Past Papers

Standard Grade

General

Chemistry

2010

Marking Scheme

2010 General	KU		PS	
	/30	%	/30	%
3	20+	67%	19+	63%
4	15+	50%	13+	43%
5	12+	40%	11+	37%
7	<12	<40%	<11	<37%

2010 Standard Grade Chemistry General Marking Scheme

Question	Answer	Chemistry Covered

1a, 1b, 1c — B, E, F

Answer	A	B	C	D	E	F
Symbol	Pt	Na	P	N	S	Ne
Name	Platinum	Sodium	Phosphorus	Nitrogen	Sulphur	Neon
Discovery	16th Century	1807	1669	1772	Pre-historic	1898
Group	transition metal	Group 1 (alkali metal)	Group 5	Group 5	Group 6	Group 0 (Noble Gas)

2a, 2b — C, E

Answer	Reagent	Test for	Colour Change
A	Bromine Solution	unsaturation (C=C bonds)	decolourises
B	Ferroxyl Indicator	Fe^{2+} ions	turns deep blue
C	Universal Indicator	acidity/alkalinity	red for acid/purple for alkali
D	Lime Water	carbon dioxide	turns milky
E	Benedict's Solution	reducing sugars e.g. glucose	blue → brick red
F	Iodine Solution	starch	turns blue/black

3a — D+F (Both for 1 mark)

Acidic	Neutral	Alkaline
pH<7	pH=7	pH>7

3b — A+E (Both for 1 mark)

In a fair test comparison:
- pH is the factor identified in the question as changing
- type of material and temperature must be the same

4a — B

The sparking of nitrogen and oxygen in air forms nitrogen dioxide

4b — A

Compound	potassium oxide	nitrogen dioxide	carbon monoxide	carbon dioxide	hydrogen oxide	sulphur dioxide
In water	alkaline	acidic	(insoluble)	acidic	neutral	acidic

5a — D+F (Both for 1 mark)

Compound	copper chloride	sodium oxide	lithium fluoride	sulphur dioxide	barium fluoride	silicon chloride
Elements in Compound	metal + non-metal	metal + non-metal	metal + non-metal	non-metals only	metal + non-metal	non-metals only
Type of Bonding	ionic	ionic	ionic	covalent molecules	ionic	covalent molecules

5b — C

Compound	$CuCl_2$	Na_2O	LiF	SO_2	BaF_2	$SiCl_4$
Flame Colour	green	orange	red	(no colour)	green	(no colour)

6a, 6b, 6c — B, E, C

Answer	Reaction Type	Definition
A	Neutralisation	Acid (H^+ ions) will react with a base to form water
B	Photosynthesis	Carbon dioxide and water react to form glucose and water. Light energy is absorbed by chlorophyll to power the reaction
C	Addition	Molecule added across a C=C double bond
D	Polymerisation	Small molecules join together to make larger polymer
E	Corrosion	Metals losing electrons to form metals ions
F	Combustion	Substance burning and joining up with oxygen

7a — A

Metals conduct in the solid state and in the liquid (molten) state.
Metals do not dissolve in water

7b — C+E (Both for 1 mark)

Covalent substances do not conduct in any state.

Bonding	Solid	Liquid	Solution
Metallic (metals only)	✓	✓	-
Covalent (non-metals only)	×	×	×
Ionic (metals +non-metals)	×	✓	✓

8	A,E 1 mark each	☑ A hydrochloric acid + potassium hydroxide → potassium chloride + water ☒ B the pH increases as the acid reacts and is used up ☒ C no gas is produced when an acid + alkali react to form a salt + water ☒ D no gas is produced when an acid + alkali react to form a salt + water ☑ E hydrochloric acid + potassium hydroxide → potassium chloride + water
9	A,D 1 mark each	☑ A $Na \longrightarrow Na^+ + e^-$ ☒ B Sodium atoms have 11 electrons and neon atoms have 10 electrons ☒ C sodium has atomic number=11 and lithium has atomic no =3 ☑ D bromine is bigger than sodium as it has more occupied electron shells ☒ E sodium and potassium have similar chemical properties (both in group 1)

