



GCSE Chemistry Question and Answers 2020/2021

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Topics that only contain interactive questions

These topics only contain interactive questions such as animations, multiple choice or audio files. To interact with this content, please go to www.s-cool.co.uk/biology.

- Electrolysis
- Writing Formulae and Balancing Equations

Acids and Alkalis (Questions) *

1. Complete the following table:

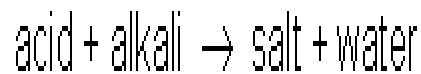
pH of solution:Colour of universal indicator:Description:

1	(ii)	strong acid
(i)	green	(iv)
14	(iii)	(v)

(5 marks)

(Marks available: 5)

2. The following equation shows the reaction that takes place between an acid and an alkali:



a) Name this type of reaction.

(1 mark)

b) Write a word equation that shows the reaction between nitric acid and potassium hydroxide.

(1 mark)

c) Write a symbol equation for the same reaction.

(1 mark)

(Marks available: 3)

3. Complete the following equations:

a) calcium carbonate + nitric acid =

(1 mark)

b) sodium carbonate + sulphuric acid =

(1 mark)

c) Ethanoic acid + sodium hydroxide =

(1 mark)

(Marks available: 3)

4. Some salts are made in industry for use as fertilizers in farming.

Complete the table showing acid and alkali used to make these salts

Salt:	Acid:Alkali:
--------------	---------------------

Ammonium nitrate	
------------------	--

Potassium phosphate	
---------------------	--

(4 marks)

(Marks available: 4)

Acids and Alkalis (Answers)

Answer outline and marking scheme for question: 1

(i) 7

(ii) red

(iii) blue/purple

(iv) neutral

(v) strong alkali

(Total = 5 marks)

Answer outline and marking scheme for question: 2

a) Neutralisation.

(1 mark)

b) nitric acid + potassium hydroxide → potassium nitrate + water

(Mark is gained for writing potassium nitrate as the salt).

(1 mark)

c) $\text{HNO}_{3(\text{aq})} + \text{KOH}_{(\text{aq})} \rightarrow \text{KNO}_{3(\text{aq})} + \text{H}_2\text{O}_{(\text{aq})}$

(1 mark)

(Total = 3 marks)

Answer outline and marking scheme for question: 3

a) = calcium nitrate + carbon dioxide + water

(1 mark)

b) = sodium sulphate + water + carbon dioxide

(1 mark)

c) = sodium ethanoate + water

(1 mark)

(Total = 3 marks)

Answer outline and marking scheme for question: 4

Salt:	Acid:	Alkali:
Ammonium nitrate	Nitric acid	Ammonium hydroxide
	(1 mark)	(1 mark)
Potassium phosphate	Potassium hydroxide	Phosphoric acid
	(1 mark)	(1 mark)

(Total = 4 marks)

Atomic Structure (Questions) *

1. Use the words below to name the four changes of state:

melting; evaporation, freezing; condensing.

(i) liquid to solid

(ii) liquid to gas

(iii) gas to liquid

(iv) solid to liquid

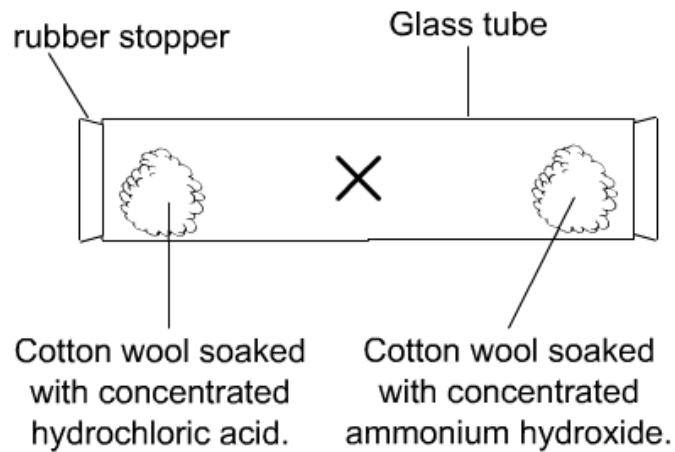
(Marks available: 2)

2. Working on a piece of paper, complete the diagram below by drawing the arrangement of particles found in a liquid. One has already been placed in the box for you.



(Marks available: 1)

3. **The following experiment was set up:**



Hydrogen chloride gas is released from the concentrated hydrochloric acid.

Ammonia gas is released from the concentrated ammonium hydroxide.

