1 d.p.)
Video 278 - https://tinyurl.com/y9x7ltoh
If we round to **significant figures**, we get rid of all digits after the required digits from the left (ignoring leading zeros). The final digit goes up by one if the first digit we ignore is 5 or more. Eg) 0.0465 = 0.047 (2 s.f.)
Video 279a - https://tinyurl.com/yakhqfup
To **estimate** we round all numbers in a calculation to 1 significant figure (1 s.f.).

A **factor** is a number you can multiply by to get a desired number. Eg) 2 is a factor of 8
Video 117 - https://tinyurl.com/zymmfev
A **multiple** is a number you can divide by an integer to get a desired number. Eg) 16 is a multiple of 8
Video 220 - https://tinyurl.com/yaudfco3
Highest Common Factor (**HCF**) is the highest factor that is common to two or more numbers. Eg) 4 is the HCF of 8 and 12
Video 219 - https://tinyurl.com/zel3pzq
Lowest Common Multiple (**LCM**) is the lowest multiple that is common to two or more numbers. Eg) 24 is the LCM of 8 and 12
Video 218 - https://tinyurl.com/y8hg8z35

Unit 2 Foundation Algebra

A **term** is a number, a letter, or a number and a letter multiplied together. Eg) 3, a, 2b, $4c^2$
Video 19 - https://tinyurl.com/hgw9ulw
Letters represent **variables**; the value can vary.
Like terms contain the same letters or power of letters, or are just numbers. Eg) 3 and 4, 3a and 6a, b^3 and $2b^3$
To **simplify** an expression we can **collect like terms**.
Eg) 3a + 2 + 4a = 7a + 2
Video 9 - https://tinyurl.com/z77lutd
We can also simplify multiplications by removing the multiplication symbol and divisions by making into a fraction. Eg) 2 x a = 2a, c ÷ d = c/d or $\frac{c}{d}$
If we have an expression or equation and are given the value of a variable, we can **substitute** this value in. Eg) 3a + b = c where a = 2 becomes 6 + b = c
Video 20 - https://tinyurl.com/zd6tv9j

Key Points:

https://tinyurl.com/y9j5u8ws

A **formula** shows the relationship between terms. Eg) 4a + b = c

An **expression** is a collection of terms. Eg) 2a + 1

An **equation** is an expression equalling another. Eg) 3b + 2 = 2d

An **inequality** is where two expressions don't, or don't necessarily, equal each other (<, >, ≤, ≥). Eg) 4f > 6

An **identity** is two expressions that always equal each other, regardless of the variables. Eg) 2(a + 5) ≡ 2a + 10

A **not equal** symbol shows that two expressions do not equal each other. Eg) 2a ≠ b
Video 16 - https://tinyurl.com/j5cdu68

To multiply terms, multiply any numbers, put non-like terms next to each other, and add powers of like terms. Eg) 2a x 3a x 4b = $24a^2b$
Video 18 - https://tinyurl.com/ybaxlv6k
To multiply the same variable with powers, add the indices. Eg) $2a^2 \times 4a^3 = 8a^5$
To divide the same variable with powers, subtract the indices. Eg) $8a^5 \div 2a^3 = 4a^2$
Video 11 - https://tinyurl.com/ycvjot5b

Knowledge Check:

https://tinyurl.com/yb8a3eto

To **expand brackets**, multiply the terms in the brackets by the multiplier. Eg) 5(a + 2) = 5 x a + 5 x 2 = 5a +10
Video 13 - https://tinyurl.com/hepjutn
To expand **double brackets**, multiply every term in on bracket by every term in the other. Eg) (a + b)(c + d) = a x c + a x d + b x c + b x d = ac + ad + bc + bd
Video 14 - https://tinyurl.com/ycptvous

To **factorise** expressions we reverse the expansion of brackets. We do this by dividing through by the **HCF** (highest common factor) and putting the HCF as the multiplier outside the brackets. Eg) 5a + 10b = 5(a + 2b)

Video 117 - https://tinyurl.com/zymmfev

To rearrange an equation (or inequality), always do the same to both sides of the equation and use the opposite operator to remove a term. Eg) a + 2b = c [- a]

2b = c – a [÷ 2]

$$b = \frac{c-a}{2}$$

We use this to change the subject of a formula.

Video 110 - https://tinyurl.com/y866296z

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Unit 1 Higher Number

HCF and LCM V219 V218

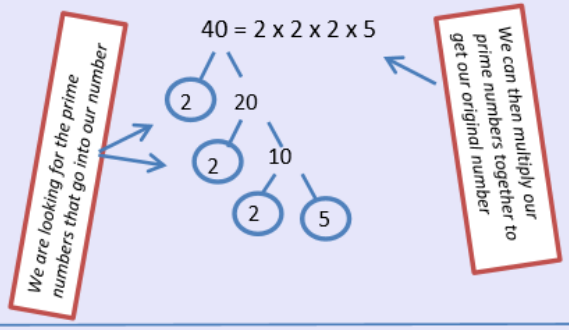
(Highest Common Factor and Lowest Common Multiple)

HCF - this is largest number that divides exactly into 2 or more numbers. E.g. HCF or 12 and 20 = 4
LCM - this is the smallest number that is in the times table of 2 or more numbers. E.g. LCM of 12 and 20 = 60

Product of Prime Factors V219

This is finding all the prime numbers that would multiply to give our number. It is often shown using a factor tree ('tree thingy'). V223

Eg. 40 as a product of prime factors



Using product of prime factors to find our HCF and LCM

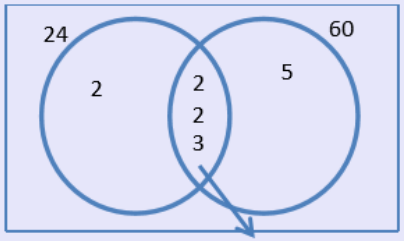
Example: Find the HCF and LCM of 24 and 60

