Oxford Cambridge and RSA

GCSE Chemistry A (Gateway Science)

J248/04 Chemistry A C4-C6 and C7 (Higher Tier)

Question Set 3

C6: Global Challenges

Multiple Choice Questions

1 The table shows the composition of the Earth's early atmosphere compared with the atmosphere today.

	Nitrogen	**Oxygen**	**Argon**	**Carbon dioxide**
Percentage of gas in the early atmosphere	4	0.5	0.5	95
Percentage of gas in the atmosphere today	78	21	0.9	0.04

Which gas has **changed by the largest percentage** from the early atmosphere to the atmosphere today?

A Nitrogen

B Oxygen

C Argon

D Carbon dioxide

Your answer ☐ **[1]**

2 Which of these pairs of gases are **both** greenhouse gases?

A Nitrogen and methane

B Nitrogen and oxygen

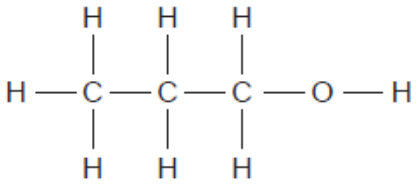
C Water vapour and methane

D Water vapour and oxygen

Your answer ☐ **[1]**

3 Which displayed formula shows butanol?

A



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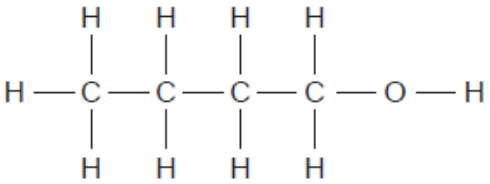

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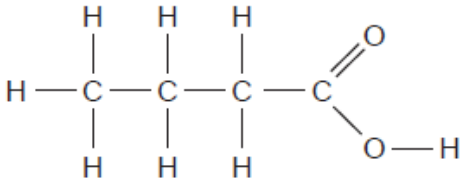

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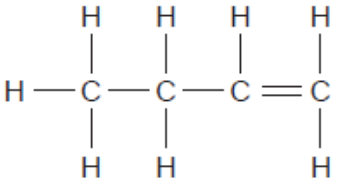


Your answer ☐ **[1]**

4 A hydrogen-oxygen fuel cell produces electricity.

Hydrogen reacts with oxygen to produce water.

What is the equation for the reaction that happens at the **anode**?

A $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$

B $4H^+(aq) + 4e^- \rightarrow 2H_2(g)$

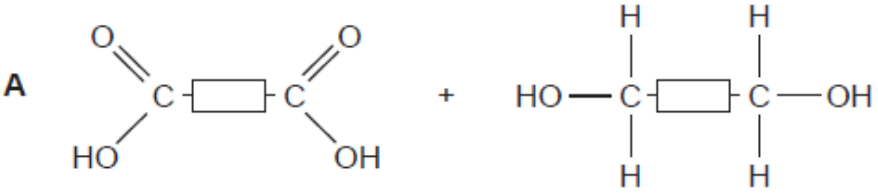
C $2H_2(g) \rightarrow 4H^+(aq) + 4e^-$

D $4H^+(aq) + O_2(g) + 4e^- \rightarrow 2H_2O(g)$

Your answer ☐ **[1]**

5 Which pairs of molecules would react to form a **polyester**?

A



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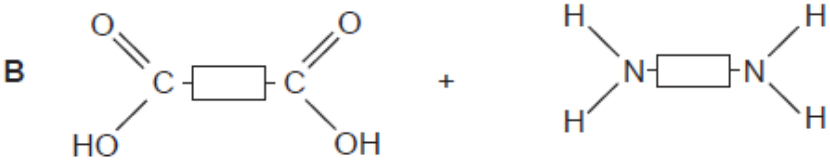

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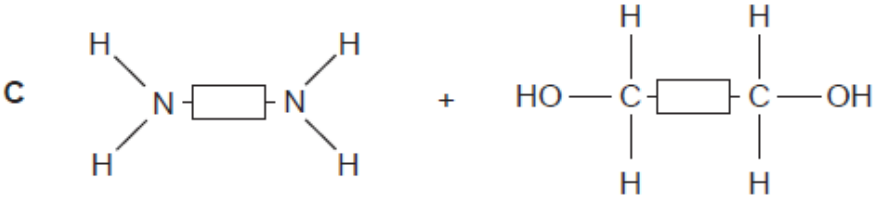

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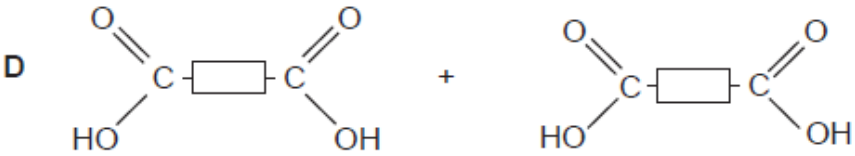


Your answer ☐ **[1]**

6 Phytoextraction is one way to extract copper from low-grade ores.

The table shows the main stages involved in phytoextraction.