After 10 minutes, white 'smoke' (ammonium chloride) was seen at X in the diagram.

a) What scientific idea does this experiment demonstrate?

(1 mark)

b) Which of the two particles, ammonia or hydrogen chloride is the heaviest?

Explain your answer.

(2 marks)

c) What would you see if the experiment was repeated at a higher temperature?

(2 marks)

(Marks available: 5)

4. Atoms are made up of three types of particle - protons, neutrons and electrons.

Complete the table showing the number of particles in the following atoms:

Element:Atomic No:Mass No:Protons:Neutrons:Electrons:

K 19 39

Ar 18 40

(Marks available: 3)

5. **a)** Draw the electron arrangement of aluminium, Al.

(2 marks)

b) Give the symbol of the ion that aluminium is most likely to form.

(1 mark)

(Marks available: 3)

Atomic Structure (Answers)

Answer outline and marking scheme for question: 1

(i) freezing

(ii) evaporating

(iii) condensing

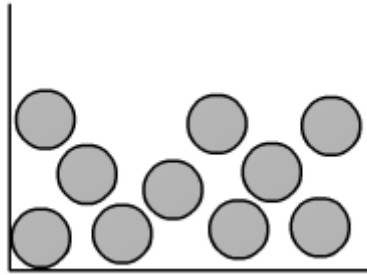
(iv) melting

(4 correct = 2 marks)

(2 correct = 1 mark)

(Total = 2 marks)

Answer outline and marking scheme for question: 2



(Total = 1 mark)

Answer outline and marking scheme for question: 3

a) Diffusion

(1 mark)

b) Hydrogen chloride is the heavier particle,

(1 mark)

because it has not moved as far down the tube as the ammonia has.

(1 mark)

c) The ammonium chloride would be formed in the same place,

(1 mark)

but it would happen faster at a higher temperature.

(1 mark)

(Total = 5 marks)

Answer outline and marking scheme for question: 4

Element: Protons: Neutrons: Electrons:

K 19 $39 - 19 = 20$ 19

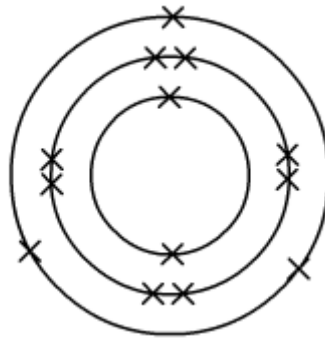
Ar 18 $40 - 18 = 22$ 18

(1 mark) (1 mark) (1 mark)

(Answers for both atoms must be correct to gain the mark underneath)

(Total = 3 marks)

Answer outline and marking scheme for question: 5



a) Atomic number of Al = 13 so there are 13 electrons present.

(1 mark)

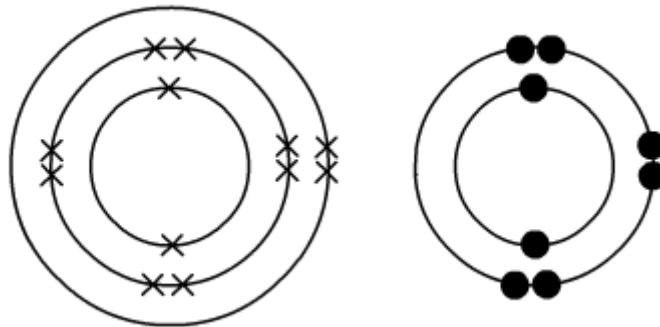
b) Al^{3+}

(1 mark)

(Total = 3 marks)

Chemical Bonding (Questions) *

1. The diagram below shows the electron arrangements of magnesium and oxygen:



- a) Draw a diagram showing how a bond is made between magnesium and oxygen.

(2 marks)

- b) What name is given to this type of chemical bond?

(1 mark)

(Marks available: 3)

2. a) What type of chemical bond would you expect in hydrogen fluoride, HF?

(1 mark)

- b) Draw a diagram to show how this bond is formed.

(2 marks)

(Marks available: 3)

3. Look at the diagram below:



a) Which type of structure is shown in the diagram?

(1 mark)

b) Will a material with this structure be able to conduct electricity?

Explain your answer.

(2 marks)

(Marks available: 3)

4. **Look at the table below:**

Substance:Melting point (°C):

A 445

B 1907

C -7

(a) Which substance, A,B or C could have a metallic structure?

(1 mark)

b) Which substance, A, B or C could have a simple covalent structure?