Step 1:
24 = 2 x 2 x 2 x 2
60 = 2 x 2 x 3 x 5

← *Write each number as a product of prime factors*

V224

Step 2: Draw a Venn Diagram



Place you prime factors into your Venn diagram

The HCF of 24 and 60 = 2 x 2 x 3 = 12 ← *Multiply the common prime factors*

The LCM of 24 and 60 = 2 x 2 x 2 x 3 x 5 = 120 ← *Multiply all the prime factors*

Laws of Indices V17

Index/power

3^3

base

When multiplying indices with the same base, you ADD the indices

Multiplying Indices

$y^3 \times y^3 = y \times y \times y \times y \times y \times y = y^6$

Dividing Indices

$y^6 \div y^4 = \frac{y \times y \times y \times y \times y \times y}{y \times y \times y \times y} = y^2$

When dividing indices with the same base, you SUBTRACT the indices

Power to another power (brackets)

$(y^3)^2 = (y \times y \times y)^2$
$= y \times y \times y \times y \times y \times y = y^6$

With brackets just MULTIPLY your indices

Zero Indices

$y^0 = 1$ ← Anything to the power of 0 always equals 1

Negative Indices V175

$y^{-1} = \frac{1}{y}$

$y^{-2} = \frac{1}{y^2}$ ← The negative sign means 'one over' the base number

e.g. $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$

Fractional Indices

$y^{\frac{2}{3}} = (\sqrt[3]{y})^2$ ← The denominator of the fractional power becomes a root and the numerator becomes a power

$8^{\frac{2}{3}} = (\sqrt[3]{8})^2 = 4$

V173

Standard Form

V300 V301 V302 V303

A number is in standard form when it is in the form $A \times 10^n$, *where* $1 \leq A < 10$.

For example, 63000 = 6.3 x 10^4. This is in standard form because 6.3 is between 1 and 10. 63 x10^4 is not in standard form as 63 is not between 1 and 10.

Examples
45 000 000 000 = 4.5 x 10^{10}
0.0000000000091 = 9.1 x 10^{-12}

Standard form is used so very large or very small numbers can be written out easily.

Surds

A surd is a number written exactly using square or cube roots.
For example $\sqrt{3}$ and $\sqrt{5}$ are surds. $\sqrt{4}$ and $\sqrt[3]{27}$ are not surds, because $\sqrt{4} = 2$ and $\sqrt[3]{27} = 3$.

Multiplying Surds

$\sqrt{m} \times \sqrt{n} = \sqrt{m \times n} = \sqrt{mn}$
E.g. $\sqrt{3} \times \sqrt{2} = \sqrt{3 \times 2} = \sqrt{6}$

Dividing Surds

$\sqrt{m} \div \sqrt{n} = \sqrt{\frac{m}{n}}$

E.g. $\sqrt{12} \div \sqrt{3} = \sqrt{\frac{12}{3}} = \sqrt{4} = 2$

V305 V306 V307 V308

Year 9 – Maths / Unit 1 Number (Higher) – HT1

Unit 2 Higher Algebra

Corbett Maths video links: V7 V13 V288

nth term:

Example: For the following sequence, the first term (n = 1) is 2.
The 2nd term (n = 2) is 5.

Positions (n numbers) →	1	2	3	4	5	6	.... n
TERMS →	2	5	8	11	14	17	.....
		+3	+3	+3	+3	+3	

So we try rule: $n^{th\ term} = 3n$. Testing the rule with n = 1 (1st term) gives 3, and we know 1st term should be 2, so we need an extra correction to rule of -1

So rule is: $t_n = 3n - 1$

67th term is $t_{67} = 3 \times 67 - 1 = 200$

Substitution:

Just like in sport, *substitution* means *swapping* one thing for another – but instead of a fresh player for a tired player, it's swapping a number for a letter.

If ⚽ = 5

then: ⚽ + 4 = 5 + 4 = 9

6 x ⚽ = 6 x 5 = 30

⚽ / 5 = 5 ÷ 5 = 1

When the expressions or formulae become a bit more complicated, it's *essential* that you follow the rules of BODMAS/BIDMAS:

e.g. If g = 10: 5 + 3g = 5 + 3 x 10
= 5 + 30
= 35

Rather than drawing a football every time, they'd just use the letter "f"

Simplifying expressions:
Gather together like terms,
eg. **3e + 2 + 4e – 8 = 7e + 6**

Solving equations:

BALANCE METHOD:

You can use this on any equation, whether the unknown is on one side, or both

You can do whatever to like, so long as you do the *same* to both sides:

4f + 3 = 2f + 23

4f + 3	=	2f + 23	[take 2f from each side]
2f + 3	=	23	[take 3 from each side]
2f	=	20	[divide both sides by 2]
f	=	10	

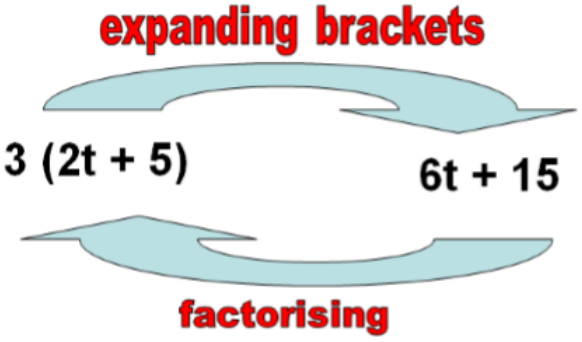
If you want to get rid of something negative, ADD that same amount to both sides

Classic exam question:

Bob works shifts in a café, where he get £6 a hour, plus a £5 travel bonus each day.

