Knowledge Organiser Focus: C1 and P1

I should already know:

Structures of an atom.

Electronic structure.

Types of energy store and an understanding of energy transfers.

I will learn:

Describe the overall structure of an atom and link to elements, compounds and mixtures.

Explain why and how chemical equations are balanced.

Explain different separation techniques.

Explain how we obtain fractions from crude oil.

Describe the changing theories of atomic structure.

Describe isotopes using the structure of the atom.

Explain how ions form.

Describe energy transfers in a system.

Explain conservation of energy.

Describe how work is linked to energy.

Define GPE, KE and EP.

Explain what happens to dissipated energy.

Evaluate electrical items in terms of efficiency.

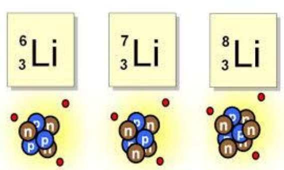
This will help in the future:

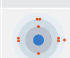
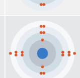
Careers in Chemistry and Physics such a pharmaceuticals, researcher.

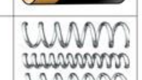
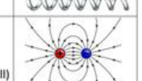
Key Words

Keyword	Definition
Atom	The smallest part of an element which can be recognised as an element
Atomic Number	The number of protons (which equals the number of electrons) in an atom.
Chromatography	The process whereby small amounts of dissolved substances are separated by running a solvent along a material such as absorbent paper.
Compound	A substance made when two or more elements are chemically bonded together. For example water (H2O) is a compound made from hydrogen and oxygen.
Distillation	Separation of a liquid from a mixture by evaporation followed by condensation.
Dot And Cross Diagram	A drawing to show the arrangement of the outer shell electrons only of the atoms or ions in a substance.
Electronic Structure	A set of numbers to show the arrangement of electrons in their shells (or energy levels).
Element	A substance made up of only one type of atom. It cannot be broken down chemically into any simpler substance.
Fraction	Hydrocarbons with a similar boiling point separated from crude oil
Fractional Distillation	A way to separate liquids from a mixture of liquids by boiling off the substances at different temperatures
Hydrocarbon	A compound containing only hydrogen and carbon.
Ion	A charged particle produced by the loss or gain of electrons.
Isotope	Atom that has the same number of protons but a different number of neutrons. It has the same atomic number but a different mass number
Relative Atomic Mass (Symbol)	Ar
Relative Formula Mass (Symbol)	Mr

Efficiency	Efficiency= useful energy output/total energy input
Kinetic energy	The energy an object possesses due to its motion
Thermal energy	Heat energy; caused by movement and vibration of particles in matter
Gravitational potential energy	The energy of an object at height
Elastic energy	The energy stored when an object is stretched or squashed
Power	The amount of energy transferred per unit time, i.e. the rate of energy transfer
Energy	The capacity for doing work
Work	The measure of energy transfer when a force (F) moves an object through a distance (d)
Conservation of energy	Energy cannot be created or destroyed; it can only be transferred, stored or dissipated



Element	Diagram	Configuration	Electrons	Periodic table group
Fluorine, F		2.7	Fluorine atoms have nine electrons. Two of these are in the first shell. The remaining seven are in the second shell.	Group 7
Neon, Ne		2.8	Neon atoms have ten electrons. Two of these are in the first shell. The remaining eight electrons are in the second shell. Because its outer shell is full, neon is stable and unreactive.	Group 0
Sodium, Na		2.8.1	Sodium atoms have 11 electrons. Two of these are in the first shell, eight are in the second shell and one is in the third shell.	Group 1
Calcium, Ca		2.8.8.2	Calcium atoms have 20 electrons. Two of these are in the first shell, eight in the second shell, another eight in the third shell, and two in the fourth shell.	Group 2

Magnetic Energy Store	Anything which has been stretched.	
Thermal Energy Store	An object/substance from which energy can be released by a chemical reaction.	
Elastic Potential Energy Store	Magnets that are attracting or repelling.	
Gravitational Potential Energy Store	Two electric charges which attract or repel	
Electrostatic Energy Store	The higher the temperature, the more of this type of energy.	
Chemical Energy Store	Anything that is moving.	
Kinetic Energy Store	Anything in a gravitational field (anything that can fall)	

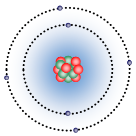
Greater Depth Challenge

Why is the mass number for chlorine 37.5?

Is energy really running out?

Further Reading

BBC Bitesize, Quizlet.



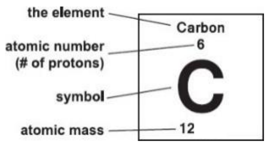
A_r = relative atomic mass

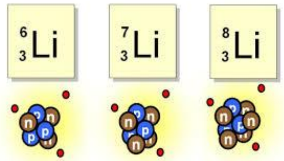
The mass of one atom of an element. Found on the periodic table (the bigger number).

M_r = relative formula mass

The sum of all the atomic masses of each element in a molecule.

Particle	Charge	Mass (in atomic units)
Proton	1+	1
Neutron	0	1
Electron	1-	Very small





Atoms have the same number of protons and electrons.