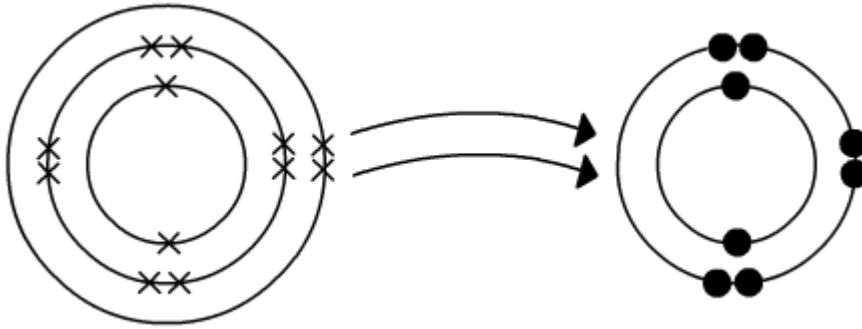
(1 mark)

(Marks available: 2)

Chemical Bonding (Answers)

Answer outline and marking scheme for question: 1

a)



(2 electrons moving = 1 mark)

(complete transfer = 1 mark)

b) Ionic

(1 mark)

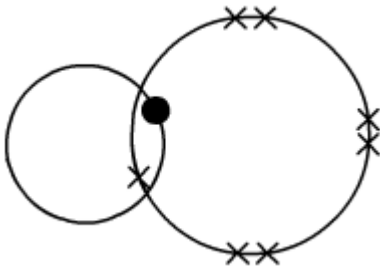
(Total = 3 marks)

Answer outline and marking scheme for question: 2

a) Covalent

(1 mark)

b)



(1 mark = 1 shared pair electrons)

(1 mark = 1 electron from each atom)

(Total = 3 marks)

Answer outline and marking scheme for question: 3

a) Metallic.

(1 mark)

b) The material will be able to conduct electricity,

(1 mark)

because there are free electrons that are able to move through the structure.

(1 mark)

(Total = 3 marks)

Answer outline and marking scheme for question: 4

a) B (highest melting point)

(1 mark)

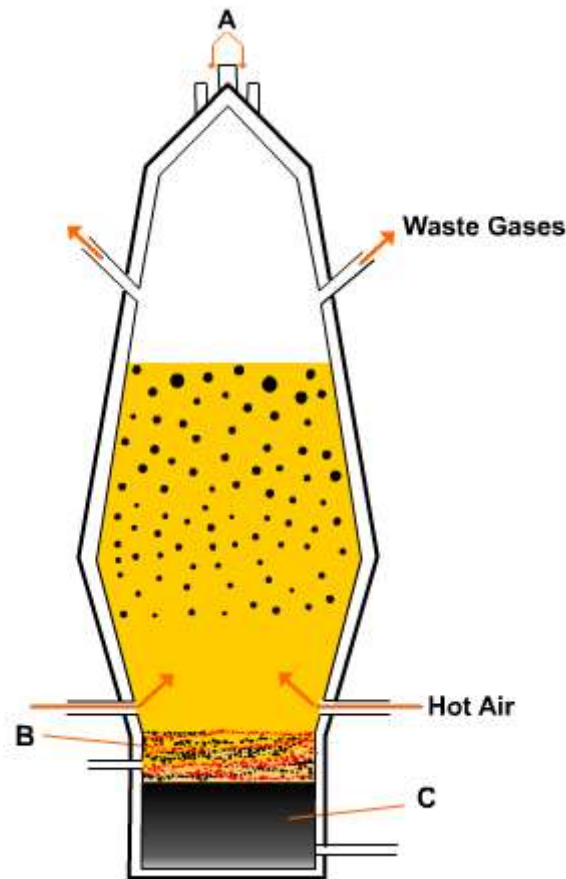
b) C (lowest melting point)

(1 mark)

(Total = 2 marks)

Extraction of Metals (Questions)

1. The diagram below shows the blast furnace:



- a)** Complete the labels A, B and C.

(3 marks)

- b)** What are the main waste gases from the blast furnace?

(2 marks)

(Marks available: 5)

2. The following questions are about the blast furnace and the production of iron.

- a)** Why are hot blasts of air blown in to the blast furnace?

(1 mark)

b) Why is limestone added to the blast furnace?

(1 mark)

c) Railway lines are welded together using molten iron.

