Exercise 1_1B Reaction Rates

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Write the date in the margin of your homework jotter.
Write the title of this Exercise as a heading: Exercise 1_1B Reaction Rates

For general revision of this area of the Unit, the **BBC Bitesize website** provides the basics and the **Chemguide website** will give an in depth understanding – often beyond the scope of the syllabus!

1.

Which of the following is **not** a factor which affects the rate of a reaction?

A   Collision geometry

B   Concentration of reactants

C   Kinetic energies of reactants

D   Enthalpy change of reaction

2.

Which of the following oxides forms an aqueous solution with pH greater than 7?

A   Carbon dioxide

B   Copper(II) oxide

C   Sulphur dioxide

D   Sodium oxide

6.

For any chemical, its temperature is a measure of

A   the average kinetic energy of the particles that react

B   the average kinetic energy of all the particles

C   the activation energy

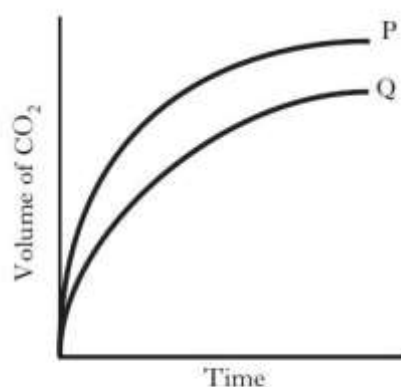D   the minimum kinetic energy required before reaction occurs.

7.

Particles with the same electron arrangement are said to be isoelectronic.

Which of the following compounds contains ions which are isoelectronic?

A Na_2S

B $MgCl_2$

C   KBr

D $CaCl_2$

3.

When copper carbonate is reacted with excess acid, carbon dioxide is produced. The curves shown above were obtained under different conditions.

The change from P to Q could be brought about by

A   increasing the concentration of the acid

B   decreasing the mass of copper carbonate

C   decreasing the particle size of the copper carbonate

D   adding a catalyst.

4.

In which of the following will **both** changes result in an increase in the rate of a chemical reaction?

A   A decrease in activation energy and an increase in the frequency of collisions

B   An increase in activation energy and a decrease in particle size

C   An increase in temperature and an increase in the particle size

D   An increase in concentration and a decrease in the surface area of the reactant particles

8.

Examine the graphs below.
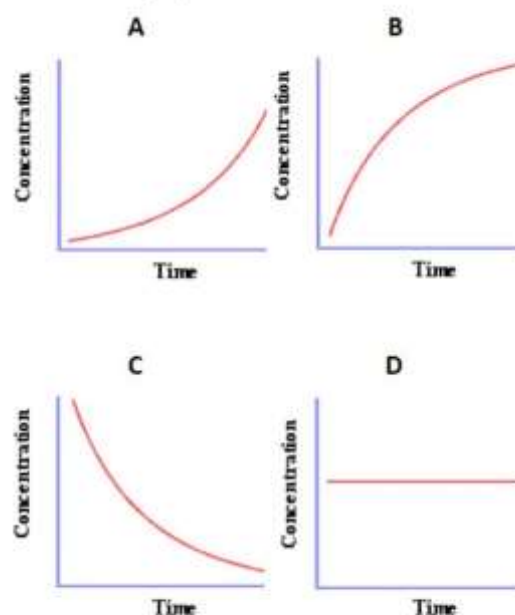
Which of the graphs shows the change in the concentrations of **products** in a chemical reaction over time?

9.

Which of the following elements is most likely to have a covalent network structure?

Element	Melting point/°C	Boiling point/°C	Density/ $g\,cm^{-3}$	Conduction when solid
A	44	280	1·82	No
B	660	2467	2·70	Yes
C	1410	2355	2·33	No
D	114	184	4·93	No

5.

Which of the following compounds contains **both** a halide ion and a transition metal ion?

A   Iron oxide

B   Silver bromide

C   Potassium permanganate

D   Copper iodate

10.

A mixture of magnesium bromide and magnesium sulfate is known to contain 3 mol of magnesium and 4 mol of bromide ions.

How many moles of sulfate ions are present?