An isotope is an atom of the same element. It has the same number of protons and electrons, but a different number of neutrons.

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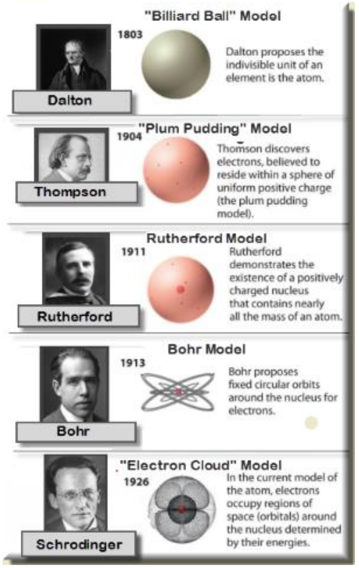
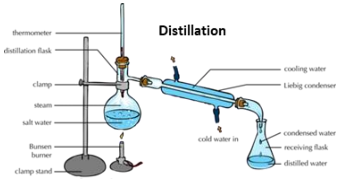


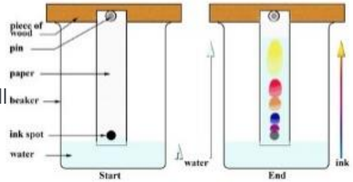
Distillation is the process of separating the components or substances from a liquid mixture by using selective boiling and condensation.



Chromatography is used to separate mixtures and help identify substances. Substances are separated by mass and size. Smaller, lighter atoms move faster and higher on the paper.

Common errors in chromatography are;

- Marking the line in pen. Ink is soluble and so will also dissolve. A pencil should be used.
- Putting the water level over the start line. This will dissolve the substance into the water and not allow it to move up the paper.



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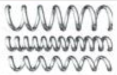
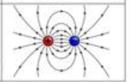
Chemical Energy Store	Anything that is moving.	
Kinetic Energy Store	Anything in a gravitational field (anything that can fall)	

Topic 1 - Energy

Equation	Symbol	Unit
$E_k = \frac{1}{2} mv^2$	E_k = kinetic energy m = mass v = speed	E_k = J (joules) m = kg (kilograms) v = m/s (meters per second)
$E_e = \frac{1}{2} ke^2$	E_e = elastic potential energy k = spring constant e = extension	E_e = J (joules) k = N/m (newton's per meter) e = m (meters)
$E_p = mgh$	E_p = gravitational potential energy m = mass g = gravitational field strength h = height	E_p = J (joules) m = kg (kilograms) g = N/kg (newton's per kilogram) h = m (meters)
$\Delta E = mc\Delta\theta$	ΔE = change in thermal energy m = mass c = specific heat capacity $\Delta\theta$ = temperature change	ΔE = J (joules) m = kg (kilograms) c = J/kg°C (joules per kilogram per degree Celsius) $\Delta\theta$ = °C (degree Celsius)
$P = \frac{E}{t}$	P = power E = energy transferred t = time	P = W (watts) E = J (joules) t = s (seconds)
$P = \frac{W}{t}$	P = power W = work done t = time	P = W (watts) E = J (joules) t = s (seconds)
$\text{Efficiency} = \frac{\text{useful energy out}}{\text{total energy in}}$		
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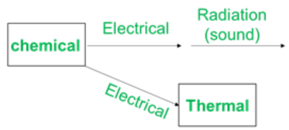
Draw an energy transfer diagram to show how the energy is transferred in an electric radio.



The four pathways

- Mechanically (when a force acts and something moves)
- Electrically (when a current flows)
- By heating (because of a temperature difference)
- By radiation (a wave such as light, microwaves or sound)

State what energy transfer diagrams show	Where energy is transferred to and from and the type of energy transfer
Name the four ways energy can be transferred	mechanically electrically by heating by radiation
Name the two types of energy transferred	Useful and wasted
State the law of the conservation of energy	Energy cannot be created or destroyed only transferred

Appliances, power and energy

All electrical appliances transfer energy from one **store** to another, for example **chemical energy** in the fuel in power stations. This is transferred into **kinetic energy** in a fan or heat energy in a cooker.

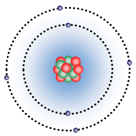
The amount of energy transferred depends on the **power** (the energy transferred each second) and the amount of time the appliance is switched on for. The energy transferred by an appliance can be calculated using the equation:

Work

Work is done whenever a force moves something.

Everyday examples of work include walking up stairs, lifting heavy objects, pulling a sledge and pushing a shopping trolley. Whenever work is done, energy is transferred from one place to another.

