Environmental chemistry/using chemistry

9G & 9H

25 min
27 marks
Q1-L4, Q2-L5, Q3-L6, Q4-L7, Q5-L7

1. These photographs show how the cliffs on the coastline by a church changed between the years 1886 and 1919.

the church and coastline in 1886

the church and coastline in 1904

-

the church and coastline in 1912

the church and coastline in 1919

photographs by kind permission of Dunwich museum

(a) (i) How can you tell from the photographs that the coastline has changed?

.....

.....

1 mark

(ii) What made the coastline change? Tick the correct box.

the rain	☐	the sea	☐
the Sun	☐	the wind	☐

1 mark

(b) On the seashore, pebbles that are rough and uneven become smooth and rounded. Explain how they become smooth and rounded.

.....

.....

1 mark

(c) The photograph below shows a carved limestone head. The surface of the limestone has changed over many years.

(i) Which process made the surface of the limestone change over many years? Tick the correct box.

carving	☐	polishing	☐
melting	☐	weathering	☐

1 mark

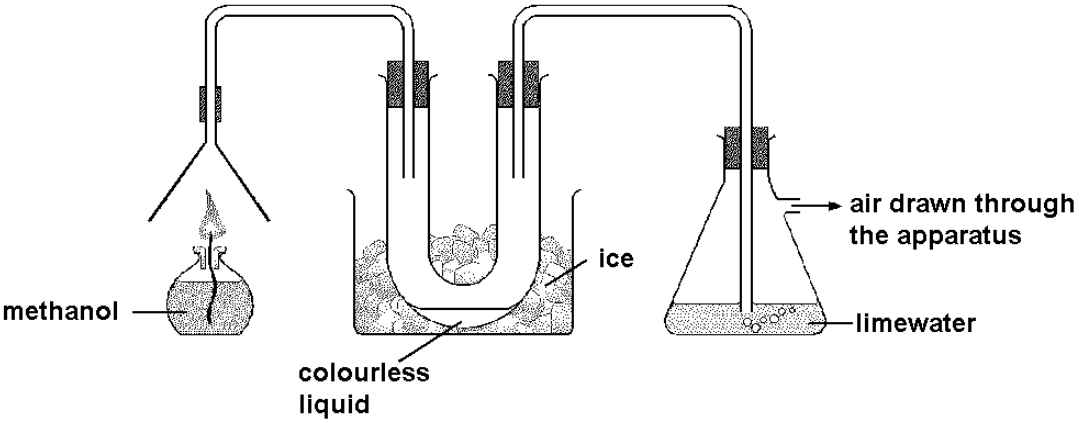
(ii) Name a substance in the air which made the surface of the limestone change.

.....

1 mark

Maximum 5 marks

2. (a) George used the apparatus below to find out what substances are produced when methanol burns.



As the methanol burned, two different gases were produced.

(i) One of these gases condensed in the U-tube to give a colourless liquid. Give the name of this liquid.

.....

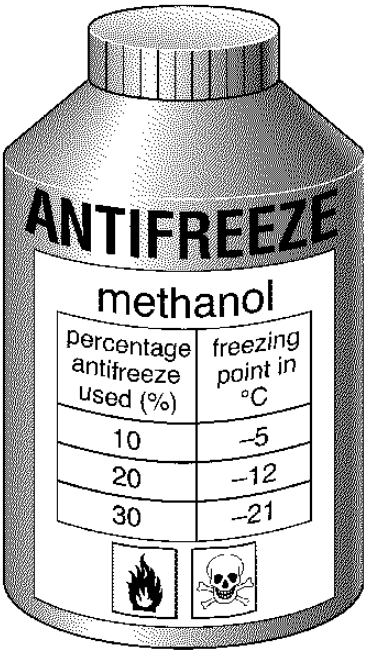
1 mark

(ii) The other gas turned the lime water cloudy. Give the name of this gas.

.....

1 mark

(b) Methanol is sometimes used in antifreeze. It can be added to water in car windscreen wash-bottles to prevent the water from freezing in cold conditions.



(i) The label on the bottle of antifreeze has two hazard warning symbols. What **two** precautions would you need to take when using this antifreeze?

1. .....

.....

2. .....

.....

1 mark

(ii) Water freezes at 0°C. The label on the bottle shows how the freezing point changes when different amounts of antifreeze are added to water.

Terry put a mixture containing 10% antifreeze into the wash-bottle of his car. During the night the temperature dropped to –14°C.
The wash-bottle burst.
Explain why the wash-bottle burst.

.....

.....

.....

.....

2 marks

Maximum 5 marks

3. (a) The list below gives some processes which occur in the rock cycle.

1. Grains of sediment collect in layers on the sea bed.

2. Large crystals form as molten magma cools deep below the Earth's surface.

3. A glassy rock forms as molten magma erupts into sea water.

4. Grains of sediment are cemented together as they are buried deep under thick layers of other sediments.

5. New crystals form in layers as rocks are affected by high temperature and increased pressure deep in the Earth's crust.

6 New minerals form with flat crystals when layers of mudstone are squeezed.

(i) Give the number of **one** metamorphic process.

.....……..

1 mark

(ii) Give the number of **one** igneous process.

.....……..

