Name and Tutor group:

Year 9 Knowledge Organiser

Term 4

Contents

CORSHAM CHARACTER

INTELLECTUAL VALUES

The pursuit of truth, knowledge and understanding.

Be reflective. Be curious. Be open-minded. Be creative.

PERFORMANCE VALUES

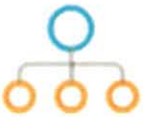
Maximum effort, maximum focus.

Be resilient. Always Persevere. Contribute to Teamwork. Be ambitious.

DREAM BELIEVE ACHIEVE

Choose any of the following activities to complete your homework

	Look, Cover, Write, Check	Definitions to key words	Flashcards	pictures
Stage 1	Look at & study an area of your knowledge organiser 	Write down the key words & definitions 	Write key words, dates/formulae, equations/quotes on one side & answers on the other 	Draw pictures/diagrams/ cartoon strips 
Stage 2	Cover up your knowledge organiser and write everything you remember 	Cover up the definitions. How many can you remember? Repeat. 	Include pictures or diagrams if it helps. Read through them. 	Label your pictures/diagrams/ cartoon strips 
Stage 3	Check. Correct mistakes in green and add anything you missed. Repeat 	Check. Correct mistakes in green pen. Which ones do you find hard to remember? 	Test yourself and get someone to test you. 	Explain out loud to yourself or family/friend what your images show 

	Self quizzing	Mindmaps	Paired retrieval	Speak, Cover, Write, Check
Stage 1	Use your knowledge organiser to create quiz questions. 	Create a mindmap of everything you can remember from your knowledge organiser 	Give a family member/friend the knowledge organiser to hold 	Read out loud the information from the knowledge organiser several times. 
Stage 2	Write down the answers to your quiz 	Check your knowledge organiser & use a green pen to make any corrections. 	Get them to test you using the knowledge organiser 	Cover up your knowledge organiser and write everything you remember 
Stage 3	Keep self-quizzing until you get all the answers correct 	Add additional information to your mindmap or make connections to other knowledge 	Write down your answers to their questions 	Check. Correct mistakes in green and add anything you missed. 

LEARN TO STUDY USING...

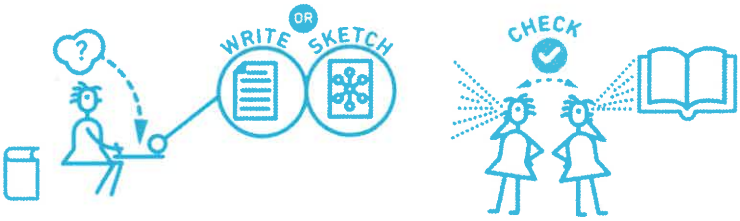
Retrieval Practice

PRACTICE BRINGING INFORMATION TO MIND

LEARNINGSCIENTISTS.ORG

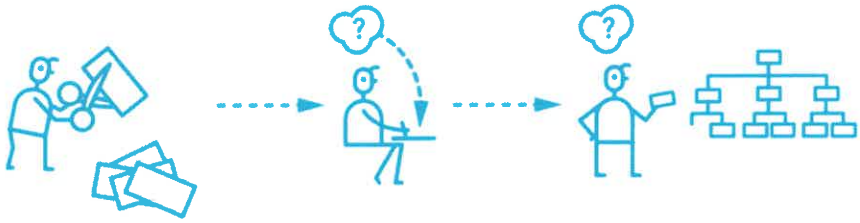
HOW TO DO IT

Put away your class materials, and write or sketch everything you know. Be as thorough as possible. Then, check your class materials for accuracy and important points you missed.



Take as many practice tests as you can get your hands on. If you don't have ready-made tests, try making your own and trading with a friend who has done the same.

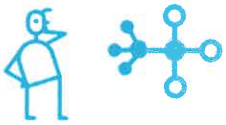
You can also make flashcards. Just make sure you practice recalling the information on them, and go beyond definitions by thinking of links between ideas.



HOLD ON!

Retrieval practice works best when you go back to check your class materials for accuracy afterward.

Retrieval is hard! If you're struggling, identify the things you've missed from your class materials, and work your way up to recalling it on your own with the class materials closed.



Don't only recall words and definitions. Make sure to recall main ideas, how things are related or different from one another, and new examples.

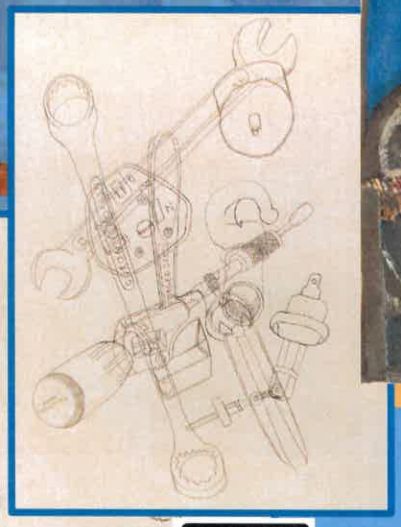
RESEARCH

Read more about Roediger, H. L., Putnam, A. L., & Smith, M. A. (2011). Ten benefits of testing and their retrieval practice applications to educational practice. In J. Mestre & B. Ross (Eds.), *Psychology of learning and motivation: Cognition in education,* (pp. 1-36). Oxford: Elsevier. as a study strateg

KNOWLEDGE ORGANIZER – YEAR 9 ART

Machine heads

EXAMPLES OF FINAL OUTCOMES:



YOU WILL LEARN:

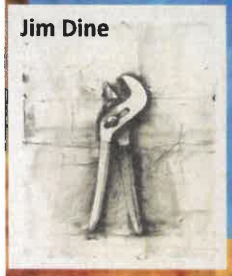
How and why artists have represented mechanical objects, in particular the Steampunk movement.
Artist techniques to create studies of mechanisms and develop a final outcome influenced by those artists.

WHY AM I LEARNING THIS?

The foundation skills in this project will enable you to tackle the varied concepts, artists, techniques and processes throughout Year 9.
You will build on your knowledge and skills with each project as they increase in difficulty, enabling you to express yourself in a confident way.

CONTEXTUAL KNOWLEDGE:

Jim Dine



Michael Craig-Martin

Jim Dine believes that tools provide a 'link with our past, the human past, the hand'. They feature in many of his works, and can be seen as a symbol of artistic creation. There is also an autobiographical resonance, as Dine's family owned a hardware store in Cincinnati. The tools are presented as a series of discrete items, as if laid out for analysis and classification.

SCAN ME

Video about Michael Craig-Martin

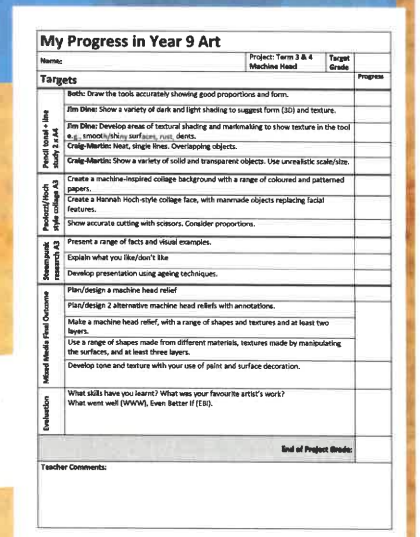
Video about Jim Dine

SCAN ME

HOMEWORK TASKS:

Tick when complete ✓

1. Tonal study of 2 kitchen gadgets/tools.
2. Artist research about Hannah Hoch.
3. Homework 3.
4. Homework 4.



My Progress in Year 9 Art

Name:	Project: Term 3 & 4 Machine Head	Target Grade	
Targets			Progress
Pencil Tonal + line Study	Beth: Draw the tools accurately showing good proportions and form.		
	Jim Dine: Show a variety of dark and light shading to suggest form (3D) and texture.		
	Jim Dine: Develop areas of textural shading and marmaking to show texture in the tool e.g., smooth/shiny surfaces, rust, dents.		
	Craig-Martin: Neat, single lines. Overlapping objects.		
	Craig-Martin: Show a variety of solid and transparent objects. Use unrealistic scale/size.		
Pattern/Hoch Study	Create a machine-inspired collage background with a range of coloured and patterned papers.		
	Create a Hannah Hoch-style collage face, with manmade objects replacing facial features.		
	Show accurate cutting with scissors. Consider proportions.		
Steampunk Research	Present a range of facts and visual examples.		
	Explain what you like/don't like		
	Develop presentation using ageing techniques.		
Mixed Media Final Outcome	Plan/design a machine head relief		
	Plan/design 2 alternative machine head reliefs with annotations.		
	Make a machine head relief, with a range of shapes and textures and at least two layers.		
	Use a range of shapes made from different materials, textures made by manipulating the surfaces, and at least three layers.		
	Develop tone and texture with your use of paint and surface decoration.		
Evaluation	What skills have you learnt? What was your favourite artist's work? What went well (WWW), Even Better If (EBI).		
		End of Project Grade:	
Teacher Comments:			

HOW WELL AM I DOING?

KEY VOCABULARY

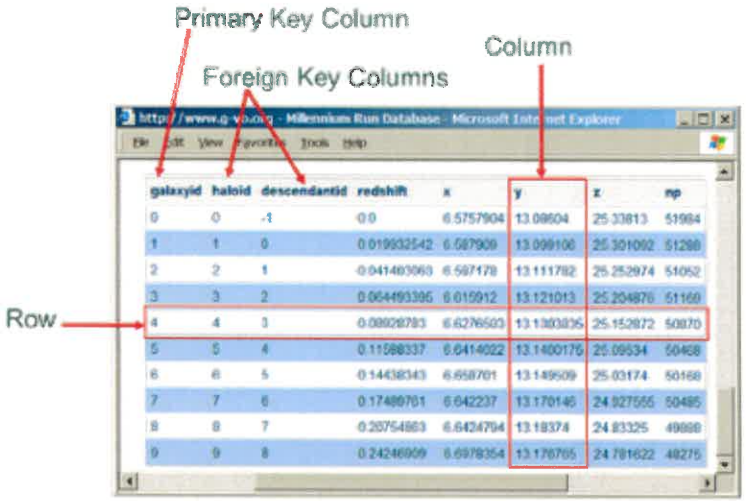
Texture	In the visual arts, texture is **the perceived surface quality of a work of art.**
Tone	The lightness or darkness of something – this could be a shade, or how dark or light a colour appears.
Mood	The emotions that are elicited in the viewer of a piece of artwork. Mood also includes the aesthetic and atmosphere portrayed by a piece of artwork.
Montage	A montage is an assembly of images that relate to each other in some way to create a single work or part of a work of art.
Relief	A relief is a wall-mounted sculpture in which the 3D elements are raised from a flat base.

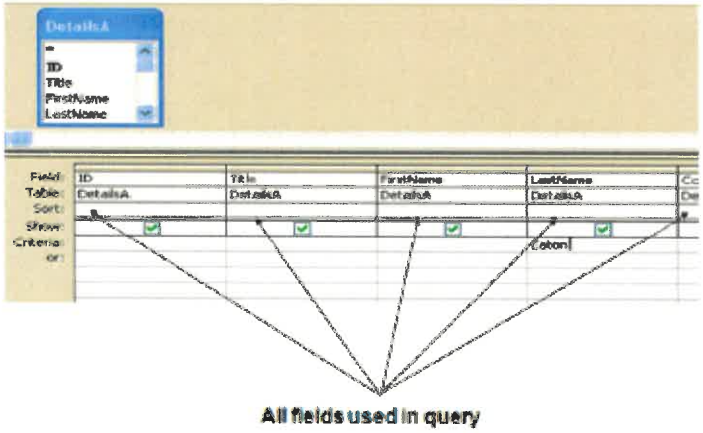
Year 9 Database Knowledge Organiser

COMPUTING CORSHAM

Keywords

Word	Meaning/Description
Database	A **Database** is a collection of data.
Form	A **form** is used to make the database more user friendly.
Table	A **table** is a collection of rows.
Data Type	A **data type** is a data storage format that can contain a specific type or range of values.
Integers	**Integers** are whole numbers. For example: 4, 27, 65535.
Boolean	**Boolean** values are either 'True' or 'False' or 1 or 0.
Primary Key	A **primary key** is a unique number for an entity.
Row	A **row** is a collection of column values.
Field Size	The **field size** is the maximum size of characters allowed for each entry field.

