Past Papers

Standard Grade

Credit

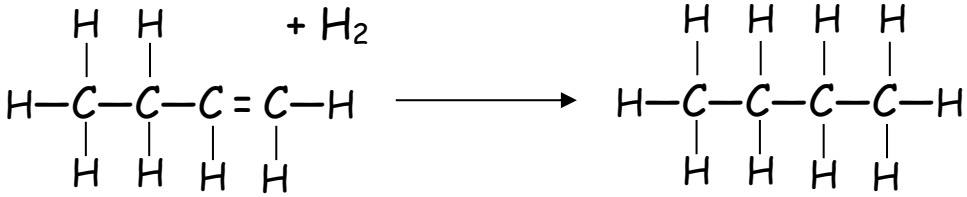
Chemistry

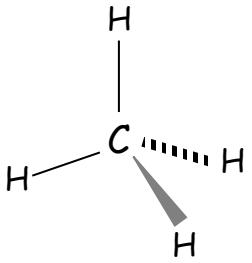
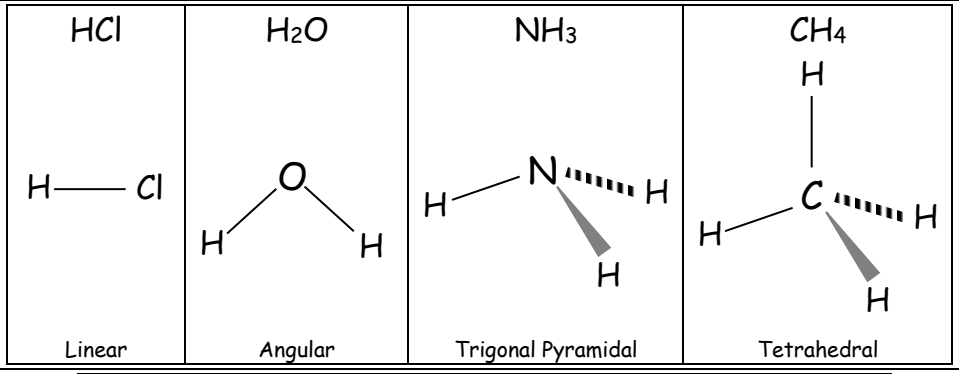
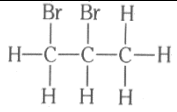
2003

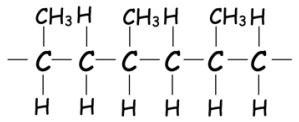
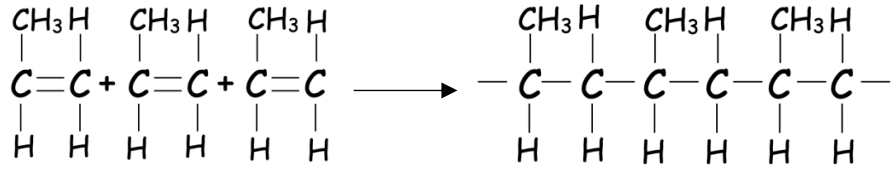
Marking Scheme