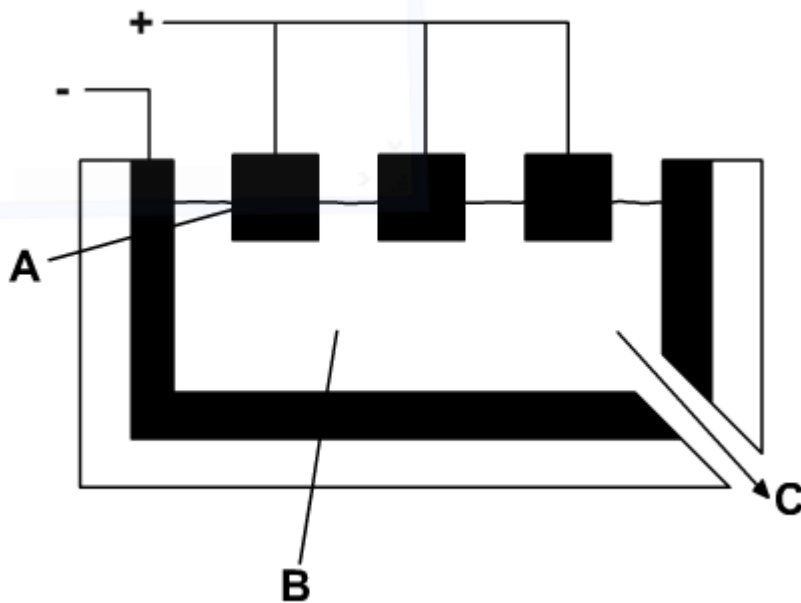
The molten iron is made using the 'thermit' reaction where iron oxide is reacted with aluminium powder.

Why is this reaction not used to make iron on a large scale?

(1 mark)

(Marks available: 3)

3. Aluminium metal is produced using electrolysis.



The cell used in this process is shown below:

a) Complete the labels A, B and C.

(3 marks)

b) Why is cryolite added to the aluminium ore in this process?

(1 mark)

(Marks available: 4)

4. The following questions are about the electrolysis of aluminium oxide.

a) Why does the anode need to be replaced regularly?

(1 mark)

b) Write an equation to show how aluminium ions are changed in to aluminium metal.

(2 marks)

c) Why can't the blast furnace be used to make aluminium?

(1 mark)

(Marks available: 4)

Extraction of Metals (Questions)

Answer outline and marking scheme for question: 1

a) A = iron ore

(1 mark)

B = slag

(1 mark)

C = molten iron

(1 mark)

b) Carbon dioxide

(1 mark)

Nitrogen

(1 mark)

(Total = 5 marks)

Answer outline and marking scheme for question: 2

a) The air is used to react with the coke/carbon to form carbon dioxide.

(1 mark)

b) To remove the impurities that are in the iron ore/to form slag.

(1 mark)

c) **Any one from:**

- Too expensive/aluminium is more expensive than iron.
- Too dangerous/aluminium reacts violently with iron oxide.

(1 mark)

(Total = 3 marks)

Answer outline and marking scheme for question: 3

a) A = graphite electrodes.

(1 mark)

B = molten bauxite/aluminium ore.

(1 mark)

C = molten aluminium metal.

(1 mark)

b) To lower the melting point of the aluminium oxide (so less energy required).

(1 mark)

(Total = 4 marks)

Answer outline and marking scheme for question: 4

a) The carbon/graphite anode reacts with the oxygen made to form carbon dioxide gas.

(1 mark)

b) $\text{Al}^{3+}_{(l)} + 3\text{e}^{-} \rightarrow \text{Al}_{(l)}$

(1 mark = formulae, 1 mark = balanced)

c) Aluminium is more reactive than carbon (not too reactive).

(1 mark)

(Total = 4 marks)

Metals - The Reactivity Series (Questions) *

1. a) What would you expect to see if zinc metal was placed in to copper sulphate solution?

(2 marks)

- b) What are the products formed in this reaction?

(2 marks)

(Marks available: 4)

2. Complete the following equations to show what happens when metals are heated with oxides of other metals.

- a) magnesium + copper oxide =

(1 mark)

- b) lead + tin oxide =

(1 mark)

- c) $\text{Fe}_2\text{O}_{3(s)} + 3\text{Zn}_{(s)} =$

(2 marks)

(Marks available: 4)

3. When iron oxide is heated with aluminium powder, the following reaction takes place:

Aluminium + iron oxide \rightarrow iron + aluminium oxide

When aluminium oxide is heated with iron no reaction takes place.

- a) Which of the two metals is more reactive?