1 mark

(iii) Give the numbers of the **two** steps which could lead to the formation of sandstone.

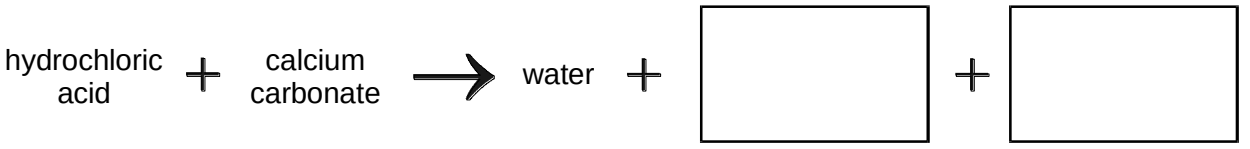
…….. and then ……

2 marks

Limestone and sandstone are two different rocks.

(b) Limestone is mainly calcium carbonate. It reacts with dilute hydrochloric acid to produce bubbles of gas.

Complete the word equation for the reaction.



2 marks

(c) Sandstone is mainly silicon dioxide. Glass for test tubes is also made from silicon dioxide.

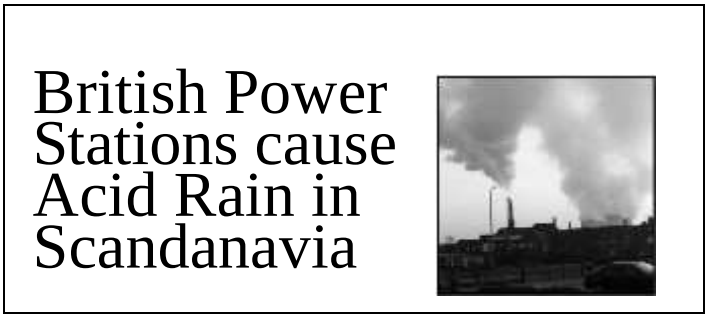
Suggest what, if anything, will happen when dilute hydrochloric acid is added to a piece of sandstone.

.....

1 mark

Maximum 7 marks

4. A headline from a newspaper is shown below.



Some countries claim that acid rain caused by power stations in Britain damages their forests.
Others argue that coal-burning power stations produce cheap electricity and that plants can stand some level of acid rain.

Imagine you are planning a laboratory investigation of the claim:

'plants can stand some level of acid rain'.

Assume you have access to whatever laboratory equipment you need, including:

- seeds
- acid
- seed trays
- soil

Plan a laboratory investigation to test the claim that **'plants can stand some level of acid rain'.**

(a) Name a factor you would need to vary in your investigation.
(This is the independent variable.)

.....

1 mark

(b) (i) What factor would you examine to see the effect?
(This is the dependent variable.)

.....

.....

1 mark

(ii) How could you measure this dependent variable?

.....

1 mark

(c) Suggest **one** factor you would control to ensure that your investigation is fair.

.....

1 mark

Maximum 4 marks

5. (a) Complete the word equation below for the reaction between calcium carbonate and hydrochloric acid.

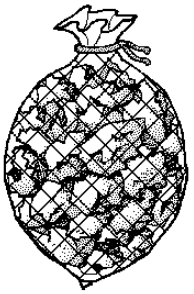
$$\text{calcium carbonate} + \text{hydrochloric acid} \rightarrow \text{.....} + \text{carbon dioxide} + \text{water}$$

1 mark

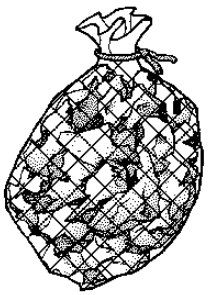
Limestone is mainly calcium carbonate. It is weathered by acids in the air or in soil.

(b) In June 1990, a Year 9 class planned a long-term investigation into the chemical weathering of limestone by acids in soil.

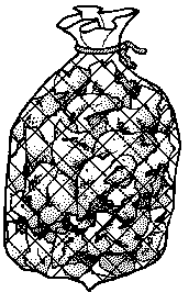
They put limestone chippings of similar size in three nylon mesh bags.
They buried the bags outside in soils of different pH.



sample A in soil of pH5



sample B in soil of pH7



sample C in soil of pH8

(i) Chemical weathering took place in sample A, and the mass of the sample decreased.

Give the reason for the decrease in mass. Use the word equation above to help you.

.....

.....

1 mark

(ii) The pupils predicted that chemical weathering would **not** take place in samples B and C.

Give the reason for their prediction.

.....

.....

1 mark

(iii) Some chemical weathering did take place in samples B and C.
What could have changed the conditions in these soils to cause weathering to take place?

.....

1 mark

(c) The table shows how the mass of each sample changed between the years 1990 and 2000.

year	**mass, in g**		
	sample A, at pH 5	**sample B, at pH 7**	**sample C, at pH 8**
1990	1000	1000	1000
1995	980	992	997
2000	960	984	995

In 2000, a year 9 class buried another identical 1000 g sample of limestone chippings in soil of pH 6.

(i) Use the results in the table to predict an approximate value for the mass of this sample in 2010.

..... g

1 mark

(ii) Why is it **not** possible to be certain what the mass of this sample will be in 2010?

.....

.....

1 mark

Maximum 6 marks