2003 Credit	KU		PS	
	/30	%	/30	%
1	22+	73%	22+	73%
2	16+	53%	15+	50%
See General Paper	<16	<53%	<15	<50%

2003 Standard Grade Chemistry Credit Marking Scheme

<table>
<tr><th>Question</th><th>Answer</th><th>Chemistry Covered</th></tr>
<tr><td>1a</td><td>A+C
Both for 1 mark</td><td>In neutral atoms: number of protons = number of electrons</td></tr>
<tr><td>1b</td><td>E</td><td>Mass number = number of protons + number of neutrons</td></tr>
<tr><td>2a</td><td>A+E
Both for 1 mark</td><td>fertilisers are soluble salts containing potassium, phosphorus and/or nitrogen</td></tr>
<tr><td>2b</td><td>B+E
Both for 1 mark</td><td>Ammonia is produced by heating an ammonium salt with a strong alkali e.g. sodium hydroxide</td></tr>
<tr><td>3a</td><td>F</td><td> 
but-1-ene butane</td></tr>
<tr><td>3b</td><td>C+D
Both for 1 mark</td><td>
<table>
<tr><td>Answer</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr>
<tr><td>Name</td><td>ethene</td><td>butane</td><td>cyclopropane</td><td>propene</td><td>cyclopentane</td><td>but-1-ene</td></tr>
<tr><td>Formula</td><td>C_2H_4</td><td>C_4H_{10}</td><td>C_3H_6</td><td>C_3H_6</td><td>C_5H_{10}</td><td>C_4H_8</td></tr>
</table>
</td></tr>
<tr><td>3c</td><td>A, C
1 mark each</td><td>
<table>
<tr><td>Answer</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr>
<tr><td>Name</td><td>ethene</td><td>butane</td><td>cyclopropane</td><td>propene</td><td>cyclopentane</td><td>but-1-ene</td></tr>
<tr><td>Homologous Series</td><td>alkene</td><td>alkane</td><td>cycloalkane</td><td>alkene</td><td>cycloalkane</td><td>alkene</td></tr>
<tr><td>Member of Series</td><td>1st Member</td><td>4th Member</td><td>1st Member</td><td>2nd Member</td><td>3rd Member</td><td>3rd Member</td></tr>
</table>
</td></tr>
<tr><td>4</td><td>A, C
1 mark each</td><td>☑A sodium + water → sodium hydroxide + hydrogen
☒B no reaction: zinc is lower than magnesium in electrochemical series
☑C copper carbonate + hydrochloric acid → copper chloride + water + carbon dioxide
☒D lead nitrate + potassium iodide → potassium nitrate + lead iodide (precipitate)
☒E no reaction: silver is below hydrogen in the electrochemical series
☒F potassium hydroxide + nitric acid → potassium nitrate + water</td></tr>
<tr><td>5</td><td>C, E
1 mark each</td><td>☒A pH of an acid will increase when metal hydroxide (alkali) is added
☒B acid + metal hydroxide → salt + water ∴ no carbon dioxide produced
☑C barium sulphate produced in reaction is insoluble ∴ precipitate produced
☒D acid + metal hydroxide → salt + water ∴ no hydrogen produced
☑E sulphuric acid + barium hydroxide → barium sulphate + water</td></tr>
<tr><td>6</td><td>C, D
1 mark each</td><td>☒ A – salt water speeds up rusting/corrosion of iron
☒ B – only higher up metals can provide sacrificial protection. Tin is lower than iron.
☑ C – rusting/corrosion of iron produces electrons: $Fe \rightarrow Fe^{2+} + 2e^-$ then $Fe^{2+} \rightarrow Fe^{3+} + e^-$
☑ D – Fe^{2+} ion produced by rusting and ferroxyl indicator turns blue in the presence of Fe^{2+}
☒ E – iron rusts slower when attached to the negative terminal due to cathodic protection</td></tr>
<tr><td>7</td><td>B, C
1 mark each</td><td>☒ A – Salts are made by neutralisation of an acid. The 1st name of the salt is from a base and the 2nd name of the salt is from an acid. No acids contain oxide ions to make iron (III) oxide
☑ B – Fe^{3+} ions in Fe_2O_3 are reduced to form iron atoms as Fe^{3+} ions gain electrons: $Fe^{3+} + 3e^- \rightarrow Fe$
☑ C – Fe has valency = 3 in iron (III) oxide. Crossover rule gives formula Fe_2O_3.
☒ D – iron (III) oxide is ionic not covalent. Only covalent compounds from molecules.
☒ E – Metal oxides like iron (III) oxide react with acids to form salt and water.</td></tr>
<tr><td>8a</td><td>C</td><td>
<table>
<tr><td>Answer</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr>
<tr><td>pH</td><td>alkaline</td><td>neutral</td><td>acidic</td><td>alkaline</td><td>neutral</td><td>acidic</td></tr>
<tr><td>State at 25°C</td><td>solid</td><td>solid</td><td>gas</td><td>gas</td><td>liquid</td><td>solid</td></tr>
</table>
</td></tr>
<tr><td>8b</td><td>E</td><td>Sodium hydroxide is an ionic compound so it will be a solid at room temperature.
Sodium hydroxide is a base so will form an alkaline solution.</td></tr>
<tr><td>9a</td><td>A+D
Both for 1 mark</td><td>Solid sodium chloride is a non-conductor
Liquid sodium chloride is a conductor</td></tr>
<tr><td>9b</td><td>C</td><td>Only metal elements and the element carbon (graphite) conduct when solid.
Elements are not compounds.</td></tr>
</table>

Question	Answer	Chemistry Covered
10a	Chemical which burns to give out energy	Fuels release energy (heat or kinetic) when burned
10b(i)	$CH_4 + 2O_2$ ↓ $CO_2 + 2H_2O$	$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$
10b(ii)	carbon monoxide or carbon/soot	Incomplete combustion produces poisonous carbon monoxide gas and black carbon soot due to the limited air supply
10b		
11a(i)	isotopes	Isotopes: Same atomic number but different mass number; Same number of protons but different number of neutrons
11a(ii)	^{35}Cl	More ^{35}Cl isotope in sample as average 35.5 is closer to 35 than 37
11b	Answer to include:	2 electrons form a shared pair between atoms. Atoms must be set distance apart for electrons to form a stable pair instead of remaining as two unpaired electrons
11c	Particle / Number: proton 17; neutron 18; electron 18	no. of protons = atomic number (bottom number) no. of neutrons = mass number – atomic number no. of electrons = number of protons - charge
12a	line graph	½ mark – both labels with units ½ mark – both scales ½ mark – points plotted correctly ½ mark – points joined
12b	~30s (from graph)	find 40cm^3 on y-axis, find point on line and follow line down to x-axis to find value
12c	32.75g	**n**o. of mol H_2 = 0.5mol (in question) $Zn + 2HCl \longrightarrow ZnCl_2 + H_2$ 1mol 1mol 0.5mol 0.5mol 1mol Zn = 65.5g **m**ass = **n**o. of mol x **gfm** = 0.5mol x 65.5g mol^{-1} = 32.75g
13a	silver nitrate solution	grey solid at –ve electrode is silver: $Ag^+ + e^- \rightarrow Ag$
13b	covalent	covalent compounds do not conduct when solid, liquid or in solution
13c	hydrogen gas	R is sulphuric acid with: $2H^+_{(aq)} + 2e^- \rightarrow H_{2(g)}$ at negative electrode.
13d	distillation	ethanol is separated from water by distillation because of ethanol has a lower boiling point than water
14a(i)	addition	Br_2 molecule adds across the C=C double bond
14a(ii)		Bromine on adjacent atoms of carbons which had C=C previously

