GCSE Science homework - combined Year 10 terms 3 & 4

The following tasks must be completed by the dates indicated:

Due date	Task
Friday 19th January 2024	**C2 Separating Techniques**
Friday 26th January 2024	**C2 Bonding**
Friday 2nd February 2024	**C2 Giant Covalent Structures**
Friday 9th February 2024	**P2 Distance-Time vs Velocity-Time Graphs**
Friday 23rd February 2024	**P2 Newton's Laws**
Friday 1st March 2024	**P2 Forces in Action**
Friday 8th March 2024	**B3 The Nervous System**
Friday 15th March 2024	**B3 Hormones**
Friday 22nd March 2024	**Working Scientifically**
Friday 12th April 2024	**C1 - Atoms vs Ions**

Due date:	Friday 19th January 2024
Student number:	
Name:	

Y10 Combined T3 W2 – C2 Separating Techniques

Question	Answer
Define pure.	A substance containing only one type of element or compound.
How is melting point used to determine purity?	A pure substance will have a distinct melting point. An impure substance will melt over a range of temperatures.
What is relative formula mass?	The total mass of all of the elements in a compound.
What is an empirical formula?	The simplest whole number ratio of elements in a compound.
What is an alloy?	A mixture of two or more elements, where at least one is a metal.
What is filtration?	A separation technique used to separate an insoluble solid from a liquid.
What is crystallisation?	A separation technique used to separate a soluble solid from a solution.
What is simple distillation?	A separation technique used to separate a mixture of solutions with two different boiling points.
What changes of state are involved in simple distillation?	Evaporation and condensation
What is a condenser used for?	To cool and condense the hot vapour

Look, Cover, Write, Check

Question	Answer
What is an alloy?	
What is crystallisation?	
What is a condenser used for?	
What is simple distillation?	
How is melting point used to determine purity?	
What is relative formula mass?	
Define pure.	
What is empirical formula?	

What changes of state are involved in simple distillation?	
What is filtration?	

Look, cover, write, check

Question	Answer
Define pure.	
How is melting point used to determine purity?	
	The total mass of all of the elements in a compound.
What is empirical formula?	The simplest whole number ratio of elements in a compound.
	A mixture of two or more elements, where at least one is a metal.
What is filtration?	
What is crystallisation?	
	A separation technique used to separate a mixture of solutions with two different boiling points.
What changes of state are involved in simple distillation?	
	To cool and condense the hot vapour

1. What is meant by an **alloy**?

A A compound substance
B A metal used in car wheels
C A mixture of metals
D An element

Your answer ☐ **[1]**

2. A molecule of glucose has the molecular formula $C_6H_{12}O_6$.

What is the **empirical formula** of glucose?

A CHO
B CH_2O
C $C_6H_{12}O_6$
D $(CO_6)H_{12}$

Your answer ☐ **[1]**

Due date:	Friday 26th January 2024
Student number:	
Name:	

Y10 Combined T3 W3 – C2 Bonding

Question	Answer
What are the properties of metals?	Metals are malleable, ductile and good conductors of electricity and heat. Metals usually have high boiling points.
What are properties of non-metals?	Non-metals are brittle and poor conductors of heat and electricity.
What does the group and period number of an element tell you?	group number: number of electrons in the outer shell of an atom period number: number of electron shells in each atom
What is the maximum number of electrons that can be held in each electron shell?	Two electrons in the first shell. Eight electrons in the second and third shells.
What is an ion?	An atom which has lost or gained electrons to become charged.
What atoms will bond ionically?	Metals and non-metals.
How does ionic bonding occur?	Electrons are transferred from the metal to the non-metal. The metal forms a positive ion and the non-metal forms a negative ion which attract together due to strong electrostatic forces.
What atoms will bond covalently?	Non-metals
How does covalent bonding occur?	Electrons are shared between the atoms to form a full outer shell of electrons.
What is metallic bonding?	The strong electrostatic attraction between positive metal ions and a sea of delocalised electrons.