Question	Answer	Chemistry Covered
10a	millions sea bed	Step / How **Coal** is Made / How **Crude Oil** is Made 1 / Dead trees fall to bottom of swamp / Dead sea organisms fall to bottom of sea 2 / Materials get covered up by mud / Materials get covered up by sand 3 / Layers of rock above provide pressure / Layers of rock above provide pressure 4 / Over millions of years turns into coal / Over millions of years turns into crude oil
10b	sulphur dioxide	Sulphur is found in some fossil fuels and burns to form sulphur dioxide. Sulphur dioxide dissolves in rain water to form acid rain. NB Nitrogen dioxide also causes acid rain but is formed by sparking of nitrogen and oxygen in air
10c	covalent bonds	Methane CH_4 is a covalent molecule as it is made up on non-metal atoms only.
11a(i)	Relights a glowing splint	Gas: Hydrogen / Oxygen / Carbon Dioxide Test: burns with a pop / relights a glowing splint / turns lime water milky
11a(ii)	X: carbon dioxide Y: water	carbon dioxide + water $\xrightarrow[\text{light}]{\text{chlorophyll}}$ glucose + oxygen $6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$
11b(i)	bar chart containing:	½mark vertical scale / ½mark correct labelling of bars / 1mark bars drawn correctly
11b(ii)	One from:	temperature of water / distance of lamp from plant / volume of water / light intensity or colour of light / lamp always on same size of beaker or test tube / number of leaves or size of leaves / brightness / size of plant or surface area / number of plants
12a	$C_4H_{10} + O_2 \downarrow CO_2 + H_2O$	butane + oxygen → carbon dioxide + water $C_4H_{10} + O_2 \longrightarrow CO_2 + H_2O$ Formula of butane is found in question / Oxygen is a diatomic element / "Di" in name means straight to formula / Cross over rule to formula of Water
12b(i)	good conductor of heat or does not corrode	A good conductor of heat is a desirable property in a cooking pot Aluminium is anodised to prevent corrosion and will lengthen the pot's life
12b(ii)	Thermosetting	Thermoplastic / Will reshape/melt on heating Thermosetting / Does not reshape/melt on heating
12c	Soot or carbon	Incomplete combustion of the butane fuel in the camping gas will form poisonous carbon monoxide gas and soot (carbon) on the bottom of the pot
13a	Potassium, carbon and oxygen	**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
13b(i)	precipitation	Chemical reaction where an insoluble substance is formed when two solutions are mixed
13b(ii)	potassium nitrate	potassium carbonate + copper nitrate → potassium nitrate *Soluble* **(dissolved in solution)** + copper carbonate *Insoluble* (precipitate)

