Past Papers

Standard Grade

Credit

Chemistry

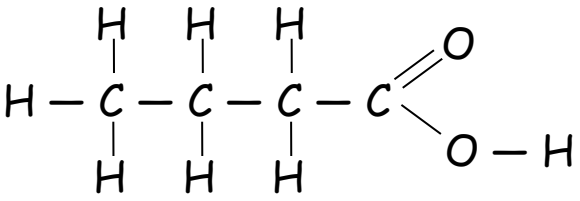
2007

Marking Scheme

2007 Credit	KU		PS	
	/30	%	/30	%
1	23+	77%	24+	80%
2	18+	60%	17+	57%
See General Paper	<18	<60%	<17	<57%

2007 Standard Grade Chemistry Credit Marking Scheme

Question	Answer	Chemistry Covered
1a	A	A – Test for *Oxygen*: oxygen gas relights a glowing splint. B – Test for *Hydrogen* : hydrogen burns with a pop C – Test for *Carbon Dioxide* – Carbon Dioxide turns lime water milky D – Test for *Ammonia Gas*: Ammonia gas turns damp pH paper blue/purple
1b	D	
2a	A	☑ A has largest Particle size (lump) ☑ A has lowest concentration (1mol/l) ☑ A has lowest temperature (20°C)
2b	B+C Both for 1 mark	Box B: Temperature **20°C**; Metal magnesium; Particle Size lump; Concentration 1mol/l; Acid hydrochloric Box C: Temperature **30°C**; Metal magnesium; Particle Size lump; Concentration 1mol/l; Acid hydrochloric
3a	E	Tar for Roads is found in the Residue fraction. Residue is the heaviest fraction found at the bottom of the distillation tower.
3b	A	The smaller the number of carbons in a hydrocarbon, the lower the boiling point.
4a	F	The polymer poly(butene) is made from the monomer butene C_4H_8
4b	B+D Both for 1 mark	Alkenes and Cycloalkanes have the general formula C_nH_{2n}. (alkanes are C_nH_{2n+2}) Reaction with hydrogen is an addition reaction across a C=C double bond. Alkenes will reaction with hydrogen while cycloalkanes do not react with hydrogen.
5a	C	Covalent compounds do not conduct as a solid or a liquid (answers A or C) ☒A high melting point means covalent network structure not molecules ☑C low melting/boiling point means molecules are present.
5b	F	Metals conduct both as solids and liquids (answers E or F) ☒E Substance E is a solid at 25°C and does melt until 181°C is reached ☑F Substance F is a liquid at 25°C as it melts at -39°C
6a	E	Both sulphur dioxide SO_2 and nitrogen dioxide NO_2 dissolve in rain water to form acid rain.
6b	C	Acid (H^+) and alkali (OH^-) neutralise each other to form water (H_2O)
6c	A,D 1 mark each	☑A– Oxidation is loss of electrons where Sn loses $2e^-$ to become Sn^{2+}. ☑D– Mg loses electrons (oxidation) to become Mg^{2+} ion within $Mg^{2+}O^{2-}$.
7	D,E 1 mark each	☒A– Protons are positively charged but neutrons are neutral ☒B- Only electrons have a negative charge ☒C- Electrons have a relative mass of almost zero ☑D- Both protons and neutrons have a relative mass of 1amu. ☑E- Both protons and neutrons are found inside the nucleus. ☒F- Electrons are found outside the nucleus
8	C,E 1 mark each	metal oxide + acid → salt + water silver (I) oxide + hydrochloric acid → silver (I) chloride (insoluble) + water
9	B,D 1 mark each	☒A– Fe^{2+} ions not formed around electrode A (iron is electrode B) ☑B- Electrode A must be iron for Fe^{2+} ions to be formed. ☒C- Electron flow is from B→A as Al is higher up electrochemical series than Fe ☑D- Iron is higher up electrochemical series so electron flow is from A→B. Iron atoms turn into Fe^{2+} ions which turn ferroxyl indicator blue. ☒E- Electron flow is from B→A as iron is higher up electrochemical series than lead