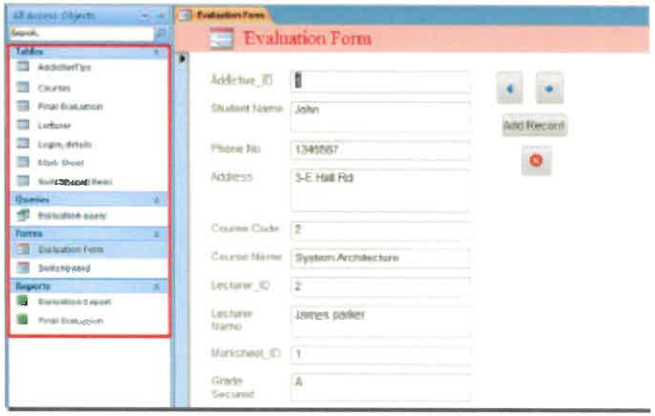




Data types

Projects

Field Name	Data Type
ID	AutoNumber
projectTitle	Long Text
partyID	Number
receiveDate	Date/Time
dueDate	Date/Time
deliveryDate	Date/Time
prepay	Currency
cost	Currency
projectTypeID	Number
lines	Number
pages	Number
words	Short Text
settled	Yes/No
projectComment	Long Text



KS3 Y9 Knowledge Organiser Term 4: Scripted Performance

THE CORSHAM SCHOOL

Key words

Accent	Inflection
Acting style	Interaction
Articulation	Intonation
Aside	Mime
Blocking	Mirroring
Body language	Motivation
Breathing	Movement
Characterisation	Pace
Clarity	Performance skills
Dialect	Pitch
Dialogue	Posture
Diction	Proxemics
Emotion	Rhythm
Emphasis	Stance
Facial expression	Timbre
Focus	Vocal expression
Gesture	Voice
Improvisation	Volume

What is your intention for performance? (You need to be able to answer these!)

- What is your role?
- What is happening to your character in the key extract?
- What are your character's objectives/motivations/feelings at this point?
- How are you interpreting this character in the performance?

How to approach the script:

- Highlight your lines.
- Consider your motivation of your character (it might change! Why are they saying this? What is their objective at this point?)
- Annotate the scripts with ideas/thoughts/interpretations you may be able to use.
- Why is this monologue/duologue a key moment in the play?
- What do you learn about your character from the extracts?
- If you can, read the play. Ask your teacher for a copy to borrow.
- Rehearse! With a partner, with a parent/guardian, in front of the mirror, with your teacher!

Assessment Objective – In this component, you will be assessed on your ability to…

AO2 – Apply theatrical skills to realise artistic intentions in live performance.

Key rehearsal techniques:

Explorative Strategies for characterisation..

Thought track Hot seating Marking the moment Narration Conscious alley Role on the Wall

Year 9 Food Knowledge Organiser.

Key Practical Skills

- **Flaky Pastry – Lamination**. The dough is rolled and folded to produce layers. Fat is placed in between the layers and this melts, leaving a space that is filled with steam from the water and fat added to the pastry. Trapped expand between the causing light crisp layers of pastry to develop. **(Sausage rolls)**

- **Short Crust pastry – Shortening**. The fat is rubbed into the flour with fingertips. It coats flour to prevent the long gluten strands from forming. This is called shortening. **(Cheese and Onion Pasties)**

- **Whisking Method – Mechanical Raising Agents.** When the eggs and sugar are whisked together this traps air bubbles as the protein from the egg stretches and surrounds the air bubbles to form an air-in-liquid foam. This is a mechanical raising agent. **(Swiss Roll)**

- **Fruit and Vegetable preparation** – Water soluble vitamins (B group &C) are easily damaged or lost during preparation and cooking. Correct preparation and cooking will minimise these losses. **(Thai Curry, Bolognaise/chilli, Carrot Cake)**

- **Presentation skills** – presenting and styling food is very important at GCSE. Decorations on savoury food are called garnish and decoration on sweet foods. (Samosas, Cheesecake)

Key Topics

Food and the environment :

Food waste – Manufacturers, retailers and consumers waste millions of tonnes of food a year for a variety of reasons

food poverty -defined as the inability to acquire or consume an adequate or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so

Food provenance – food that is grown, food that is caught, food that is reared. E.g. organic

Food miles – how far food has travelled from farm to fork

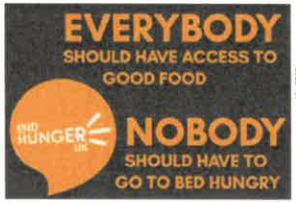
Food and Nutrition:

Nutrition – main nutrients , functions and sources

Food Choices – There are many reasons why we choose the food we eat, but they can often be related to religion and culture, ethical and moral beliefs, medical conditions or personal preference. This affects the diets they eat

Food intolerance – a reaction to a specific food

Allergen – A substance in food that may cause an allergic reaction



Personal Skills

- Confidence
- Organisation
- Teamwork
- Time management

Nutrient	Functions	Examples
Carbohydrates & Fibre	• Energy • Aids Digestion • Fills us up	• Pasta, Rice, Bread, Cereals, potatoes
Vitamins & Minerals	• Keeps us healthy • Protect from illness • Each vitamin and mineral has a specific job	• Most foods we eat contain at least one vitamin and/ a mineral. • Such as - Meat, fish, alternatives, fruit, vegetables, dairy, cereals, bread pasta
Proteins	• Repairs and replaces worn and old cells and tissues. • Builds muscle and makes us strong • growth	• **Meat** – lamb, pork, beef • **Fish** – cod, tuna, sardines • **Pulses and beans** – lentils, chick peas, beans, peas • **Alternatives** – soya, tofu, Quorn • **Dairy products** – milk, cheese, yoghurt
Fats	• Give us energy • Protect our bodies • Insulate • Needed to use fat soluble vitamins	Saturated fats –meat, lard, cheese, cream, eggs Unsaturated – oily fish, avocado's, oils such as sunflower, olive, rapeseed vegetable.

Nutritional Analysis

Evaluate the nutritional content of some of our practical outcomes using explore food which is an online nutritional analysis tool. Adapt recipes and compare.

Keywords

- Nutrients
- Carbohydrate
- Protein
- Lamination
- Shortening
- Garnish
- Food miles
- Food Provenance
- Saturated and unsaturated fats
- vegetarian

KS3 YEAR 9 D&T RESISTANT MATERIALS — METALS

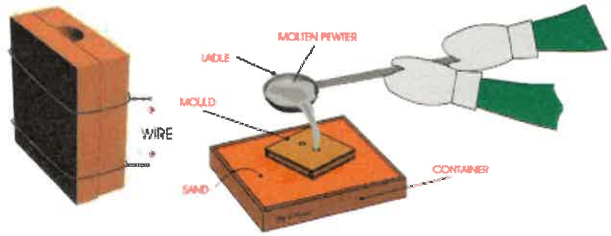
Tools and Equipment

Measuring and marking

Steel rule		An accurate tool for measuring and marking out
Try square		A tool used to check right angles on wood or plastic
Template		A template is a tool used to mark out shapes repeatedly

Cutting

Hack saw		A general purpose metal work saw
Metal vice		Supports work whilst cutting or finishing
Pillar drill		A machine used to make holes in materials
Laser cutter		CAM: Laser cutting is the use of a high-powered laser to cut, etch and engrave your material



Metals and Alloys

Ferrous Metals: *these metals contain iron*
Low Carbon Steel
High Carbon Steel
Cast Iron

Non-ferrous Metals: *these are pure metals*
Aluminium
Copper
Tin
Zinc

Alloys: a mix of one pure metal and another *element*
Brass
Stainless steel
High speed steel

Shaping and finishing

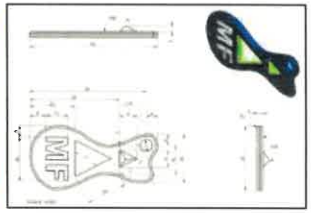
Metal file		Used to shape or smooth wood, metal or plastic
Wet and Dry Paper		An abrasive paper used to smooth the surface or edges of plastic
Draw filing method		A technique used to produce a fine filed surface
Cross Filing method		A technique used to produce a fine filed surface
Pewter casting mould		Heating metal into liquid form and pouring it into a mould

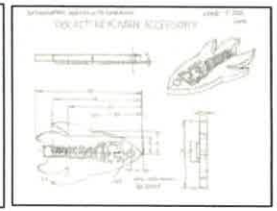
Manufacturing

Brazing Hearth		Raises metal to high temperatures using a blow torch
Welding		Fusing together two metals of the same type using a filler
Brazing		Fusing together two metals using **spelter** (a type of filler)
Annealing		The process of softening metals to make it workable
Casting		Heat metal to liquid and pour into a mould

Keywords

Ideation	Evaluation
Specification	Orthographic
Research	Pewter
Manufacture	Mould
Design	Sprue





What is good design?

Clear ideas
Annotations
Measurements
Content
Presentation
Balance

Maths in DT:

Multiplication
Divide
Add / Subtract
Measurement conversion
Ratios
Percentages
Surface area

Health and Safety in DT:

- Listen to your teacher's instructions
- Always wear an apron
- Long hair should be tied back
- Don't use equipment you are not trained on
- Always stand up during practical lessons
- When using machines, always wear safety glasses
- Only use the stop button in an emergency
- Work quietly and be sensible and careful at all times

KS3 YEAR 9 D&T RESISTANT MATERIALS

Tools and Equipment

Measuring and marking

Steel rule		An accurate tool for measuring and marking out
Try square		A tool used to check right angles on wood or plastic
Template		A template is a tool used to mark out shapes repeatedly

Shaping and finishing

Metal file		Used to shape or smooth wood, metal or plastic
Wet and Dry Paper		An abrasive paper used to smooth the surface or edges of plastic
Disc sander		A machine used to smooth the edges of materials

Polymers

Thermoform Polymer

A polymer which can be reheated and moulded.

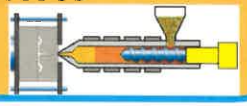
Acrylic
High impact polystyrene (HIPS)
Polypropylene (PP)

Thermosetting Polymer

A polymer which cannot be re moulded.

Epoxy resin (ER)
Melamine Formaldehyde (MF)
Urea Formaldehyde (UF)

Polymer processes



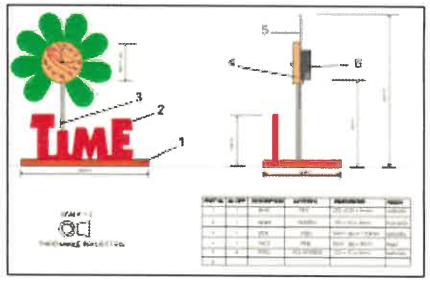
Injection moulded
Extrusion
Vacuum formed

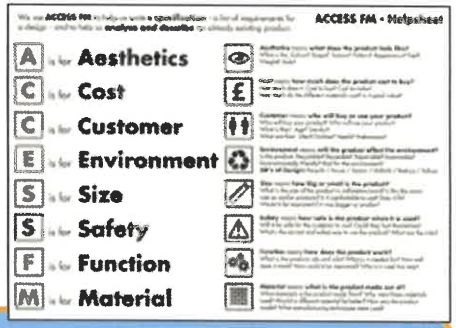
Memphis Design Movement

Ettore Sottsass

POLYMERS

Orthographic Drawing





Cutting

Coping saw		A hand saw used to cut complex shapes in wood and plastic
Scroll saw		A machine saw used to cut complex shapes in wood and plastic
Vice		Supports work whilst cutting or finishing
Pillar drill		A machine used to make holes in materials
Laser cutter		CAM: Laser cutting is the use of a high-powered laser to cut, etch and engrave your material

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Keywords

Template
Polymer
Tensol Cement
Modelling
Acrylic
Specification
Research
Design
Evaluation
6Rs
Sustainable
Manufacture

Health and Safety in DT:

- Listen to your teacher's instructions
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KS3 YEAR 9

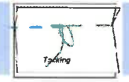
DT TEXTILES

Tools and Equipment

Measuring and marking

Measuring Tape		Fabric tape measure used to measure
Tailor's chalk		A temporary mark on fabric
Template / Pattern		A template / pattern is a tool used to mark out shapes repeatedly

Constructing

Sewing needle		Helps to sew fabric together
Embroidery needle		A needle with a larger eye to accommodate embroidery thread
Sewing machine		Machine sews fabric together
Pins		A temporary method to hold fabric in place
Tacking stitch		A temporary stitch to hold fabric together

Stencils

What?

- A stencil is a template used to transfer patterns
- It can be used multiple times
- It is one way of adding decoration to fabric

How?

- You can create a stencil by hand or using CAD
- You can use card, paper or thin, sturdy plastic to make it
- You can use a craft knife to cut by hand or CAM; laser cutter
- You need to think about islands/bridges
- Gently dab the paint using a sponge – too much paint might bleed under the stencil.
- Gently remove and wait to dry.