(a) Write a formula to describe his pay P for a day's shift of h hours: P = 6h + 5
(b) Use this formula to find his pay for a 7 hour shift: P = 6h + 5 = 6 x 7 + 5 = 42 + 5 = £47

Factorising



Expanding (2a+3)(4a+2)

	2a	+3
4a	$8a^2$	+12a
+2	+4a	+6

$8a^2 + 16a + 6$

Year 9 – Maths / Unit 2 Algebra (Higher) – HT1

Year 9 knowledge Organiser

AO3- Analyse and evaluate

Key
GCSE
Advanced
Secure
Developing

		Examples
Isometric	When the muscle contracts but does not change in length	e.g. Handstand, a gymnast holding the crucifix
Isotonic contraction	Concentric contraction - shortening of the muscle	e.g. execution phase of a chest pass (extension at the elbow)
	Eccentric contraction - lengthening of the muscle	e.g. downwards phase of a squat during the preparation phase of a basketball set shot (flexion at the knees)
SPORT	Specificity- Making training specific to the sport being played	• movements used • muscles used • energy system(s) used
	Progressive Overload- Gradual increase of the amount of overload so that fitness gains occur, but without potential for injury.	Frequency – how often you train e.g. training twice a week and increasing this to three times a week
		Intensity – how hard you train e.g. speed, level, intensity or weight e.g. from 20 reps to 22 reps
		Time – the length of the training session e.g. training for 45mins per session to 50mins.
		type – the specific method, e.g. continuous training. Refer to year 8 knowledge Organiser
	Reversibility -Losing fitness levels when you stop exercising. This could be caused by gaps in training or due to an injury	To avoid- use the SAFER principles - Stretch before training, appropriate intensity, correct footwear and clothing and correct rest and recovery.
	Tedium - Boredom that can occur from training the same way every time.	Variety is needed: changing the exercises, method of training or listening to music.
Aerobic	Summarised as: glucose + oxygen → energy + carbon dioxide + water.	When exercise is low to moderate intensity, the heart can supply all the oxygen that the working muscles need. Sports: long distance runners,
Anaerobic	Summarised as: glucose → energy + lactic acid	When exercise duration is short and at high intensity, the heart and lungs cannot supply blood and oxygen to muscles as fast as the respiring cells need them. Sports: sprinters, shotput, long jumpers etc.
Aerobic training zone	The aerobic training zone allows the aerobic system to be trained. 1. Calculate maximum heart rate (220 bpm) minus age: 220-age 2. Work at 60-80% of maximum heart rate.	Types of training: Continuous, long interval
anaerobic training zone	The anaerobic training zone- 80-90% of Maximum heart rate.	Types of Training: Short interval, plyometric

Short term-effects of exercise

- Increases heart rate
- Increases tidal volume

- Increases stroke volume (SV)
- Increase cardiac output
- Increases Temperature: vasodilation

Long term-effects of exercise

- Decreases fat stores
- Improves components of fitness e.g. flexibility, strength, muscular endurance.

- Lower resting HR 60> bradycardia
- Increased cardiac muscle (SV)-hypertrophy

Language for learning Physical Education

Year 7 (AO1)

Movement Analysis
- **Muscles**
  - Position and location on the body
- **Types of actions/movements**
  - Definitions: Flexion, extension, abduction, adduction, Planta flexion & dorsi-flexion.
  - Linked to practical examples

Fitness & Training
- **Components of fitness**
  - Definitions: Muscular endurance, cardiovascular endurance, agility, reaction time, flexibility and coordination.
  - Linked to sporting examples

Cardio-respiratory
- **Short-term effects of exercise**
  - Linked to components of an effective warm-up.

Year 8 (AO2)

Movement Analysis
- **Bones / Types of bones**
  - Position and location on the body
- **Antagonistic pairs**
  - Agonist and antagonist
- **Types of actions/movements**
  - Linked to practical examples (preparation, execution & follow through)

Fitness & Training
- **Components of fitness**
  - Relative of importance to a sports performer.
- **Methods of training / FITT**
  - Linked to component of fitness and specificity of a performer

Cardio-respiratory
- **Types of respiration**
  - Definitions: Aerobic (with O2) Anaerobic (without O2)
  - Link to practical examples
- **long-term effects of exercise**

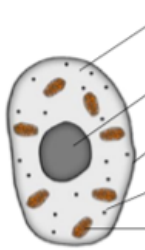
Year 9 (AO3)

Movement Analysis
- **Muscles & bones working together**
  - Actions and movements
  - Analysis linked to practical examples
- **Types of Muscle contractions**
  - Analysis- Isometric, isotonic: eccentric & concentric

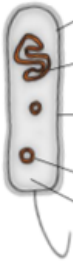
Fitness & Training
- **Components of fitness**
  - Analysis & Evaluation
- **Methods of training / SPORT**
  - Comparing sports performers
  - Advantages and disadvantages

Cardio-respiratory
- **Types of respiration**
  - Calculations
  - Analysis to practical examples/ components of fitness
- **Short/ long-term effects of exercise**
  - Evaluate benefits to a performer

Cell Biology and diffusion L1-7



cytoplasm	*site of chemical reactions in the cell*	gel like substance containing enzymes to catalyse the reactions
nucleus	*contains **genetic material***	controls the activities of the cell and codes fro proteins
cell membrane	*semi permeable*	controls the movement of substances in and out of the cell
ribosome	*site of protein synthesis*	mRNA is translated to an amino acid chain
mitochondrion	*site of respiration*	where energy is released for the cell to function



cell membrane	*site of chemical reactions in the cell*	gel like substance containing enzymes to catalyse the reactions
bacterial DNA	*not in nucleus floats in the cytoplasm*	controls the function of the cell
cell wall	***NOT** made of cellulose*	supports and strengthens the cell
plasmid	*small rings of DNA*	contain additional genes
cytoplasm	*semi permeable*	controls the movement of substances in and out of the cell

Bacterial cells are much smaller than plant and animal cells

animal cell

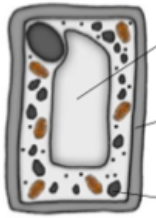
plant cell

Eukaryotes complex organisms

AQA Cell Structure

Prokaryotes simpler organisms

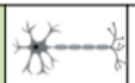
contains all the parts of animal cells plus extras



permanent vacuole	*contains cell sap*	keeps cell turgid, contains sugars and salts in solution
cell wall	*made of cellulose*	supports and strengthens the cell
chloroplast	*site of photosynthesis*	contains chlorophyll, absorbs light energy

