JABchem

Past Papers Int 2 Chemistry

2008

Marking Scheme

Grade Awarded	Mark Required (/80)	%	% candidates achieving grade
A	57+	71%	40.8%
B	49+	61%	23.6%
C	41+	51%	18.7%
D	37+	46%	5.8%
No award	<37	<46%	11.0%

Section:	Multiple Choice	Extended Answer
Average Mark:	21.7 /30	31.5 /50

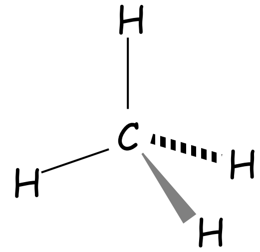
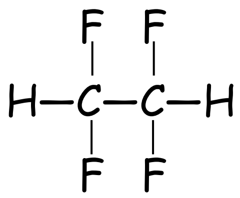
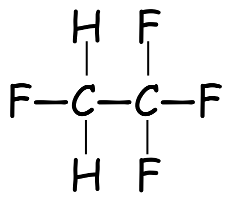
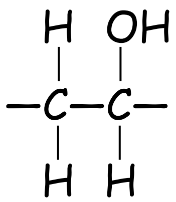
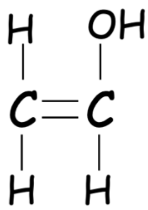
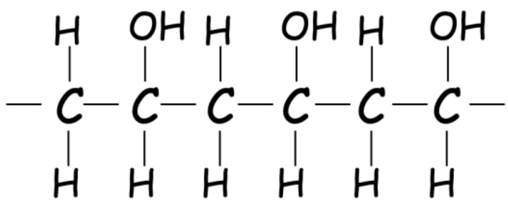
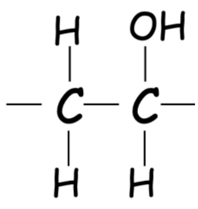
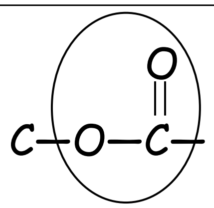
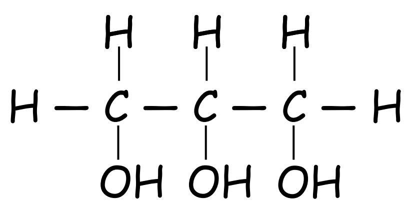
<table>
<tr><th colspan="4">2008 Int2 Chemistry Marking Scheme</th></tr>
<tr><th>MC Qu</th><th>Answer</th><th>% Pupils Correct</th><th>Reasoning</th></tr>
<tr><td>1</td><td>B</td><td>86</td><td>☒A Fastest: smallest particle size (powder) and highest concentration (4 mol l^{-1})
☑B Slowest: largest particle size (ribbon) and lowest concentration (2 mol l^{-1})
☒C Medium: smallest particle size (powder) and lowest concentration (2 mol l^{-1})
☒D Medium: Largest particle size (ribbon) and highest concentration (4 mol l^{-1})</td></tr>
<tr><td>2</td><td>C</td><td>67</td><td>☒A Ethanoic Acid is the solute (substance which is dissolved)
☒B Saturated describes a solution where no more solute will dissolve in the solvent
☑C Water is the solvent (the liquid which does the dissolving)
☒D Vinegar is the solution (ethanoic acid dissolved in water)</td></tr>
<tr><td>3</td><td>C</td><td>95</td><td>☒A ammonia is a compound with the formula NH_3
☒B carbon dioxide is a compound with the formula CO_2
☑C fluorine is a diatomic element with the formula F_2
☒D methane is a compound with the formula CH_4</td></tr>
<tr><td>4</td><td>D</td><td>81</td><td>☒A number of electrons = no of protons in neutral atoms
☒B number of neutrons = mass number – atomic number
☒C number of protons = number of electrons in a neutral atom
☑D number of protons = number of electrons in a neutral atom</td></tr>
<tr><td>5</td><td>D</td><td>95</td><td>☒A Nitrogen (group 5) has the electron arrangement 2,5
