JABchem

Past Papers

Standard Grade

Credit

Chemistry

2011

Marking Scheme

2011 Credit	KU		PS	
	/30	%	/30	%
1	21+	70%	22+	73%
2	16+	53%	13+	43%
See general	<16	<53%	<13	<43%

2011 Standard Grade Chemistry Credit Marking Scheme

Question	Answer	Chemistry Covered
1	C	(see table below)

solute	the substance that is dissolved
solvent	the liquid that does the dissolving
solution	A mixture formed when a solute dissolves in a solvent
insoluble	substance which does not dissolve in water/solvent

Question	Answer
2a	E

Property	Fraction A	Fraction B	Fraction C	Fraction D	Fraction E
Name	Petroleum Gas	Naphtha/Gasoline	Kerosene	Gas Oil	Residue
Use	Camping Gas	Petrol	Aircraft Fuel	Diesel	Tar/Bitumen

Question	Answer
2b	A

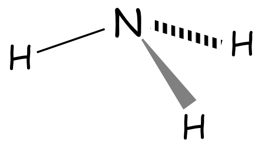
Property	Fraction A	Fraction B	Fraction C	Fraction D	Fraction E
Viscosity	Low	←———	———	———→	High
Evaporation	Easily	←———	———	———→	Slowly
Flammability	High	←———	———	———→	Low
Boiling Point	Low	←———	———	———→	High

Question	Answer
3a	A
3b	A+D Both for 1 mark

Element	Oxygen	Potassium	Phosphorus	Fluorine	Lithium	Aluminium
Density (g cm^{-3})	0.0014	0.89	1.82	0.0017	0.53	2.70
Electron Arrangement	2,6	2,8,8,1	2,8,5	2,7	2,1	2,8,3
Ion Formed	O^{2-}	K^+	P^{3-}	F^-	Li^+	Al^{3+}
Ion Electron Arrangement	2,8	2,8,8	2,8,8	2,8	2	2,8

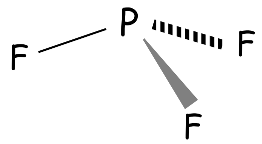
Question	Answer
3c	C+D Both for 1 mark

Ammonia NH_3



pyramidal shape

phosphorus fluoride



pyramidal shape

Question	Answer
4a	F
4b	A+F Both for 1 mark

Substance	A	B	C	D	E	F
State at 0°C	Liquid	Solid	Solid	Solid	Liquid	Gas
Bonding Type	covalent molecular	metallic	covalent network	ionic	metallic	covalent molecular

Question	Answer
5a	B+F Both for 1 mark

Oxide	ZnO	NO_2	K_2O	CuO	Fe_2O_3	CO
Elements in Compound	Zn (metal), O (non-metal)	N, O (both non-metals)	K (metal), O (non-metal)	Cu (metal), O (non-metal)	Fe (metal), O (non-metal)	C, O (both non-metals)
Bonding	ionic	covalent	ionic	ionic	ionic	covalent

Question	Answer
5b	C

Oxide	ZnO	NO_2	K_2O	CuO	Fe_2O_3	CO
Type	metal oxide	non-metal oxide	metal oxide	metal oxide	metal oxide	non-metal oxide
Effect of dissolving in water	(Insoluble)	forms acid	forms alkali	(Insoluble)	(Insoluble)	(Insoluble)