Look, Cover, Write, Check

Question	Answer
What does the group and period number of an element tell you?	
What is an ion?	
What atoms will bond ionically?	
What are properties of non-metals?	
How does ionic bonding occur?	
What are the properties of metals?	
How does covalent bonding occur?	
What is the maximum number of electrons that can be held in each electron shell?	
What atoms will bond ionically?	
What is metallic bonding?	

Look, Cover, Write, Check

Question	Answer
	Electrons are shared between the atoms to form a full outer shell of electrons.
What are properties of non-metals?	
What atoms will bond ionically?	
	The strong electrostatic attraction between positive metal ions and a sea of delocalised electrons.
What does the group and period number of an element tell you?	
How does ionic bonding occur?	Electrons are transferred from the metal to the non-metal. The metal forms a positive ion and the non-metal forms a negative ion which attract together due to strong electrostatic forces.
	Two electrons in the first shell. Eight electrons in the second and third shells.
What atoms will bond covalently?	
	An atom which has lost or gained electrons to become charged.
What are the properties of metals?	

1. An atom of an element forms an ion with the formula X^{2-}. Which **Group** of the Periodic Table is this element found in?

A Group 0
B Group 2
C Group 6
D Group 7

Your answer ☐ **(1)**

2. Fluorine is the most reactive element in Group 7 (Group 17). Why?

A Fluorine atoms gain an electron more readily than the other Group 7 elements.
B Fluorine is a gas.
C Fluorine exists as diatomic molecules.
D Fluorine atoms lose electrons more readily than the other Group 7 elements.

Your answer ☐ **(1)**

3. Which statement describes a covalent bond?

A A shared pair of electrons.
B The electrostatic attraction between oppositely charged ions.
C The electrostatic attraction between delocalised electrons and positive ions.
D The forces of attraction between molecules.

Your answer ☐ **(1)**

Due date:	Friday 2nd February 2024
Student number:	
Name:	

Y10 Combined T3 W4 – Giant Covalent Structures

Question	Answer
Define a ‘covalent bond’’.	A shared pair of electrons between 2 non-metal atoms.
Give an example of a giant covalent structure.	Diamond, graphite and silicon dioxide.
Why do giant covalent structures have a high melting and boiling point?	They have lots of strong covalent bonds, therefore lots of energy is required to break these covalent bonds.
Define ‘allotrope’	Different structural forms of the same element in the same physical state.
Name 2 allotropes of carbon.	Diamond and graphite.
State some properties of graphite.	Soft and slippery; good conductor of heat and electricity; high melting and boiling point.
State some uses of graphite	Pencils; lubricant; electrodes in batteries and electrolysis.
Describe the bonding in graphite.	Each carbon atom is covalently bonded to 3 other carbon atoms, forming hexagons.
State some properties of diamond.	Very hard; shiny; does not conduct heat or electricity; high melting and boiling point.
State some uses of diamond	Jewellery; cutting tools.
Describe the bonding in diamond.	Each carbon atom is covalently bonded to 4 other carbon atoms.

Look, Cover, Write, Check

Question	Answer
Define an ‘allotrope’	
Name 2 allotropes of carbon.	
Give an example of a giant covalent structure.	
Define a ‘covalent bond’’.	
Why do giant covalent structures have a high melting and boiling point?	
State some properties of graphite.	
State some properties of diamond.	
Describe the bonding in graphite.	
Describe the bonding in graphite.	
State some uses of graphite.	
State some uses of diamond	

Look, Cover, Write, Check

Question	Answer
	A shared pair of electrons between 2 non-metal atoms.
Give an example of a giant covalent structure.	
Why do giant covalent structures have a high melting and boiling point?	
	Different structural forms of the same element in the same physical state.
Name 2 allotropes of carbon.	
	Soft and slippery; good conductor of heat and electricity; high melting and boiling point.
State some uses of graphite.	
Describe the bonding in graphite.	
	Very hard; shiny; does not conduct heat or electricity; high melting and boiling point
State some uses of diamond	
Describe the bonding in diamond.	