Stage	Process
1	Copper ions accumulate in the roots, shoots and leaves of plants.
2	Copper is extracted from ash with a high concentration of copper compounds.
3	Plants absorb dissolved copper ions through their roots.
4	A crop is planted in soil containing low-grade copper ore.
5	Plants are harvested and burned.

What is the correct order for the stages?

A 1, 3, 4, 5, 2

B 4, 1, 3, 2, 5

C 4, 3, 1, 5, 2

D 1, 4, 3, 5, 2

Your answer ☐ **[1]**

7 Which statement about the greenhouse effect and greenhouse gases is correct?

A Greenhouse gases absorb all the infrared radiation that is emitted by the Earth's surface.

B The greenhouse effect is caused by the infrared radiation being absorbed and re-emitted by greenhouse gases.

C The lower the concentration of greenhouse gases in the Earth's atmosphere, the warmer the Earth becomes.

D Greenhouse gases are a large percentage of the Earth's current atmosphere.

Your answer ☐ **[1]**

8 Which statement explains why **polyamides** are condensation polymers?

A A molecule of water forms each time a hydroxyl link forms.

B A molecule of water forms each time an ester link forms.

C A molecule of water forms each time an amine group reacts with a carboxylic acid group.

D A molecule of water forms each time an alcohol group reacts with a carboxylic acid group.

Your answer

[1]

9 The following statements describe one possible theory for how the Earth's atmosphere evolved.

The statements are not in the correct order.

1	Formation of water
2	Carbon cycle now keeps the composition of the atmosphere almost constant
3	Atmosphere of ammonia and carbon dioxide
4	Increase in oxygen and nitrogen levels
5	Photosynthetic organisms began to make oxygen
6	Degassing from the Earth's crust

What is the correct order for the sentences?

A 3, 5, 4, 6, 1, 2

B 3, 6, 5, 4, 1, 2

C 6, 1, 3, 5, 4, 2

D 6, 3, 1, 5, 4, 2

Your answer ☐ **[1]**

10 Look at the information about four different polymers.

Polymer	Cost (£ per kg)	Tensile strength (MPa)	Melting point (°C)	Maximum useable temperature (°C)
A	0.74	15	120	85
B	1.20	78	254	70
C	0.92	35	176	160
D	1.42	42	156	160

Which polymer would be best for making a plastic washing up bowl?

Your answer ☐ **[1]**

11 Aluminium is extracted by the electrolysis of molten aluminium oxide, Al_2O_3.

Which equation shows the reaction at the **anode** in this electrolysis?

A $4OH^- - 4e^- \rightarrow O_2 + 2H_2O$

B $Al^{3+} + 3e^- \rightarrow Al$

C $2H^+ + 2e^- \rightarrow H_2$

D $2O^{2-} - 4e^- \rightarrow O_2$

Your answer ☐ **[1]**

12 Look at the equations for the reactions that happen at each side of a hydrogen-oxygen fuel cell.

Reaction 1: $2H_2(g) \rightarrow 4H^+(aq) + 4e^-$

Reaction 2: $4H^+(aq) + O_2(g) + 4e^- \rightarrow 2H_2O(g)$

	Reaction 1	Reaction 2
A	Oxidation because electrons are	Reduction because electrons are lost
B	Reduction because electrons are	Reduction because electrons are
C	Oxidation because electrons are lost	Reduction because electrons are
D	Oxidation because electrons are lost	Oxidation because electrons are lost

Which row of the table, **A**, **B**, **C** or **D**, is correct about reactions **1** and **2**?

Your answer ☐ **[1]**

13 Which one of the following is an **advantage** of phytoextraction?

A A high concentration of a metal can be obtained from a low grade ore.

B Bacteria are used to dissolve metals instead of chemical solutions.

