Cambridge Assessment International Education

Cambridge IGCSE™

11: Redox, electrochemistry and Group VII – Topic questions

Paper 3

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

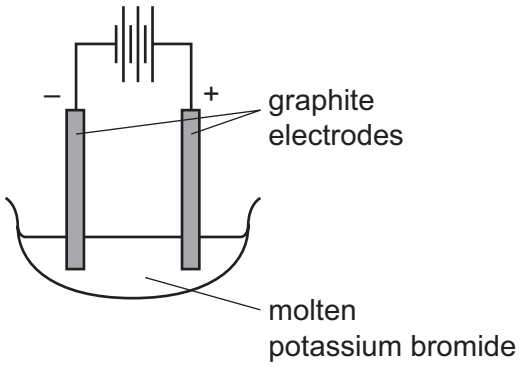
Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
2	2016	March	32
2	2016	June	31
5	2015	June	31

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

2 Molten potassium bromide can be electrolysed using the apparatus shown.



(a) Predict the products of this electrolysis at the

positive electrode (anode), ...

negative electrode (cathode). .....

[2]

(b) **(i)** Explain why graphite electrodes are used in this electrolysis.

..... [1]

(ii) Give **one** other use of graphite.

..... [1]

(c) When chlorine is bubbled through an aqueous solution of potassium bromide, the solution turns red-brown in colour.

Which substance causes the red-brown colour?

..... [1]

(d) Describe what you would observe when an aqueous solution of potassium bromide is added to an acidified aqueous solution of silver nitrate.

..... [1]

(e) Silver nitrate decomposes when heated. One of the products is nitrogen dioxide.

State **one** adverse effect of nitrogen dioxide on health.

..... [1]

[Total: 7]

2 A bicycle maker wants to choose a suitable material to make bicycle frames.
The table shows the properties of some materials that could be used.

material	relative strength	density in g / cm^3	resistance to corrosion	cost per tonne in $ / tonne
aluminium	8	2.7	very good	1500
iron	21	7.9	poor	450
stainless steel	24	7.9	very good	600
titanium	27	4.5	very good	15000
zinc	14	7.1	good	1300

(a) Which material is the most suitable for making the bicycle frame?

Explain your answer using information from the table.

.....

.....

.....

..... [3]

(b) Aluminium is extracted from aluminium oxide by electrolysis.

(i) State the name of the main ore of aluminium.

..... [1]

(ii) Suggest why aluminium is extracted by electrolysis and **not** by reduction with carbon.

..... [1]

(iii) Molten aluminium oxide is electrolysed using graphite electrodes.

Predict the products of this electrolysis at

the positive electrode (anode), ...

the negative electrode (cathode). ..... [2]

(c) The diagram shows the changes of state when zinc vapour is cooled slowly to room temperature.

Explain what happens during these changes in terms of

- the distance between the particles,
- the type of motion shown by the particles.

.....

.....

.....

.....

..... [4]

[Total: 11]

5 The Group VII elements are called the halogens.

(a) Describe the trends in

- the physical properties of the halogens,
- the reactivity of halogens with other halide ions.

Include a relevant word equation in your answer.

.....

.....

.....

.....

.....

.....

..... [5]

(b) Iodine reacts with hot concentrated nitric acid.

$$I_2 + 10HNO_3 \rightarrow 2HIO_3 + 4H_2O + 10NO_2$$

(i) Explain why this reaction could have an adverse effect on health if not carried out in a fume cupboard.

.....

..... [2]

(ii) Nitric acid is strongly acidic.

Which one of the following pH values represents a strongly acidic solution?

Put a ring around the correct answer.

pH 1 pH 7 pH 9 pH 13

[1]

(iii) Nitric acid reacts with zinc oxide.

State the names of the products of this reaction.

..... and .....

[2]

[Total: 10]

Question	Answer	Marks
2 (a)	anode: bromine / Br_2; cathode: potassium / K;	**2**
2 (b) (i)	they are inert / they do not react;	**1**
2 (b) (ii)	any suitable use, e.g. lubricant / pencil leads / brake linings / steelmaking / walls of blast furnace;	**1**
2 (c)	Bromine / Br2;	**1**
2 (d)	cream precipitate / cream solid;	**1**
2 (e)	irritates eyes / irritates nose / irritates lungs;	**1**
		Total: 7

Question	Answer	Marks
2 (a)	stainless steel; any 2 from: (very) strong; (good) resistance to corrosion; cheap; **OR** iron; strong; cheap; **OR** aluminium; low density; (good) resistance to corrosion; **OR** titanium; any 2 from: strong; (good) resistance to corrosion; low density; **OR** zinc; (good) resistance to corrosion;	**3**

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Question	Answer	Marks
2 (b) (i)	bauxite;	**1**
2 (b) (ii)	aluminium is too reactive / aluminium is high in the electrochemical series / aluminium is very reactive;	**1**
2 (b) (iii)	anode: oxygen / O_2; cathode: aluminium / A*l*;	**2** **1** **1**
2 (c)	any 4 from: • atoms in gas far apart / all over the place; • atoms in gas moving (very) fast / move freely / bouncing around / move randomly; • atoms slow down during condensation / move less than before; • atoms get closer together in condensation; • atoms in liquid are close together / touching; • atoms in liquid slide over each other / atoms in liquids move slowly / restricted movement; • atoms slow down (further) during freezing / atoms in liquid move more than in solid; • atoms in solid only vibrate; • atoms in solid are / touching / close to each other / closely packed / tightly packed;	**4**
		Total: 11

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Question	Answer	Marks
5 (a)	any 3 physical properties: • melting point increases down the Group; • boiling point increases down the Group; • density increases down the Group; • colour gets darker down the Group / states goes from gas to liquid to solid down the Group; reactivity: • more reactive halogen displaces less reactive halogen (from halide); • correct word equation, e.g. chlorine + potassium bromide → potassium chloride + bromine;	**5** **3** **2**
5 (b) (i)	nitrogen dioxide (formed) / NO2 (formed) / nitrogen oxide (formed) / gas (formed); damages lungs / irritates eyes / sore throat / skin burns / difficulty swallowing / persistent coughing / headache / vomiting;	**2** **1** **1**
5 (b) (ii)	pH 1;	**1**
5 (b) (iii)	zinc nitrate; water;	**2** **1** **1**
		Total: 10