1. Which particles in a metal allow it to **conduct electricity**?

A Atoms
B Electrons
C Ions
D Protons

Your answer ☐ **(1)**

2. Graphite is used in pencils. Why can graphite make marks on paper?

A All the bonds in graphite are weak.
B Atoms in graphite are in layers.
C Forces between layers in graphite are strong.
D Every atom in graphite is strongly bonded to four others.

Your answer ☐ **(1)**

3. Look at the information about four different substances, **A**, **B**, **C** and **D**.

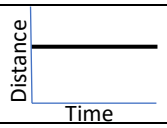
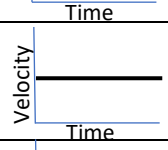
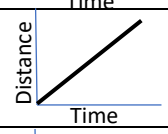
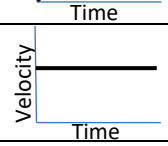
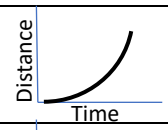
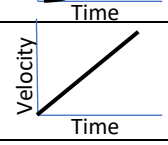
Substance	Melting point (°C)	Conducts electricity?
A	−30	no
B	3550	no
C	1660	yes
D	124	no

Your answer ☐ **(1)**

Which substance is **diamond**?

Due date:	Friday 9th February 2024
Student number:	
Name:	

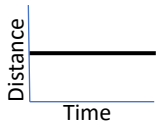
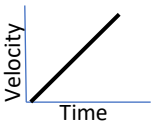
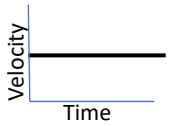
Y10 Combined T3 W5 – P2 Distance-Time vs Velocity-Time Graphs

Question	Answer
Define 'stationary'	Not moving (still).
Define 'acceleration'	Velocity increasing.
Sketch a **distance-time** graph for an object that is **stationary.**	
Sketch a **velocity-time** graph for an object that is **stationary.**	
Sketch a **distance-time** graph for an object travelling at a **constant speed**.	
Sketch a **velocity-time** graph for an object travelling at a **constant speed**.	
How is speed calculated from a distance-time graph?	The gradient (steepness) of the line.
Sketch a **distance-time** graph for an object that is **accelerating.**	
Sketch a **velocity-time** graph for an object that is **accelerating.**	

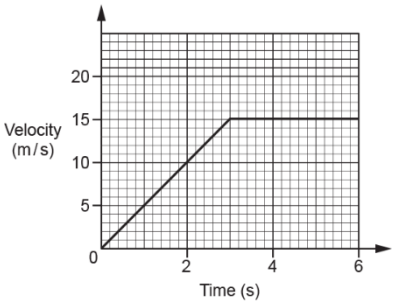
Look, Cover, Write, Check

Question	Answer
Define 'stationary'	
Sketch a **velocity-time** graph for an object that is **stationary.**	
Sketch a **distance-time** graph for an object that is **stationary.**	
Define 'acceleration'	
How is speed calculated from a distance-time graph?	
Sketch a **velocity-time** graph for an object that is **accelerating.**	
Sketch a **distance-time** graph for an object that is **accelerating.**	
Sketch a **velocity-time** graph for an object travelling at a **constant speed**.	
Sketch a **distance-time** graph for an object travelling at a **constant speed**.	

Look, Cover, Write, Check

Question	Answer
	Not moving (still).
Sketch a **velocity-time** graph for an object that is **stationary.**	
	
	Increase in velocity.
How is speed calculated from a distance-time graph?	
	
Sketch a **distance-time** graph for an object that is **accelerating.**	
	
Sketch a **distance-time** graph for an object travelling at a **constant speed**.	

1. Look at the graph below.

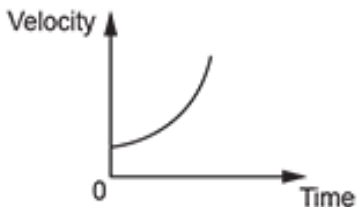


Which of the following is the distance travelled between 0 and 6 seconds?