(1 mark)

- b) The formula for iron oxide is Fe_2O_3 . The formula for aluminium oxide is Al_2O_3 .

Write a balanced symbol equation to show the reaction between aluminium and iron oxide.

(1 mark)

c) Window frames made from aluminium do not corrode as quickly as windows made from iron.

Explain this statement using the information above.

(2 marks)

(Marks available: 4)

Metals - The Reactivity Series (Answers)

Answer outline and marking scheme for question: 1

a) Grey metal turns brown/brown metal displaced.

(1 mark)

Blue solution turns colourless.

(1 mark)

b) Copper.

(1 mark)

Zinc sulphate.

(1 mark)

(Total = 4 marks)

Answer outline and marking scheme for question: 2

a) magnesium oxide + copper

(1 mark)

b) No reaction.

(1 mark)

c) $3\text{ZnO}_{(s)} + 2\text{Fe}_{(s)}$

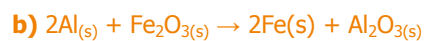
(1 mark for formula, 1 mark for balanced equation)

(Total = 4 marks)

Answer outline and marking scheme for question: 3

a) Aluminium

(1 mark)



(1 mark)

c) Aluminium should corrode faster than iron because it is more reactive,

(1 mark)

It does not because the aluminium reacts with oxygen in the air to form a layer of oxide, which protects the aluminium.

(1 mark)

(Total = 4 marks)

(When iron oxide forms, it flakes off exposing fresh iron underneath).

Products From Crude Oil (Questions) *

1. Crude oil is described as a fossil fuel but it is much more important than that as many plastics have crude oil as a raw material.

a) Name two other fossil fuels.

(2 marks)

b) Crude oil is mixture of different 'hydrocarbons'.

Explain the term 'hydrocarbon'.

(1 mark)

c) Describe how crude oil was formed.

(4 marks)

(Marks available: 7)

2. A lot of useful materials are produced from crude oil. Unfortunately, there is not enough of the most useful materials in crude oil. Chemists take the longer chained molecules and break them down in to shorter chained molecules.

a) What name is given to this process?

(1 mark)

b) Complete the equation below to show what could be made if a molecule of dodecane was broken down.



(1 mark)

c) To what group of hydrocarbons does C_4H_{10} belong?

(1 mark)

(Marks available: 3)

Products From Crude Oil (Answers)

Answer outline and marking scheme for question: 1

a) Coal.

(1 mark)

Natural gas.

(1 mark)

b) A compound that contains hydrogen and carbon only.

(1 mark)

c) Should contain:

- Sea animals died and sank to bottom of sea where they were buried.

(1 mark)

- Bodies did not decay as no oxygen for bacteria to survive.

(1 mark)

- Remains placed under high temperatures and high pressures.

(1 mark)

- Process takes millions of years.

(1 mark)

(Total = 7 marks)

Answer outline and marking scheme for question: 4

a) Cracking.

(1 mark)

b) C_8H_{16}

(1 mark)

c) Alkanes.

(1 mark)

(Total = 3 marks)

Radioactivity (Questions) *

1. Radioactive isotopes of elements can emit 3 types of radioactivity a, b and g.

a) Explain the term 'isotope'.

(1 mark)

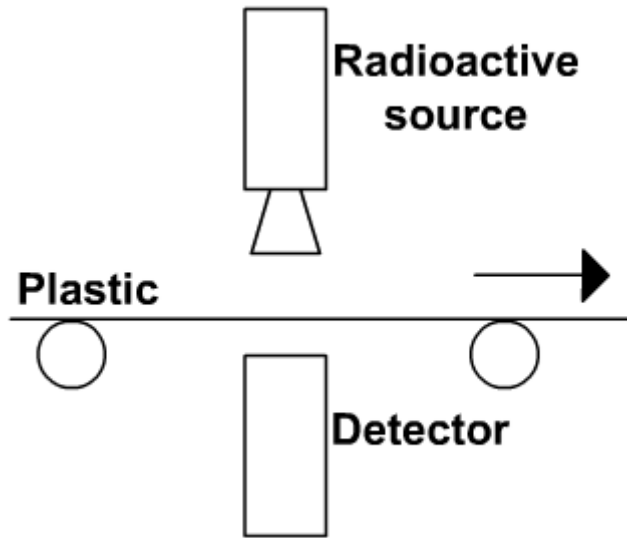
b) Complete the table below showing the properties of the three types of radioactivity:

Type of radioactivity:	Nature:	Charge:	Ionising power:	Penetrating power:
a	(i)	+2	large	Thin sheet of paper
b	(ii)	(iii)	medium	(vi)
g	Electromagnetic waves	(iv)	(v)	Many cm of lead

(3 marks)

(Marks available: 4)

2. The diagram below shows how radioactivity can be used to check the thickness of a plastic as it is manufactured.



a) What type of detector is used in this process?