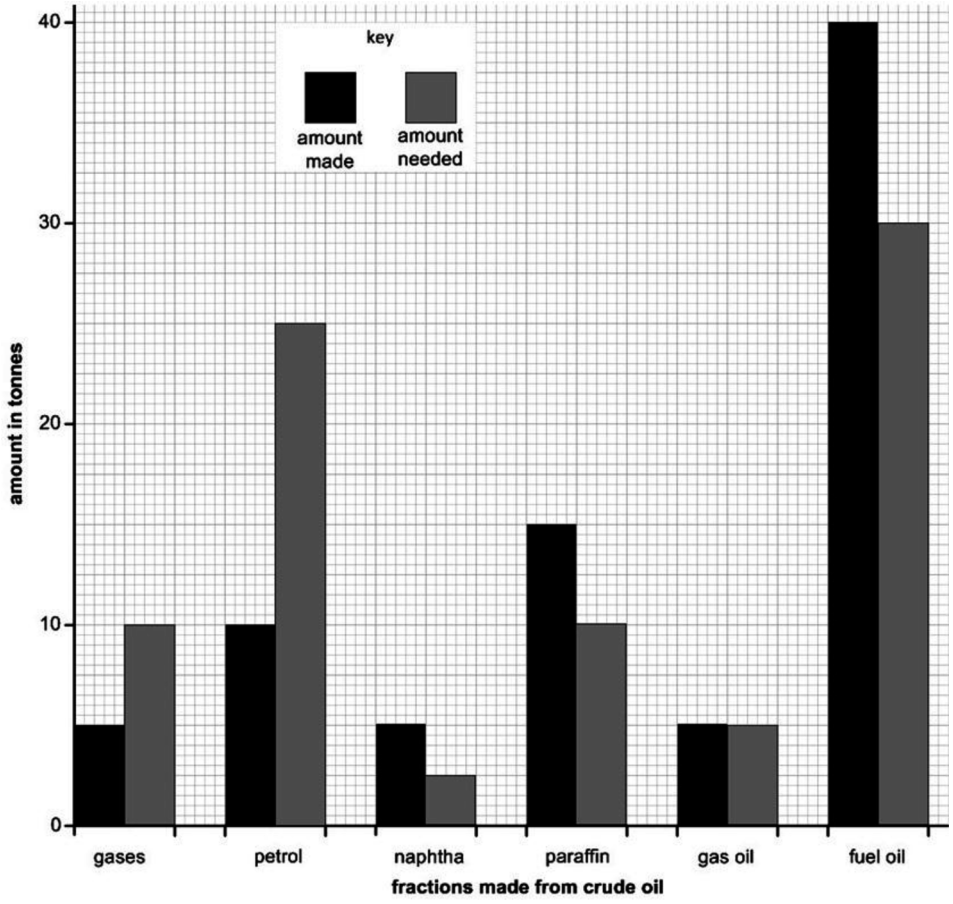
C Better crops of plants are harvested.

D Phytoextraction is a quick process and is not affected by poor weather.

Your answer ☐ **[1]**

14 The bar chart shows the amount of some fractions made from 100 tonnes of crude oil by fractional distillation.

It also shows the amount of each fraction needed for everyday uses.



Cracking converts large molecules into smaller more useful molecules to make the supply match the demand.

Which fractions are most likely to be cracked to make the supply match the demand?

A Gas, oil and fuel oil

B Gas, oil and petrol

C Naphtha, paraffin and fuel oil

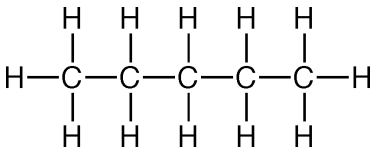
D Petrol and gases

[1]

Your answer ☐

15 Which displayed formula includes the functional group of an alcohol?

A



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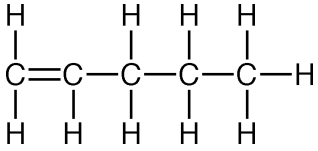

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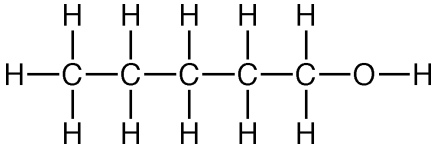

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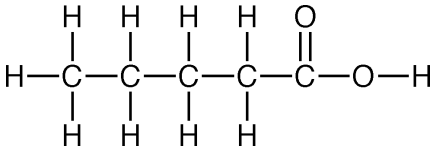


Your answer

[1]

16 These statements explain how scientists think our modern-day atmosphere was formed.

1 Plants evolved and used carbon dioxide during photosynthesis to make oxygen.

2 As the Earth cooled down, water fell as rain resulting in the formation of the oceans.

3 The atmosphere today consists of nitrogen, oxygen and a small amount of carbon dioxide.

4 Volcanoes gave out ammonia and carbon dioxide as well as methane and water vapour.

5 Ammonia was changed by bacteria in the soil into nitrogen gas.

What is the correct order that these events happened?

A **1**, **4**, **2**, **5**, **3**

B **2**, **4**, **5**, **3**, **1**

C **4**, **1**, **5**, **2**, **3**

D **4**, **2**, **5**, **1**, **3**

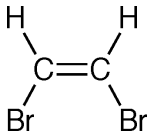
Your answer

[1]

17 A student bubbles ethene gas into bromine water.

Which displayed formula shows the product of this reaction?