Keywords

Design
Product analysis
Research
Evaluation
Stitch
Scissors
Sewing machine
Customer
Environment
Function
Material
Seam allowance
UCD
Fastener
Stencil

Cutting

Fabric shears		Scissors used for cutting fabric
Thread scissors		Scissors used for cutting thread
Stitch ripper		Used for removing sewn stitches from fabric
Pinking shears		Creates a zig zag cut edge for decoration to prevent fraying

Fasteners

Buttons		Decorative fasteners used in conjunction with a button hole
Zip		Tape with zipper teeth which interlock
Poppers / press studs		A pair of interlocking disks, usually made from metal or plastic

Woven Fabric

Knitted Fabric

Types of Seams:

Plain
French
Flat felled
Bound
Lapped

Maths in DT:

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A is for **Aesthetics**
C is for **Cost**
C is for **Customer**
E is for **Environment**
S is for **Size**
S is for **Safety**
F is for **Function**
M is for **Material**

Year 9 Graphic Design

Key information:

Target audience - Age range

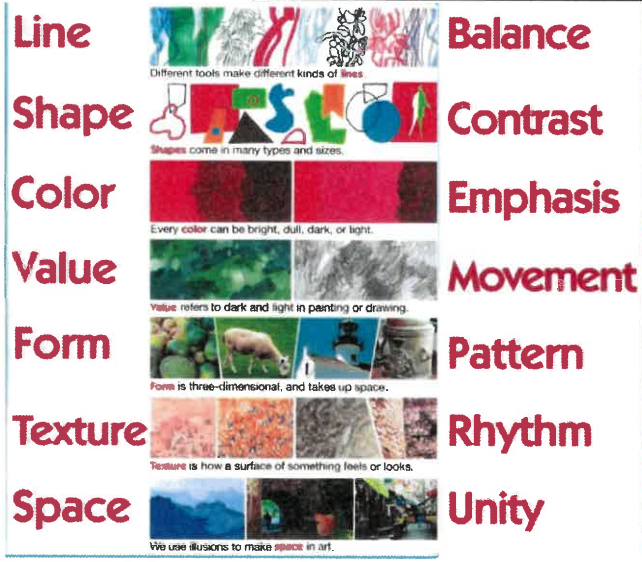
Concept – Bold, beautiful illustrations which celebrate endangered animals

Media – Fine liners, felt tip pens/coloured pencils

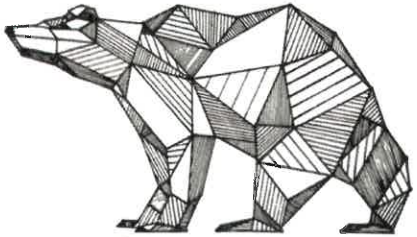
GRAPHICS



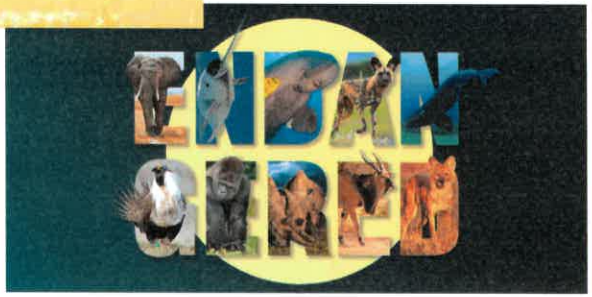
THE PRINCIPLES OF DESIGN



Graphics
Artists
Luke Dixon
Craig Redman



WWF



THE CORSHAM SCHOOL

Y9 ENGLISH – LONG WAY DOWN

Narrative Voice

A story has to be 'told' to the reader and a 'narrator' is needed to do this. A narrator's voice can be first, second or third person. Here is a quick summary:

- **First person** uses 'I' or 'we' to tell the story. In this case, the narrator is a character and you will read about events from their point of view. You are more likely to be able to relate to and sympathise with their feelings because of this.
- **Second person** uses 'you'. It is not often used in fiction texts and it's rare to find a story written entirely from this perspective (*try writing a piece in the second person to see how difficult it is*). However, some fiction texts, such as gamebooks (choose your own adventure) use this perspective.
- **Third person** uses 'he', 'she', 'it' or 'they'. The narrator of the story will usually be the writer. Some texts will give many different characters' viewpoints, but others will focus on one character, the hero or heroine, and the reader will usually relate to and sympathise with them more than others.

What is explicit and implicit meaning?

Explicit meaning describes something that is very clear and without vagueness or ambiguity.

Implicit meaning often functions as the opposite, referring to something that is understood, but not described clearly or directly, and often using implication or assumption.

Context

The context of a text is the place and time in which it was written, who it was written by, and where it was published. All of these affect the purpose and effect of the text.

Word Class	Definition
Noun	A naming word.
Adjective	Adjectives are used to describe nouns.
Verb	A verb is a word that describes an action.
Adverb	An adverb explains how a verb is being performed.
Pronoun	A pronoun replaces a proper noun or common.

Terminology	Definition
Symbolism	Use of symbols to represent ideas or qualities.
Imagery	Visually descriptive language.
Hyperbole	An exaggeration.
Allegory	Extended metaphor in which a symbolic story is told.
Onomatopoeia	A word that imitate the sound it represents.
Personification	A figure of speech in which an object is given human feelings, thoughts or attitudes.
Metaphor	A metaphor is a figure of speech that describes an object or action in a way that isn't literally true.
Simile	A comparison that uses 'like' or 'as'.

Using quotations and useful phrases

When quoting from a text, remember to:

- use quotation marks
- quote accurately
- quotes of three words or fewer can be used in the sentence you are writing - for example, when the writer talks about the 'futility of life' he means...
- short, well-chosen quotations are better than long ones , so that you can give more precise analysis

Remember that certain words and phrases are helpful when you're explaining an idea in some detail, especially if you are commenting on implicit meaning. The following list shows some of those phrases:

- this implies
- this suggests
- which gives the impression that
- possibly
- perhaps
- this indicates that
- this shows
- obviously

Use to **connectives** to build your analysis. Here are some examples:

- however
- therefore
- in contrast
- because
- but
- and
- furthermore
- also
- then
- at first

Les parties du corps	***Parts of the body***
la bouche	*mouth*
le bras	*arm*
le corps	*body*
le dos	*back*
l'épaule (f)	*shoulder*
les fesses (fpl)	*buttocks*
le front	*forehead*
le genou	*knee*
la jambe	*leg*
la main	*hand*
le nez	*nose*
les oreilles (fpl)	*ears*
le pied	*foot*
la tête	*head*
le visage	*face*
les yeux (mpl)	*eyes*
On joue au paintball	***We go paintballing***
Qu'est-ce qui s'est passé?	*What happened?*
Tu es touché(e)?	*Have you been hit?*
Où est-ce que tu es touché(e)?	*Where have you been hit?*
le terrain	*grounds*
les billes (fpl)	*paintballs*
le casque	*helmet*
le matériel	*materials*
les règles (fpl)	*rules*
le fairplay	*fairplay*
le respect	*respect*
Le sport et le fitness	***Sport and fitness***
Pour arriver en forme, il faut ...	*In order to get fit, you must ...*
avoir un bon programme.	*have a good schedule.*
bien manger.	*eat well.*
bien dormir.	*sleep well.*
être motivé.	*be motivated.*
faire du sport tous les jours.	*do sport every day.*
jouer dans une équipe.	*play in a team.*
Tu aimes le sport?	***Do you like sport?***
Le sport ...	Sport ...
diminue le stress.	decreases stress.

est bon pour le moral.	is good for morale.
est important dans la vie.	is important in life.
ça me fatigue	it makes me tired
il faut apprendre à suivre les règles	you must learn to follow rules
Les opinions	***Opinions***
À mon avis, ...	*In my opinion, ...*
Moi, je trouve ça très ennuyeux de ... (+ inf)	*I find it very boring to ...*
Je crois fermement que ...	*I firmly believe that ...*
Manger sain	***Healthy eating***
les boissons gazeuses (fpl)	*fizzy drinks*
les céréales (fpl)	*cereals*
les chips (mpl)	*crisps*
l'eau (f)	*water*
les fruits (mpl)	*fruit*
les gâteaux (mpl)	*cakes*
les légumes (mpl)	*vegetables*
les légumes secs (mpl)	*pulses*
la nourriture salée	*salty food*
les œufs (mpl)	*eggs*
le pain	*bread*
le poisson	*fish*
les pommes de terre (fpl)	*potatoes*
les produits laitiers (mpl)	*dairy products*
le repas	*meal*
le sel	*salt*
les sucreries (fpl)	*sweets/confectionery*
la viande	*meat*
manger équilibré	*to have a balanced diet*
Pour être en forme ...	***In order to keep fit ...***
je ferai du sport	*I will do sport*
je ferai trente minutes d'exercice par jour	*I will do 30 minutes exercise per day*
j'irai au collège à vélo et pas en voiture	*I will go to school by bike and not by car*
je jouerai au foot	*I will play football*
je mangerai équilibré	*I will eat a balanced diet*
je marcherai jusqu'au collège	*I will walk to school*
je ne boirai jamais de boissons gazeuses	*I will never drink fizzy drinks*
je ne jouerai plus à des jeux vidéo	*I won't play with my video games*

	any more
je ne mangerai plus de frites/hamburgers	*I will not eat chips/hamburgers any more*
je ne prendrai pas le bus	*I will not take the bus*
je prendrai les escaliers	*I will take the stairs*
je prendrai des cours d'arts martiaux	*I will take martial arts classes*

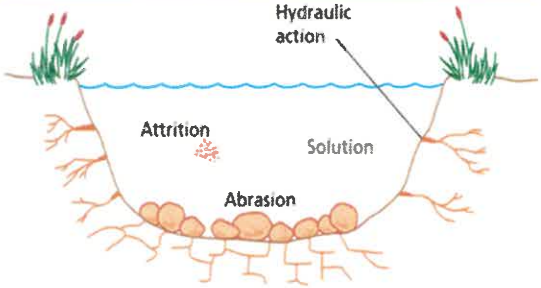
Les mots essentiels	***High-frequency words***
alors	*so/then*
au moins	*at least*
c'est-à-dire	*that is to say*
ce qui veut dire	*which means*
chaque	*each*
d'abord	*first*
de bonne heure	*early*
deux fois par semaine	*twice a week*
donc	*so*
ensuite	*then*
finalement	*finally*
où	*where*
peut-être	*perhaps*
pour le futur	*for the future*
quand	*when*
tous les jours	*every day*
Voilà!	*That's that!/ Here you are!/ There you go!*

Geography: How the Sea shapes and attacks our land?

Erosion

Erosion attacks and wears away the cliff. There are four types.

Attrition	Rocks that bash together to become smooth/smaller.
Solution	A chemical reaction that dissolved rocks.
Abrasion	Rocks hurled at the base of a cliff to break pieces apart.
Hydraulic Action	Water enters cracks in the cliff, air compresses, causing the crack to expand.



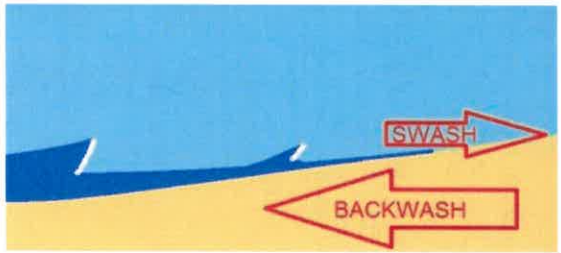
Weathering

Weathering weakens rocks and helps mass movement occur. There are 3 types.

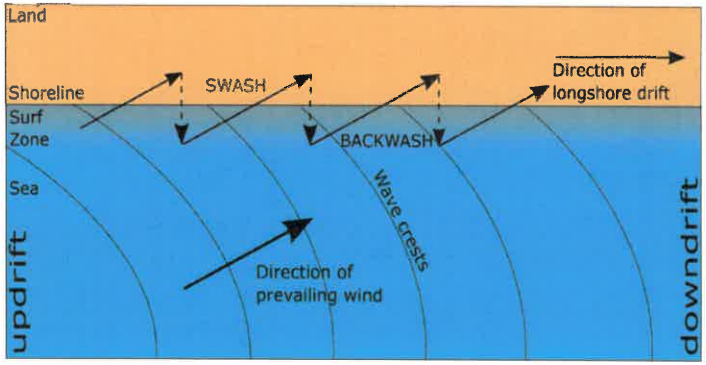
Chemical weathering	All rain is slightly acidic. Consequently the acid in the rain can dissolve the calcium carbonate in the rocks.
Physical weathering (freeze thaw)	In winter, water can enter cracks in rocks, when it freezes, the ice expands and weaken the cracks further.
Biological weathering	Plants can weaken the rocks due to their roots. Animals can also weather rocks.

