Chemistry
Summer Work Booklet

PETERBOROUGH KEYS
ACADEMIES TRUST

Summer work – Chemistry

When you start the course you will complete a test within the first few weeks on the following topics. Please complete the booklet over the summer so you are prepared for:

Topic
Atomic Structure and Electron Configurations, focus on group 1 and group 7 trends in reactivity.
Bonding and Structure Revision – Ionic, Covalent, Metallic (link structure to properties, such as high melting points for giant structures and low boiling points for simple covalent structures)
Organic Chemistry – Organic molecules (alkanes, alkenes, alcohols, carboxylic acids and esters). Structure, bonding and properties of alkanes and alkenes, complete and incomplete combustion, recap Fractional Distillation (relate boiling points to intermolecular forces), polymerisation, recognise functional groups of alcohols, carboxylic acids and esters.
Chemical Equations and Calculations revision – writing and balancing symbol equations from word equations, calculating the number of moles, calculating empirical and molecular formulae, calculating reacting masses, calculating the concentration of an unknown solution (Titration)
Exothermic and Endothermic reaction - definition for an exothermic and endothermic reaction, energy level diagrams, calculating the change in energy of a reaction using average bond energies, calculating energy changes in solutions and energy released by fuels
Rates of reactions - measuring the rate of a chemical reaction, describe and explain factors that affect the rate of a chemical reaction, a definition of a catalyst and a description of how a catalyst is able to alter the rate of a reaction, reversible reactions and equilibrium, factors that affect the position of equilibrium, best conditions for chemical reactions.

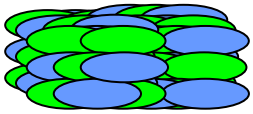
Bonding

Property	**Explanation**
Diamond	
..... melting point and boiling point	
..... electrical conductivity	
Graphite	
..... melting point and boiling point	
..... electrical conductivity	
Silica	
..... melting point and boiling point	
..... electrical conductivity	LEAVE BLANK

Exam questions – Giant ionic substances

a. In giant ionic substances ions arrange themselves in giant ionic lattices, as shown below. What is the force that holds these ions together?

.....(1 mark)



b. Sodium chloride (table salt) is an example of a giant ionic substance. Explain as fully as you can the electrical conductivity of sodium chloride.

Include in your answer the electrical conductivity or sodium chloride in solid, molten and dissolved forms and an explanation to support your answer.

.....

.....

.....

.....

.....

.....

(4 marks)

c. The bonding in an ionic compound such as sodium chloride is ionic. How could we know this only from knowing the atoms or ions that the compound contains?

.....

.....(1 mark)

a. Tick 2 boxes to indicate which 2 are properties of giant ionic substances (2 marks)

Property	Tick (✓)
Do not dissolve in water	
High melting points	
Low boiling points	
Strong bonds	

Total: /8

Quantitative

C1 REVISION – QUANTITATIVE CHEMISTRY

A student added marble chips to hydrochloric acid.

Balance the symbol equation for the reaction that took place

$$\_\_ HCl + \_\_ CaCO_3 \rightarrow \_\_ CaCl_2 + \_\_ H_2O + \_\_ CO_2$$

Explain why there was a change in mass in the experiment

Calculate the concentration in g/dm^3 for:

1. 50 g of sodium chloride in 2.5 dm^3 of water

2. 1.8g of sodium carbonate in 862cm^3 of water

Calculate the mass of potassium bromide (KBr) dissolved in 200 cm^3 of water with a concentration of 1.5g/dm^3

Calculate the relative formula mass (M_r) of:

Sulfuric acid (H_2SO_4).
Relative atomic masses: H = 1, S = 32, O = 16

Ammonia (NH_3).
Relative atomic masses: N = 14, H = 1

Copper oxide (CuO).
Relative atomic masses: O = 16, Cu = 64

0.50g of sodium chloride is mixed with water to make 25cm^3 of solution.

Calculate the mass of sodium chloride in 10cm^3 of solution

[H] When calcium carbonate is heated it thermally decomposes into calcium oxide and carbon dioxide.

$$CaCO_3 \rightarrow CaO + CO_2$$

Calculate the maximum mass of calcium oxide that could be formed from 1.5 g of calcium carbonate.