Specialised cells

specialised animal cells

nerve		*carry electrical signals*	long branched connections and insulating sheath
sperm		*fertilise an egg*	streamlined with a long tail acrosome containing enzymes large number of mitochondria
muscle		*contract to allow movement*	contains a large number of mitochondria long

specialised plant cells

root hair		*absorb water and minerals from soil*	hair like projections to increase the surface area
xylem		*carry water and minerals*	TRANSPIRATION - dead cells cell walls toughened by lignin flows in one direction
phloem		*carry glucose*	TRANSLOCATION - living cells cells have end plates with holes flows in both directions

Cell differentiation

how a cell changes and becomes **specialised** **Undifferentiated** call are called **STEM** cells

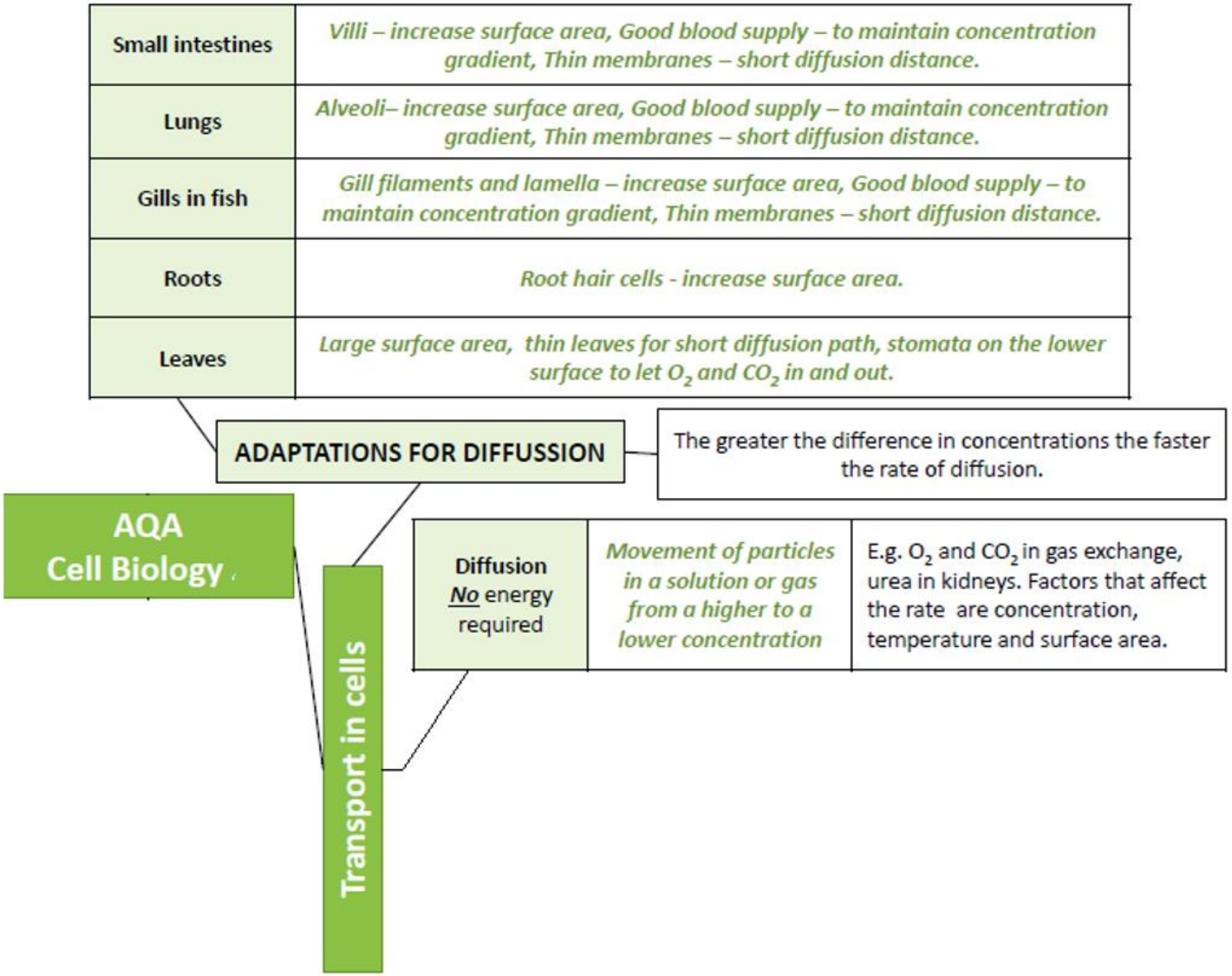
animal cell differentiation

early stages of development only for repair and replacement

plant cell differentiation

all stages of life cycle the stem cells are grouped together in meristems

Cell Biology and diffusion L1-7



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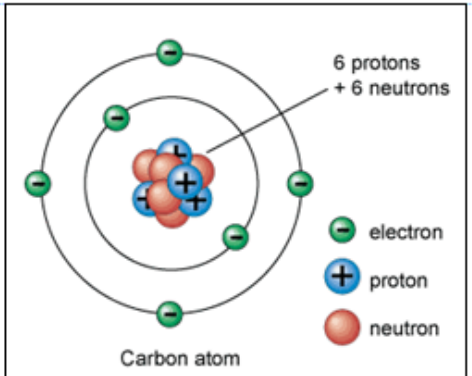
Atomic Structure Knowledge Organiser



Carbon atom

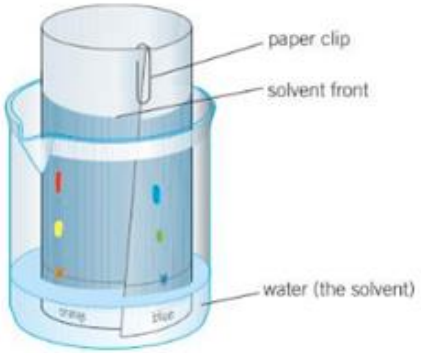
Name	Charge	Mass
Proton	+1	1
Neutron	0	1
Electron	-1	1/1840

Year	History of the Atom
1800s	John Dalton came up with the idea of the atom—tiny, hard spheres.
1800s	J.J. Thomson discovered the electron and theorised the Plum Pudding model.
1900s	Geiger and Marsden completed the gold-foil experiment and discovered the nucleus.
1914	Niels Bohr came up wit h the idea of energy levels.
1932	James Chadwick discovered the neutron.