Types of waves

The swash is the wave going onto the beach and the backwash is the wave coming off the beach

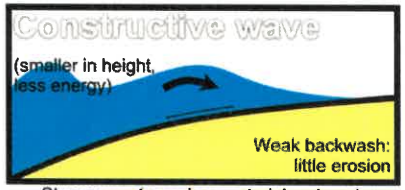


Longshore drift



Swash hits the beach at an angle due to the prevailing wind, depositing sand on the beach.
Backwash goes straight back because of gravity and removes the swash.
This zig zag pattern continues along the beach.
AS a result, long shore drift removes material from one side of the beach and deposits it at the other, changing the shape of the beach.

Types of waves



Strong swash: pushes material up beach

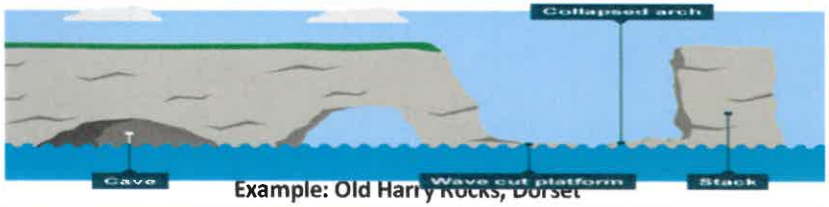
Weak swash: little beach building

Destructive waves
These are tall waves that crash onto the beach.
They have a string backwash which results in the wave removing sand from the beach.

Constructive waves
These are smaller waves that push onto the beach.
They have a weaker backwash and so can deposit sand on the beach.

Geography: How the Sea shapes and attacks our land?

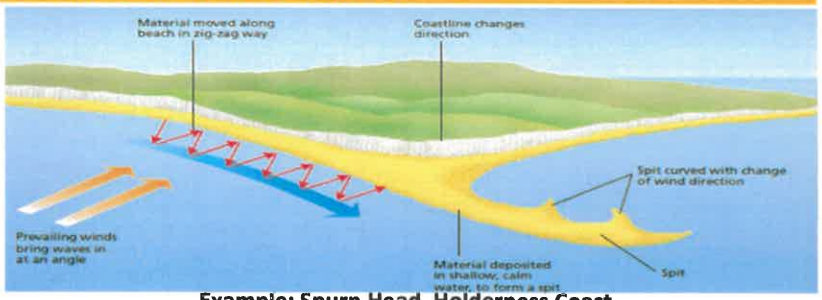
Formation of Coastal Stack



Example: Old Harry Rocks, Dorset

1) **Hydraulic action widens cracks in the cliff face over time.**
2) **Further abrasion widens the crack to from a cave.**
3) **Caves from both sides of the headland break through to form an arch.**
4) **Weathering weakens the arch and it collapses as mass movement leaving a stack.**
5) **Further weathering and erosion eaves a stump.**

Formation of Coastal Spits - Deposition



Example: Spurn Head, Holderness Coast

1) Longshore drift moves sediment along a beach.
2) When the land changes direction (at an estuary) deposition causes the beach to extend into the sea.
3) A spit is eventually formed, then a change in wind direction forms a hook.
4) Sheltered area behind spit encourages deposition, salt marsh forms.

Management: Hard engineering

Hard engineering strategies are artificial (man made) structures designed to reduce coastal erosion or long shore drift.

Groynes	Groynes can be made of wood or rocks. They stick out into the sea at right angles and are designed to reduce long shore drift. This keeps sand on the beach so the beach can act as a natural barrier.
Rip Rap	Rip Rap are large boulders placed in front of cliffs or human structures. They are designed to absorb the power of the waves, reducing erosion.
Sea wall	Sea walls are placed where coastal towns are right on the beach. They reduce the chance of flooding and reduce erosion. However they do not look in keeping with the natural environment
Gabions	Gabions are rocks in cages. The both absorb the energy of the waves and support cliffs to stop them collapsing.

Formation of Bays and Headlands

1) Waves attack the coastline.
2) Softer rock is eroded by the sea quicker forming a bay, calm area cases deposition.
3) More resistant rock is left jutting out into the sea. This is a headland and is now more vulnerable to erosion.

Management: soft engineering

Soft engineering strategies are designed to be more natural and less artificial but still reduce beach or cliff erosion.

Beach replenishment	After long shore drift has moved material along a beach, beach replenishment can put it back. This can be done via boats pumping sand onto the beach or bu trucks moving the sand back to where it came from. This means the beach can act as a natural barrier.
Managed retreat	Managed retreat is where people allow the sea to flood inland areas that are not of use. This reduces costs of defence and can also create valuable wetlands for ecosystems.
Do nothing	This decision to do nothing is based on the fact that the sea will always erode so should we pay for defences to be constantly replaced or just let nature take its toll?

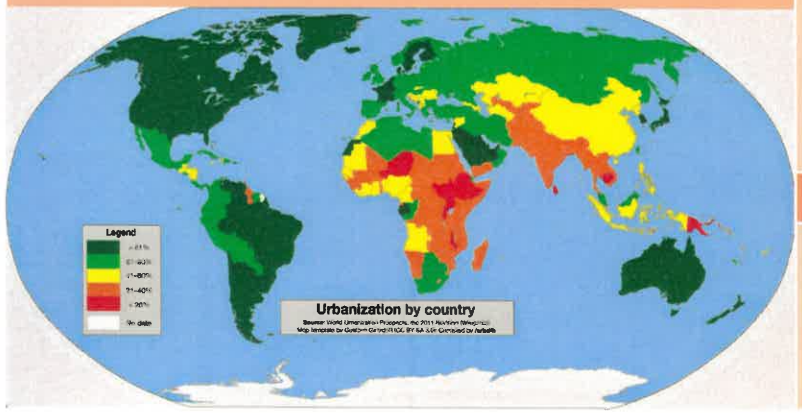
Year 9 Geography – Living in an urban world

What is Urbanisation?

This is an increase in the amount of people living in urban areas such as towns or cities. In 2007, the UN announced that for the first time, more than 50 % of the world's population live in urban areas. Generally, if a country is rich and developed it is likely to be more urbanised.

Where is urbanisation happening today?

Urbanisation is happening fastest in sub-Saharan Africa, and southern Asia this is because of the rural to urban migration in these regions. Red and orange countries represent the fasted urbanising countries. The green countries are already urbanised.



Causes of Urbanisation

The movement (migration) of people from rural to urban areas. This happens because of a combination of push and pull factors

Push factors	Pull factors
• Natural disasters • War and Conflict • Mechanisation • Drought	• More Jobs • Better education & healthcare • Increased quality of life. • Following family members

Consequences of urbanisation in LIDCs

Slums: Why are they built

Due to rapid rural to urban migration, there is not enough housing for all the migrants. Consequently migrants often build their own informal housing. These "informal settlements" are known as slums or shanty towns. You find slums in most LIDC major cities. The largest and most famous are Kerela slum (Nairobi) and Dharavi slum (Mumbai)

Life in the slums

Social	Economic	Environmental
• Many live without electricity. • High diseases rate and life expectancy low.	• High rate of corruption to officials. • Most jobs are informal and low paid.	• Large scale traffic issues. • Slums are heavily polluted with poor sanitation.

Management

- Authorities removed many dwellings in slums and have upgraded them with more "planned buildings"
- Slums can be "upgraded" with electricity and water supply.
- New ideas such as the 'floating homes and school' have been suggested.

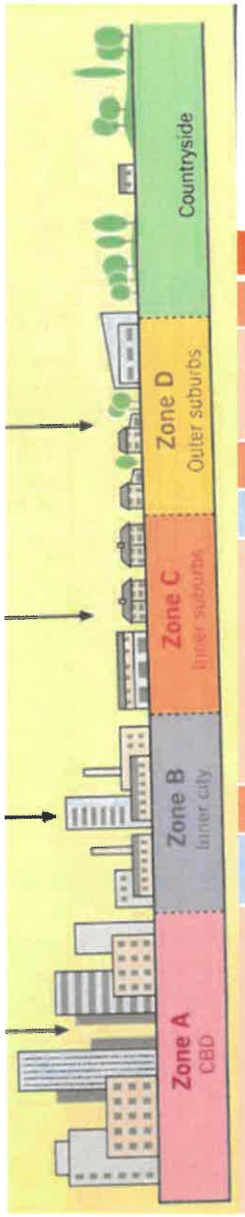
Types of Cities

Mega city — An urban area with over 10 million people living there.

More than two thirds of current megacities are located in either EDCs and LIDCs. The amount of megacities are predicted to increase from 28 to 41 by 2030.

World City — Cities that are centres for trade and business. They hold global influence.

Key 'world cities' include London, New York, Tokyo and Paris. Most are located within ACs but are now gradually expanding into EDCs, for example Moscow.



Year 9 Geography – Living in an urban world

Life in a city in the UK

Issues

All major UK cities have issues, (see the table below). Life in cities is always changing, the ethnicity of UK cities is increasing, the age of people living in cities is getting younger as older people move out

Problems of living in a city

Waste	Traffic	Inequality
The high density housing produces a lot of waste that the council has to collect and dispose of. A lot of household waste ends up in landfill sites.	High volumes of cars and inadequate public transport systems aften result in congestion which can result in lateness and road rage. 	The inner city terraced housing is often home to lower income families whereas the suburbs and semi-detached housing is often home to higher income families.

Solutions

Waste	Traffic	Inequality
Increasing and encouraging recycling will reduce waste to landfill but this costs the council money. 	Bus lanes and park and ride should reduce the number of cars on the road but people still prefer to use their car. Electric scooters are being trialled in UK cities but hospitals are worried about accidents.	Providing more green spaces and services in the inner city plus spending on schools in the local area can help those living in the low income areas.

Sustainable cities

What does being sustainable mean?

Being sustainable means that people live in a way where they can meet their needs (heating/food/transport) but at the same time have a minimal impact on the environment and also help create jobs. Most cities are unsustainable. Some countries are rising to the challenge and are trying to build sustainable cities from scratch others are just tring to make their cities more sustainable.

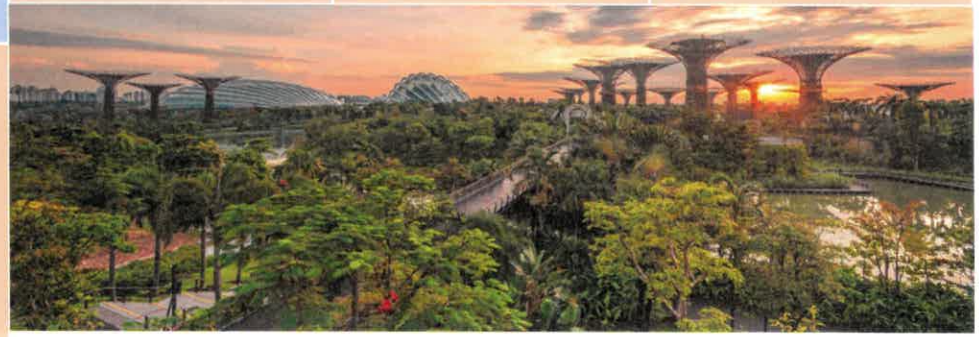
An example of a city trying to be sustainable

Copenhagen in Denmark is aiming to be the "Worlds most sustainable city". It has

- 500km of wide and safe cycle lanes in and around the city.
- The routes have air pumps, safe intersections and café's lining the routes.
- Air pollution in Copenhagen has reduced dramatically.

What makes cities sustainable?

Social	Economic	Environmental
There are enough doctors and schools. People have a say in how their city is run. People encouraged to walk and cycle.	Lots of well paid jobs available. Good quality and affordable homes are built.	Solar or wind energy creates electricity so reducing carbon emissions. There is a lot of green space. People use electric cars to reduce carbon emissions.



Enquiry: How far did life in Britain change after World War Two?

History – Year 9
Knowledge Organiser
Topic 3

Outline: After WW2, Britain went through a wide range of social and economic changes. In particular, people of colour, women and young people encountered many of these changes and these had a profound impact on their lives.

