Past Papers

Standard Grade

Credit

Chemistry

2012

Marking Scheme

2012 Credit	KU		PS	
	/30	%	/30	%
1	23+	77%	24+	80%
2	18+	60%	15+	50%
See general	<18	<60%	<15	<50%

2012 Standard Grade Chemistry Credit Marking Scheme

Question 1a — Answer: A+E (Both for 1 mark)

Toxic Gas	Carbon monoxide	Hydrogen chloride	Hydrogen cyanide
Plastic burned	All plastics	Poly(chloroethene) (PVC)	Superglue or Polyurethane

Question 1b — Answer: D

Gas	Hydrogen	Oxygen	Carbon Dioxide
Test	burns with a pop	relights a glowing splint	turns lime water milky

Question 2a — Answer: E

Question 2b — Answer: C

Property	Fraction A	Fraction B	Fraction C	Fraction D	Fraction E
Name	Refinery Gas	Naphtha/Gasoline	Kerosene	Gas Oils	Residue
Use	Camping Gas	Petrol	Aircraft Fuel	Diesel	Tar
Chain Length	Short ⟷				Long
Viscosity	Low ⟷				High
Evaporation	Easily ⟷				Slowly
Flammability	High ⟷				Low
Boiling Point	Low ⟷				High

Question 3 — Answer: C+D (Both for 1 mark)

Spectator ions are ions which do not take part in a chemical reaction but are present in the reaction mixture. Spectator ions can be identified as they appear on both sides of the arrow in a chemical reaction can be removed from an equation.

Question 4a — Answer: E

Answer	A	B	C	D	E
protons - electrons	11 – 11 = 0	9 – 9 = 0	11 – 11 = 0	19-18 = +1	9 – 10 = -1
Charge	Neutral	Neutral	Neutral	Positive	Negative

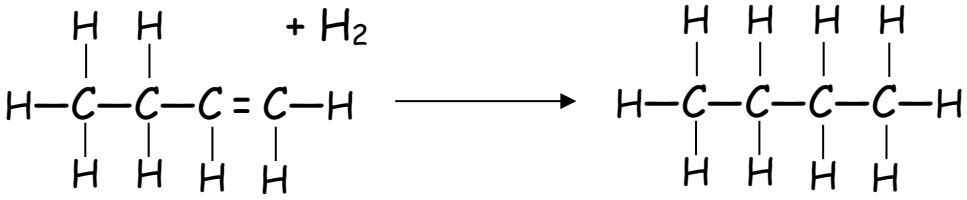
Question 4b — Answer: D

Answer	A	B	C	D	E
No of Protons	11	9	11	19	9
Element	Sodium	Fluorine	Sodium	Potassium	Fluorine
Flame Colour	yellow	Not listed in data book	orange	lilac	Not listed in data book

Question 4c — Answer: A+C (Both for 1 mark)

Isotopes	Same atomic number but different mass number
	Same number of protons but different number of neutrons

Question 5a — Answer: F



Question 5b — Answer: C+D (Both for 1 mark)

Answer	A	B	C	D	E	F
Name	Propane	Butane	Cyclopropane	Propene	Cyclopentane	Butene
Formula	C_3H_8	C_4H_{10}	C_3H_6	C_3H_6	C_5H_{10}	C_4H_8

Isotopes: Same molecular formula but different structural formula

Question 5c — Answer: D

Propene

3 carbons C=C double bond

Question 6a — Answer: C

Sulphur dioxide dissolves in rain water to form acid rain.
All acids contain H^+ ions

Question 6b — Answer: B

Combustion is also known as burning where a substance joins up with oxygen.

Question 7a — Answer: E

Bases are chemicals which neutralise acids to form water:

metal hydroxides (alkalis)	metal oxides	metal carbonates

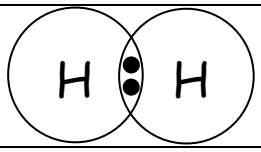
Question 7b — Answer: D+F (Both for 1 mark)

