Past Papers

Standard Grade

General

Chemistry

2003

Marking Scheme

2003 General	KU		PS	
	/30	%	/30	%
3	18+	60%	20+	67%
4	13+	43%	16+	53%
5	10+	33%	13+	43%
7	<10	<33%	<13	<43%

2003 Standard Grade Chemistry General Marking Scheme

Question	Answer	Chemistry Covered

1a / 1b — E / D

Answer	A	B	C	D	E	F
Element	Magnesium	Lithium	Calcium	Nickel	Aluminium	Potassium
Discovery	1775 (1808 in new data booklet)	1817	1808	1751	1827 (1825 in new data booklet)	1807
Group	Group 2	Group 1	Group 2	Transition Metal	Group 2	Group 1

2 — B

Ending	Meaning	Example
-ide	2 elements in compound	Copper sulphide = copper + sulphur
-ate	2 elements in compound + oxygen	Copper sulphate = copper + sulphur + oxygen
-ite	2 elements in compound + oxygen	Sodium sulphite = sodium + sulphur + oxygen

3a — A

Elements with 5 outer electrons are found in group 5

3b — C+F (Both for 1 mark)

Elements in the same group (column) have similar chemical properties
e.g. alkali metals (group 1) are all very reactive metals which react with water to form alkalis

3c — E

Group	1	7	0	Between Groups 2+3
Name	alkali metals	halogen	noble gases	transition metals

4a / 4b / 4c — A / F / C

A	Combustion	The burning of a substance and joining up with oxygen
B	Neutralisation	The reaction of H^+ ions with a base to form water
C	Polymerisation	The joining of small molecules to form a larger molecule
D	Addition	C=C double bonds open up and join to form a long C-C chain polymer
E	Cracking	Larger hydrocarbons split into smaller hydrocarbons, some with C=C bonds
F	Electrolysis	Passing electricity through an ionic substance, breaking the substance back to elements

5a / 5b / 5c — B / E / D

A	Iodine Solution	Turns blue/black in the presence of starch
B	Benedict's Solution	Turns brick red in the presence of reducing sugars e.g. glucose
C	Lime Water	Turns milky in the presence of carbon dioxide
D	Bromine Solution	Decolourises in the presence of unsaturated C=C double bonds
E	Ferroxyl Indicator	Turn blue in the presence of Fe^{2+} ions
F	pH Indicator	Turns red in acid conditions & turns blue/purple in alkaline conditions

6a — B

All metals conduct electricity in the solid state.
Non-metals do not conduct electricity except carbon (graphite)

6b — F

Air contains 79% nitrogen and 21% oxygen

6c — A+F (Both for 1 mark)

Answer	A	B	C	D	E	F
Element	Nitrogen	Carbon	Argon	Neon	Sulphur	Oxygen
Formula	N_2	C	Ar	Ne	S	O_2

7a — A

Magnesium carbonate neutralises hydrochloric acid and excess magnesium carbonate is used to ensure all hydrochloric acid has been neutralised.
The excess magnesium carbonate is insoluble in water and can be removed by filtration from the products of the reaction.

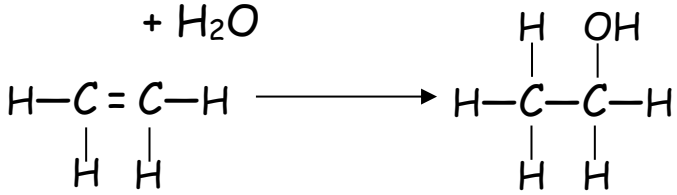
7b — C,E (1 mark each)

☒A copper carbonate reacted and excess removed by filtration
☒B All hydrochloric acid has been neutralised by copper carbonate
☑C copper chloride is formed and dissolves in the solution
☒D Carbon dioxide gas escapes into the atmosphere
☑E Water is formed in the reaction and ends up in the flask

8 — D,E (1 mark each)

☒A larger volume of acid would not increase the rate the gas is produced
☒B diluting the acid would slow the rate the gas is produced
☒C Using a larger beaker would not alter the rate gas is produced
☑D Increasing the temperature increases the rate gas is produced
☑E Using a catalyst would increase the rate gas is produced