A 22.5 m
B 45.0 m
C 67.5 m
D 90.0 m

Your answer ☐ **(1)**

2. This is a velocity-time graph for an object.



Which statement describes the motion of the object?

A The object has a constant acceleration.
B The object is accelerating at a decreasing rate.
C The object is accelerating at an increasing rate.
D The object is decelerating.

Your answer ☐ **(1)**

Due date:	Friday 23rd February 2024
Student number:	
Name:	

Y10 Combined T4 W1 – P2 Newton's Laws

Question	Answer
What is Newton's first law?	An object remains is the same state of motion unless a resultant force acts on it.
What state of motions would an object have if the resultant force is zero?	Stationary or moving at a constant velocity
What is Newton's second law?	Force = mass x acceleration
What is Newton's third law?	When objects interact, they exert equal and opposite forces on each other.
What are contact forces?	Forces exerted between two objects when they are touching.
What are non-contact forces?	The push or pull between objects that are not physically touching when they interact.
What are the force pairs that occur when pushing a pram?	The person pushes the pram forwards, the pram pushes the person backwards.
What are the force pairs that occur between a satellite in orbit and the Earth?	The Earth pulls the satellite, and the satellite pulls the Earth.
What forces are acting on a skydiver?	Weight and air resistance
What is terminal velocity?	The maximum speed of an object, reached when the forces moving the object are balanced by frictional forces.

Look, Cover, Write, Check

Question	Answer
What are contact forces?	
What are non-contact forces?	
What is Newton's second law?	
What are the force pairs that occur when pushing a pram?	
What is Newton's third law?	
What forces are acting on a skydiver?	
What is terminal velocity?	
What is Newton's first law?	
What are the force pairs that occur between a satellite in orbit and the Earth?	
What state of motions would an object have if the resultant force is zero?	

Look, Cover, Write, Check

Question	Answer
	An object remains is the same state of motion unless a resultant force acts on it.
What state of motions would an object have if the resultant force is zero?	
	Force = mass x acceleration
	When objects interact, they exert equal and opposite forces on each other.
What are contact forces?	
What are non-contact forces?	
	The person pushes the pram forwards, the pram pushes the person backwards.
What are the force pairs that occur between a satellite in orbit and the Earth?	
	Weight and air resistance
	The maximum speed of an object, reached when the forces moving the object are balanced by frictional forces.

1. This is a picture of a ball on a field.

i. The ball is stationary on the field. Explain why using Newton's laws.

(1)

ii. Student **A** kicks the ball with their toes. This hurts the student's toes. Explain why using Newton's laws.

(3)

Due date:	Friday 1st March 2024
Student number:	
Name:	

Y10 Combined T4 W2 – P2 Forces in Action

Question	Answer
What is momentum?	The product of mass and velocity
How is momentum calculated?	momentum = mass x velocity
What is work done?	A measure of how much energy is transferred when an object is moved.
How is work done calculated?	work done = force x distance
What is power?	The rate at which energy is transferred or work is done.
What is weight (also known as gravity force)?	The force acting on an object due to the pull of gravity from a massive object like a planet.
How is weight (gravity force) calculated?	weight = mass x gravitational field strength
What is gravitational field strength on Earth?	10 N/kg
How is gravitational potential energy (GPE) calculated?	GPE = mass x height x gravitational field strength
What are the units of GPE?	Joules (J)