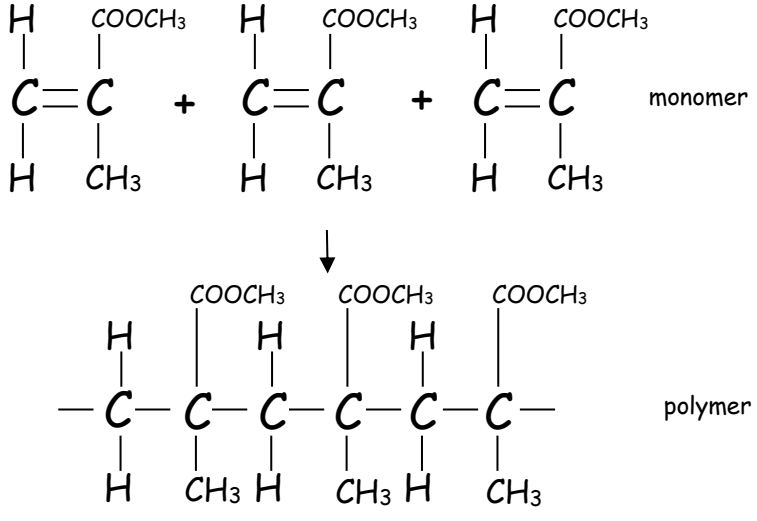
Swap names of both chemicals over and look for an insoluble product in the data booklet.

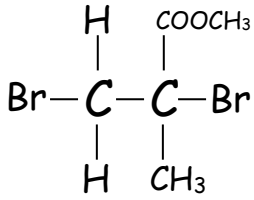
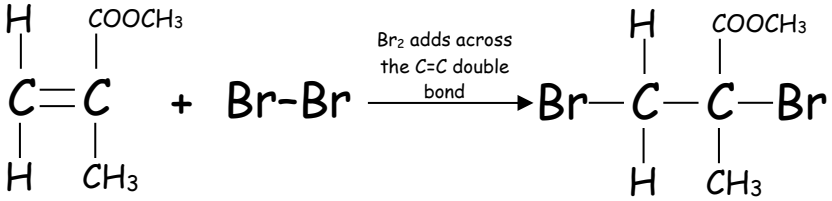
Barium bromide + potassium sulphate ⟶ barium sulphate (insoluble) + potassium bromide (soluble)

<table>
<tr><td>7c</td><td>D</td><td>
<table>
<tr><th>Write down Formulae</th><th>Write Down Reverse of Cross Over Rule</th><th>Follow arrows to get formula</th></tr>
<tr><td>XY_2</td><td>X Y
2 1</td><td>Valency of X=2
Metal X = Barium