Date	Event	Description
1948	Windrush arrived	One of the first ships to arrive from the Caribbean with migrants invited to Britain to work.
1948	NHS set up	The Labour government, led by Clement Attlee set up the NHS as part of the Welfare State to help people after WW2.
1958	Notting Hill race riots	A series of racially motivated riots that took place in London when people of colour were targeted by gangs like the Teddy boys.
1962	First Beatles single	"Love me do" was released by this band from Liverpool and they started a teenage craze.
1963	Bristol Bus Boycott	When people stopped using the bus network in Bristol to end discrimination against people of colour.
1964	"Summer of violence"	When mods and rockers went to seaside towns and fought each other.
1968	Ford Strike	Women in Essex went on strike to achieve fair pay.

Key individuals

Kelso Cochrane. A young man who emigrated from Antigua and worked as a carpenter in London. He was murdered by a racist gang in 1959.

Paul Stephenson. Helped to organise the Bristol Bus Boycott in 1963 when Black people were barred from working as drivers

Eileen Pullen. One of leaders of the Ford strike by women asking for equal pay to the men.

Mary Quant. A fashion designer from the 1960s who revolutionised fashion. She designed mini-skirts and made short hair fashionable.

Key vocabulary:

Boycott: when you stop using or buying something as a protest.
Colour bar: discrimination where people were barred from certain jobs or houses due to their skin colour.
Counter-culture: youth culture from the 1960s where young people were reacting against the values and culture of their parents.
Feminism: a campaigning protest movement to work towards equal right for women.
Marriage bar: when women automatically lost their job once they married.
Migration: when people move from one country to live in another, often to find work.
Mods: youth gangs who rode mopeds and wore smart clothes. They fought against the rockers.
Notting Hill: area of west London where many people of colour lived, especially those who had migrated from the Caribbean islands.
Race riot: violence on the streets of a city, involving fighting between people from different ethnicities.
Rockers: youth gangs who rode motorbikes and wore leather jackets and jeans. They fought against the mods.
Swinging Sixties: name given to 1960s when there was a revolution in music, fashion and films, particularly for young people.
Teddy boys: street gangs of young men who wore long coats and styled hair. They were often involved in attacks on immigrants.
Teenage culture: entertainment that targeted a young audience, especially films, tv, fashion and music.
Welfare State: set up after WW2 by the Labour government to create the NHS and a support network for the more vulnerable people in society.
Windrush: one of the first ships to arrive from the Caribbean carrying migrants who were invited by the government to work in Britain after WW2.

Furthering learning

Want to find out more about life after WW2?

Historical skill focus: change & continuity

- Why have people's lives changed or stayed the same?
- Which changes have ben the most significant?

Prior learning:
Popular culture
Empire
Misogyny

YEAR 9 – REASONING WITH GEOMETRY...

Deduction

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What do I need to be able to do?

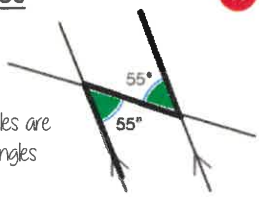
By the end of this unit you should be able to:

- Identify angles in parallel lines
- Solve angle problems
- Make conjectures with angles
- Make conjectures with shapes

Keywords

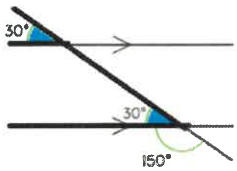
Parallel: two straight lines that never meet with the same gradient.
Perpendicular: two straight lines that meet at 90°
Transversal: a line that crosses at least two other lines.
Sum: the result of adding two or more numbers.
Conjecture: a statement that might be true but is not proven.
Equation: a statement that says two things are equal
Polygon: a 2D shape made from straight edges.
Counterexample: an example that disproves a statement

Alternate angles (R)



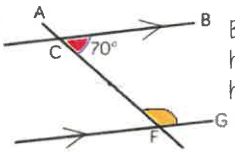
Because alternate angles are equal the highlighted angles are the same size

Corresponding angles (R)



Because corresponding angles are equal the highlighted angles are the same size

Co-interior angles (R)



Because co-interior angles have a sum of 180° the highlighted angle is 110°

Ols angles on a line add up to 180° co-interior angles can also be calculated from applying alternate/ corresponding rules first

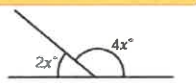
Solving angle problems

Angles on a straight Line
180°

Vertically opposite angles
Equal

Angles around a point
360 °

Link angle facts to algebra



Form an equation

$2x + 4x = 180°$

State the reason

The sum of angles on a straight line is 180 °

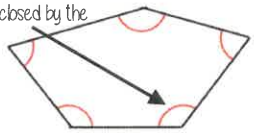
Solve

$2x + 4x = 180°$
$6x = 180°$
$x = 30°$

Triangles
Sum of angles is 180 °

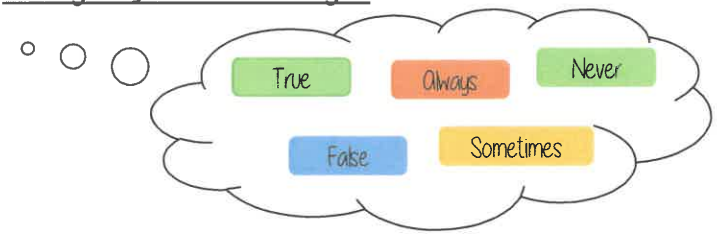
Isosceles have the same base angles

Interior Angles
The angles enclosed by the polygon



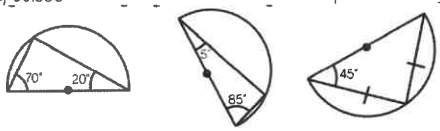
(number of sides – 2) x 180

Making conjectures with angles



Proving a conjecture
A pattern is noticed for many cases

Disproving a conjecture
Only one counterexample is needed to disprove a conjecture



Apply the angle rules

The sum of angles in a triangle is 180°

Test the theory

$180 - 70 - 20 = 90$
$180 - 85 - 5 = 90$
$180 - 45 - 45 = 90$

Make conjecture

The angle that meets the circumference in a semi circle is 90°

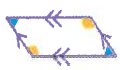
Making conjectures with shapes

Keywords and facts to recall with shape

Area: the amount of space inside a shape
Perimeter: the length around a shape
Regular Polygons: All sides and angles are equal

Quadrilateral Facts

Square
All sides equal size
All angles 90°
Opposite sides are parallel



Parallelogram
Opposite sides are parallel
Opposite angles are equal
Co-interior angles

Rectangle
All angles 90°
Opposite sides are parallel

Rhombus
All sides equal size
Opposite angles are equal

Kite
No parallel lines
Equal lengths on top sides
Equal lengths on bottom sides
One pair of equal angles

YEAR 9 – REASONING WITH GEOMETRY...

Rotation & Translation

@whisto_maths

What do I need to be able to do?

By the end of this unit you should be able to:

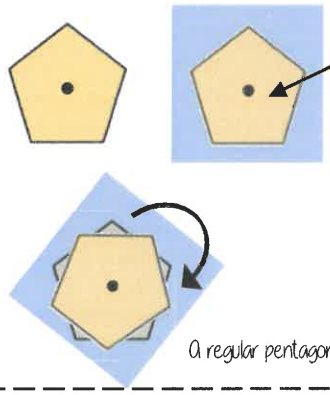
- Identify the order of rotational symmetry
- Rotate a shape about a point on the shape
- Rotate a shape about a point not on a shape
- Translate by a given vector
- Compare rotations and reflections

Keywords

Rotate: a rotation is a circular movement
Symmetry: when two or more parts are identical after a transformation
Regular: a regular shape has angles and sides of equal lengths.
Invariant: a point that does not move after a transformation
Vertex: a point two edges meet.
Horizontal: from side to side
Vertical: from up to down

Rotational Symmetry

Tracing paper helps check rotational symmetry



1 Trace your shape (mark the centre point)

2 Rotate your tracing paper on top of the original through 360°

3 Count the times it fits back into itself

A regular pentagon has rotational symmetry of order 5

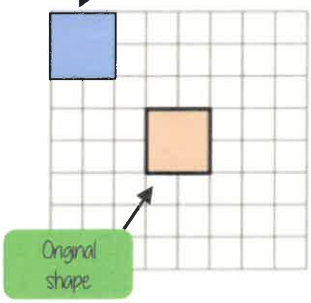
Translation and vector notation

Vector Notation → $\begin{pmatrix} 1 \\ -2 \end{pmatrix}$

How far left or right to move
Negative value (left)
Positive value (right)

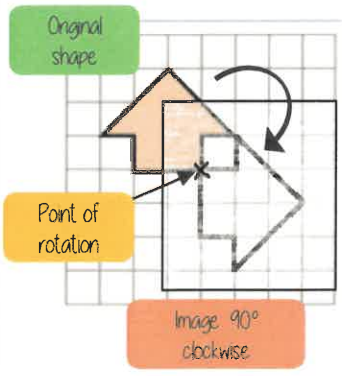
How far up or down to move
Negative value (down)
Positive value (up)

Translation $\begin{pmatrix} -3 \\ 3 \end{pmatrix}$



Every vertex has been translated by the same amount

Rotate from a point (in a shape)



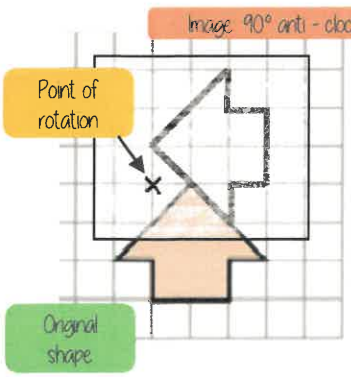
1 Trace the original shape (mark the point of rotation)

2 Keep the point in the same place and turn the tracing paper

3 Draw the new shape

Clockwise Anti-Clockwise

Rotate from a point (outside a shape)

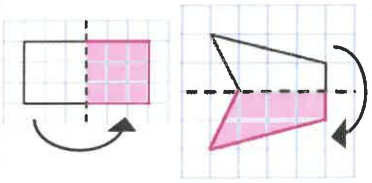


1 Trace the original shape (mark the point of rotation)

2 Keep the point in the same place and turn the tracing paper

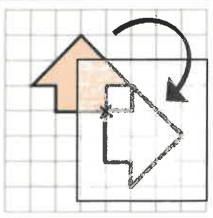
3 Draw the new shape

Compare rotations and reflections



R Reflections are a mirror image of the original shape.

Information needed to perform a reflection:
- Line of reflection (Mirror line)



Rotations are the movement of a shape in a circular motion

Information needed to perform a rotation:
- Point of rotation
- Direction of rotation
- Degrees of rotation

YEAR 9 — REASONING WITH GEOMETRY...

Pythagoras' theorem

@whisto_maths

What do I need to be able to do?

By the end of this unit you should be able to:

- Use square and cube roots
- Identify the hypotenuse
- Calculate the hypotenuse
- Find a missing side in a Right angled triangle
- Use Pythagoras' theorem on axes
- Explore proofs of Pythagoras' theorem

Keywords

Square number: the output of a number multiplied by itself
Square root: a value that can be multiplied by itself to give a square number
Hypotenuse: the largest side on a right angled triangle. Always opposite the right angle.
Opposite: the side opposite the angle of interest
Adjacent: the side next to the angle of interest

Squares and square roots (R)

This can also be written as 6^2

$\sqrt{}$ is the square root symbol

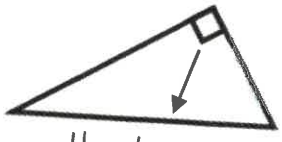
eg $\sqrt{64} = 8$

Because $8 \times 8 = 64$

1 × 1	2 × 2	3 × 3	4 × 4	5 × 5	6 × 6	7 × 7	8 × 8	9 × 9	10 × 10
1	4	9	16	25	36	49	64	81	100

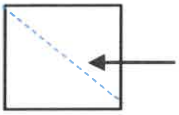
Square numbers

Identify the hypotenuse



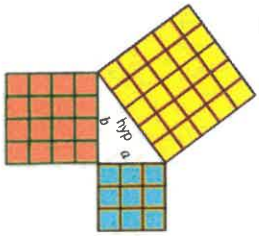
Hypotenuse

The hypotenuse is always the longest side on a triangle because it is opposite the biggest angle



Polygons can still have a hypotenuse if it is split up into triangles and opposite a right angle

Determine if a triangle is right-angled



If a triangle is right-angled, the sum of the squares of the shorter sides will equal the square of the hypotenuse

$a^2 + b^2 =$ hypotenuse^2

eg $a^2 + b^2 =$ hypotenuse^2

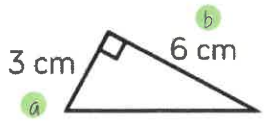
$3^2 + 4^2 = 5^2$

$9 + 16 = 25$

Substituting the numbers into the theorem shows that this is a right-angled triangle