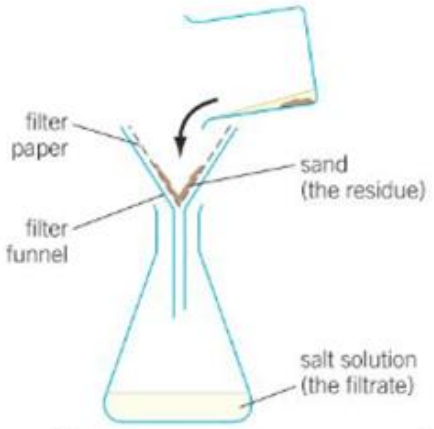
Keyword	Definition	Keyword	Definition
1. Atoms	The smallest part of an element that can still be recognised as that element.	13. Reactant	The substances you start a reaction with
2. Element	A substance made up from only one type of atom. An element cannot be broken down chemically into any simpler substance.	14. Product	The substances made from the reaction
3. Compound	A substance made when two or more elements are chemically bonded together.	15. Symbol Equation	An equation that uses the symbols for elements found in the periodic table.
4. Mixture	When some elements or compounds are mixed together and intermingle but do not react together (i.e. no new substance is made)	16. Word Equation	An equation that uses words to name the substances found in the reaction.
5. Periodic Table	An arrangement of elements in the order of their atomic numbers, forming groups and periods.	17. Law of the conversation of mass	The total mass of the products formed in the reaction is equal to the total mass of the reactants.
6. Group	A column of the periodic table.	18. State symbol	Added to a reactant or product to tell you whether or not a substance is solid (s), liquid, (l), gas, (g) or aqueous (aq)
7. Period	A row of the periodic table.	19. Atomic Number	The amount of protons found in the nucleus for that particular element.
8. Nucleus	The very small and dense central part of an atom that contains protons and neutrons.	20. Ion	When an electron is either gained or lost from an atom
9. Electron	A tiny particle with a negative charge. Electrons orbit the nucleus of atoms or ions in shells. It has a negligible mass.	21. Isotope	When the number of electrons and protons for an element is the same but the neutrons have changed
10. Proton	A tiny positive particle found inside the nucleus. It has a mass of one.	22. Shell	Electrons are arranged around the nucleus, going up in energy per shell.
11. Neutron	A dense particle found in the nucleus of an atom. It is electrically neutral, carrying no charge.	23. Electronic Structure	The arrangement of electrons around the nucleus. There are 2 electrons in the first shell, and 8 in every shell after that.
12. Molecule	A grouping of two or more atoms bonded together.	24. Noble Gas	Gases that always have a full outer shell of electrons.

Year 9 – Science / Atomic Structure– HT1

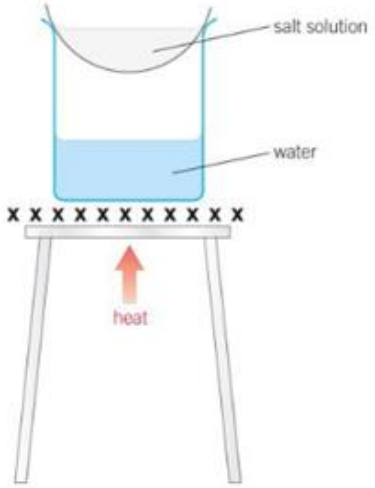
Atomic Structure Knowledge Organiser



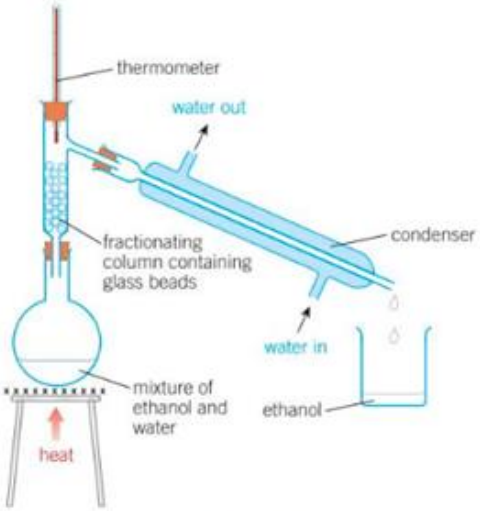
Chromatography



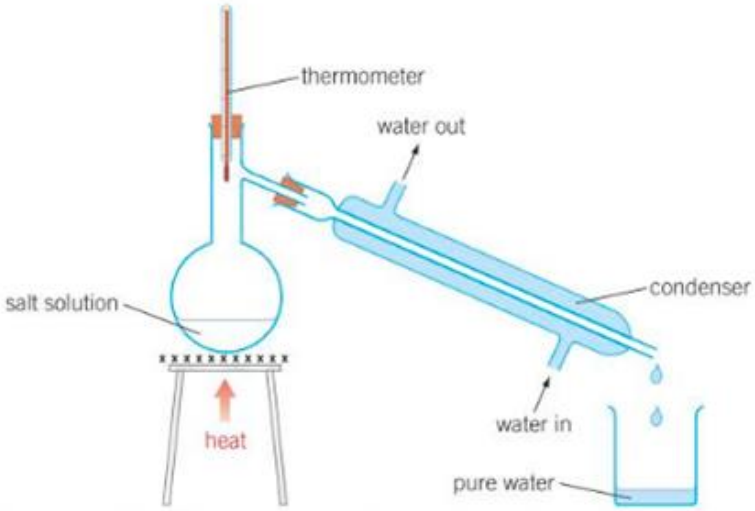
Filtration



Crystallisation



Fractional Distillation



Distillation

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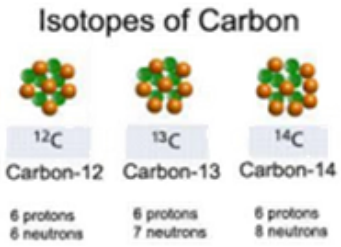
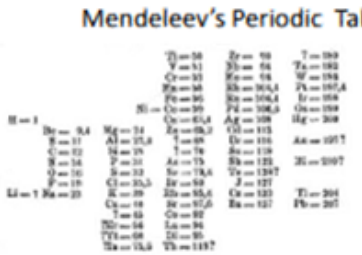
The Periodic Table knowledge Organiser