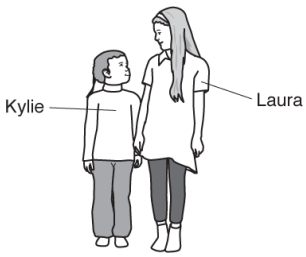
Look, Cover, Write, Check

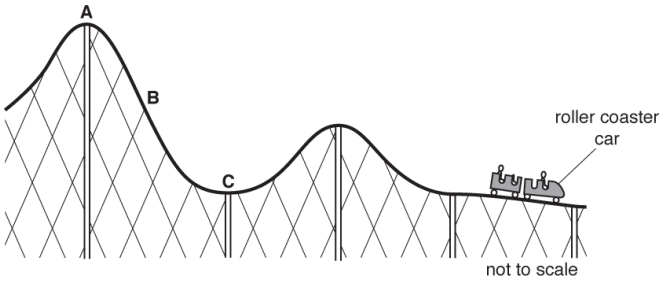
Question	Answer
What is power?	
What is weight (also known as gravity force)?	
How is gravitational potential energy (GPE) calculated?	
What are the units of GPE?	
How is work done calculated?	
How is weight (gravity force) calculated?	
What is work done?	
What is gravitational field strength on Earth?	
What is momentum?	
How is momentum calculated?	

Look, Cover, Write, Check

Question	Answer
	The product of mass and velocity
How is momentum calculated?	
What is work done?	
How is work done calculated?	
	The rate at which energy is transferred or work is done.
	The force acting on an object due to the pull of gravity from a massive object like a planet.
How is weight (gravity force) calculated?	
What is gravitational field strength on Earth?	
	GPE = mass x height x gravitational field strength
	Joules (J)

1. Kylie and Laura ride in a roller coaster car. They have different masses. The diagram shows the girls in the roller coaster car at the end of the ride.





Describe why Kylie and Laura have different kinetic energy (KE) to each other at **B**.

Describe how their gravitational potential energy (GPE) changes as the roller coaster car moves. Use letters **A, B and C** from the diagram in your answer.

(6)

Due date:	Friday 8th March 2024
Student number:	
Name:	

Y10 Combined T4 W3 – B3 The Nervous System

Question	Answer
What do receptor cells detect?	They detect different stimuli.
What are the three main neurons called?	Sensory neurone, relay neurone and motor neurone.
What happens to a stimulus once it has been detected?	It is converted into an electrical impulse which can travel along sensory neurones to the CNS.
What are the receptors and stimuli associated with the skin organ?	Receptor cells detect pressure and temperature. The stimulus is pressure and heat.
What is a reflex action?	A reflex action is an involuntary response that bypasses the brain.
Write the pathway/order of a nervous reaction	Stimulus → Receptor cells → Sensory neurone → Brain → Motor neurone → Effector → Response
Write the pathway/order of a reflex response	Stimulus → Receptor cells → Sensory neurone → Spinal cord → Motor neurone → Effector → Response
Why is a reflex response faster than a voluntary response?	The response bypasses (misses out) the brain, so the body can respond faster.
What is the difference between a receptor and an effector?	A receptor detects the change in stimuli whereas an effector is a muscle or gland that initiates a response

Look, Cover, Write, Check

Question	Answer
What do receptor cells detect?	
What are the three main neurons called?	
What happens to a stimulus once it has been detected?	
What are the receptors and stimuli associated with the skin organ?	
What is a reflex action?	
Write the pathway/order of a nervous reaction	
Write the pathway/order of a reflex response	
Why is a reflex response faster than a voluntary response?	
What is the difference between a receptor and an effector?	

Look, Cover, Write, Check

Question	Answer
What do receptor cells detect?	
What are the three main neurons called?	
What happens to a stimulus once it has been detected?	
What are the receptors and stimuli associated with the skin organ?	
What is a reflex action?	
Write the pathway/order of a nervous reaction	
Write the pathway/order of a reflex response	
Why is a reflex response faster than a voluntary response?	
What is the difference between a receptor and an effector?	

Exam Question:

This question is about the nervous system.

(a) Describe the difference between the function of a receptor and the function of an effector.