$a = 3$ $b = 4$ $c = 5$

Calculate the hypotenuse



Either of the short sides can be labelled a or b

$a^2 + b^2 =$ hypotenuse^2

1 Substitute in the values for a and b

$3^2 + 6^2 =$ hypotenuse^2

$9 + 36 =$ hypotenuse^2

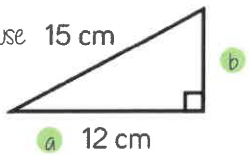
$45 =$ hypotenuse^2

2 To find the hypotenuse square root the sum of the squares of the shorter sides

$\sqrt{45} =$ hypotenuse

$6.71cm =$ hypotenuse

Calculate missing sides



Either of the short sides can be labelled a or b

$a^2 + b^2 =$ hypotenuse^2

$12^2 + b^2 = 15^2$

1 Substitute in the values you are given

$144 + b^2 = 225$

-144 -144

Rearrange the equation by subtracting the shorter square from the hypotenuse squared

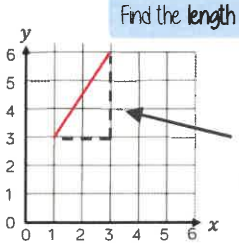
Square root to find the length of the side

$b^2 = 111$

$b = \sqrt{111} = 10.54\ cm$

Pythagoras' theorem on a coordinate axis

Find the **length** of the line segment



The segment can be made into a right-angled triangle by adding the sides on the diagram

The line segment is the **hypotenuse**

$a^2 + b^2 =$ hypotenuse^2

The lengths of a and b are the sides of the triangle

Be careful to check the scale on the axes

1. Pop Music		
1	**Pop music**	A style of music, it is short for popular music, and so changes over time.
2	**Cover version**	A different musicians version of a song.
3	**Acoustic**	Music created with no electrical instruments.
4	**Live lounge**	A series of performances recorded by Radio one – performers do mainly acoustic versions of their own and others songs.
6	**Music technology**	Using computers to create music.
7	**Mixcraft**	A computer programme used to create and edit music.
8	**Sample**	A small digitally recorded clip of music, often musicians use other artists samples in their own pieces.
9	**Multitrack recording**	A method of sound recording that allows people to record onto individual tracks, before combining them to create a whole song.
10	**Overdubbing**	Recording additional sounds onto a track, often to correct previous mistakes.
11	**Synthesiser**	An electronic musical instrument that uses human made sounds to create music. An example would be a keyboard.
12	**Drum machine**	An electronic instrument that creates percussion tracks.

2. Chords for composition		
1	**C major chord**	A happy sounding chord that uses the notes C, E and G.
2	**F Major Chord**	A happy sounding chord that uses the notes F, A and C.
3	**G Major chord**	A happy sounding chord that uses the notes G, B and D.
4	**A minor chord**	A sad sounding chord that uses the notes A, C and E.

3. Key vocab Song structure		
1	**Intro**	The section of the music that introduces the song.
2	**Verse**	A section that repeats in a song, it has the same music, but different lyrics
3	**Chorus**	The main section of a song, it will repeat both the lyrics and the music in the same way..
4	**Bridge**	A section in a song that links two other sections.
5	**Instrumental**	A section in the music with no lyrics and the instruments contain the melodic interest.
6	**Outro**	The ending section of a song.

4.Key Vocab Musical elements		
1	**Melody**	The main tune, played on instruments or sung.
2	**Chords**	Two or more notes played at once.
3	**Bass line**	The lowest part in music, provides the harmonic structure of the music.
4	**Riff**	A repeated musical pattern used in Rock, Pop and Jazz.
5	**Ensemble**	Performing as part of a group.
6	**Unison**	Playing the same part together with another person
7	**Broken chords**	Playing the notes of a chord separately
8	**Block chords**	Playing all of the notes of a chord at once.
9	**Um-pa chords**	Playing the bottom note of a chord on beat one, and the other notes together n beat2 and 3.
10	**Pitch**	How high or low a sound is.
11	**Tempo**	The speed of the music.
12	**Hook**	A catchy melody that hooks the listener in and keeps them interested.

Other musical styles linked to this: Garage, Hip-Hop, Soul, Funk, New Wave, Rock.

Glossary

Crucifixion: the killing of Jesus on the cross, an ancient form of execution

Evil: something that is morally wrong or unjust

Free will: ability to act based on your own decisions

Karma: sum of a person's actions, affects the life you go into after death

Omnibenevolent: All loving, all good

Original Sin: a consequence of the disobedience of Adam and Eve in the Garden of Eden

Sin: an immoral act, going against God's law

Suffering: undergoing pain or distress

The Fall: name given to the disobedience of Adam and Eve, which caused sin to exist in the world

Theodicy: the attempt to explain how an omnipotent and omnibenevolent God can allow suffering

Types of evil:

Evil is a **cause** of human suffering. There are two types of evil:

Moral evil – the acts of humans which are considered to be morally wrong e.g. stealing, murder or abuse

Natural evil – acts that cause suffering for which humans are not responsible, such as natural disaster.

These two can work together. Sometimes human actions can make natural evil worse e.g. climate crisis.

Causes of evil and suffering:

Free will: Despite the fact that God has provided guidance on how to behave in the Bible, people choose to ignore them.

The Fall: Adam and Eve using their free will to disobey God. This is the first example of sin in the Bible and caused Adam and Eve to be punished.

Karma: suffering is the consequence of your good and bad actions in your previous life.

Key people – Jesus Christ:

- *Jesus was sentenced to death on the cross, which was a popular method of execution under Roman governance*
- *Jesus was also mocked and beaten, though different gospels give slightly different accounts of this*
- *Christians believe that Jesus had to suffer in this way, and that he rose from the dead, three days later*
- *Jesus' suffering shows Christians that God understands what it is like for humans to suffer, both mentally and physically*
- *It can also give them hope, as Jesus overcame his suffering, they can too*
- *It can also show Christians that suffering does not go on forever, which can give them comfort*

Key people – Job:

Job's **faith** in God was **tested**. Satan did not believe that Job would continue to believe in God if he suffered. God gave Satan permission to test Job by:

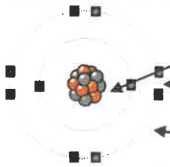
- Attacking Job's servants
- Stealing Job's animals
- Killing Job's children
- Making Job sick

Job did not lose his faith in God, so everything Job had lost was restored. This shows Christians that they should always have faith in God.

AQA GCSE Atomic structure and periodic table part 1

Atoms, elements and compounds

Atom	*The smallest part of an element that can exist*	Have a radius of around 0.1 nanometres and have no charge (0).
Element	*Contains only one type of atom*	Around 100 different elements each one is represented by a symbol e.g. O, Na, Br.
Compound	*Two or more elements chemically combined*	Compounds can only be separated into elements by chemical reactions.



Central nucleus	Contains protons and neutrons
Electron shells	Contains electrons

Name of Particle	Relative Charge	Relative Mass
Proton	+1	1
Neutron	0	1
Electron	-1	Very small

Electronic structures

Electronic shell	Max number of electrons
1	2
2	8
3	8
4	2

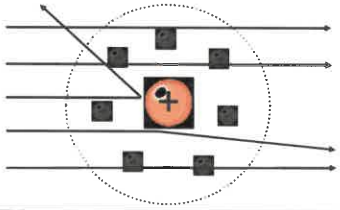
The development of the model of the atom

Pre 1900		*Tiny solid spheres that could not be divided*	Before the discovery of the electron, John Dalton said the solid sphere made up the different elements.
1897 'plum pudding'		*A ball of positive charge with negative electrons embedded in it*	JJ Thompson 's experiments showed that showed that an atom must contain small negative charges (discovery of electrons).
1909 nuclear model		*Positively charge nucleus at the centre surrounded negative electrons*	Ernest Rutherford's alpha particle scattering experiment showed that the mass was concentrated at the centre of the atom.
1913 Bohr model		*Electrons orbit the nucleus at specific distances*	Niels Bohr proposed that electrons orbited in fixed shells; this was supported by experimental observations.

James Chadwick	*Provided the evidence to show the existence of neutrons within the nucleus*

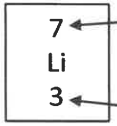
Rutherford's scattering experiment

A beam of alpha particles are directed at a very thin gold foil



Most of the alpha particles passed right through.
A few (+) alpha particles were deflected by the positive nucleus.
A tiny number of particles reflected back from the nucleus.

Relative electrical charges of subatomic particles



Mass number	*The sum of the protons and neutrons in the nucleus*	
Atomic number	*The number of protons in the atom*	Number of electrons = number of protons

Mixtures	*Two or more elements or compounds not chemically combined together*	Can be separated by physical processes.

Method	Description	Example
Filtration	*Separating an insoluble solid from a liquid*	To get sand from a mixture of sand, salt and water.
Crystallisation	*To separate a solid from a solution*	To obtain pure crystals of sodium chloride from salt water.
Simple distillation	*To separate a solvent from a solution*	To get pure water from salt water.
Fractional distillation	*Separating a mixture of liquids each with different boiling points*	To separate the different compounds in crude oil.
Chromatography	*Separating substances that move at different rates through a medium*	To separate out the dyes in food colouring.

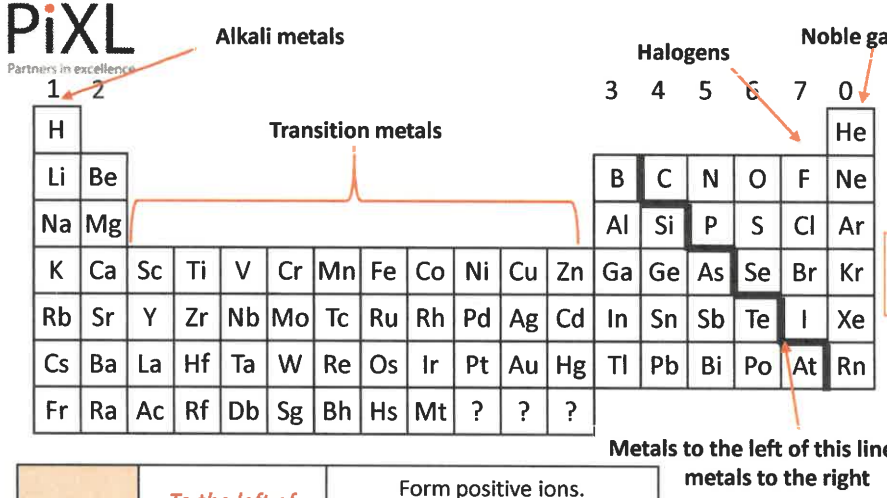
Chemical equations

Chemical equations	*Show chemical reactions - need reactant(s) and product(s) energy always involves and energy change*	Law of conservation of mass states the total mass of products = the total mass of reactants.
Word equations	*Uses words to show reaction* **reactants → products** magnesium + oxygen → magnesium oxide	Does not show what is happening to the atoms or the number of atoms.
Symbol equations	*Uses symbols to show reaction* **reactants → products** $2Mg + O_2 \rightarrow 2MgO$	Shows the number of atoms and molecules in the reaction, these need to be balanced.

Relative atomic mass

Isotopes	*Atoms of the same element with the same number of protons and different numbers of neutrons*	^{35}Cl (75%) and ^{37}Cl (25%) Relative abundance = (% isotope 1 x mass isotope 1) + (% isotope 2 x mass isotope 2) ÷ 100 **e.g. (25 x 37) + (75x 35) ÷ 100 = 35.5**

AQA GCSE Atomic structure and periodic table part 2



The Periodic table

Elements arranged in order of atomic number	*Elements with similar properties are in columns called groups*	Elements in the same group have the same number of outer shell electrons and elements in the same period (row) have the same number of electron shells.

Development of the Periodic table

Before discovery of protons, neutrons and electrons	*Elements arranged in order of atomic weight*	Early periodic tables were incomplete, some elements were placed in inappropriate groups if the strict order atomic weights was followed.
Mendeleev	*Left gaps for elements that hadn't been discovered yet*	Elements with properties predicted by Mendeleev were discovered and filled in the gaps. Knowledge of isotopes explained why order based on atomic weights was not always correct.

Metals and non metals

Metals	*To the left of the Periodic table*	Form positive ions. Conductors, high melting and boiling points, ductile, malleable.
Non metals	*To the right of the Periodic table*	Form negative ions. Insulators, low melting and boiling points.

Group 1

Alkali metals	*Very reactive with oxygen, water and chlorine*	Only have one electron in their outer shell. Form +1 ions.
	Reactivity increases down the group	The radius increases. Negative outer electron is further away from the positive nucleus so is more easily lost.