<table>
<tr><td>13b(iii)</td><td>Filtration</td><td>Insoluble precipitates are removed by filtering through filter paper
• copper carbonate precipitate collects as residue in filter paper
• potassium nitrate solution passes through filter paper as filtrate</td></tr>
<tr><td>14a</td><td>Table showing:</td><td><table><tr><th>Element Added to Iron</th><th>Use of Steel</th></tr><tr><td>Chromium</td><td>Cooking Pots</td></tr><tr><td>Manganese</td><td>Railway Tracks</td></tr><tr><td>Titanium</td><td>Aircraft Bodies</td></tr><tr><td>Tungsten</td><td>Hammers</td></tr></table></td></tr>
<tr><td>14b(i)</td><td>oxygen/air and water</td><td>Both oxygen in air and water are required for corrosion/rusting to occur.
If either oxygen/air or water are removed then corrosion/rusting will not occur.
• Silica gel can be used to remove water moisture
• Boiling water removes air dissolved in water</td></tr>
<tr><td>14b(ii)</td><td>sacrificial protection</td><td>Magnesium is higher up electrochemical series then iron (p10 data booklet)
Magnesium will sacrificially protect iron by giving the iron electrons</td></tr>
<tr><td>14c</td><td>one from:</td><td><table><tr><td>Painting</td><td>Greasing</td><td>Coating In Plastic</td></tr><tr><td>Galvanising</td><td>Tin plating</td><td>Cathodic Protection</td></tr></table></td></tr>
<tr><td>15a</td><td>diatomic</td><td>A diatomic molecule is a 2 atom molecule joined by covalent bond(s)</td></tr>
<tr><td>15b</td><td>electrolysis</td><td>Electrolysis is the passing of d.c. current resulting in the breakdown of the compound back into elements. The ionic substance must be molten or in solution as ions are not free to move in the solid state.</td></tr>
<tr><td>15c(i)</td><td>no CO_2 produced
or
no greenhouse gases</td><td>The fuel cell does not involve the combustion of carbon compounds and does not produce carbon dioxide as a waste product. Carbon dioxide contributes to the Greenhouse Effect (Global Warming or climate change)</td></tr>
<tr><td>15c(ii)</td><td>air or water</td><td>Air contains 21% oxygen and the oxygen can be separated easily by distillation.
Water has the formula H_2O and the oxygen can be extracted by electrolysis</td></tr>
<tr><td>15c(iii)</td><td>Speeds up chemical reaction</td><td>A catalyst speeds up a chemical reaction but the catalyst is not used up in the reaction and can be fully recovered at the end of the reaction.</td></tr>
<tr><td>16a</td><td>potassium or phosphorus</td><td>Fertilisers are soluble compounds containing the elements:<table><tr><td>Nitrogen</td><td>Phosphorus</td><td>Potassium</td></tr></table></td></tr>
<tr><td>16b</td><td>Must be soluble in water</td><td>A fertiliser is a soluble compound with one or more of the following elements: nitrogen, potassium and phosphorus</td></tr>
<tr><td>16c</td><td>root nodules</td><td>Nitrifying bacteria in root nodules of leguminous plants are able to fix nitrogen from the atmosphere into nitrate compounds.
e.g. clover, pea family and bean family</td></tr>
<tr><td>17a</td><td>Alkanes</td><td>Homologous series are a family of compounds with the same chemical properties and a general formula.<table><tr><td>Alkanes</td><td>Alkenes</td><td>Cycloalkanes</td><td>Alcohols</td><td>Carboxylic Acids</td></tr></table></td></tr>
<tr><td>17b(i)</td><td>aluminium oxide
bromine solution
test tube</td><td>The aluminium catalyst is heated first to raise its temperature enough to make it work effectively as a catalyst
The octane in the test tube is heated carefully and octane vapour passes over the aluminium catalyst and cracks in smaller hydrocarbons, some of which are unsaturated with C=C double bonds.
The gases given off bubble through the bromine solution and the unsaturated products will decolourise the bromine solution</td></tr>
<tr><td>17b(ii)</td><td>C_5H_{12}</td><td>$\underset{\text{saturated}}{C_8H_{18}} \longrightarrow \underset{\text{unsaturated}}{C_3H_6} + \underset{\text{saturated}}{C_5H_{12}}$</td></tr>
<tr><td>17b(iii)</td><td>poly(propene)</td><td>C_3H_6 is the formula of both propene and cyclopropane. To be turned into a plastic, the monomer must have a C=C double bond $\therefore$ C_3H_6 is propene.
If monomer is propene then the name of the polymer is poly(propene).</td></tr>
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<tr><td>18a</td><td>Solvent</td><td><table>
<tr><td>solution</td><td>a mixture formed when a solute dissolves in a solvent</td></tr>
<tr><td>solute</td><td>The substance that is dissolved</td></tr>
<tr><td>solvent</td><td>The liquid that does the dissolving</td></tr>
</table></td></tr>
<tr><td>18b(i)</td><td>Increasing temperature increases the solubility</td><td>Problem Solving: Interpretation of graph to work out a trend</td></tr>
<tr><td>18b(ii)</td><td>52-53cm^3</td><td>Problem Solving: Estimation of point on a line graph</td></tr>
<tr><td>19a</td><td>From right to left
←
(iron to copper)</td><td>Iron is higher up the electrochemical series than copper (p10 data booklet)
Electrons always flow from the higher up metal to the lower down metal.</td></tr>
<tr><td>19b</td><td>Ions free to move in solution</td><td>In solid ionic substances, the ions are held tightly in a lattice of oppositely charged ions and are unable to move. This prevents conduction of electricity.
When ionic substances are melted or dissolved, the tightly held lattice breaks up and the substance is able to conduct as the ions can move to the oppositely charged electrode.</td></tr>
<tr><td>19c</td><td>Nickel,
Tin or Lead</td><td>The electrochemical series is found on p10 of the data booklet
Magnesium
Aluminium
Zinc
Iron ←
Nickel ←
Tin ←
Lead ←
Copper
Replacing iron with one of these metals will decrease the voltage</td></tr>
<tr><td>19d</td><td>To complete the circuit</td><td>The ion bridge is a piece of filter soaked in an electrolyte e.g. salt solution.
The ion bridge completes the circuit by allow charged ions to travel from side to side to balance out the movement of negative charge in the electrical current.</td></tr>
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