In your answer you should give **one** example of a receptor and **one** example of an effector.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

Due date:	Friday 15th March 2024
Student number:	
Name:	

Y10 Combined T4 W4 – B3 Hormones

Question	Answer
What are hormones?	Chemical messengers
How are hormones transported around the body?	Through the bloodstream.
What is homeostasis?	Keeping the internal conditions of the body constant.
What is the menstrual cycle?	A monthly cycle during which a woman's body gets ready for pregnancy.
What are the four menstrual hormones?	FSH, LH, Oestrogen and Progesterone.
Where are the menstrual hormone made?	FSH and LH are made in the pituitary gland. Oestrogen and progesterone are made in the ovaries.
What does FSH do?	FSH causes an egg to mature.
What does oestrogen do?	Oestrogen causes the lining of the uterus to build up.
What does LH do?	When LH levels reach a peak in the middle of the cycle, ovulation is triggered.
What does progesterone do?	Progesterone maintains the uterus lining.

Look, Cover, Write, Check

Question	Answer
How are hormones transported around the body?	
What is homeostasis?	
What does FSH do?	
What are hormones?	
What are the four menstrual hormones?	
What does oestrogen do?	
Where are the menstrual hormone made?	
What does progesterone do?	
What is the menstrual cycle?	
What does LH do?	

Look, Cover, Write, Check

Question	Answer
	Chemical messengers
	Through the bloodstream.
What is homeostasis?	
	A monthly cycle during which a woman's body gets ready for pregnancy.
What are the four menstrual hormones?	
Where are the menstrual hormone made?	
	It travels to the ovaries and causes an egg to mature.
	It causes the lining of the uterus to build up.
What does LH do?	
What does progesterone do?	

Exam Question:

1. Hormones are involved in controlling the menstrual cycle and fertility.

Complete the following sentences:
(i) A hormone produced by the pituitary gland is _____ **(1)**

(ii) A hormone produced by the ovaries is _____ **(1)**

Describe how the hormones FSH, oestrogen and LH are involved in the control of the menstrual cycle.

_____

_____

_____

_____

_____

_____ **(3)**

Due date:	Friday 22nd March 2024
Student number:	
Name:	

Y10 Combined T4 W5 – Working Scientifically

Question	Answer
What is the definition of accurate?	Close to the true value.
What is the definition of reliable (sometimes called precise)?	Consistent with one another: this means they have a small range.
What is the definition of valid?	The investigation is appropriate to answer the question: only one variable is changed.
What is the definition of repeatable?	One person can use the same method and equipment to obtain similar results.
What is the definition of reproducible?	Someone else can repeat the experiment and obtain similar results.
What is the cause of a systematic error?	A problem with the method. All results are affected in the same way.
What is the cause of a random error?	Each result is effected differently: it can be an error reading the scale or human reaction time.
What is the cause of a zero error?	A lack of calibration (setting the equipment to zero before use). All results are affected in the same way.
What is an independent variable?	What you change/investigate in the investigation.
What is a control variable?	The control variables are what you keep the same.

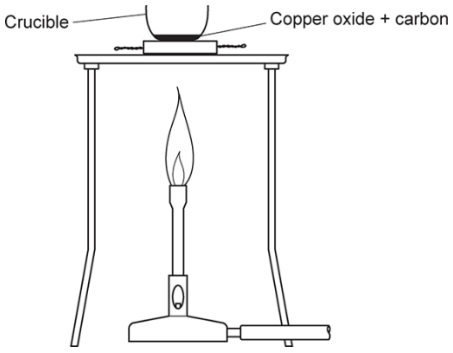
Look, Cover, Write, Check

Question	Answer
What is an independent variable?	
What is the definition of repeatable?	
What is the cause of a systematic error?	
What is the definition of reliable (sometimes called precise)?	
What is a control variable?	
What is the definition of accurate?	
What is the cause of a zero error?	
What is the definition of reproducible?	
What is the definition of valid?	
What is the cause of a random error?	

Look, Cover, Write, Check

Question	Answer
	The control variables are what you keep the same.
What is the definition of repeatable?	
What is the cause of a random error?	
	Reproducible means that someone else can repeat the experiment and obtain similar results.
	Valid means the investigation is appropriate to answer the question: only one variable is changed.
What is an independent variable?	
	Results which are reliable are consistent with one another: this means they have a small range.
	A zero error is caused by a lack of calibration (setting the equipment to zero before use). All results are affected in the same way.
What is the cause of a systematic error?	
What is the definition of accurate?	