☒B Oxygen (group 6) has the electron arrangement 2,6
☒C Fluorine (group 7) has the electron arrangement 2,7
☑D Neon (group 0) has the electron arrangement 2,8</td></tr>
<tr><td>6</td><td>A</td><td>76</td><td>Charge on ion = number of protons – number of electrons = 19 – 18 = +1</td></tr>
<tr><td>7</td><td>A</td><td>70</td><td>☑A Metals have electrons which can jump from atom to atom
☒B Diagram shows a covalent molecular substance
☒C Diagram shows an ionic substance
☒D Diagram shows a covalent network substance</td></tr>
<tr><td>8</td><td>D</td><td>65</td><td>Hydrocarbons burn in a plentiful supply of air to form carbon dioxide and water
• methane is an alkane
• alkanes are hydrocarbons</td></tr>
<tr><td>9</td><td>A</td><td>81</td><td>gfm NH_3 = (1x14) + (3x1) = 17g
$\text{no. of mol} = \frac{\text{mass}}{\text{gfm}} = \frac{1.7}{17} = 0.1\text{mol}$</td></tr>
<tr><td>10</td><td>C</td><td>72</td><td>☒A Metallic substance: conducts when solid and liquid
☒B Covalent substance: does not conduct when solid or liquid
☑C Ionic Substance: Does not conduct when solid but conducts when liquid
☒D Covalent Network: high melting point and does not conduct when solid or liquid</td></tr>
<tr><td>11</td><td>D</td><td>77</td><td><table>
<tr><th>Property</th><th>Petroleum Gas</th><th>Gasoline</th><th>Kerosene</th><th>Light gas Oil</th><th>Heavy Gas Oil</th><th>Residue</th></tr>
<tr><td>Viscosity</td><td>Low</td><td colspan="4">⟷</td><td>High</td></tr>
<tr><td>Evaporation</td><td>Quickly</td><td colspan="4">⟷</td><td>Slowly</td></tr>
<tr><td>Flammability</td><td>High</td><td colspan="4">⟷</td><td>Low</td></tr>
<tr><td>Boiling Point</td><td>Low</td><td colspan="4">⟷</td><td>High</td></tr>
</table></td></tr>
<tr><td>12</td><td>C</td><td>32</td><td>☒A Longest chain length incorrect (methyl side groups cannot be on Carbon no. 1)
☒B Longest chain length incorrect (ethyl side groups cannot be on Carbon no. 2)
☑C 2-methylbutane: methyl $-CH_3$ group on carbon no. 2 of a 4 carbon main chain
☒D Numbering system is incorrect as side group must have lowest number possible</td></tr>
</table>