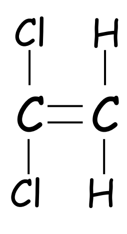
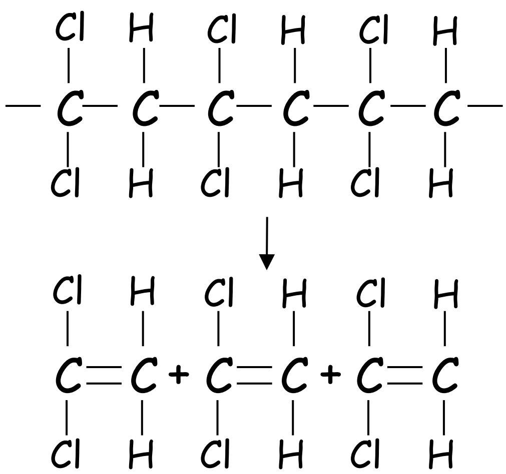
Question	Answer	Chemistry Covered
5c	E	Iron is made by reducing iron oxide to iron in a blast furnace
6a	D	All neutralisation reactions have H^+ ions reacting to form H_2O
6b	B	The electrons produced in the oxidation reaction are used up in the reaction:

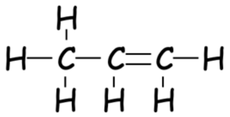
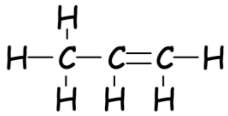
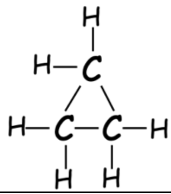
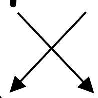
Oxidation Reactions in Rusting	Reduction Reaction in Rusting
$Fe \rightarrow Fe^{2+} + 2e^-$ $Fe^{2+} \rightarrow Fe^{3+} + e^-$	$2H_2O + O_2 + 4e^- \rightarrow 4OH^-$

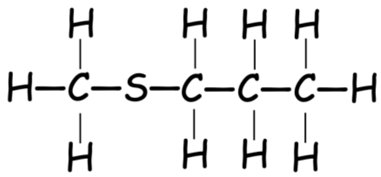
Question	Answer
7	C+E Both for 1 mark

Particle	**Location**	**Charge**	**Mass**
Proton	in nucleus	+1	1 amu
Neutron	in nucleus	0	1 amu
Electron	outside nucleus	−1	approx zero

<table>
<tr><td>8</td><td>D,E
1 mark each</td><td>☒ A zinc is below calcium in electrochemical series are cannot displace calcium
☒ B zinc is not reactive enough to react with cold water
☒ C To make zinc from zinc oxide, zinc oxide is heated with carbon
☑ D zinc reacts with dilute hydrochloric acid (MAZIT metals react with dilute acid)
☑ E magnesium is higher than zinc in ECS and Mg displaces zinc from solution.</td></tr>
<tr><td>9</td><td>A,D
1 mark each</td><td>☑ A ions flow through solution, electrons flow through wires
☒ B Silver Ag^+ ions travel to the negative electrode (object electrode)
☒ C Galvanising is coating iron in zinc
☑ D $Ag_{(s)}$ atoms turn into $Ag^+_{(aq)}$ ions which dissolve in the solution
☒ E $Ag \longrightarrow Ag^+ + e^-$ is a oxidation reaction (e^- after the arrow)</td></tr>
<tr><td>10</td><td>B,E
1 mark each</td><td>☒ A Rusting: $Fe \longrightarrow Fe^{2+} + 2e^-$ followed by $Fe^{2+} \longrightarrow Fe^{3+} + e^-$
☑ B Rusting: the loss of electrons from Fe atoms to form Fe^{3+} ions
☒ C Iron is protected by attaching to negative terminal (Cathodic Protection)
☒ D Tin is lower than iron in ECS so tin cannot sacrificially protect iron
☑ E Layer on outside prevents rusting by preventing air/water getting to metal underneath</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Chemistry Covered</th></tr>
<tr><td>11a</td><td>Distillation</td><td>Distillation separated chemicals with different boiling points</td></tr>
<tr><td>11b(i)</td><td>isotopes</td><td><table><tr><td rowspan="2">Isotopes</td><td>Same atomic number</td><td>but different mass number</td></tr><tr><td>Same number of protons</td><td>but different number of neutrons</td></tr></table></td></tr>
<tr><td>11b(ii)</td><td><table><tr><td>8</td><td>10</td></tr><tr><td>8</td><td>8</td></tr></table></td><td>Number of Protons = atomic number (lower number)
Number of Neutrons = mass number – atomic number
(top number) (lower number)</td></tr>
<tr><td>12a</td><td>Fermentation</td><td>glucose $\xrightarrow[\text{(no air)}]{\text{yeast}}$ alcohol + carbon dioxide
$C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2CO_2$</td></tr>
<tr><td>12b(i)</td><td>Increase in percentage alcohol, decrease in density</td><td>Problem Solving: Formation of conclusion from data in table</td></tr>
<tr><td>12b(ii)</td><td>20</td><td><table><tr><td>Percentage</td><td>20%</td><td>30%</td><td>40%</td><td>50%</td><td>60%</td><td>70%</td><td>80%</td></tr><tr><td>Density</td><td>-</td><td>-</td><td>0.928</td><td>0.907</td><td>0.886</td><td>0.865</td><td>0.844</td></tr><tr><td>Difference</td><td></td><td>(0.021)</td><td>(0.021)</td><td>0.021</td><td>0.021</td><td>0.021</td><td>0.021</td></tr><tr><td>Prediction</td><td>0.970</td><td>0.949</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr></table></td></tr>
<tr><td>13a</td><td></td><td>poly(vinyldichloride)