A   1

B   2

C   3

D   4

11.

Many factors influence the rates of reactions.

A	B	C
particle size of reactants	temperature	surface area available for reaction
D	E	F
activation energy	concentration	average kinetic energy of reactant molecules

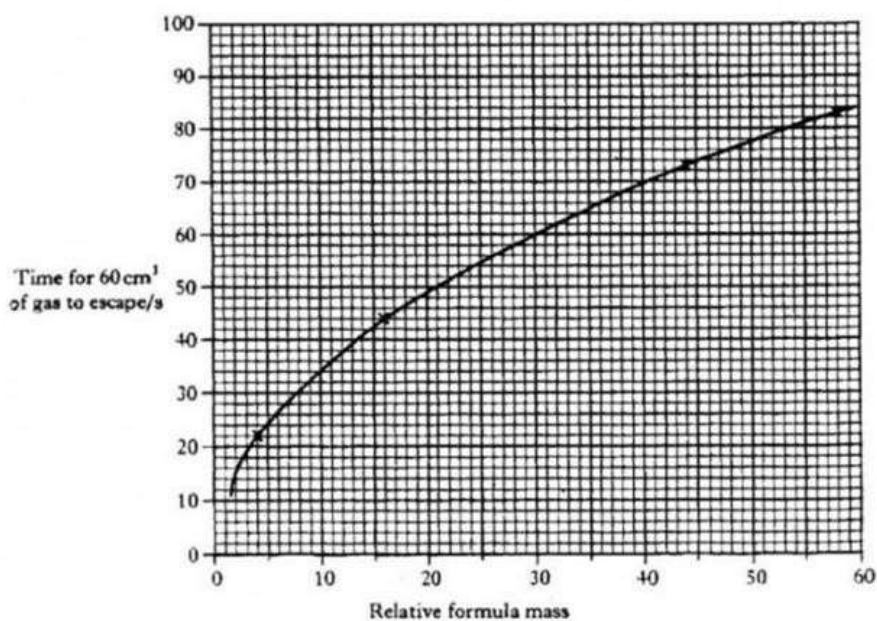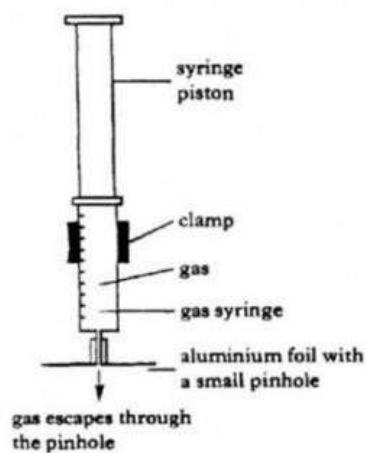a) Identify the factor, which of increased, causes an increase in the factor shown in box F.

b) Identify the factor(s), which, if increased would make a reaction slower.

12.

In experiments with four different gases, a syringe was held vertically as shown with the weight of the syringe piston applying a downward pressure on the gas. The times taken for 60cm^3 of helium, methane, carbon dioxide and butane to escape through the pinhole were measured and the graph shows the results plotted against relative formula mass.

syringe piston

clamp

gas

gas syringe

aluminium foil with a small pinhole

gas escapes through the pinhole

Time for 60 cm^1 of gas to escape/s

Relative formula mass

a) Calculate the average rate of escape from the syringe of 60cm^3 of methane in cm^3.s^{-1}.

b) The error in measurement decreases as the actual size of the measurement increases. Suggest **one** way of reducing the error in each of the time measurements.
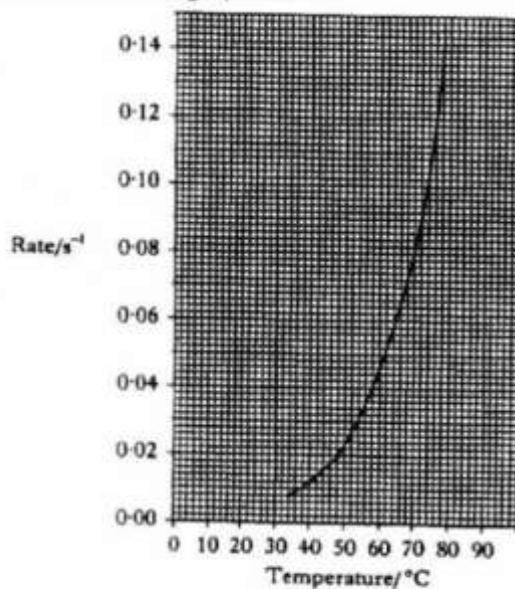
13.