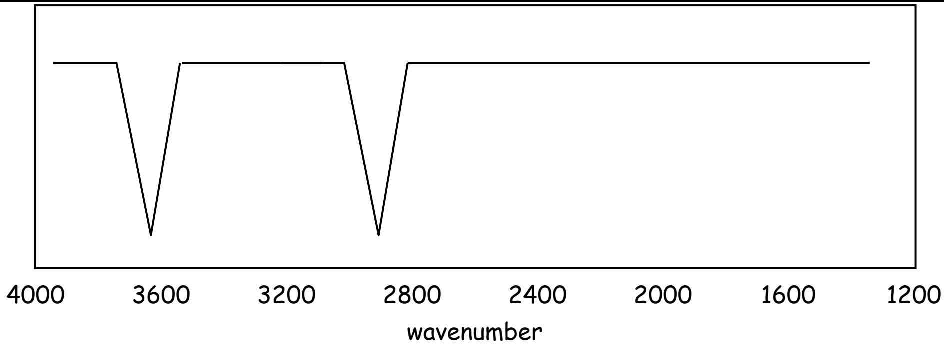
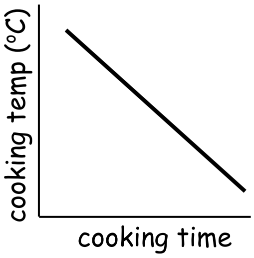
<table>
<tr><td>13</td><td>D</td><td>67</td><td>☒A Cycloalkanes do not have a C=C double bond to decolourise bromine solution
☒B Cycloalkenes do not have the general formula C_nH_{2n}
☒C Alkanes do not have a C=C double bond to decolourise bromine solution
☑D Alkenes have general formula C_nH_{2n} and C=C bond decolourises bromine solution</td></tr>
<tr><td>14</td><td>C</td><td>87</td><td><table>
<tr><td>C_4H_6</td><td>C_5H_8</td><td>C_6H_{10}</td></tr>
<tr><td colspan="3">Correct general formula: C_nH_{2n-2}</td></tr>
<tr><td>If n=4
2n-2 = (2x4) -2 = 8-2 = 6</td><td>If n=5
2n-2 = (2x5) -2 = 10-2 = 8</td><td>If n=6
2n-2 = (2x6) -2 = 12-2 = 10</td></tr>
</table></td></tr>
<tr><td>15</td><td>B</td><td>73</td><td>☒A Formula = C_6H_{14} ∴different no. of carbons so not an isomer of heptane C_7H_{16}
☑B Formula = C_7H_{16} ∴ an isomer of heptane C_7H_{16}
☒C Formula = C_7H_{14} ∴ different no. of hydrogens so not an isomer of heptane C_7H_{16}
☒D Formula = C_7H_{14} ∴different no. of hydrogens so not an isomer of heptane C_7H_{16}</td></tr>
<tr><td>16</td><td>A</td><td>62</td><td>☑A Alcohol becomes toxic to yeast at ~13-15% alcohol
☒B Sweet wines still have sugar left when fermentation stops at ~13-15%
☒C Carbon dioxide is not harmful to yeast
☒D Alcohol solution is not saturated at ~13%</td></tr>
<tr><td>17</td><td>C</td><td>72</td><td>☒A Addition reactions add a substance across a C=C double bond
☒B Dehydration reactions remove H_2O from a molecule leaving a C=C double bond
☑C Condensation reactions join molecules together with water removed at the join
☒D Neutralisation involves the reaction of H^+ ions to become H_2O molecules</td></tr>
<tr><td>18</td><td>D</td><td>70</td><td><table>
<tr><th>Letter</th><th>Name of Process</th><th>Description</th></tr>
<tr><td>X</td><td>Distillation</td><td>Separation of compounds due to their different boiling points</td></tr>
<tr><td>Y</td><td>Cracking</td><td>Breaking larger saturated hydrocarbons into smaller, unsaturated hydrocarbons</td></tr>
<tr><td>Z</td><td>Polymerisation</td><td>Joining up small monomers together to form large polymers</td></tr>
</table></td></tr>
<tr><td>19</td><td>A</td><td>59</td><td>☑A Amino acids contain both the NH_2- group and –COOH group
☒B Amino acids have a carboxyl -COOH group not an hydroxyl –OH group
☒C Amino acids only have one amine $–NH_2$ group
☒D Amino acids only have one carboxyl –COOH group</td></tr>
<tr><td>20</td><td>C</td><td>58</td><td><table>
<tr><th>Type of Lipid</th><th>Saturation</th><th>Melting Point</th></tr>
<tr><td>Fat</td><td>more saturated</td><td>higher</td></tr>
<tr><td>Oil</td><td>less saturated</td><td>lower</td></tr>
</table></td></tr>
<tr><td>21</td><td>B</td><td>95</td><td><table>
<tr><th>Solution Type</th><th>Description</th></tr>
<tr><td>Acidic Solution</td><td>Number of H^+ ions > Number of OH^- ions</td></tr>
<tr><td>Neutral Solution</td><td>Number of H^+ ions = Number of OH^- ions</td></tr>
<tr><td>Alkaline Solution</td><td>Number of H^+ ions < Number of OH^- ions</td></tr>
</table></td></tr>
<tr><td>22</td><td>C</td><td>84</td><td>☒A non-metal oxides like carbon dioxide dissolve to form acids
☒B copper (II) oxide is insoluble in water (p8 of data booklet)
☑C metal oxides like potassium oxide dissolve to form alkalis
☒D non-metal oxides like nitrogen dioxide dissolve to form acids</td></tr>
<tr><td>23</td><td>B</td><td>47</td><td>☒A no. of mol = volume x concentration = 0.25litres x 0.4mol l^{-1} = 0.1 mol
☑B no. of mol = volume x concentration = 0.25litres x 4mol l^{-1} = 1.0 mol
☒C no. of mol = volume x concentration = 0.2litres x 0.5mol l^{-1} = 0.1 mol
☒D no. of mol = volume x concentration = 0.2litres x 1mol l^{-1} = 0.2 mol</td></tr>
<tr><td>24</td><td>A</td><td>56</td><td><table>
<tr><th>Solution</th><th>Type</th><th>pH</th><th>Reaction with Magnesium</th></tr>
<tr><td>Hydrochloric acid</td><td>strong acid</td><td>lower</td><td>faster</td></tr>
<tr><td>Ethanoic acid</td><td>weak acid</td><td>higher</td><td>slower</td></tr>
</table></td></tr>
</table>