With oxygen	Forms a metal oxide	Metal + oxygen → metal oxide	e.g. $4Na + O_2 \rightarrow 2Na_2O$
With water	Forms a metal hydroxide and hydrogen	Metal + water → metal hydroxide + hydrogen	e.g. $2Na + 2H_2O \rightarrow 2NaOH + H_2$
With chlorine	Forms a metal chloride	Metal + chlorine → metal chloride	e.g. $2Na + Cl_2 \rightarrow 2NaCl$

Group 7

Halogens	*Consist of molecules made of a pair of atoms*	Have seven electrons in their outer shell. Form -1 ions.
	Melting and boiling points increase down the group (gas → liquid → solid)	Increasing atomic mass number.
	Reactivity decreases down the group	Increasing proton number means an electron is more easily gained

With metals	Forms a metal halide	Metal + halogen → metal halide e.g. Sodium + chlorine → sodium chloride	e.g. NaCl metal atom loses outer shell electrons and halogen gains an outer shell electron
With hydrogen	Forms a hydrogen halide	Hydrogen + halogen → hydrogen halide e.g. Hydrogen + bromine → hydrogen bromide	e.g. $Cl_2 + H_2 \rightarrow 2HCl$
With aqueous solution of a halide salt	A more reactive halogen will displace the less reactive halogen from the salt	Chlorine + potassium bromide → potassium chloride + bromine	e.g. $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

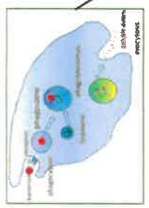
Group 0

Noble gases	*Unreactive, do not form molecules*	This is due to having full outer shells of electrons.
	Boiling points increase down the group	Increasing atomic number.

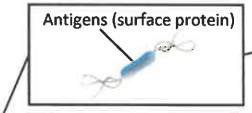
Transition metals (Chemistry only)

Compared to group 1	• *Less reactive* • *Harder* • *Denser* • *Higher melting points*	• *Cu^{2+} is blue* • *Ni^{2+} is pale green, used in the manufacture of margarine* • *Fe^{2+} is green, used in the Haber process* • *Fe^{3+} is reddish-brown* • *Mn^{2+} is pale pink*
Typical properties	• *Many have different ion possibilities with different charges* • *Used as catalysts* • *Form coloured compounds*	

AQA GCSE INFECTION AND RESPONSE part 1



Phagocytes	*Phagocytosis*	Phagocytes engulf the pathogens and digest them.
Lymphocytes	*Antibody production*	Specific antibodies destroy the pathogen. This takes time so an infection can occur. If a person is infected again by the same pathogen, the lymphocytes make antibodies much faster.
	Antitoxin production	Antitoxin is a type of antibody produced to counteract the toxins produced by bacteria.



Pathogens are identified by white blood cells by the different proteins on their surfaces **ANTIGENS.**

White blood cells are part of the immune system

Immune system

Non-specific defence systems

The human body has several non specific ways of defending itself from pathogens getting in

	*Nose*	Nasal hairs, sticky mucus and cilia prevent pathogens entering through the nostrils.
	*Trachea and bronchus (respiratory system)*	Lined with mucus to trap dust and pathogens. Cilia move the mucus upwards to be swallowed.
	*Stomach acid*	Stomach acid (pH1) kills most ingested pathogens.
	*Skin*	Hard to penetrate waterproof barrier. Glands secrete oil which kill microbes

Human defence systems

Plants have several ways of defending themselves from pathogens and animals

Physical	*Mechanical*
Thick waxy layers, cell walls stop pathogen entry	Thorns, curling up leaves to prevent being eaten
Chemical	
Antibacterial and toxins made by plant	

Detection and identification of plant diseases (bio only)

Detection	**Identification**
Stunted growth	Reference using gardening manual or website, laboratory test for pathogens, testing kit using monoclonal antibodies.
Spots on leaves	
Area of decay	
growths	
Malformed stem/leaves	
Discolouration	
Presence of pests	

Nitrate ions needed for protein synthesis – lack of nitrate = stunted growth.

Magnesium ions needed to make chlorophyll – not enough leads to chlorosis – leaves turn yellow.

Pathogens may infect plants or animals and can be spread by direct contact, water or air

Pathogen	*Disease*	Symptoms	Method of transmission	Control of spread
Virus	*Measles*	Fever, red skin rash.	Droplet infection from sneezes and coughs.	Vaccination as a child.
Virus	*HIV*	Initially flu like systems, serious damage to immune system.	Sexual contact and exchange of body fluids.	Anti-retroviral drugs and use of condoms.
Virus	*Tobacco mosaic virus*	Mosaic pattern on leaves.	Enters via wounds in epidermis caused by pests.	Remove infected leaves and control pests that damage the leaves.
Bacteria	*Salmonella*	Fever, cramp, vomiting, diarrhoea.	Food prepared in unhygienic conditions or not cooked properly.	Improve food hygiene, wash hands, vaccinate poultry, cook food thoroughly.
Bacteria	*Gonorrhoea*	Green discharge from penis or vagina.	Direct sexual contact or exchange of body fluids.	Use condoms. Treatment using antibiotics.
Protists	*Malaria*	Recurrent fever.	By an animal vector (mosquitoes).	Prevent breeding of mosquitoes. Use of nets to prevent bites.
Fungus	*Rose black spot*	Purple black spots on leaves.	Spores carried via wind or water.	Remove infected leaves. Spray with fungicide.

Bacteria may produce toxins that damage tissues and make us fell ill

Viruses	Bacteria (prokaryotes)	Protists (eukaryotes)	Fungi (eukaryotes)
e.g. cold, influenza, measles, HIV, tobacco mosaic virus	*e.g. tuberculosis (TB), Salmonella, Gonorrhoea*	*e.g. dysentery, sleeping sickness, malaria*	*e.g. athlete's foot, thrush, rose black spot*
DNA or RNA surrounded by a protein coat	No membrane bound organelles (no chloroplasts, mitochondria or nucleus). Cell wall. Single celled organisms	Membrane bound organelles. Usually single celled.	Membrane bound organelles, cell wall made of chitin. Single celled or multi-cellular

Pathogens are microorganisms that cause infectious disease

Pathogens

Communicable diseases

Viruses live and reproduce inside cells causing damage

AQA INFECTION AND RESPONSE

Antibiotics and painkillers

Antibiotics have greatly reduced deaths from infectious bacterial disease

antibiotics	*e.g. penicillin*	Kill infective bacteria inside the body. Specific bacterial infections require specific antibiotics.
Painkillers and other medicines	*e.g. aspirin, paracetamol, ibuprofen*	Drugs that are used to treat the symptoms of a disease. They do not kill pathogens

Antibiotics cannot be use to treat viral pathogens

Bacteria can mutate

Sometimes this makes them resistant to antibiotic drugs.

Traditionally drugs were extracted from plants and microorganisms

Digitalis	*Aspirin*	*Penicillin*
Extracted from foxglove plants and used as a heart drug	A painkiller and anti-inflammatory that was first found in willow bark	Discovered by Alexander Fleming from the *Penicillium* mould and used as an antibiotic
		

Most new drugs are synthesised by chemists in the pharmaceutical industry.

Discovery and drug development

Drugs have to be tested and trialled before to check they are safe and effective

New drugs are extensively tested for:	
Efficacy	Make sure the drug works
Toxicity	Check that the drug is not poisonous
Dose	The most suitable amount to take

Preclinical trials - using cells, tissues and live animals - must be carried out before the drug can be tested on humans.

Clinical trials use healthy volunteers and patients

Stage 1	*Stage 2*	*Stage 3*	*Stage 4*
Healthy volunteers try small dose of the drug to check it is safe record any side effects	A small number of patients try the drug at a low dose to see if it works	A larger number of patients; different doses are trialled to find the optimum dose	A double blind trial will occur. The patients are divided into groups. Some will be given the drug and some a placebo.

Double blind trial: patients and scientists do not know who receives the new drug or placebo until the end of the trial. This avoids bias.

A placebo can look identical to the new drug but contain no active ingredients

Vaccination

Used to immunise a large proportion of the population to prevent the spread of a pathogen

Vaccination	*Small amount of dead or inactive form of the pathogen*	*1st infection by pathogen*	White blood cells detect pathogens in the vaccine. Antibodies are released into the blood.
		Re-infection by the same pathogen	White blood cells detect pathogens. Antibodies are made much faster and in larger amounts.

A person is unlikely to suffer the symptoms of the harmful disease and it's spread in a population is prevented

It is difficult to develop drugs to kill viruses without harming body tissues because viruses live and reproduce inside cells

Created more side effects than expected (fatal in some cases) and are not as widely used as everybody hoped when first developed.

Monoclonal antibodies (Biology only HT)

Monoclonal antibodies	*Identical copies of one types of antibody produced in laboratory*	1. A mouse is injected with pathogen
		2. Lymphocytes produce antibodies
		3. Lymphocytes are removed from the mouse and fused with rapidly dividing mouse tumour cells
		4. The new cells are called hybridomas
		5. The hybridomas divide rapidly and release lots of antibodies which are then collected

Specific to one binding site on the antigen. Can target specific chemicals or cells in the body

Monoclonal antibodies can be used in a variety of ways

Diagnosis	*Detecting pathogens*	*Detecting molecules*	*Treatment*
e.g. pregnancy test – measure the level of hormones	Can detect very small quantities of chemicals in the blood	Fluorescent dye can be attached so it can be seen inside cells or tissues	Bound to radioactive substance, toxic drug or chemical Cancer cells are targeted to normal body cells are unharmed

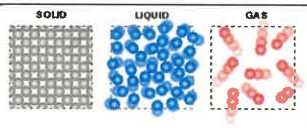
AQA BONDING, STRUCTURE AND THE PROPERTIES OF MATTER 1

Chemical bonds

Ionic	*Particles are oppositely charged ions*	Occurs in compounds formed from metals combined with non metals.
Covalent	*Particles are atoms that share pairs of electrons*	Occurs in most non metallic elements and in compounds of non metals.
Metallic	*Particles are atoms which share delocalised electrons*	Occurs in metallic elements and alloys.

The three states of matter

Solid, liquid, gas	*Melting and freezing happen at melting point, boiling and condensing happen at boiling point.*	The amount of energy needed for a state change depends on the strength of forces between particles in the substance.



(HT only) Limitations of simple model:
- There are no forces in the model
- All particles are shown as spheres
- Spheres are solid

s	solid
l	liquid
g	gas

Properties of ionic compounds

High melting and boiling points	Large amounts of energy needed to break the bonds.
Do not conduct electricity when solid	Ions are held in a fixed position in the lattice and cannot move.
Do conduct electricity when molten or dissolved	Lattice breaks apart and the ions are free to move.

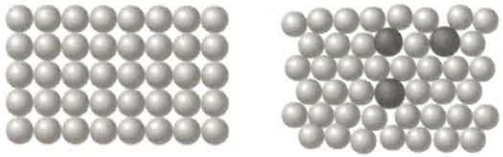
Metals as conductors

Good conductors of electricity	Delocalised electrons carry electrical charge through the metal.
Good conductors of thermal energy	Energy is transferred by the delocalised electrons.

High melting and boiling points	This is due to the strong metallic bonds.
Pure metals can be bent and shaped	Atoms are arranged in layers that can slide over each other.

Properties of metals and alloys

Alloys — *Mixture of two or more elements at least one of which is a metal* — Harder than pure metals because atoms of different sizes disrupt the layers so they cannot slide over each other.



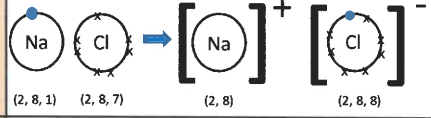
Ionic bonding

Electrons are transferred so that all atoms have a noble gas configuration (full outer shells).

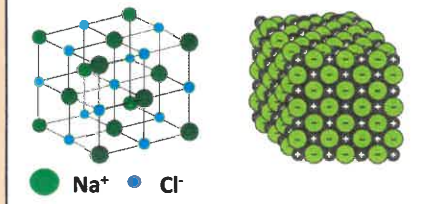
Metal atoms lose electrons and become positively charged ions	Group 1 metals form +1 ions Group 2 metals form +2 ions
Non metals atoms gain electrons to become negatively charged ions	Group 6 non metals form -2 ions Group 7 non metals form -1 ions

Ionic compounds

Dot and cross diagram



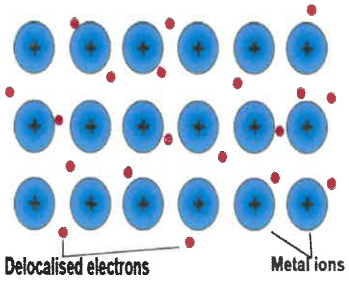
Giant structure



Structure
- *Held together by strong electrostatic forces of attraction between oppositely charged ions*
- *Forces act in all directions in the lattice*

Metallic bonding

Giant structure of atoms arranged in a regular pattern



Electrons in the outer shell of metal atoms are delocalised and free to move through the whole structure. This sharing of electrons leads to strong metallic bonds.