vinyldichloride</td></tr>
<tr><td>13b</td><td>carbon monoxide or hydrogen chloride</td><td><table><tr><td>Toxic Gas</td><td>Carbon monoxide</td><td>Hydrogen chloride</td><td>Hydrogen cyanide</td></tr><tr><td>Plastic burned</td><td>All plastics</td><td>Poly(chloroethene) (PVC)</td><td>Superglue or Polyurethane</td></tr></table></td></tr>
<tr><td>14a</td><td>higher</td><td><table><tr><td>Solution</td><td>Acidic</td><td>Neutral</td><td>Alkaline</td></tr><tr><td>H^+ concentration</td><td>H^+ greater than OH^-</td><td>H^+ equal to OH^-</td><td>H^+ less than OH^-</td></tr><tr><td>OH^- concentration</td><td>OH^- less than H^+</td><td>OH^- equal to H^+</td><td>OH^- greater than H^+</td></tr></table></td></tr>
</table>

<table>
<tr><td>14b</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>15a</td><td>$C_{12}H_{22}O_{11}$</td><td rowspan="2"><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>15b</td><td>Maltose</td></tr>
<tr><td>15c(i)</td><td>biological catalyst</td><td>Enzymes are biological catalyst that catalyse the reactions inside living organisms</td></tr>
<tr><td>15c(ii)</td><td>pH</td><td>Enzymes have a temperature (usually 37°C) and a pH at which they work best at.
Enzymes are denatured by high temperatures and large changes in pH.</td></tr>
<tr><td>16a</td><td></td><td><table>
<tr><td>Propene C_3H_6</td><td>Cyclopropane C_3H_6</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Decolourises bromine solution as it contains C=C double bond</td><td>Does not decolourises bromine solution as it does not contains C=C double bond</td></tr>
</table></td></tr>
<tr><td>16b(i)</td><td>Lowers temperature reaction takes place at</td><td>Catalysts speed up a chemical reactions but are not used up in reaction
• Catalysts can lower the temperature at which the reaction can take place at.</td></tr>
<tr><td>16b(ii)</td><td>Al_2O_3</td><td><table>
<tr><td>Write down Valency below each element's symbol</td><td>Put in Cross-over Arrows</td><td>Follow arrows and cancel down if necessary to get formula</td></tr>
<tr><td>Al O
3 2</td><td>Al O