25	A	95	☑A burns with a pop ∴hydrogen gas ☒B relights a glowing splint ∴oxygen gas ☒C turns damp pH paper red ∴sulphur dioxide/nitrogen dioxide/carbon dioxide ☒D turns lime water milky ∴carbon dioxide gas
26	D	61	☒A Electrons travel through the wires not the solution ☒B Electrons travel through the wires not the solution ☒C Electrons flow from the higher metal (zinc) to the lower metal (tin) ☑D Electrons flow through the wires from the higher metal zinc to the lower tin
27	D	74	Order of metals in electrochemical series: Zinc Iron Tin Copper Copper is the closest metal to silver in the electrochemical series • Smallest voltage is obtained from the closest pairing
28	D	75	☒A Aluminium is too reactive to be found uncombined (made by molten electrolysis) ☒B Iron is too reactive to be found uncombined (made by heating ore with carbon) ☒C Lead is too reactive to be found uncombined (made by heating ore with carbon) ☑D Silver is unreactive and found uncombined in the Earth's crust
29	C	70	☒A H^+ ions are detected by universal indicator/pH paper turning red ☒B OH^- ions are detected by ferroxyl indicator turning pink (+pH paper turning blue) ☑C Fe^{2+} ions are detected by ferroxyl indicator turning blue ☒D Ferroxyl indicator and universal indicator do not detect Fe^{3+} ions
30	D	70	☒A Painting provides a physical barrier to corrosion only ☒B Greasing provides a physical barrier to corrosion only ☒C Tin-plating has a physical barrier but tin does not sacrificially protect iron ☑D Galvanising has a physical barrier and zinc sacrificially protects iron