<table>
<tr><th>Question</th><th>Answer</th><th>Chemistry Covered</th></tr>
<tr><td>10a</td><td>Equal proportions of each isotope</td><td>The relative (average) atomic mass is an average. Average of 107 and 109 = $^{(107+109)}/_{2}$ = 108 if isotope masses 107 and 109 are equal.</td></tr>
<tr><td>10b</td><td><table><tr><th>Particle</th><th>Number</th></tr><tr><td>proton</td><td>47</td></tr><tr><td>neutron</td><td>60</td></tr><tr><td>electron</td><td>26</td></tr></table></td><td>No. of protons = atomic number = <u>47</u> (½ mark)
No. of neutrons = mass number – atomic number = 107 – 47 = <u>60</u> (½ mark)
No of electrons in neutral atom – no. of protons = atomic number = 47
1+ ion has one less electron than proton ∴no. of electrons = <u>46</u> (1 mark)</td></tr>
<tr><td>10c(i)</td><td>$2AgNO_3 + Cu \downarrow 2Ag + Cu(NO_3)_2$</td><td>$\underline{2}AgNO_3 + Cu \longrightarrow \underline{2}Ag + Cu(NO_3)_2$</td></tr>
<tr><td>10c(ii)</td><td>Mercury, Gold or Platinum</td><td>Only a metal below silver in the electrochemical series will not displace silver form a solution of one of its compounds.</td></tr>
<tr><td>11a</td><td>Any structure of butanoic acid with formula C_3H_7COOH</td><td>  </td></tr>
<tr><td>11b(i)</td><td>Higher number if carbons the higher the boiling point</td><td>As number of carbons increases (methanoic acid (C_1) → butanoic acid (C_4), the boiling point increases (101°C → 164°C)</td></tr>
<tr><td>11b(ii)</td><td>175 – 193</td><td><table><tr><td>Acid</td><td>Methanoic</td><td>Ethanoic</td><td>Propanoic</td><td>Butanoic</td></tr><tr><td>Boiling Point</td><td>101°C</td><td>118°C</td><td>141°C</td><td>164°C</td></tr><tr><td>Difference</td><td></td><td>17°C</td><td>23°C</td><td>23°C</td><td></td></tr></table>Pentanoic acid should have boiling point ~23°C higher than butanoic acid
∴164°C + 23°C = 187°C</td></tr>
<tr><td>12a</td><td>Bar Chart 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>60 ±1</td><td>or correct answer from line graph</td></tr>
<tr><td>12c</td><td>alkali or hydroxide</td><td>alkalis are hydroxide compounds and can also be described as a base.
NH_4^+ (from ammonium compound) + OH^- (from alkali) → NH_3 (ammonia gas) + H_2O</td></tr>
<tr><td>13a</td><td>Glucose + Fructose</td><td>Sucrose is a disaccharide sugar made when a glucose and a fructose join together by condensation polymerisation with H_2O removed as they join.
glucose ($C_6H_{12}O_6$) + fructose ($C_6H_{12}O_6$) → sucrose ($C_{12}H_{22}O_{11}$) + water (H_2O)</td></tr>
<tr><td>13b</td><td>Enzyme or Biological catalyst</td><td>Enzymes are biological catalysts which catalyse the chemical reactions inside biological organisms</td></tr>
<tr><td>14a</td><td>negative</td><td>Cathodic Protection: Metal is protected from corrosion when attached to the negative terminal of a battery. The electrons from the negative terminal are needed to reverse the corrosion reaction.</td></tr>
<tr><td>14b(i)</td><td>Galvanising</td><td>Galvanised iron has a coating of zinc metal</td></tr>
<tr><td>14b(ii)</td><td>Any answer from:</td><td>zinc is more reactive than iron
zinc is higher up electrochemical/reactivity series
zinc provides sacrificial protection
zinc provides electrons to iron
zinc sacrifices itself</td></tr>
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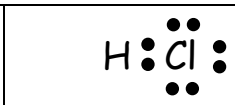
<table>
<tr><td>15a</td><td>  </td><td>H becomes stable with 2 electrons in outer shell.
Cl becomes stable with 8 electrons in outer shell.</td></tr>
<tr><td>15b</td><td>Any answer from:</td><td>to form a full/complete/stable electron shell
to become stable
to achieve same electron arrangement as Noble gas
to get 8 outer electrons</td></tr>
<tr><td>16a(i)</td><td>Fermentation or
Anaerobic respiration</td><td>Fermentation: glucose → ethanol + carbon dioxide
$C_6H_{12}O_6 \rightarrow C_2H_5OH + CO_2$</td></tr>