(1 mark)

b) What would happen to the radioactive count if the plastic sheet was too thin?

(1 mark)

c) Which type of radioactivity could be used for this process?

Explain your answer.

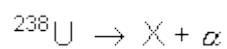
(3 marks)

(Marks available: 5)

3. When a radioactive isotope emits radioactivity a new substance can be made. Balance the following radioactive equations to identify the new element made.

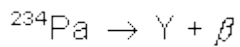
(You may need to look at a periodic table to help you).

a) What is element X?



(1 mark)

b) What is element Y?



(1 mark)

(Marks available: 2)

4. A sample of wood from the British museum is sent for radiocarbon dating. In this process, the radioactivity emitted from the sample is compared to the count from a new piece of wood. The radioactivity is due to ${}^{14}\text{C}$, which has a half-life of 5600 years.

a) Explain the term 'half-life'.

(1 mark)

b) The radioactive counts of the samples is shown below;

Sample:Radioactive count (counts/min/g):

Old 5

New 20

Using this information, calculate the age of the old sample of wood.

(2 marks)

(Marks available: 3)

Radioactivity (Answers)

Answer outline and marking scheme for question: 1

a) An isotope of an element has the same number of protons in the nucleus but different numbers of neutrons.

(1 mark)

b)

(i) helium nuclei

(ii) electrons

(iii) -1

(iv) 0

(v) small

(vi) a few mm of aluminium

(6 correct = 3 marks, 4 correct = 2 marks, 2 correct = 1 mark)

(Total = 4 marks)

Answer outline and marking scheme for question: 2

a) Gieger-Muller tube/G-M tube/Geiger counter

(1 mark)

b) It would increase.

(1 mark)

c) β

(1 mark)

because all the a radioactivity would be stopped by the plastic (so a change in thickness would not be detected),

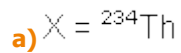
(1 mark)

and g radioactivity would not be stopped at all by the plastic (and a change in thickness would not stop any more).

(1 mark)

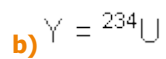
(Total = 5 marks)

Answer outline and marking scheme for question: 3



(Atomic number decreased by 2, atomic mass decreased by 4)

(1 mark)



(Atomic number increased by 1, atomic mass is the same)

(1 mark)

(Total = 2 marks)

Answer outline and marking scheme for question: 4

a) The half-life is the time taken for the radioactivity of a material to decrease by half.

(1 mark)

b) Half-life of ${}^{14}\text{C}$ is 5600 years.

Radioactive count has decreased from 20 to 5 = 2 half-lives.

(1 mark)

(20 → 10 is one half-life, 10 → 5 is the second).

Age of wood = 2 x 5600 years = 11200 years.

(1 mark)

(Total = 3 marks)

Rates of Reaction (Questions) *

1. An experiment was carried out to look at the reaction between magnesium and hydrochloric acid.

The word equation for this reaction is:

Magnesium + Hydrochloric Acid → Magnesium Chloride + Hydrogen

a) What would you see when this reaction is taking place?

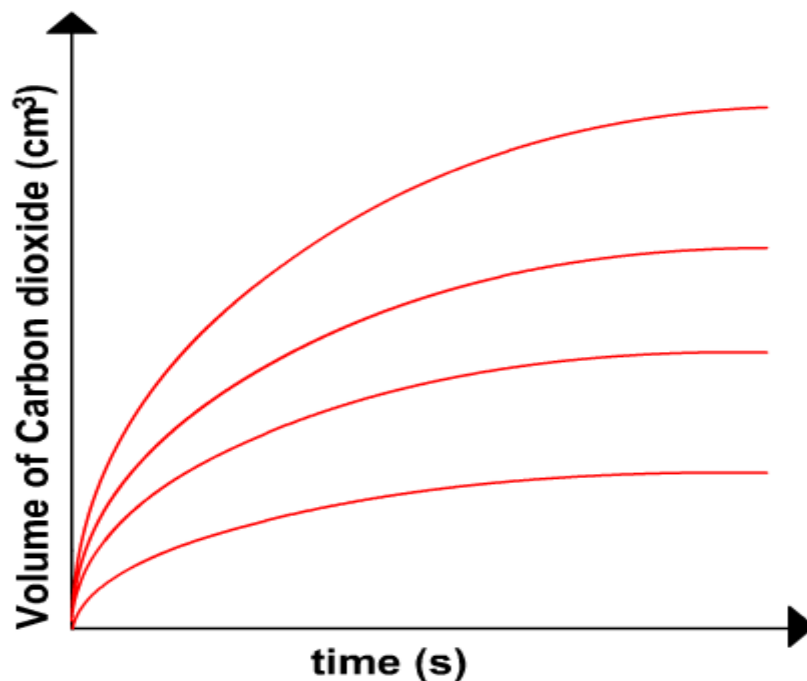
(1 mark)