The History Of The Periodic Table

- Throughout history scientists have tried to classify substances and many scientists attempted to construct a Periodic table.
- Before the knowledge of proton , neutrons and electrons, scientists arranged the periodic table by **atomic weight** . This meant the groups were not always correct.
- In 1869 Dimitri **Mendeleev**, a Russian scientist, published his Periodic Table. It was slightly different to those that had been before. He still arranged elements by atomic weight but he also left gaps for where he predicted elements would be.
- He very accurately predicted the properties of elements that were not discovered until many years later; for example Gallium.
- Mendeleev's Periodic table is still different from the modern one as some of his masses were wrongdue to the existence of **isotopes**.
- Isotopes are elements with the same number of protons and electrons but a different number of neutrons and therefore different atomic weight.

Key Terms	Definitions
Dimitri Mendeleev	A Russian chemist, who in 1869 published a Periodic Table con-
Periodic Table	The Table which organises the 118 elements based on atomic
Isotope	Two atoms with the same number of protons and electrons but
Metal	An element which loses electrons to form a positive charge.
Non Metal	An element which gains electrons to form a negative charge.
Ion	An element with a positive or negative charge





The transition metals, in the central block of the periodic table are :

- good conductors of heat and electricity.
- can be bent or hammered into shape.
- copper is used in plumbing because it is resistant to corrosion (will not react with the water in the pipes) and electrical wiring because it is a good conductor of heat and electricity.

Aluminium and titanium are useful metals because they have a low density and are resistant to corrosion.

Groups in the Periodic Table

	Physical Properties	Chemical Properties	Equation	Trends / Explanation
Group 1 (Alkali Metals)	Soft, low density	React vigorously with water releasing hydrogen.	Sodium + water → sodium hydroxide + hydrogen	More reactive as you go down. Outermost electron further from the nucleus so it's easy to lose.
Group 7 (Halogens)	Low melting point, exist as a pair(Cl_2)	React with group 1 metals to form compounds. Can carry out displacement reactions.	Sodium + chlorine → sodium chloride Sodium bromide + chlorine → sodium chloride + bromine	Higher melting popint as you go down the group (higher molecular mass). Less reactive as you go down the group.
Group 0 (Nobel Gasses)	Low melting / boiling point. Eight electrons in outer shell (except helium)	Unreactive, as they have a full outer shell	N/A	Higher melting point and boiling point as you go down the gfroup (due to increase in density).

Year 9 – Science / Periodic Table – HT1

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Year 9

Rotation 1: Designing for user needs.

Smart and modern materials:

Smart materials react with their surrounding environment such as changing colour in the sun. Modern materials have been produced to fit a need such as Kevlar in military body armour.

Understanding a client's needs

A client is the person the product is designed for. You need to 'know' your client and their 'needs' in a product to ensure your designs will be suitable. Carrying out a client profile is one way of fact finding as well as research such as product analysis to identify what is already available on the market.

Designers identify the opportunity to develop new products based on technology push or market pull.

Technology push

Technology push is when products are re-designed because of changes in materials or manufacturing methods. This might mean that new materials have become available, with improved properties; or that improvements in manufacturing processes mean a manufacturer can make the product cheaper of more effectively, which reduces manufacturing costs.

Market pull

Market pull is when product ideas are produced in response to market forces. Examples of market influences include;

- A demand from consumers for new or improved products.
- A competing product is launched by another manufacturer.
- A manufacturer wants to increase their share of the market.

Consumer choice

Once a designer has identified an opportunity for a product, the next step is to identify the detail of what consumers want. To do this they need to identify who the different customers are and what they are looking for, e.g. a choice of different styles, performances and process.

For example, car manufacturers design slightly different versions of the same car model to suit individual driver's different tastes. Market research is carried out to identify consumer wants and desires.

Design should consider its impact on:

Social/moral/ethical/environmental issues.

Context/brief/specification

These are all vital to establish at the start of the designing process. The context is the general situation where there is a problem such as 'encouraging people to live healthier lifestyles'. The brief is then written to identify the client, some of their needs and possible constraints such as 'design and make an app that monitors the user's health'. Constraints could include cost, materials, time, safety. A specification is a detailed document that clearly identifies what the client needs and wants from the product and should be detailed enough that a designer could read t and design a suitable product. ACCESSFM is often used to help identify all aspects of the

Materials

When choosing suitable materials for designs it is important to consider the properties and characteristics of the materials and how they perform as well as look, last over time and can be shaped and finished.

Timbers: wood comes from trees and can come from hard or soft woods.

Hard wood comes from deciduous trees which shed their leaves in autumn such as oak. They grow slowly so tend to be more expensive. **Soft woods** come from coniferous trees that have needles or leaves that are evergreen. These tend to grow much quicker making it cheaper to produce. Each ring in the tree trunk shows you the year's growth, count the rings and you can see how old the tree is. **Manufactured boards** are mad by gluing wood pieces together. They are made from waste materials or recycled woods, an example of this is plywood and MDF.

Design Strategies & communication methods

Different approaches to designing a product are called design strategies.

Iterative design is widely used, it involves making a model of the design, which is then tested and evaluated. A new improved model is then made, and the process is repeated until you have a suitable idea that meets all the client's needs. There is also user **centered design** (where the user is integral to every step of the process and decision) and **inclusive design** (that considers all potential users including ages/gender/physical abilities).

Freehand sketching is great for quick initial ideas, they can be 2D or 3D and may have technical notes.