The effect of temperature changes on reaction rate can be studied using the reaction between oxalic acid and acidified potassium permanganate solution.

thermometer ———

oxalic acid and acidified potassium
permanganate solutions
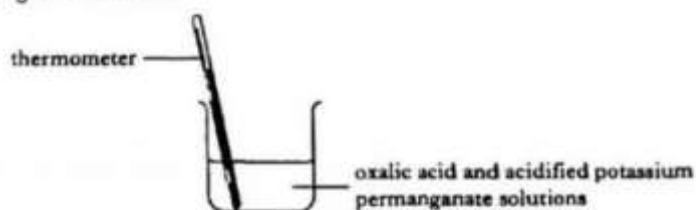
a) What colour change would indicate that the reaction was complete?

b) A student's results are shown on the graph below.

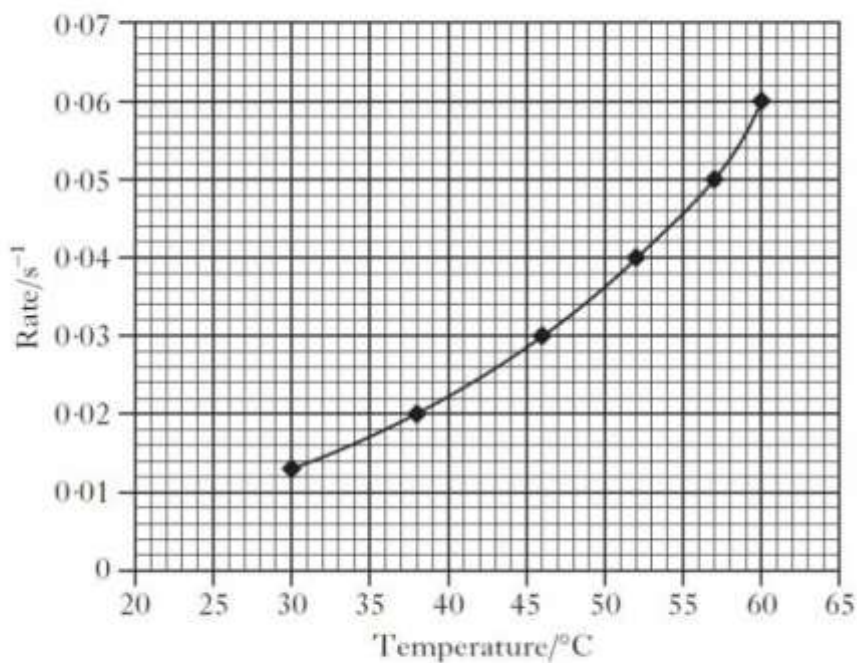Use the graph to calculate the reaction time, in s, at 40°C.

c) Why is it difficult to obtain an accurate reaction time when the reaction is carried out at room temperature?

14.

A student investigated the effect of changing temperature on the rate of chemical reaction.

The results from the investigation are shown in the graph below.

(a) Use the graph to determine the temperature rise required to double the rate of reaction.

(b) Collision theory can be used to explain reaction rates.

Collision theory states that for two molecules to react, they must first collide with one another.

State **two** conditions necessary for the collisions to result in the formation of products.

15.

The energy changes taking place during chemical reactions have many everyday uses.

(a) Some portable cold packs make use of the temperature drop that takes place when the chemicals in the pack dissolve in water.

Name the type of reaction that results in a fall in temperature.

(b) Flameless heaters are used by mountain climbers to heat food and drinks. The chemical reaction in a flameless heater releases 45 kJ of energy.

If 200 g of water is heated using this heater, calculate the rise in temperature of the water, in °C.

A marking guide for this Homework is available (password required).