b) Give three ways in which the rate of reaction could be increased.

(3 marks)

(Marks available: 4)

2. The following graphs were obtained in an experiment to look at the reaction between nickel carbonate and hydrochloric acid:



a) Write a word equation for the reaction between nickel carbonate and hydrochloric acid.

(1 mark)

b) Which of the graphs shows the reaction that had the most concentrated hydrochloric acid?

Explain your answer.

(2 marks)

(Marks available: 3)

3. **Hydrogen peroxide decomposes at room temperature to give oxygen and water:**

Hydrogen peroxide → oxygen + water

a) Which piece of apparatus could be used to measure the rate of this reaction?

(1 mark)

b) What effect would adding manganese (IV) oxide have on the rate of this reaction?

(1 mark)

c) What name do we give to chemicals like manganese (IV) oxide?

(1 mark)

(Marks available: 3)

4. Most of the chemical reactions that take place in living organisms involve enzymes.

a) Explain the term 'enzyme'.

(1 mark)

b) Catalase is an enzyme that is found in liver. It can cause a change in the decomposition of hydrogen peroxide.

What effect would you expect if a piece of liver was placed in hydrogen peroxide solution?

(1 mark)

c) If manganese (IV) oxide is added to hydrogen peroxide the rate of reaction increases. If the mixture is heated to 80°C the reaction is vigorous. If the same is done with a piece of liver the reaction rate is less at 80°C.

Explain these observations.

(2 marks)

(Marks available: 4)

Rates of Reaction (Answers)

Answer outline and marking scheme for question: 1

a) Bubbles of gas/hydrogen/effervescence/metals fizzes.

(1 mark)

b) Any three from:

- Increase the temperature/heat mixture.
- Increase concentration of acid (not add more acid).
- Add more magnesium.
- Cut up/powder the magnesium.
- Add a suitable catalyst.

(maximum, 3 marks)

(Total = 4 marks)

Answer outline and marking scheme for question: 2

a)

Nickel carbonate + hydrochloric acid → nickel chloride + carbon dioxide + water

(1 mark)

b) A,

(1 mark)

because the graph is the steepest showing carbon dioxide is made the fastest.

(1 mark)

(Total = 3 marks)

Answer outline and marking scheme for question: 3

a) Gas syringe/inverted measuring cylinder full of water/balance.

(1 mark)

b) Rate would increase.

(1 mark)

c) Catalysts.

(1 mark)

(Total = 3 marks)

Answer outline and marking scheme for question: 4

a) A biological catalyst.

(1 mark)

b) Rate would increase/oxygen is made faster.

(1 mark)

c) Manganese (IV) oxide is a catalyst. When mixture is heated rate is increased due to usual effect of increased temperature on rate.

(1 mark)

Catalase is denatured/broken down at higher temperatures ($60^{\circ}\text{C}+$) so heating the solution destroys the catalyst and so its effect is lost - rate lowered.

(1 mark)

(Total = 4 marks)

The Earth and the Atmosphere (Questions) *

1. **An experiment was set up as shown below:**

The syringe on the left started with 100cm³ of air, the syringe on the right was empty.

The air is passed from syringe to syringe through the glass tube and over the hot copper.

This continues until there is no further change in the volume.

a) What would be made as the air passes over the hot copper?

(1 mark)

b) What volume of air would be left in the syringe at the end of the experiment?

(2 marks)

c) Carbon dioxide is one of the gases found in the air.

How can you test to see if a gas is carbon dioxide?

(2 marks)

(Marks available: 5)

2. **The diagram below shows a section of part of the earth's crust:**

a) Which of the layers contains the youngest sedimentary rock?

(1 mark)

b) Which of the layers contains metamorphic rock?

