Trilogy P1: Conservation and dissipation of energy

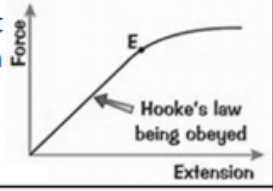
Collins revision guide: Energy

Knowledge Organiser

Key points to learn

1. Energy stores [J]	Chemical energy
	Kinetic energy
	Gravitational potential energy
	Elastic potential energy
2. Chemical energy [J]	Transferred during chemical reactions eg fuels, foods, or in batteries
3. Kinetic energy [J]	All moving objects have it.
	k.e = 0.5 x mass x (speed)^2 E_k = ½ x m x v^2 [J] [kg] [m/s]
4 Gravitational potential energy [J]	Stored in an object lifted up.
	g.p.e = mass x g x height E_p = m x g x h [J] [kg] [N/kg] [m]
5. Elastic potential energy [J]	Energy stored in a springy object
	e.p.e = 0.5 x spring constant x (extension)^2 E_e = ½ x k x e^2 *(You are given this equation)* [J] [N/m] [m]
6. Energy can be transferred by…	Heating (thermal energy always flows from hot to cold objects)
	An electrical current flowing
	A force moving an object
7. Useful energy [J]	Energy transferred to the place and in the form we need it.
8. Wasted energy [J]	Not useful. Eventually transferred to surroundings

Key points to learn

9. Work done [J]	Equal to the energy transferred.
	When a force moves an object.
	Work done = Force x distance moved W = F x s [J] [N] [m]
10. Energy flow diagram	Show energy transfers eg for a torch lamp:
	Chemical → Light + Heat
11. Conservation of energy	Energy cannot be created or destroyed. It can only be transferred usefully, stored or dissipated.
12. Dissipated energy [J]	Wasted energy, usually spread to the surroundings as heat.
13. Hooke's Law and k the spring constant	The extension of a spring is proportional to the force on it.
	The gradient of this graph is known as k, the spring constant. 
14. Efficiency	Proportion of input energy transferred to useful energy. 100% means no wasted energy. Efficiency = useful energy ÷ total input energy
15. Power [W]	Energy [J] transferred in 1 second.
	Power [W] = Energy [J] ÷ time [s]
16. Wasted power [W]	Total power in – useful power out

Big picture (Physics Paper 1)

- Energy and energy resources
  - Conservation and dissipation of energy
  - Energy transfer by heating
  - Energy resources
- Particles at work
  - Electric circuits
  - Electricity in the home
  - Molecules and matter
  - Radioactivity

Background

Energy is the capacity of something to make something happen.

The Universe and everything in it is constantly changing energy from one form into another.

Maths skills

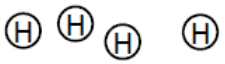
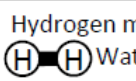
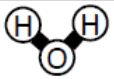
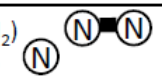
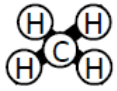
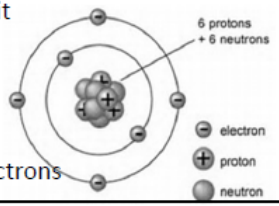
You should be able to recall, use and rearrange all the equations on this page except number 5.

g is Earth's acceleration due to gravity. It has a constant value of approximately 9.8m/s^2

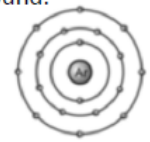
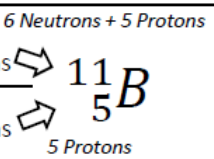
You need to remember the units for each quantity. They are in [ ] next to equations.

You should be able to calculate the gradient of a Force – extension graph.

Key points to learn

1. Atom	Smallest part of an element that can exist
	Hydrogen atoms (4H) 
2. Molecule	Two or more atoms chemically bonded
	Hydrogen molecule (H_2)  Water molecule (H_2O) 
3. Element	Only one type or atom present. Can be single atoms or molecules
	Both examples of the Nitrogen element (N_2) (N) 
4. Compound	Two or more different elements chemically bonded
	Carbon dioxide (CO_2)   Methane (CH_4)
5. Nuclear atom model	• Electrons orbit • Protons and neutrons in nucleus • Number of protons = electrons 
6. Nucleus	The centre of the atom. Contains neutrons and protons
7. Proton	Charge of +1. Mass of 1. Found inside the nucleus
8. Neutron	Charge of 0. Mass of 1. Found inside the nucleus
9. Electron	Charge of -1. Mass of almost 0. Found orbiting around the nucleus