<table>
<tr><td>14b</td><td>  </td><td>Draw propene into a 'H' shape, draw three and polymerise them into polymer
  </td></tr>
<tr><td>15a</td><td>$6Cl^- + 6Na^+$</td><td>Spectator Ions appear on both sides of the arrow</td></tr>
<tr><td>15b</td><td>filtration</td><td>calcium phosphate is insoluble (p8 of data booklet)</td></tr>
<tr><td>15c</td><td>38.7%</td><td>gfm $Ca_3(PO_4)_2$ = (3x40) + (2x31) + (8x16) = 120 + 62 + 128 = 310g
$\%Ca = \frac{\text{mass of Ca}}{gfm} \times 100 = \frac{120}{310} \times 100 = 38.7\%$</td></tr>
<tr><td>16a(i)</td><td>From B(RIGHT) to A(LEFT) through the wires</td><td>At Electrode A: $Fe^{3+}_{(aq)} + e^- \longrightarrow Fe^{2+}_{(aq)}$
Electrons are moving from B to A for Fe^{3+} ion to gain electrons</td></tr>
<tr><td>16a(ii)</td><td>Reduction</td><td>Reduction is Gain of Electrons: $Fe^{3+} + e^- \longrightarrow Fe^{2+}$</td></tr>
<tr><td>16b(i)</td><td>blue/black colour appearing</td><td>Oxidation reaction at B: $2I^- \longrightarrow I_2 + 2e^-$
Iodine produced turns blue/black in presence of starch</td></tr>
<tr><td>16b(ii)</td><td>$2I^- \longrightarrow I_2 + 2e^-$</td><td>reverse of equation on p10 of data booklet</td></tr>
<tr><td>17a</td><td>enzymes</td><td>enzymes are biological catalysts which catalyse chemical reactions in the body</td></tr>
<tr><td>17b</td><td>hydrolysis</td><td>Hydrolysis: Starch $\longrightarrow$ glucose.
Water molecules are added across the breaks in the molecule as starch is broken down into glucose</td></tr>
<tr><td>17c</td><td>respiration</td><td>aerobic respiration: $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$</td></tr>
<tr><td>17d</td><td>fructose</td><td><table><tr><td>Carbohydrate</td><td>glucose</td><td>fructose</td><td>maltose</td><td>sucrose</td><td>starch</td></tr><tr><td>Formula</td><td>$C_6H_{12}O_6$</td><td>$C_6H_{12}O_6$</td><td>$C_{12}H_{22}O_{11}$</td><td>$C_{12}H_{22}O_{11}$</td><td>$(C_6H_{10}O_5)_n$</td></tr></table></td></tr>
<tr><td>18a</td><td>2,8,1</td><td>Magnesium atoms have an electron arrangement of 2,8,2.
Mg^+ ions have lost one electron so have electron arrangement of 2,8,1</td></tr>
<tr><td>18b(i)</td><td>Ionisation energy increases</td><td>2nd Period: Li atomic number =3, Ne atomic number = 10
General increase in ionisation energy from 3 → 10</td></tr>
<tr><td>18b(ii)</td><td>Ionisation energy decreases</td><td><table><tr><td rowspan="2">Group</td><td colspan="3">Atomic Number of</td></tr><tr><td>1st Member</td><td>2nd Member</td><td>3rd Member</td></tr><tr><td>1</td><td>3</td><td>11</td><td>19</td></tr><tr><td>2</td><td>4</td><td>12</td><td>20</td></tr><tr><td>0</td><td>2</td><td>10</td><td>18</td></tr></table></td></tr>
<tr><td>19a(i)</td><td>1st clip on zinc rod
2nd clip on copper can</td><td>cells which produce electricity often have two different metals in them.</td></tr>
<tr><td>19a(ii)</td><td>ions cannot move through glass</td><td>ions need to move through porous cardboard container to complete circuit (glass blocks movement of ions)</td></tr>
<tr><td>19a(iii)</td><td>reading decreases</td><td>tin is closer to copper in the electrochemical series so voltage/current will be lower.</td></tr>
<tr><td>19b</td><td>6.725g</td><td>1 mol $CuCl_2$ = (1x 63.5) + (2x35.5) = 134.5g
no. of mol = **v**olume x **c**oncentration
= 0.05litres x 1 mol/l
= 0.05mol
mass of $CuCl_2$ = **n**o. of mol x **gfm**
= 0.05mol x 134.5g mol^{-1}
= 6.725g</td></tr>
</table>