Valency of Y=1
Non-Metal = Bromine</td></tr>
</table>
</td></tr>
<tr><td>8a</td><td>A</td><td>☑ A distillation separates alcohol & water due to different boiling points
☒ B precipitation is when ions meet and become an insoluble solid
☒ C filtering separates insoluble solid from liquids
☒ D electrolysis breaks down compounds back to their elements
☒ E dissolving is the process where the solute dissolves in a solvent</td></tr>
<tr><td>8b</td><td>C+E
Both for 1 mark</td><td>By adding the mixture to water, the magnesium chloride will dissolve in water but the magnesium carbonate will lie on the bottom of the beaker. Filtration will separate the insoluble magnesium carbonate (remains in filter paper as residue) and the magnesium chloride solution will pass through the filter paper (filtrate)</td></tr>
<tr><td>9</td><td>A,D
1 mark each</td><td>
<table>
<tr><th>Particle</th><th>Location</th><th>Charge</th><th>Mass</th></tr>
<tr><td>Proton</td><td>in nucleus</td><td>+1</td><td>1 amu</td></tr>
<tr><td>Neutron</td><td>in nucleus</td><td>0</td><td>1 amu</td></tr>
<tr><td>Electron</td><td>outside nucleus</td><td>–1</td><td>approx zero</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Chemistry Covered</th></tr>
<tr><td>10a</td><td>Prevents air/water getting to metal</td><td>Both air (oxygen) and water are required for corrosion/rusting to take place. By putting a barrier on top of iron, the barrier prevents air and water getting to the metal underneath and prevents corrosion.</td></tr>
<tr><td>10b(i)</td><td>A</td><td>Galvanising: Layer of zinc sacrificially protects iron underneath</td></tr>
<tr><td>10b(ii)</td><td>C</td><td>
<table>
<tr><th>A</th><th>B</th><th>C</th><th>D</th></tr>
<tr><td>Zinc sacrificially protects the iron so iron does not rust</td><td>Iron rusts at the normal rate as the iron is exposed to both air and water.</td><td>Corrosion of tin is reversed by sacrificial protection by iron as iron is higher up ECS</td><td>Silver is naturally unreactive so iron does not have to provide much in the way of sacrificial protection to silver.</td></tr>
</table>
</td></tr>
<tr><td>11a</td><td>2</td><td>The reaction is finished when the line becomes horizontal.
Lines 1 and 3 become horizontal before Line 2.</td></tr>
<tr><td>11b(i)</td><td>one from:</td><td>Decrease in concentration or increase in particle size</td></tr>
<tr><td>11b(ii)</td><td>0.5g</td><td>Line 3 gives off half the volume of gas as Line 1.
$\therefore$ As there is excess hydrochloric acid, mass of zinc must be halved.</td></tr>
<tr><td>12a</td><td>Line graph showing:</td><td>½ mark – both labels with units
½ mark – both scales
½ mark – points plotted correctly
½ mark – points joined up appropriately</td></tr>
<tr><td>12b</td><td>25-26</td><td>Value must be as drawn on the graph.</td></tr>
<tr><td>12c</td><td>Answer to include:</td><td>Reactions can be faster at higher temperatures and can produce more product in a shorter time.</td></tr>
<tr><td>13a</td><td>  </td><td>Hydrogen atoms pair up to form a covalent bond between them.
A covalent bond is a shared pair of electrons.</td></tr>
<tr><td>13b(i)</td><td>$MgSO_4$</td><td>Metal + Acid $\longrightarrow$ Salt + Hydrogen
Mg + H_2SO_4 $\longrightarrow$ $MgSO_4$ + H_2</td></tr>
<tr><td>13b(ii)</td><td>1.5</td><td>$\text{Rate} = \frac{\Delta\text{quantity}}{\Delta\text{time}} = \frac{55-40}{30-20} = \frac{15}{10} = 1.5\ cm^3/s$</td></tr>
<tr><td>14a</td><td>Hydrolysis</td><td>$\underset{\text{starch}}{(C_6H_{10}O_5)_n} + n\,\underset{\text{water}}{H_2O} \longrightarrow n\,\underset{\text{glucose}}{C_6H_{12}O_6}$</td></tr>
<tr><td>14b</td><td>Enzyme activity is stopped</td><td>Enzymes denature (change shape) permanently at temperatures well above 37°C.
Enzymes are biological catalysts and work best at 37°C.</td></tr>
<tr><td>14c</td><td>Fructose</td><td>
<table>
<tr><td>Carbohydrate</td><td>fructose</td><td>glucose</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>
<tr><td>Type</td><td>monosaccharide</td><td>monosaccharide</td><td>disaccharide</td><td>disaccharide</td><td>polysaccharide</td></tr>
</table>
</td></tr>
<tr><td>15a</td><td>$2KOH + H_2SO_4 \downarrow K_2SO_4 + 2H_2O$</td><td>$2KOH + H_2SO_4 \longrightarrow K_2SO_4 + 2H_2O$</td></tr>
<tr><td>15b</td><td>Neutralisation</td><td>Metal Hydroxide + Acid $\longrightarrow$ Salt + Water
2KOH + H_2SO_4 $\longrightarrow$ K_2SO_4 + $2H_2O$</td></tr>
<tr><td>15c</td><td>44.8%</td><td>gfm K_2SO_4 = (2x39) + (1x32) + (4x16) = 78+32+64 = 174g
$\%\ K = \frac{\text{mass K}}{\text{gfm}} = \frac{78}{174} \times 100 = 44.8\%$</td></tr>
<tr><td>15d</td><td>$(NH_4^+)_3PO_4^{3-}$</td><td>Formula of ammonium phosphate is $(NH_4)_3PO_4$
Ammonium ions have a formula of NH_4^+ and phosphate ions PO_4^{3-}</td></tr>
</table>