3 2</td><td>Al_2O_3</td></tr>
</table></td></tr>
<tr><td>17a</td><td>Hydrolysis</td><td>Hydrolysis: splitting a molecule into smaller molecules with water added into the molecule.</td></tr>
<tr><td>17b</td><td>51g</td><td>1mol H_2NCONH_2 = (1x12)+(2x14)+(1x16)+(4x1) = 12+28+16+4 = 60g
no. of mol = $\frac{\textbf{mass}}{\textbf{gfm}} = \frac{90g}{60g\ mol^{-1}}$ = 1.5mol
$H_2NCONH_2 + H_2O \longrightarrow CO_2 + 2NH_3$
1mol 2mol
1.5mol 3mol
1mol NH_3 = (1x14)+(3x1) = 14+3 = 17g
mass = no. of mol x gfm = 3mol x 17g mol^{-1} = 51g</td></tr>
<tr><td>18a</td><td>d.c.</td><td>d.c. is direct current and has a flow of electrons is a steady direction.
a.c. is alternating current with the direction of electron flow changing.</td></tr>
<tr><td>18b</td><td>chlorine</td><td>Negative ions are attracted to the positive electrode:
• Non-metals form negative ions ∴ chloride ions move to positive electrode
• Reduction reactions take place at positive electrode: $2Cl^- \longrightarrow Cl_2 + 2e^-$</td></tr>
<tr><td>18c</td><td>Co^{2+} or 2+</td><td>Chlorine is a non-metal in group 7, with a valency of 1 and forms the Cl^- ion.
$CoCl_2$ has two Cl^- ions ∴ Cobalt ion must be 2+ to balance charge ∴ Co^{2+} ion</td></tr>
<tr><td>19a</td><td>Arrow from unreacted gases to catalyst</td><td>It is much more economical to recycle unused reactants back into the process than to throw them away and replace them with new chemicals.</td></tr>
<tr><td>19b(i)</td><td>platinum</td><td>$NH_3 + O_2 \xrightarrow[\text{catalyst}]{\text{Pt}} NO_2 + H_2O$</td></tr>
</table>

19b(ii)	Reaction is exothermic	Ostwald Process is exothermic and gives out heat. Once reaction starts, the heat given off during the reaction is enough to heat the reactions from that point onwards.
19c	To remove harmful gases	Catalytic converters contain transition metals which catalyse the break down of harmful gases to harmless gases: nitrogen oxides → nitrogen | carbon monoxide → carbon dioxide | unburnt hydrocarbons → carbon dioxide + water
20a(i)	$Pb(NO_3)_2 + 2NaI$ ↓ $PbI_2 + 2NaNO_3$	$Pb(NO_3)_2 + 2NaI \longrightarrow PbI_2 + 2NaNO_3$
20a(ii)	Filtration	Insoluble solids can be removed from liquids by filtration
20b	copper carbonate	metal carbonate + acid ⟶ salt + water + carbon dioxide copper carbonate + nitric acid ⟶ copper nitrate + water + carbon dioxide
20c(i)	Indicator	Indicator is added to change colour at the point of neutralisation
20c(ii)	0.002	no. of moles = volume x concentration = 0.02litres x 0.1 mol l^{-1} = 0.002 mol
20d	0.001	$H_2SO_4 + 2KOH \longrightarrow K_2SO_4 + 2H_2O$ 1mol 2mol 0.001mol 0.002mol
21a	from B to A through the wires	Electrode A — Electrons flow from B to A — Electrode B $2Au^+ + 2e^- \longrightarrow 2Au$ Electrons are absorbed by Au^+ ions is the above reduction reaction $2Br^- \longrightarrow Br_2 + 2e^-$ Electrons are generated in the above oxidation reaction
21b	$Au^+ + 2e^- \longrightarrow Au$	Au^+ ions must pick up electrons from electrode B to form Au atoms
21c	Ion bridge	Ion bridge completes the circuit by balancing the movement of charge through the wires e.g. ions bridge can be filter paper soaked in ionic solution
22a	Family of compounds with similar chemical properties	Homologous series are families of compounds with similar chemical properties and gradually changing physical properties.
22b	diagram showing:	
22c	Addition