2008 Int2 Chemistry Marking Scheme

<table>
<tr><th>Long Qu</th><th>Answer</th><th>Reasoning</th></tr>
<tr><td>1a</td><td>Transition metals</td><td>
<table>
<tr><td>Name</td><td>Alkali Metals</td><td>Halogens</td><td>Noble gases</td><td>Transition Metals</td></tr>
<tr><td>Location</td><td>Group 1</td><td>Group 7</td><td>Group 0</td><td>Between Group 2 + 3</td></tr>
</table>
</td></tr>
<tr><td>1b(i)</td><td>
<table>
<tr><td>29</td><td>34</td></tr>
<tr><td>29</td><td>36</td></tr>
</table>
</td><td>No of protons = atomic number (lower number)
No of neutrons = mass number (upper no.) – atomic number (lower no.)</td></tr>
<tr><td>1b(ii)</td><td>Isotopes</td><td>
<table>
<tr><td rowspan="2">Isotopes</td><td>Same atomic number but different mass number</td></tr>
<tr><td>Same number of protons but different number of neutrons</td></tr>
</table>
</td></tr>
<tr><td>2a</td><td>46</td><td>Problem Solving: Reading information from a graph</td></tr>
<tr><td>2b(i)</td><td>9</td><td>Solubility at 60°C =46g per 100cm^3 and solubility at 30°C =37g per 100cm^3
Mass of solid potassium chloride formed = 46g – 37g = 9g</td></tr>
<tr><td>2b(ii)</td><td>Filtration</td><td>Solids can be separated from liquids by filtering. Solids remains in the filter paper (residue) and liquid goes through filter paper (filtrate)</td></tr>
<tr><td>3a</td><td>$4N_2O + CH_4$
↓
$4N_2 + CO_2 + 2H_2O$</td><td>$4N_2O + CH_4 \longrightarrow 4N_2 + CO_2 + 2H_2O$</td></tr>
<tr><td>3b</td><td>Catalyst in different state from reactants</td><td>
<table>
<tr><th>Type of Catalyst</th><th>Definition</th></tr>
<tr><td>Homogeneous</td><td>Catalyst in same state as reactants</td></tr>
<tr><td>Heterogeneous</td><td>Catalyst in different state from reactants</td></tr>
</table>
</td></tr>
<tr><td>3c</td><td>Products desorb from catalyst surface</td><td>Once the chemical reaction has taken place, the catalyst must release the products to allow next reaction to take place on the surface.
• catalyst remains chemically unchanged throughout.</td></tr>
<tr><td>3d</td><td>Poisons the catalyst</td><td>Catalysts get poisoned and stop working as the active sites on the catalyst surface get blocked up and this stops the reactants from adsorbing the catalyst surface.</td></tr>
<tr><td>4a</td><td>Compound breaks down to elements by passing electricity through it</td><td>Electrolysis used d.c. electricity to provide the energy to break compounds down into its constituent elements</td></tr>
<tr><td>4b</td><td>Direction of electron flow remains the same</td><td>D.C. electricity has a single direction of electron flow which means a constant positive and negative electrode.
• Positive ions (usually metal ions) move to the negative electrode and pick electrons to become atoms
• Negative ions move to the positive electrode to lose electrons and become an element again</td></tr>
<tr><td>4c(i)</td><td>
<table>
<tr><td>positive</td><td>negative</td></tr>
<tr><td>Bubbles of gas</td><td>Brown solid made</td></tr>
</table>
</td><td>Positive electrode: $2Cl^- \rightarrow Cl_2 + 2e^-$
Negative electrode: $Cu^{2+} + 2e^- \rightarrow Cu$</td></tr>
<tr><td>4c(ii)</td><td>Gas has distinctive chlorine smell (from swimming baths)</td><td>Chlorine gas has a very distinctive smell, recognisable from the swimming baths
• Gas must be carefully wafted over your nose so not to breathe in too much of it.
• Chlorine can be detected because it bleaches blue litmus paper.</td></tr>
</table>

<table>
<tr><td>5a</td><td>tetrahedral</td><td>CFC molecule has similar in shape to methane</td><td></td></tr>
<tr><td>5b(i)</td><td>1 from:</td><td colspan="2"><table><tr><td>
(1,1,2,2-tetrafluoroethane)</td><td>
(1,1,1,2-tetrafuoroethane)</td></tr></table></td></tr>
<tr><td>5b(ii)</td><td>chlorine</td><td colspan="2"><table><tr><td>Compound</td><td>CCl_2F_2</td><td>Replacement 1</td><td>Replacement 2</td><td>Replacement 3</td></tr><tr><td>Formula</td><td>CCl_2F_2</td><td>$CHClF_2$</td><td>$C_2H_2F_4$</td><td>CH_2F_2</td></tr><tr><td>No of Cl</td><td>2</td><td>1</td><td>0</td><td>0</td></tr></table></td></tr>
<tr><td>5b(iii)</td><td>Shorter atmospheric life</td><td colspan="2">The atmospheric life is linked to the number of chlorine atoms within the CFC compound.</td></tr>
<tr><td>6a</td><td>hydroxyl</td><td colspan="2">The hydroxyl group is the –OH group</td></tr>
<tr><td>6b</td><td></td><td colspan="2"><table><tr><td></td><td></td><td></td></tr><tr><td>Monomer</td><td>Polymer</td><td>Repeating Unit</td></tr></table></td></tr>
<tr><td>6c</td><td>Soluble in water</td><td colspan="2">Poly(ethenol) is soluble in water due to hydrogen bonding between the –OH groups in poly(ethenol) and water</td></tr>
<tr><td>7a</td><td>man-made or not natural</td><td colspan="2">Synthetic materials are made by the chemical industry and are not made from natural materials</td></tr>
<tr><td>7b</td><td></td><td colspan="2">The ester link is formed during a condensation between a hydroxyl group and a carboxyl group. Water is removed as the groups join together.</td></tr>
<tr><td>7c</td><td>Glycerol</td><td colspan="2"><table><tr><td>Glycerol is also known as propane-1,2,3-triol</td><td></td></tr></table></td></tr>
<tr><td>8a</td><td>C = C
Carbon – carbon double bond</td><td colspan="2"><table><tr><td>Substance</td><td colspan="3">Types of bond present</td></tr><tr><td>propane</td><td>C-H</td><td>C-C</td><td></td></tr><tr><td>butene</td><td>C-H</td><td>C-C</td><td>C=C</td></tr></table></td></tr>
</table>