<table>
<tr><td>16a</td><td>Displacement or Redox</td><td>Displacement reactions occur when a more reactive metal displaces a less reactive metal from its ion form: $TiCl_4 + 2Mg \longrightarrow Ti + 2MgCl_2$
Redox $Ti^{4+} + 2Mg \longrightarrow 2Mg^{2+} + Ti$
Oxidation $2Mg \longrightarrow 2Mg^{2+} + 4e^-$
Reduction $Ti^{4+} + 4e^- \longrightarrow Ti$</td></tr>
<tr><td>16b(i)</td><td>B</td><td>Magnesium is formed from the reaction: $Mg^{2+} + 2e^- \longrightarrow Mg$
Positive Mg^{2+} ions are attracted to the negative electrode (B) to form Mg.</td></tr>
<tr><td>16b(ii)</td><td>$2Cl^- \rightarrow Cl_2 + 2e^-$</td><td>Chloride ions ($Cl^-$) are attracted to the positive electrode where they lose an electron each as they turn into Chlorine atoms. Chlorine atoms then pair up into a diatomic molecule Cl_2. This oxidation reaction is the reverse of the oxidation reaction on page 10 of the data booklet.</td></tr>
<tr><td>17a(i)</td><td>Red</td><td>
<table>
<tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr>
<tr><td colspan="3">acidic ←</td><td colspan="9">neutral</td><td colspan="3">→ alkali</td></tr>
<tr><td colspan="3">RED</td><td colspan="9">GREEN</td><td colspan="3">BLUE/PURPLE</td></tr>
</table>
</td></tr>
<tr><td>17a(ii)</td><td>pH increases up 7 and stays at 7</td><td>A 1 in 10 dilution of an acid will increase the pH number by 1. Further dilutions will increase the pH number until the pH reaches pH=7. The pH will not increase above pH=7 as pH values above 7 are alkaline and no alkali has been added.</td></tr>
<tr><td>17b</td><td>0.005mol</td><td>no. of moles = volume x concentration = 0.05litres x 0.1mol l^{-1} = 0.005mol</td></tr>
<tr><td>18a</td><td>Ionic</td><td>
<table>
<tr><td>Bonding Type</td><td>Metallic</td><td>Covalent</td><td>Ionic</td></tr>
<tr><td>Elements in Bonding Type</td><td>Metals Only</td><td>Non-metals Only</td><td>At least 1 metal and 1 non-metal</td></tr>
</table>
</td></tr>
<tr><td>18b</td><td>Increase in concentration decrease in freezing point</td><td>Problem Solving: Drawing a Conclusion from a table.
NB: the freezing point is decreasing as it goes from 0 to -1.5</td></tr>
<tr><td>18c</td><td>-1.9 or -2.0</td><td>
<table>
<tr><td>Concentration</td><td>0</td><td>0.09</td><td>0.18</td><td>0.27</td><td>0.37</td><td>0.46</td><td>(0.55)</td></tr>
<tr><td>Difference</td><td></td><td>0.09</td><td>0.09</td><td>0.09</td><td>0.10</td><td>0.09</td><td>(0.09)</td><td></td></tr>
<tr><td>Freezing Point (°C)</td><td>0</td><td>-0.2</td><td>-0.5</td><td>-0.8</td><td>-1.1</td><td>-1.5</td><td>-</td></tr>
<tr><td>Difference</td><td></td><td>0.2</td><td>0.3</td><td>0.3</td><td>0.4</td><td>0.4</td><td>(0.4-0.5)</td><td></td></tr>
<tr><td>Prediction</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-1.9 or -2.0</td></tr>
</table>
</td></tr>
<tr><td>19a</td><td>Oxidation</td><td>
<table>
<tr><td>Type</td><td>OILRIG</td><td>Position of Electrons</td></tr>
<tr><td>oxidation</td><td>loss of electrons</td><td>Electrons after arrow</td></tr>
<tr><td>reduction</td><td>gain of electrons</td><td>Electrons before arrow</td></tr>
</table>
</td></tr>
<tr><td>19b</td><td>From A to B through the wires</td><td>At Electrode A: $Zn \rightarrow Zn^{2+} + 2e^-$ .Electrons leave electrode A and travel to electrode B. Electrons travel though the wires (Ions travel through the solution)</td></tr>
<tr><td>19c</td><td>Carbon/Graphite</td><td>Graphite is a form of carbon which is able to conduct electricity.</td></tr>
<tr><td>20a</td><td>Diagram showing the polymer shown:</td><td> 
</td></tr>
<tr><td>20b</td><td>Thermosetting</td><td>
<table>
<tr><td>Thermoplastic</td><td>will reshape on heating</td></tr>
<tr><td>Thermosetting</td><td>will not reshape on heating</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>20c</td><td>  </td><td>  </td></tr>
<tr><td>21a</td><td>By electrolysis</td><td>
<table>
<tr><td>Method</td><td>Electrolysis</td><td>Heat With Carbon</td><td>Heat Alone</td></tr>
<tr><td>Metals Made This Way</td><td>Potassium | Sodium
Lithium | Calcium
Magnesium | Aluminium</td><td>Zinc | Iron | Copper
Tin | Lead</td><td>Mercury | Silver
Gold | Platinum</td></tr>
<tr><td>Reason</td><td>most reactive metals</td><td>medium reactive metals</td><td>least reactive metals</td></tr>
</table>
</td></tr>
<tr><td>21b</td><td>Alloy</td><td>Alloys are mixtures of metals e.g. brass, bronze, amalgam, steel, stainless steel</td></tr>
<tr><td>21c(i)</td><td>25</td><td>Mass Al = 10% of 250g = $\frac{10}{100}$ x250g = 25g</td></tr>
<tr><td>21c(ii)</td><td>0.926</td><td>no. of mol = $\frac{\textbf{mass}}{\textbf{gfm}}$ = $\frac{25g}{27g}$ = 0.926mol</td></tr>
</table>