Working drawings are more formal and communicate the sizes and technical aspects of the design. **Orthographic** is a way of drawing 3D objects in 2D from different viewpoints. **Isometric** is a method of drawing an object in 3D with each side being drawn at a 30' angle. **Perspective drawings** can have one or two-point perspective, where the image looks like it is vanishing away to a point or points. **Exploded views** show how all the parts of the product fit together, this can often be drawn on a computer. This is known as CAD-computer aided design.

Key words

Design context: the general situation where there are problems that need solutions.

Design possibilities: opportunities, related to the design context, from which the need for a specific solution is identified.

Client: also known as the user, the person or persons who will buy/use the product.

Client profile: a summary of the client's needs/likes/dislikes.

Primary research: first hand, gathered direct from the client.

Secondary research: comes from second hand sources such as the internet.

Manufacturing specification: a document containing all the information needed to make the product.

Iterative design: a design strategy that follows a cyclic make-test-evaluate approach.

Orthographic projection: a way of showing a 3D object in 2D by drawing it from the front, plan and side views.

Isometric projection: a method of drawing an object in 3D where each side is drawn at a 30' angle.

Year 9 – Design & Technology / Designing – HT1

Exmouth Community College
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Year 9 Food Preparation and Nutrition Block 1: Knowledge Organizer

The Eatwell Guide

The Eatwell Guide is the UK healthy eating model. It shows the proportions in which different types of foods are needed to have a well-balanced and healthy diet. The proportions shown are representative of your food consumption over the period of a day or even a week, not necessarily each meal time.

The Eatwell Guide is based on the Government's *Eight tips for healthy eating*, which are:

1. Base your meals on starchy foods.
2. Eat lots of fruit and vegetables.
3. Eat more fish – including a portion of oily fish each week.
4. Cut down on saturated fat and sugar.
5. Try to eat less salt – no more than 6g a day for adults.
6. Get active and be a healthy weight.
7. Don't get thirsty
8. Don't skip breakfast.

Information on a label

The name of the food
An ingredients list
Information on certain foods causing allergies
The net quantity of the food
A date of minimum durability
Any special storage conditions
The name and address of the food manufacturer
The country of origin
Instructions for use
The alcoholic strength by volume
A nutrition declaration

A date of minimum durability (how long the product will keep):

Use-by dates – On foods that can go off quickly, e.g. sandwiches.
Sell-by date/display-until dates – A few days before the use-by date, to allow time to eat the food.
Best-before dates – These are on foods that keep for longer, such as biscuits or canned foods. The food should be eaten before this date when the food is at its best, but to eat it after that date will not usually be harmful.

Basic Nutrition

Nutrient	Function
Protein	Growth & repair
Carbohydrate (Starch & sugar)	Energy
Fat	Energy
Vitamins	
A, B, C, D	General protection
Minerals	
Iron	Healthy Blood
Calcium	Healthy Bones and teeth

Conduction	**When heat travels through solid materials such as metals and food.**
Convection	When heat travels through air or water.
Radiation	When heat rays directly warm and cook food. Heat travels from one place to another.

Nutritional Needs

Babies
Ideally they should have breast milk for the first six months.
Babies should taste and try lots of different suitable foods.
They need lots of energy for growth and movement.
Don't add salt or sugar to babies' food.
Foods rich in iron and vitamin C are especially needed from 6 months, as the baby's natural stores of iron are low.

Children
Gradually introduce the Eatwell Guide between 2 and 5 years.
All need to eat regular, smaller meals, snacks and drinks.
High energy needs due to growth and activity.
Eat less salt and sugar.
Protein
Calcium and vitamin D
Iron and vitamin C
B group vitamins

Teenagers
Follow the Eatwell Guide.
Increased appetites.
Growth spurts and very active, so high energy needs.
If teenagers are inactive, they should eat smaller portions to avoid weight gain.
Protein
Calcium and vitamin D
Iron and vitamin C

Adults
Follow the Eatwell Guide.
Adults have lower energy needs.
They need to avoid foods high in sugar and fat to prevent weight gain.
Many adults are overweight or obese, so they should make lower-calorie choices.
Calcium and vitamin D
Iron and vitamin C

Year 9 – Design & Technology / Food Preparation & Nutrition – HT1

Click on the images to find hidden content!

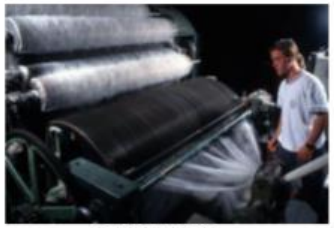
How are Fabrics Made?

Fabrics are made up of different types of fibres. Fibres can come from nature, like cotton from the cotton plant, or wool from sheep and they can also be synthetic (man-made) and be made from chemicals. Fibres often look like hair and they can be processed in different ways to make fabric. How they are processed affects the properties of the fabric, as does the fibre you start with.

There are three main ways to make fabric- Weaving, Knitting and Felting or Bonding.

Woven Fabric

When fibres are collected from nature, they need to be cleaned before they can be turned into fabric, they also are often carded (combed) to remove any debris and help the fibres lay in the same direction. Imagine a sheep's fleece- that needs cleaning and carding before the next stage of the process can begin.

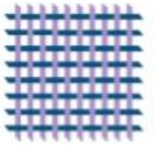


Carding machine

This giant machine spins all the fibres into yarn, ready for weaving.

Once the fibres are clean and ready to use, they are twisted together- this is called spinning. Lots of fibres are spun together making one long strand. The thickness of the strand varies, depending on how you want finished fabric to turn out.

The spun fibres are then woven together on something called a loom. There are lots of different types of weaves and they give a different end result. You might be most familiar one called a plain weave, this is used for fabric that could be made into school shirts, dresses and bedding. If you look very carefully at your school shirt, you might be able to see the different strands woven together. A Twill weave is used to make Denim fabric, which will be used to make Jeans.



Plain weave

Twill weave

Weaving can also be done by hand, this is usually for special fabric, perhaps even using silk.