A



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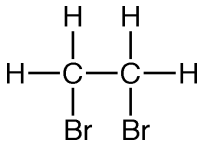

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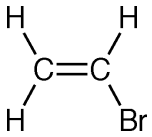

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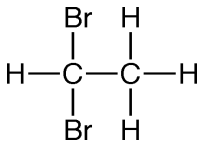
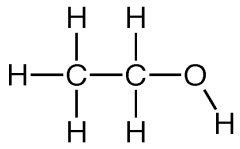


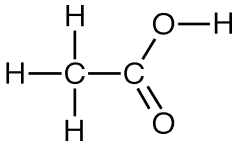
Your answer ☐ **[1]**

18 A student heats compound **X** with acidified potassium manganate(VII) solution.

The product of the reaction is compound **Y**.



X



Y

What is the colour change seen during this reaction?

A Colourless to orange

B Colourless to purple

C Orange to colourless

D Purple to colourless

Your answer ☐ **[1]**

19 A condensation polymer is made from two monomers.

- One monomer has two –OH groups in its molecule.
- The other monomer has two –COOH groups in its molecule.

Which term describes the polymer?

A DNA

B Polyamide

C Poly(chloroethene)

D Polyester

Your answer ☐ **[1]**

Total Marks for Question Set 3: 19

The Periodic Table of the Elements

(1)	(2)											(3)	(4)	(5)	(6)	(7)	(0)
1																	18
1 **H** hydrogen 1.0	2											13	14	15	16	17	2 **He** helium 4.0
3 **Li** lithium 6.9	4 **Be** beryllium 9.0											5 **B** boron 10.8	6 **C** carbon 12.0	7 **N** nitrogen 14.0	8 **O** oxygen 16.0	9 **F** fluorine 19.0	10 **Ne** neon 20.2
11 **Na** sodium 23.0	12 **Mg** magnesium 24.3	3	4	5	6	7	8	9	10	11	12	13 **Al** aluminium 27.0	14 **Si** silicon 28.1	15 **P** phosphorus 31.0	16 **S** sulfur 32.1	17 **Cl** chlorine 35.5	18 **Ar** argon 39.9
19 **K** potassium 39.1	20 **Ca** calcium 40.1	21 **Sc** scandium 45.0	22 **Ti** titanium 47.9	23 **V** vanadium 50.9	24 **Cr** chromium 52.0	25 **Mn** manganese 54.9	26 **Fe** iron 55.8	27 **Co** cobalt 58.9	28 **Ni** nickel 58.7	29 **Cu** copper 63.5	30 **Zn** zinc 65.4	31 **Ga** gallium 69.7	32 **Ge** germanium 72.6	33 **As** arsenic 74.9	34 **Se** selenium 79.0	35 **Br** bromine 79.9	36 **Kr** krypton 83.8
37 **Rb** rubidium 85.5	38 **Sr** strontium 87.6	39 **Y** yttrium 88.9	40 **Zr** zirconium 91.2	41 **Nb** niobium 92.9	42 **Mo** molybdenum 95.9	43 **Tc** technetium	44 **Ru** ruthenium 101.1	45 **Rh** rhodium 102.9	46 **Pd** palladium 106.4	47 **Ag** silver 107.9	48 **Cd** cadmium 112.4	49 **In** indium 114.8	50 **Sn** tin 118.7	51 **Sb** antimony 121.8	52 **Te** tellurium 127.6	53 **I** iodine 126.9	54 **Xe** xenon 131.3
55 **Cs** caesium 132.9	56 **Ba** barium 137.3	• 57–71 lanthanoids	72 **Hf** hafnium 178.5	73 **Ta** tantalum 180.9	74 **W** tungsten 183.8	75 **Re** rhenium 186.2	76 **Os** osmium 190.2	77 **Ir** iridium 192.2	78 **Pt** platinum 195.1	79 **Au** gold 197.0	80 **Hg** mercury 200.6	81 **Tl** thallium 204.4	82 **Pb** lead 207.2	83 **Bi** bismuth 209.0	84 **Po** polonium	85 **At** astatine	86 **Rn** radon
87 **Fr** francium	88 **Ra** radium	• 89–103 actinoids	104 **Rf** rutherfordium	105 **Db** dubnium	106 **Sg** seaborgium	107 **Bh** bohrium	108 **Hs** hassium	109 **Mt** meitnerium	110 **Ds** darmstadtium	111 **Rg** roentgenium	112 **Cn** copernicium		114 **Fl** flerovium		116 **Lv** livermorium		

Key
atomic number
Symbol
name
relative atomic mass