(relative masses: Ca = 40, C = 12, O = 16)

[H] When potassium sulfate solution and barium chloride solution are mixed together, a displacement reactions takes place and a white precipitate is formed.

$$K_2SO_4\,(aq) + BaCl_2\,(aq) \rightarrow 2\,KCl\,(aq) + BaSO_4\,(s)$$

Calculate the maximum mass of barium sufate that could be formed from 870 cm^3 of potassium sulfate.

The concentration of potassium sulfate solution is 2 g/dm^3

(relative masses: K = 39, S = 32, O = 16, Ba = 137)

C2 REVISION – THE RATE AND EXTENT OF CHEMICAL CHANGE

What do we mean by 'rate of reaction'?

What factors affect the rate of a reaction?

1.

2.

3.

4.

5.

What must happen for a reaction to occur?

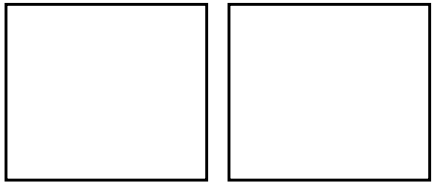
1.

2.

What is the smallest amount of energy that must be overcome for a reaction to occur?

Explain the effect of concentration on the rate of reaction

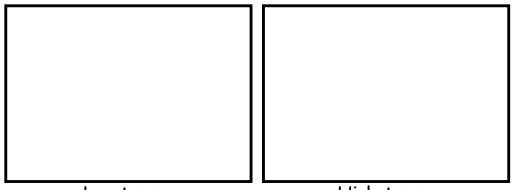
Draw diagrams to represent it:



Low conc^{n} High conc^{n}

Explain the effect of temperature on the rate of reaction

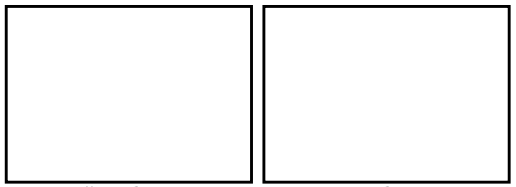
Draw diagrams to represent it:



Low temp High temp

Explain the effect of surface area on the rate of reaction

Draw diagrams to represent it:



Small surface area Large surface area

Why does increasing the pressure increase the rate of reaction?

What do catalysts do?

What happens to them during a reaction?

Energy activation collide frequently minimum

Particles can react with each other only when they _____ with sufficient _____.

Reaction rates increase when collisions are more energetic and/or happen more _____. The _____ amount of energy needed for particles to react is known as the _____ energy.

Rate

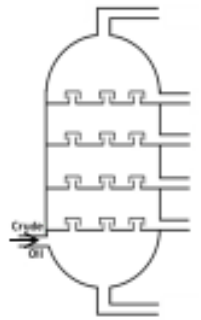
C2 REVISION – CRUDE OIL AND FUELS

Complete the table for the alkane homologous series

No. of carbons in chain	Name	Formula	Displayed formula
1			
2			
3			
4			

Label the diagram of the fraction column. Use the following phrases to help you:

Small molecules collected
Large molecules collected
Hottest temperatures
Coolest temperatures
Gases
Liquids



What is cracking and why is it necessary?

Large hydrocarbon molecules can be broken up into smaller hydrocarbon molecules by:

1.

2.

Carbon Distillation Hydrocarbons Hydrogens Mixture

Crude oil is a _____ of compounds. Many of these only contain atoms of _____ and _____. They are called _____. The compounds in crude oil can be separated using _____.

The shorter the hydrocarbon chain:

The _____ the boiling point.

The _____ the ignition.

The _____ viscous.

Complete the symbol equation for the cracking of decane:

$C_{10}H_{22}$ → 2 C_2H_6 + _____

Complete the word equation which summarises the combustion of hydrocarbons:

Hydrocarbon + Oxygen → _____ + _____

Complete and balance the symbol equations for the combustion of hydrocarbons:

CH_4 + __ O_2 → _____ + _____

$C_{20}H_{42}$ + __ O_2 → _____ + _____

Saturated High Colourless Small Alkenes Cracking Bromine

There is a _____ demand for fuels with _____ molecules.

_____ produces _____ hydrocarbons, used as fuels, and unsaturated hydrocarbons called _____.

Alkenes react with orange _____ water turning it _____.

Organic