1(a) In an experiment a student heats copper oxide and carbon to produce copper.



Complete the word equation for the reaction.

copper oxide + carbon → copper + ... [1]

(b). The student measures the mass of copper made in the experiment.

She repeated the experiment four times.

Experiment	1	2	3	4
Mass of copper oxide (g)	2.4	2.4	2.4	2.4
Mass of copper (g)	1.7	1.7	0.8	1.6

i. Look at the mass of copper made in **Experiment 3**.

Suggest why the result of **Experiment 3** is different and why it should **not** be used to calculate the mean.

_____

_____

_____**(3)**

ii. Calculate the **mean** mass of copper formed. Do **not** include the result of **Experiment 3** in your calculation.

Give your answer to **2** significant figures.

Mean mass of copper = _____g **(3)**

Due date:	Friday 12th April 2024
Student number:	
Name:	

Y10 Combined T5 W1 C1 - Atoms vs Ions

Question	Answer
What is the charge of a proton?	**+1** (positive 1)
What is the charge of an electron?	**-1** (negative 1)
Why do atoms have an overall neutral charge?	They have an **equal number of protons and electrons**.
Define an ion.	**An atom with an overall charge due to the loss of gain of electrons.**
How does an atom form a positive ion?	Positive ions are formed when the **atom loses electrons.**
Why does losing electrons cause an ion to become positive?	An atom that has lost electrons, now has **more protons than electrons,** giving it an overall positive charge.
How does an atom form a negative ion?	Negative ions are formed when the **atom gains electrons.**
Why does gaining electrons cause an ion to become negative?	An atom that has gained electrons, now **has more electrons than** protons, giving it an overall negative charge.
What type of elements form positive ions?	**Elements in group 1, 2 and 3** (most of which are **metals**).
What type of elements form negative ions?	**Elements in group 5,6,7** (most of which are **non-metals**).
Why does group 0 not form ions?	Group 0 are inert (unreactive) because **they have a full outer shell. They do not gain or lose electrons**.

Look, Cover, Write, Check

Question	Answer
Why do atoms have an overall neutral charge?	
What is the charge of an electron?	
What is the charge of a proton?	
Define an ion.	
Why does group 0 not form ions?	
What type of elements form positive ions?	
How does an atom form a negative ion?	
Why does gaining electrons cause an ion to become positive?	
Why does losing electrons cause an ion to become positive?	
What type of elements form negative ions?	
How does an atom form a positive ion?	

Look, Cover, Write, Check

Question	Answer
	+1 (positive 1)
	-1 (negative 1)
Why do atoms have an overall neutral charge?	
	An atom with an overall charge due to the loss of gain of electrons.
How does an atom form a positive ion?	
Why does losing electrons cause an ion to become positive?	
	When the atom **gains electrons**.
Why does gaining electrons cause an ion to become positive?	
	Elements in group 1, 2 and 3 (most of which are metals).
	Elements in group 5,6,7 (most of which are non-metals).
	Group 0 are **inert** (unreactive) because they have a full outer shell. **They do not gain or lose electrons.**

1. Atoms can form ions. Which statement is **correct**?

A All metal ions are negatively charged.
B Ions are always smaller than the atom they are made from.
C Negative ions are formed when an atom gains electrons.
D Positive ions are formed when an atom gains electrons.

Your answer ☐ **[1]**

2. The table shows some common ions.

Negative ions		**Positive ions**	
Nitrate	NO_3 –	Aluminium	Al^{3+}
Oxide	O^{2-}	Magnesium	Mg^{2+}

Write the formula for **aluminium oxide**.

_____

[1]

3. The element **sodium** forms an **ion** with a charge of **1+**.

Work out the number of electrons in an **ion** of this element.

Electrons: _____ **[1]**