8b	Absorption peaks at a) 2800 – 3000 b) 3500 - 3700	
9a	Glucose	glucose ⟶ starch + water $nC_6H_{12}O_6 \longrightarrow (C_6H_{10}O_5)_n + nH_2O$
9b	Iodine	Iodine solution turns blue-black in the presence of starch
9c(i)	Line graph showing:	Correct Points (½mark) Line drawn (½mark)
9c(ii)	80	rate= $\frac{1}{\text{time}}$ time= $\frac{1}{\text{rate}} = \frac{1}{0.0125}$ = 80s
10a	shape of protein changes	Denaturing: specific shape of the protein is changed permanently
10b	Use lime juice/acid	Acid in lime juice changes the shape of the protein
10c	Weak bonds	The bonds holding the protein shape together must be weak as proteins can be denatured relatively easily.
10d		The hotter the temperature, the less time needed to denature the proteins and cook the protein.
11a	1.62	gfm Al = 27g no of mol = $\frac{\textbf{mass}}{\textbf{gfm}} = \frac{0.135}{27}$ = 0.005 mol $3Ag_2S + 2Al \longrightarrow 6Ag + Al_2S_3$ 2mol 6mol 0.005mol 0.015mol gfm Ag = 108g **mass** = **no**. of mol x **gfm** = 0.015 x 108 = 1.62g
11b	Weigh clean beaker at start and end	The beaker will get lighter as the aluminium in the beaker is used up • aluminium metal atoms in the beaker turn into aluminium ions in the solution
12a	Carbon dioxide	Sodium hydrogencarbonate will react with acid to release carbon dioxide
12b	$C_6H_8O_7$	$HOOC\text{-}CH_2\text{-}C(OH)(COOH)\text{-}CH_2\text{-}COOH \rightarrow C_6H_8O_7$
12c	weak	Partial dissociation of COOH bonds is found in weak acids only.
13a	Precipitation	$NaCO_{3(aq)} + SrS_{(aq)} \longrightarrow Na_2S_{(aq)} + SrCO_{3(s)}$ precipitate
13b	Nitric acid	ACID + METAL CARBONATE ⟶ SALT + WATER + CARBON DIOXIDE nitric acid + strontium carbonate ⟶ strontium nitrate + water + carbon dioxide

<table>
<tr><td>13c</td><td>red colour</td><td>Flame Colours: page 6 of data book</td></tr>
<tr><td>14a</td><td>To complete the circuit</td><td>Ions are able to move to complete the circuit</td></tr>
<tr><td>14b(i)</td><td>Oxidation</td><td>Oxidation is Loss of Electrons (electrons after the arrow on right hand side)</td></tr>
<tr><td>14b(ii)</td><td>Aluminium hydroxide</td><td>$Al^{3+}{}_{(aq)} + 3OH^{-}{}_{(aq)} \longrightarrow Al^{3+}(OH^{-})_{3\ (s)}$</td></tr>
<tr><td>15a</td><td>$KMnO_4$</td><td>
<table>
<tr><td>Write down Formulae of ions</td><td>Write down Valency below each ion</td><td>Put in Cross-over Arrows</td><td>Follow arrows to get formula</td></tr>
<tr><td>K^+ MnO_4^-</td><td>K^+ MnO_4^-
1 1</td><td>K MnO_4
1 1</td><td>$KMnO_4$</td></tr>
</table>
</td></tr>
<tr><td>15b</td><td>Releases oxygen when heated</td><td>Potassium permanganate is an oxidising agent which releases oxygen when heated.</td></tr>
<tr><td>15c</td><td>Powders react too fast</td><td>Powders react much faster than lumps</td></tr>
</table>