AQA BONDING, STRUCTURE AND THE PROPERTIES OF MATTER 2

Polymers

Very large molecules	*Solids at room temperature*	Atoms are linked by strong covalent bonds.	

Diamond

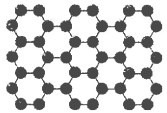
Each carbon atom is bonded to four others		Very hard.	Rigid structure.
		Very high melting point.	Strong covalent bonds.
		Does not conduct electricity.	No delocalised electrons.

Properties of small molecules

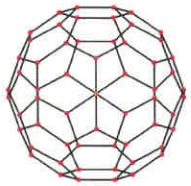
Usually gases or liquids	*Covalent bonds in the molecule are strong but forces between molecules (intermolecular) are weak*	Low melting and boiling points.	Due to having weak intermolecular forces that easily broken.
		Do not conduct electricity.	Due to them molecules not having an overall electrical charge.
		Larger molecules have higher melting and boiling points.	Intermolecular forces increase with the size of the molecules.

Graphene and fullerenes

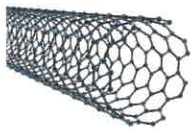
Graphene

Graphene	 *Single layer of graphite one atom thick*	Excellent conductor.	Contains delocalised electrons.
		Very strong.	Contains strong covalent bonds.

Fullerenes

Fullerenes		Buckminsterfullerene, C_{60} First fullerene to be discovered.	Hexagonal rings of carbon atoms with hollow shapes. Can also have rings of five (pentagonal) or seven (heptagonal) carbon atoms.

Carbon nanotubes

Carbon nanotubes		*Very thin and long cylindrical fullerenes*	Very conductive.	Used in electronics industry.
			High tensile strength.	Reinforcing composite materials.
			Large surface area to volume ratio.	Catalysts and lubricants.

Size of particles and their properties (Chemistry only)

Nanoparticles

Nanoparticles	*Between 1 and 100 nanometres (nm) in size*	1 nanometre (1 nm) = 1 x 10^{-9} metres (0.000 000 001m or a billionth of a metre).

Use of nanoparticles

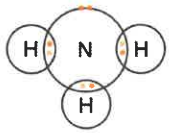
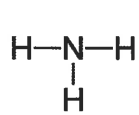
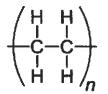
Healthcare, cosmetics, sun cream, catalysts, deodorants, electronics.	Nanoparticles may be toxic to people. They may be able to enter the brain from the bloodstream and cause harm.

Giant covalent structures

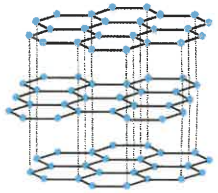
Diamond, graphite, silicon dioxide	*Very high melting points*	Lots of energy needed to break strong, covalent bonds.

Covalent bonding

Atoms share pairs of electrons

Can be small molecules e.g. ammonia		Dot and cross : + Show which atom the electrons in the bonds come from - All electrons are identical
		2D with bonds: + Show which atoms are bonded together - It shows the H-C-H bond incorrectly at 90°
		3D ball and stick model: + Attempts to show the H-C-H bond angle is 109.5°
Can be giant covalent structures e.g. polymers		

Graphite

Each carbon atom is bonded to three others forming layers of hexagonal rings with no covalent bonds between the layers		Slippery.	Layers can slide over each other.
		Very high melting point.	Strong covalent bonds.
		Does conduct electricity.	Delocalised electrons between layers.

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Global Energy Resources

AQA ENERGY – part 2

National Grid

Transport	*Petrol, diesel, kerosene produced from oil*	Used in cars, trains and planes.
Heating	*Gas and electricity*	Used in buildings.
Electricity	*Most generated by fossil fuels*	Used to power most devices.

Using renewable energy will need to increase to meet demand.

Renewable energy makes up about 20% of energy consumption.

Fossil fuel reserves are running out.

Energy demand is increasing as population increases.

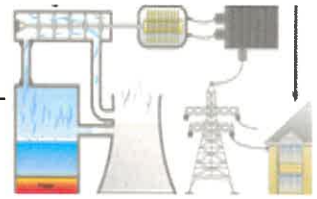
Using fuels

Non-renewable energy resource	*These will run out. It is a finite reserve. It cannot be replenished.*	e.g. Fossil fuels (coal, oil and gas) and nuclear fuels.
Renewable energy resource	*These will never run out. It is an infinite reserve. It can be replenished.*	e.g. Solar, Tides, Waves, Wind, Geothermal, Biomass, Hydroelectric

Energy resources

Power station – NB: You need to understand the principle behind generating electricity. An energy resource is burnt to make steam to drive a turbine which drives the generator.

Power station	*Generates electricity*	Fuel burnt releasing thermal energy →	Water boils into steam →	Steam turns turbine →	Turbine turns generator →	Generator induces voltage
National Grid	*Transports electricity across UK*	Power station →	Step-up transformer →	Pylons →	Step-down transformer →	House, factory



Energy resource	*How it works*	Uses	Positive	Negative
Fossil Fuels (coal, oil and gas)	*Burnt to release thermal energy used to turn water into steam to turn turbines*	Generating electricity, heating and transport	Provides most of the UK energy. Large reserves. Cheap to extract. Used in transport, heating and making electricity. Easy to transport.	Non-renewable. Burning coal and oil releases sulfur dioxide. When mixed with rain makes acid rain. Acid rain damages building and kills plants. Burning fossil fuels releases carbon dioxide which contributes to global warming. Serious environmental damage if oil spilt.
Nuclear	*Nuclear fission process*	Generating electricity	No greenhouse gases produced. Lots of energy produced from small amounts of fuel.	Non-renewable. Dangers of radioactive materials being released into air or water. Nuclear sites need high levels of security. Start up costs and decommission costs very expensive. Toxic waste needs careful storing.
Biofuel	*Plant matter burnt to release thermal energy*	Transport and generating electricity	Renewable. As plants grow, they remove carbon dioxide. They are 'carbon neutral'.	Large areas of land needed to grow fuel crops. Habitats destroyed and food not grown. Emits carbon dioxide when burnt thus adding to greenhouse gases and global warming.
Tides	*Every day tides rise and fall, so generation of electricity can be predicted*	Generating electricity	Renewable. Predictable due to consistency of tides. No greenhouse gases produced.	Expensive to set up. A dam like structure is built across an estuary, altering habitats and causing problems for ships and boats.
Waves	*Up and down motion turns turbines*	Generating electricity	Renewable. No waste products.	Can be unreliable depends on wave output as large waves can stop the pistons working.
Hydroelectric	*Falling water spins a turbine*	Generating electricity	Renewable. No waste products.	Habitats destroyed when dam is built.
Wind	*Movement causes turbine to spin which turns a generator*	Generating electricity	Renewable. No waste products.	Unreliable – wind varies. Visual and noise pollution. Dangerous to migrating birds.
Solar	*Directly heats objects in solar panels or sunlight captured in photovoltaic cells*	Generating electricity and some heating	Renewable. No waste products.	Making and installing solar panels expensive. Unreliable due to light intensity.
Geothermal	*Hot rocks under the ground heats water to produce steam to turn turbine*	Generating electricity and heating	Renewable. Clean. No greenhouse gases produced.	Limited to a small number of countries. Geothermal power stations can cause earthquake tremors.

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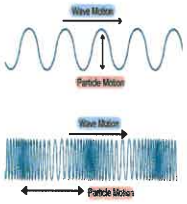
Wave speed	Wave speed = frequency X wavelength	V = f X λ
Wave period	Wave period = 1 ÷ frequency	T = 1 ÷ f
Speed	Speed = distance ÷ time	v = d ÷ t

Wavelength	*Distance from one point on a wave to the same point of the next wave*
Amplitude	*The maximum disturbance from its rest position*
Frequency	*Number of waves per second*
Period	*Time taken to produce 1 complete wave*



Transverse wave	*Vibration causing the wave is at right angles to the direction of energy transfer*	Energy is carried outwards by the wave.	Water and light waves, S waves.
Longitudinal wave	*Vibration causing the wave is parallel to the direction of energy transfer*	Energy is carried along the wave.	Sound waves, P waves.

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Transverse and Longitudinal waves

Waves in air, fluids and solids

AQA Waves

Electromagnetic waves

Black body radiation

PHYSICS ONLY

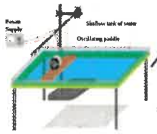
Earth and Global warming

Ultraviolet, visible light, infra-red radiation penetrate atmosphere and heat up Earth's surface.

Longer wavelengths are radiated back, trapped by atmosphere.

Energy lost is not at the same rate as energy being absorbed so Earth heats up.

Black body radiation	*All objects absorb or reflect infrared radiation*	Hotter objects emit more infrared radiation.
Constant temperature	*Rate of absorption = rate of radiation*	Intensity and wavelength of energy affects temperature.



In water, use a ripple tank.

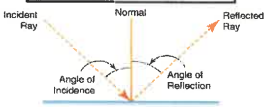
In air, use echoes.

Measuring speed

Properties

Sound waves travelling through different mediums, the frequency stay constant.

Air Water



Angle of incidence = angle of reflection
(i) = (r)

PHYSICS ONLY

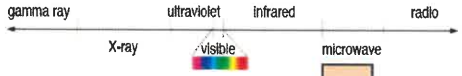
Reflection	Wave bounces off the surface.
Refraction	Waves changes direction at boundary.
Transmitted	Passes through the object.
Absorbed	Passes into but not out of, transfers energy and heats up the object.

Light refracts as it slows down in a denser substance

e.g. Gamma

Short wavelengths have high frequency and high energy.

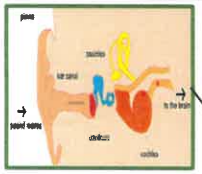
Electromagnetic wave	*Continuous spectrum of transverse waves*



PHYSICS ONLY

Magnification = image size ÷ object size

	Units
Distance	*Metres (m)*
Wave speed	*Metres per second (m/s)*
Wavelength	*Metres (m)*
Frequency	*Hertz (Hz)*
Period	*Seconds (s)*



PHYSICS HIGHER ONLY

Hearing	*Frequencies between 20 – 20,000 Hz*	Longitudinal waves cause ear drum to vibrate, amplified by three ossicles which creates pressure in the cochlea.

Absorbed light changes into thermal energy store.

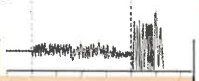
HIGHER: Properties

HIGHER: Lenses

Convex	Real or virtual images.	2F: Image same size, upside down, real. 2F - F: Image larger, upside down, real. < F: Image bigger, right way, virtual.
Concave	Only virtual images.	

Specular	Flat surface reflection.
Diffuse	Rough surface reflection.

Seismic waves



P wave	S wave	Seismograph
Longitudinal	*Transverse*	*Shows P and S waves arriving at different times.*
Fast	*Slow*	By using the times the waves arrive at the monitoring centres, the epicentre of earthquake can be found. (v = x ÷ t).
Travel through solids and liquids	*Travels through solids*	
Produced by earthquakes.		

Black surfaces	*Good emitters, good absorbers*
White surfaces	*Poor emitters, poor absorbers*
Shiny surfaces	*Good reflectors*

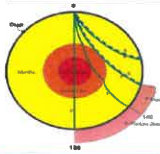
EM waves refract

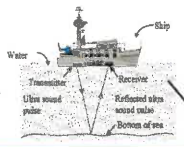
EM wave	Danger	Use
Radio	Safe.	Communications, TV, radio.
Microwave	Burning if concentrated.	Mobile phones, cooking, satellites.
Infrared		Heating, remote controls, cooking.
Visible	Damage to eyes.	Illumination, photography, fibre optics.
Ultra violet	Sunburn, cancer.	Security marking, disinfecting water.
X-ray	Cell destruction, mutation, cancer.	Broken bones, airport security.
Gamma		Sterilising, detecting and killing cancer.

Low frequency, long wavelength.

White	Wave lengths reflected
Black	Wave lengths absorbed

High frequency, short wavelength





Ultra sound	*Partially reflected off boundary*	Used for medical and foetal scans.
Sonar	*Reflected off objects*	Used to determine depth of objects under the sea.