A man pushes a box with a force of 10 newtons to move it a distance of 2 metres



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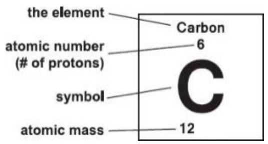

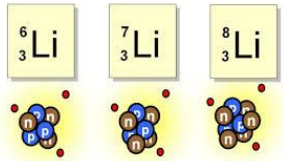

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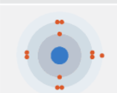
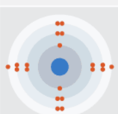
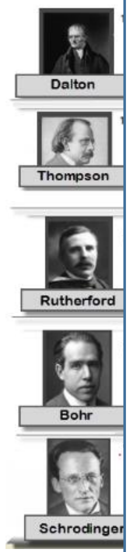
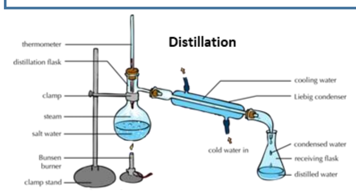
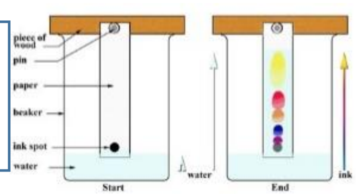
Sodium, Na				
Calcium, Ca				







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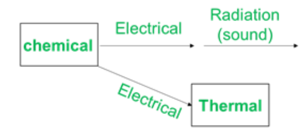

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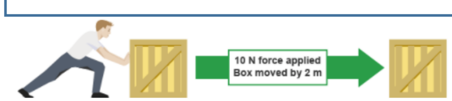
Name the two types of energy transferred	
State the law of the conservation of energy	

Appliances, power and energy

Work



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Scientific equipment

Name	Use
Bunsen burner	**Heating by burning a gas**
Conical flask	To measure volume of liquids
Beaker	**To hold, pour and heat liquids**
Measuring cylinder	To measure precise volume of liquid
Evaporating basin	**To heat and evaporate liquids**

Name	Use
Stopwatch	**To measure time**
Tongs	To hold hot things (not test tubes)
Thermometer	**To measure temperature**
Safety Goggles	To protect your eyes
Tripod	**To hold a beaker above a Bunsen burner**
Gauze	Used to support a beaker

Risk assessment

Hazard / Chemical	Risks	Control measures	Emergency measures

Hazard – something that has the potential to cause harm to a person, property or environment.

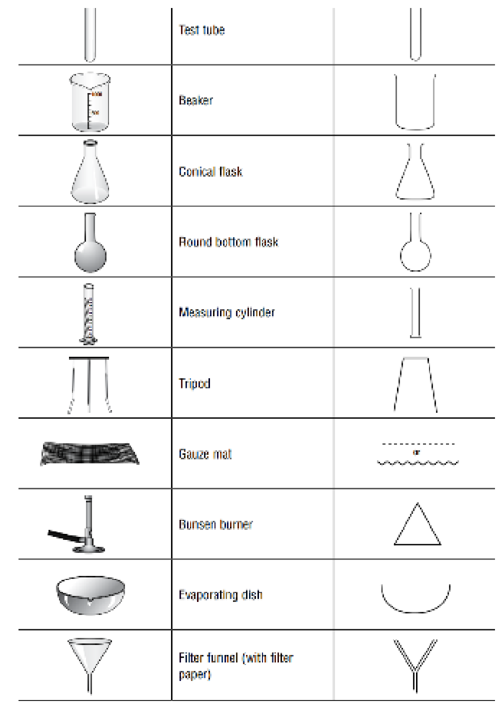
Risk – is the chance or probability of the hazard causing harm or damage to people, property or the environment.

Control measures – minimises the risk of the hazard causing harm.

Drawing equipment

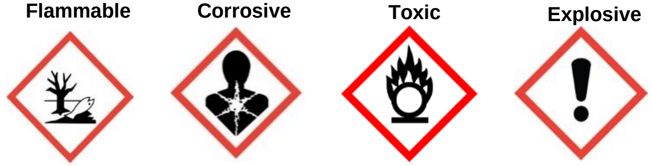
When drawing scientific equipment it must be drawn in 2D and not 3D.

Equipment diagrams should be drawn as part of the method for the experiment.



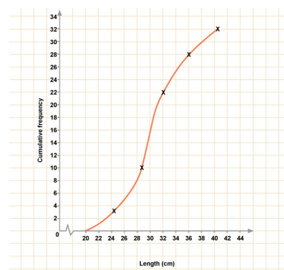
Hazard symbols

Flammable **Corrosive** **Toxic** **Explosive**



Harmful to the environment **Serious health hazard** **Oxidising** **Harmful**

Graphs



Rules for a graph

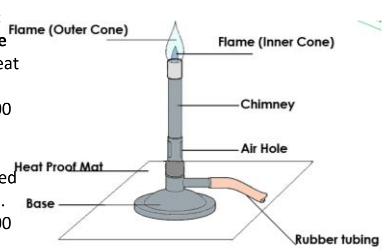
1. Title
2. Size
3. Appropriate scale
4. Labelled axis
5. Plot points accurately
6. Line of best fit

When describing graphs make sure you…

- Identifying if it's an increasing or decreasing trend.
- Support your chosen trend with evidence from the graph.
- Give a reason or opinion for the observed trend.

Bunsen burner

Different flames:
Collar open= Blue flame- used to heat substances
Temperature= 500 degrees
Collar closed=
Yellow flame: used as a safety flame .
Temperature= 300 degrees



Calculation

Formula	Write the formula you are using.
Numbers	Substitute in the known numbers.
Answer	Calculate the answer.
Unit	Add units if appropriate.