Key points to learn

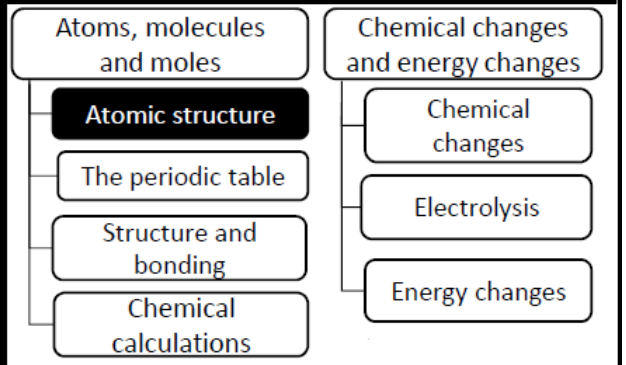
10. Mixture	Two or more chemicals not chemically bonded
11. Separation techniques	Used to separate mixtures. Ones you need to know: Filtration - get an insoluble solid from a liquid Crystallisation - get a soluble solid from a liquid by evaporating liquid off Distillation - get a pure liquid from a mixture of liquids Chromatography - separate mixtures of coloured compounds
12. Electron energy levels	Where electrons are found. The shells can each hold this many electrons maximum: 2,8,8 
13. Periodic Table	A list of all the elements in order or atomic number. Columns called **Groups**. Rows called **Periods**
14.Conservation of mass	In a chemical reaction the total mass of reactants = total mass of products
15. Mass number	Number of neutrons + protons 
16. Atomic number	Number of protons
17. Isotope	Same number of protons different number of neutrons
18. Ion	Atom where number of protons is not equal to electrons (+'ve or –'ve)
19 Plum pudding atom model	Early model: ball of positive charge with electrons in it 

Trilogy C1: Atomic structure

Collins revision guide: Atomic structure and the periodic table

Knowledge Organiser

Big picture (Chemistry Paper 1)



Background

Atoms are the building blocks of us, our world and our universe. Everything that we can touch is made of atoms.

The Periodic Table organises them into a way that helps us make sense of the physical world.

Even though they make everything atoms are mostly (99.9%) empty space. If an atom was as big as Wembley, the nucleus would be pea-sized.

Additional information

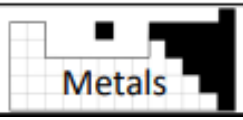
A great deal of this topic is also covered in your Paper 1, Physics lessons during Electricity and Radioactivity.

Trilogy C2: The Periodic Table

Collins revision guide: Atomic structure and the periodic table

Knowledge Organiser

Key points to learn

1. Chemical symbol	An abbreviated name for every element. Maximum of two letters always starts with a capital letter
2 Reactivity	How easily an element will react
3. Group	Columns in the Periodic Table. Elements in the same group have similar properties
	Tells you how many electrons that atom has in its outer shell
4. Period	Rows in the periodic table
	Tells you how many electron shells that atom has
5. Mass number	Number of neutrons + protons
6. Atomic number	Number of protons
7. Ion	Atom where number of protons is not equal to electrons (+'ve or –'ve)
8. Mendeleev	Scientist who placed elements in order of atomic weight but left gaps for undiscovered elements
9. Metals	Have delocalised (free) electrons that can move
	Atoms lose electrons and become positive (+'ve) ions
	 Metals

4 Neutrons + 3 Protons

$^{7}_{3}Li$

3 Protons

Key points to learn

10. Non-metals	Have electrons that cannot move
	Nearly always gain electrons and become (negative -'ve) ions
	 Non-metals
11. Group 0 Noble gases	He, Ne, Ar, Kr, Xe, Rn
	Unreactive: full outer shell
	Boiling point increases as you go down the group
12. Group 1 Alkali metals	Li, Na, K, Rb, Cs, Fr
	Very reactive: only one electron in their outer shell
	Reactivity increases as you go down the group
	React with oxygen to give metal oxides eg MgO
	React with water to give metal hydroxide (alkali) and hydrogen eg MgOH
	React with chlorine to give metal chloride eg MgCl
13. Group 7 Halogens	F, Cl, Br, I
	Melting and boiling point increase as you go down group
	Reactivity decreases as you go down the group
	A more reactive halogen will displace a less reactive one

Big picture (Chemistry Paper 1)

- Atoms, molecules and moles
  - Atomic structure
  - The periodic table
  - Structure and bonding
  - Chemical calculations
- Chemical changes and energy changes
  - Chemical changes
  - Electrolysis
  - Energy changes

Background

The periodic table is amazing because it allows us to predict and explain the properties of elements even before they are discovered.

Maths skills

Losing –'ve charge makes you more +'ve.
Gaining –'ve charge makes you more –'ve.

Additional information

Remember Electron energy levels	Where electrons are found. The shells can each hold this many electrons maximum: 2,8,8