<table>
<tr><th>Question</th><th>Answer</th><th>Chemistry Covered</th></tr>
<tr><td>9a</td><td>table showing:</td><td>
<table>
<tr><th>Metal Added to Copper</th><th>Use</th></tr>
<tr><td>Aluminium</td><td>Aircraft bodies</td></tr>
<tr><td>Nickel</td><td>Coins</td></tr>
<tr><td>Zinc</td><td>Musical instruments</td></tr>
<tr><td>Tin</td><td>Ship Propellers</td></tr>
</table>
</td></tr>
<tr><td>9b</td><td>it will run out eventually</td><td>Finite resources will eventually run out with over use.
They are non-renewable resources like coal, oil and gas.</td></tr>
<tr><td>10a(i)</td><td>distillation</td><td>Fractional distillation separate substances with different boiling points</td></tr>
<tr><td>10a(ii)</td><td>
<table>
<tr><th>Flammability</th><th>Viscosity</th></tr>
<tr><td>increases</td><td>decreases</td></tr>
</table>
</td><td>
<table>
<tr><th>Property</th><th>Gases</th><th>Naphtha</th><th>Kerosene</th><th>Gas Oils</th><th>Residue</th></tr>
<tr><td>Viscosity</td><td>Low</td><td colspan="3">←——————→</td><td>High</td></tr>
<tr><td>Evaporation</td><td>Fast</td><td colspan="3">←——————→</td><td>Slow</td></tr>
<tr><td>Flammability</td><td>High</td><td colspan="3">←——————→</td><td>Low</td></tr>
<tr><td>Boiling Point</td><td>Low</td><td colspan="3">←——————→</td><td>High</td></tr>
</table>
</td></tr>
<tr><td>10a(iii)</td><td>gases</td><td>Propane has a boiling point of -42°C and will be found in the gases fraction where the compounds boil at temperatures below 20°C.</td></tr>
<tr><td>10b</td><td>alkanes</td><td>Homologous series are a family of compounds with the same chemical properties and a general formula. Homologous series include:
<table>
<tr><td>Alkanes</td><td>Alkenes</td><td>Cycloalkanes</td><td>Alcohols</td><td>Carboxylic Acids</td></tr>
</table>
</td></tr>
<tr><td>10c(i)</td><td>no C=C bonds</td><td>Saturated hydrocarbons have C-C single bonds in them and do not decolourise bromine solution. Unsaturated hydrocarbons contain at least one C=C double bond which will decolourise bromine solution quickly.</td></tr>
<tr><td>10c(ii)</td><td>C_3H_6</td><td>$C_{10}H_{22} \longrightarrow C_7H_{16} + C_3H_6$
saturated — saturated — unsaturated</td></tr>
<tr><td>11a</td><td>sulphur dioxide or nitrogen dioxide</td><td>Sulphur dioxide SO_2 is formed when sulphur in fuels is burned.
Nitrogen dioxide NO_2 is formed when nitrogen and oxygen in air is sparked.
Both SO_2 and NO_2 are non-metal oxides and dissolve in water to form an acid.</td></tr>
<tr><td>11b</td><td>hydrogen or H^+</td><td>All acids contain more of the hydrogen ion (H^+ ion)</td></tr>
<tr><td>11c</td><td>lime</td><td>Lime neutralises acid so would increase an acidic pH up towards pH=7
Any alkali or base could also be used to increase the pH of the water.</td></tr>
<tr><td>12a</td><td>bar chart containing:</td><td>
<table>
<tr><td>½mark
vertical scale</td><td>½mark
correct labelling of bars</td><td>1mark
bars drawn correctly</td></tr>
</table>
</td></tr>
<tr><td>12b</td><td>SiO_2</td><td>The two most common elements in the pie chart are silicon and oxygen:
<table>
<tr><th>Write down Elements and their valency below</th><th>Write Down Arrow of Cross Over Rule</th><th>Follow arrows and cancel down to get formula</th></tr>
<tr><td>Si O
4 2</td><td>Si O
4 2</td><td>SiO_2</td></tr>
</table>
</td></tr>
<tr><td>13a</td><td>biological catalyst</td><td>An enzyme is a biological catalyst made of protein which catalyse the chemical reactions which take place in the body.</td></tr>
<tr><td>13b</td><td>relights a glowing splint</td><td>
<table>
<tr><th>Gas</th><th>Hydrogen</th><th>Oxygen</th><th>Carbon Dioxide</th></tr>
<tr><td>Test</td><td>burns with a pop</td><td>relights a glowing splint</td><td>turns lime water milky</td></tr>
</table>
</td></tr>
<tr><td>13c</td><td>rate increases</td><td>The chopping of the liver in small pieces increase the surface area of the liver and reduces the particle size. This speeds up the reaction.</td></tr>
</table>