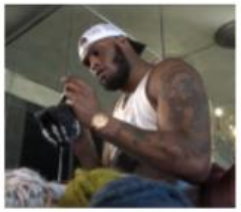
How are Fabrics Made?

Knitted Fabric

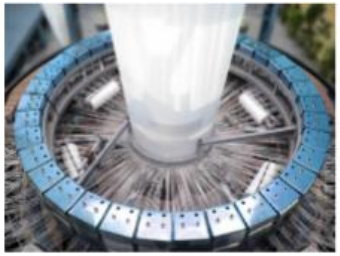
When you think of knitted fabric, you might think of what your grandparents or parents or even you do with knitting needles. Essentially, it is the same process for making knitted fabrics, but on a much larger scale, and using machinery.

Just the same as when making woven fabric, the fibres need cleaning and carding and then spinning before they can be knitted.

After that, the yarn is knitted into either rolls of flat fabric, or sometimes tubes of fabric or even whole garments such as tights or socks.



Heavy weight fighter Maurice Greene started knitting before a fight to calm him down. He's recently moved onto crochet.

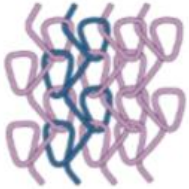


This is a type of loom that is making knitted fabric that is in the shape of a tube. This could be used to make the body of a t-shirt, the arms and neck hole would be attached separately.

This is a picture of what knitted fabric would look like if you looked at it very closely. You can see the yarn is looped together. This makes knitted fabric stretchy so it's great for making into things like T-shirts and sportswear.

So it's not just woolly jumpers that are knitted, but also leggings, swim suits, underwear, socks and any other Textiles items that are stretchy, are likely to be made from knitted fabric.

'Weft' knit



'Warp' knit

How are Fabrics Made?

Felted and Bonded Fabric

Felted fabric is made directly from the fibres. No spinning is needed, although the fibres are still washed and carded. Wool is one of the best natural fibres to create felted fabric, because each fibre has a scaly structure that looks a bit like a fir-cone. When the fibres are heated up, the scales open up and then lock together with other fibres when they are agitated (rubbed together).

Wool fibre under a microscope

Felt fabric does not stretch, and can be very warm because of the way it is made. Felt does not fray like woven fabric, or unravel or ladder like knitted fabric but it doesn't drape very well so tends to be used for items like hats, bags and coats.

You may have heard of Needle Felting and Wet Felting. These are both crafts that can be done at home to create a variety of different items. Felting is also done on an industrial scale, and felt can be shaped as it's being made- like into the shape of a hat!

Bonded fabrics are also made directly from fibres, rather than yarn. The fibres are laid out in a random pattern, and then bonded together using heat or glue.

These fabrics tend to be very weak, but they don't stretch or fray. They are used for disposable items like J-cloths, surgical gowns and wet wipes.

Q What would be the best method of making fabric for a school bag? Explain why.

Q Why are fibres 'carded' before being spun into yarn?

Q What is the name for the machine that is used to make yarn into fabric?

Click on the images to find hidden content!

Natural Fibres

Textiles are usually made up of fibres. Fibres can come from all sorts of places like plants, animals, insects and even synthetic (man-made) fibres that come from chemicals. Fibres often look like hairs and can be processed in different ways to make Textiles, also called fabric.

Wool

Wool is a fibre that comes from animals. We mostly get wool from sheep, but you can also get wool from camels, alpacas, llamas, goats and even rabbits! It's possible to make wool from anything that is hairy- you could even make wool fabric from a dog!

Angora rabbit

Before and after shearing!

The wool is sheared from the animal (like having a haircut) and then it's washed, combed and processed to turn it into wool fabric. Wool fabric is warm so it's good for making into things like jumpers, scarves and coats. It's also used to make carpets and insulation to keep your house warm. Wool is absorbent and it can also shrink easily so you have to be careful when you wash it.



Cotton

Cotton Boll

Cotton is a fibre that comes from the cotton plant. The plant grows in warm climates and needs lots of water. After the plant has flowered, it produces a 'boll' which contains the seeds of the plant. In nature, these would be blown around by the wind and the seeds would disperse and grow new plants. Instead, we farm the plants and pick the cotton 'bolls', process them and turn them into cotton fabric.

Cotton feels cool to wear when it's hot, but it can crease easily. It can be quite hard wearing so can be washed easily and can last a long time. Cotton is also absorbent so it's good for making things like towels. Other items made from cotton include bedding, t-shirts, socks and underwear, trousers and school shirts. Cotton is cool to wear so it is used for a lot of clothing.

Field of Cotton plants




Silk

Silk comes from the cocoon of a silk worm. The silk worm (which is actually a caterpillar) spins a cocoon of silk around itself when it is ready to turn into a moth. People farm the silk worms, just like people farm sheep and when they make their cocoons it can take them up to 8 days! The farmers then put them in hot water to release the glue that holds the silk fibres together. Then the silk fibres are processed to turn them into silk fabric.

Silk Worm

Silk Worm Cocoon

As each cocoon is very small, silk fabric is very expensive as it takes so much effort to make just one item – it takes around 1,800 cocoons to make one silk dress! Silk is quite a delicate fabric and can be easily damaged when it's wet (eg washing). Silk is often used for special items like wedding dresses, or special occasion shirts or ties but some people have silk underwear! Silk keeps you cool when it's hot, and also keeps you warm when it's cold. It has a natural 'lustre' or shine.

Linen

Flax plant

Linen comes from a plant called the Flax plant. The stem of the plant is used to make fibres. The plants are cut, then the stems are soaked in water to get rid of the soft parts. That leaves the tough fibres behind which are then processed to turn them into linen fabric.

Flax plant drying after cutting

Linen is great for summer clothes because it's very cool to wear. Linen is hardwearing so lasts for a long time but creases very easily. Apart from summer clothes, it can also be used to make tea towels and table cloths among other things.

Q What type of fibre do you think would make a good T-shirt? Can you give reasons why?

Q Why do you think cotton is a good fibre to make summer socks?

Q What fibre would be good to make a blanket from? Why would it work well?