<tr><td>16a(ii)</td><td>slows down
or stops</td><td>Fermentation is performed by enzymes in yeast when there is no air available. At temperatures of 50°C and above, the enzymes are destroyed (denatured) and no longer work.</td></tr>
<tr><td>16b(i)</td><td>Addition
or hydration</td><td>Addition Reaction: Molecule adds across a C=C double bond
Hydration is the addition of water across a C=C double bond</td></tr>
<tr><td>16b(ii)</td><td>isomers</td><td>Isomers have same molecular formula but different structural formula</td></tr>
<tr><td>16b(iii)</td><td>distillation</td><td>Distillation separates liquids with different boiling points by evaporation of the lower boiling point liquid followed by condensation in a condenser unit.</td></tr>
<tr><td>17a</td><td>zinc sulphide</td><td><table><tr><td>-ide</td><td>Compound contains the two named elements</td><td rowspan="3">NB metal always comes first in name</td></tr><tr><td>-ate</td><td>Compound contains 3 elements (two named elements + oxygen)</td></tr><tr><td>-ite</td><td>Compound contains 3 elements (two named elements + oxygen)</td></tr></table></td></tr>
<tr><td>17b</td><td>aluminium chloride</td><td>acid + alkali (metal hydroxide) → salt + water
hydrochloric acid + aluminium hydroxide → aluminium chloride + water
$3HCl + Al(OH)_3 \rightarrow AlCl_3 + 3H_2O$</td></tr>
<tr><td>17c</td><td>51.3%</td><td>1 mol CaF_2 = 40 + 19 + 19 = 78g
$\%Ca = \frac{\text{mass of Ca}}{\text{mass of } CaF_2} \times 100 = \frac{40}{78} \times 100 = 51.3\%$</td></tr>
<tr><td>17d</td><td>$Fe_2O_3 + CO$
↓
$Fe + CO_2$</td><td>The reaction in a blast furnace has the reduction of iron ore (Fe_2O_3) by carbon monoxide. Carbon monoxide is made by incomplete combustion of carbon in the blast furnace.
$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$</td></tr>
<tr><td>17e</td><td>gold or silver or
mercury or platinum</td><td>Only the least reactive metals will release them metal from the metal ore by heat alone.</td></tr>
<tr><td>18a</td><td>Reshapes/softens
on heating</td><td>Thermoplastic: material which softens on heating and can be reshaped
Thermosetting: material which does not softens on heating</td></tr>
<tr><td>18b</td><td>Condensation</td><td>Condensation polymerisation is polymerisation (joining of monomer units together) where water molecules are removed at the joins.</td></tr>
<tr><td>19a</td><td>colourless</td><td><table><tr><th>Compound</th><th>Colour</th><th>Conclusion</th></tr><tr><td>nickel (II) nitrate</td><td>green</td><td rowspan="2">Nickel Ni^{2+} ions are green
Nitrate + Sulphate ions are colourless</td></tr><tr><td>nickel (II) sulphate</td><td>green</td></tr><tr><td>potassium sulphate</td><td>colourless</td><td>Potassium and sulphate ions are both colourless</td></tr><tr><td>potassium permanganate</td><td>purple</td><td>K^+ ions are colourless ∴ Permanganate ions are purple</td></tr></table></td></tr>
<tr><td>19b</td><td>$Ni^{2+}(NO_3^-)_2$</td><td>NO_3^- ions have a valency of 1. Use cross over rule to calculate formula</td></tr>
<tr><td>19c(i)</td><td>yellow</td><td>Chromate (CrO_4^-) ions move to positive electrode. CrO_4^- must be yellow</td></tr>
<tr><td>19c(ii)</td><td>to complete circuit</td><td>The ions in the electrolyte move between electrodes to complete the circuit</td></tr>
<tr><td>19c(iii)</td><td>insoluble</td><td>Lithium phosphate is insoluble (p5of data booklet)</td></tr>
<tr><td>20a</td><td>0.2</td><td>no. of mol = volume x concentration = 0.05litres x 4 mol/l = 0.2 mol</td></tr>
<tr><td>20b(i)</td><td>0.1</td><td>$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$
1mol 2mol
0.1mol 0.2mol</td></tr>
<tr><td>20b(ii)</td><td>10g</td><td>1mol $CaCO_3$ = (1x40) + (1x12) + (3x12) = 40 + 12 + 48 = 100g
mass = no. of mol x gfm = 0.1mol x 100g mol^{-1} = 10g</td></tr>
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