<table>
<tr><td>13d</td><td>activity increases and then decreases</td><td>The activity of the enzyme increases as the temperature increases from 20°C until around 37°C. The activity of the enzyme then decreases</td></tr>
<tr><td>14a</td><td>hydrogen</td><td>ACID + METAL → SALT + HYDROGEN</td></tr>
<tr><td>14b</td><td>copper, mercury, silver or gold</td><td>Metals below hydrogen in the electrochemical series (copper, mercury, silver and gold) are not reactive enough the react with dilute acids.</td></tr>
<tr><td>14c</td><td>one from:</td><td><table><tr><td>Temperature</td><td>Volume of acid</td><td>Mass of metal</td><td>Particle size of metal</td><td>Concentration of acid</td></tr></table></td></tr>
<tr><td>15a</td><td>$C_2H_6O_2$</td><td>Ethylene glycol is used as an anti-freeze</td></tr>
<tr><td>15b</td><td>H_2O</td><td>Addition: molecule adds across the C=C double bond
 
ethene ethanol
Hydration: H_2O molecule adds across the C=C double bond</td></tr>
<tr><td>15c</td><td>man-made</td><td>Synthetic materials are not found in nature and are made by the chemical industry.</td></tr>
<tr><td>16a</td><td>$Mg + H_2O \downarrow MgO + H_2$</td><td>Magnesium + Water → magnesium oxide + Hydrogen
$Mg + H_2O \rightarrow MgO + H_2$
Magnesium is a metal so formula is Mg; Steam is water in the gaseous state; Magnesium oxide is worked from the crossover rule; Hydrogen is a diatomic element</td></tr>
<tr><td>16b</td><td>neutralisation</td><td>ACID + METAL OXIDE → SALT + WATER
hydrochloric acid + magnesium oxide → magnesium chloride + water</td></tr>
<tr><td>16c</td><td>water or H_2O</td><td>$2H_2 + O_2 \rightarrow H_2O$</td></tr>
<tr><td>17a</td><td>electrons</td><td>Electrons are charged particles which travel through the wires
Ions are charged particles which travel though the solution.</td></tr>
<tr><td>17b</td><td>to complete the circuit</td><td>The electrolyte completes the circuit as the ions move through the filter paper to balance the movement of charge as electrons move through the wires.</td></tr>
<tr><td>17c</td><td>chemicals run out</td><td>Cells/batteries are portable but run out when the chemicals in the battery are used up.</td></tr>
<tr><td>17d</td><td>magnesium or aluminium</td><td>Magnesium or aluminium are higher up the electrochemical series and would produce a higher voltage than zinc in a cell with copper.
Potassium, sodium, lithium and calcium are also higher up but would not work in practice as they would react with the water in the solution.</td></tr>
<tr><td>18a</td><td>turns lime water milky</td><td><table><tr><td>Gas</td><td>Hydrogen</td><td>Oxygen</td><td>Carbon Dioxide</td></tr><tr><td>Test</td><td>burns with a pop</td><td>relights a glowing splint</td><td>turns lime water milky</td></tr></table></td></tr>
<tr><td>18b(i)</td><td>no gas given off or mass is same</td><td>The experiment will release carbon dioxide gas as the reaction is proceeding.
The reaction is over when the gas is stopped being produced and no more mass is lost on the balance.</td></tr>
<tr><td>18b(ii)</td><td>egg shell</td><td>Mass loss for sea shell = 106.19 – 104.22g =1.97g
Mass loss for egg shell = 106.19 – 104.01g =2.18g</td></tr>
</table>

<table>
<tr><td>19</td><td>sulphur air
sulphur trioxide
conc sulphuric acid absorber</td><td>Problem Solving: Information transfer from written passage to flow chart</td></tr>
<tr><td>20a</td><td>Increase in carbons increases the boiling point</td><td>Problem Solving: Draw a conclusion from a bar chart</td></tr>
<tr><td>20b</td><td>125-135</td><td>
<table>
<tr><td>No of Carbons</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>Boiling Point</td><td>65 °C</td><td>80 °C</td><td>97 °C</td><td>117 °C</td><td>-</td></tr>
<tr><td>difference</td><td></td><td>15 °C</td><td>17 °C</td><td>20 °C</td><td>(17 °C)</td><td></td></tr>
<tr><td>Estimate</td><td></td><td></td><td></td><td></td><td>134°C</td></tr>
</table>
</td></tr>
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