(1 mark)

c) Describe how granite is formed.

(2 marks)

(Marks available: 4)

3. **The diagram below shows the rock cycle:**

a) Which type of rock are shown at A and B?

(2 marks)

b) Which process takes place at X?

(1 mark)

c) Give two examples of sedimentary rocks.

(2 marks)

(Marks available: 5)

4. Sedimentary rocks are formed when small particles are squashed together by other layers of sediment/rock being placed on them.

Sedimentary rocks sometimes contain fossils that can be useful when dating the rock

a) How can fossils be used to date sedimentary rock?

(2 marks)

b) From which type of sedimentary rock is marble formed?

(1 mark)

c) On the south coast of England, it is possible to see the 'White Cliffs of Dover'.

How could you tell that the cliffs were made out of sedimentary rock?

(1 mark)

(Marks available: 4)

The Earth and the Atmosphere (Answers)

Answer outline and marking scheme for question: 1

a) Copper oxide.

(1 mark)

b) The air is about 20% oxygen.

(1 mark)

So 80% would be left = 80cm^3 of air.

(1 mark)

c) Bubble the gas through (add to) limewater.

(1 mark)

Will turn cloudy if the gas is carbon dioxide.

(1 mark)

(Total = 5 marks)

Answer outline and marking scheme for question: 2

a) A.

(1 mark)

b) D.

(1 mark)

c) Magma.

(1 mark)

Cools and crystallises.

(1 mark)

(Total = 4 marks)

Answer outline and marking scheme for question: 3

a) A = igneous

(1 mark)

B = metamorphic

(1 mark)

b) Melting.

(1 mark)

c) Two from:

Chalk/mudstone/limestone/sandstone/conglomerate.

(1 mark each, maximum = 2 marks)

(Total = 5 marks)

Answer outline and marking scheme for question: 4

a) Look at type of animal/plant that made fossil - find when animal/plant was alive.

(1 mark)

Type of animal/plant would have been alive when sedimentary rock was made so age of plant/animal is the same as the rock.

(1 mark)

b) Limestone.

(1 mark)

c) One from:

- Rock is soft and made out of particles, which can be rubbed away with a fingernail.
- It is possible to see layers in the cliff due to the different layers of sediment.

2. Sodium oxide forms an alkaline solution when it dissolves in water, sulphur dioxide forms an acidic solution.

a) What type of elements usually have alkaline oxides?

(1 mark)

b) What type of element usually forms acidic oxides?

(1 mark)

(Marks available: 2)

3. Elements of the periodic table that have similar properties are organised in to groups.

The following questions are about Group VII.

a) What name do we give to the Group VII elements?

(1 mark)

b) How many electrons do the members of Group VII have in their outer shell?

(1 mark)

c) What happens to the reactivity of the halogens as you go down Group VII?

Explain your answer.

(2 marks)

(Marks available: 4)

4. Transition metals are found in the centre section of the periodic table.

a) Give two ways that transition metals are different to Group I metals?

(2 marks)

b) Give one way that transition metal compounds are different to Group I metal compounds.

(1 mark)

(Marks available: 3)

The Periodic Table (Answers)

Answer outline and marking scheme for question: 1

a)

(i) C and D.

(1 mark)

(ii) A and C.

(1 mark)

(iii) A and B.

(1 mark)

(iv) E.

(1 mark)

(Total = 4 marks)

Answer outline and marking scheme for question: 2

a) Metals.

(1 mark)

b) Non-metals

(1 mark)

(Total = 2 marks)

Answer outline and marking scheme for question: 3

a) Halogens.

(1 mark)

b) 7.

(1 mark)

c) It decreases,

(1 mark)

because the atoms of the halogens are getting larger as you go down the group so they do not gain electrons as readily.

(1 mark)

(Total = 4 marks)

(Nucleus of elements lower down does not attract electrons as much as the higher elements as the positive charge is shielded by the inner electrons).

Answer outline and marking scheme for question: 4

a) Any two from:

- Transition metals are denser than water.
- Transition metals have much higher melting/boiling points.
- Transition metals do not react as vigorously.
- Transition metals can be used as catalysts.

Or opposite statement referring to Group I metals.

(1 mark each, maximum 2 marks)

b) Either answer = one mark:

- Transition metal compounds can be coloured, (Group I metals are white/colourless in solution).
- Transition metals can form compounds with more than one formula.

Or opposite statement referring to Group I metals.

(1 mark)

(Total = 3 marks)