



## Mark Scheme (Results)

October 2019

Pearson Edexcel International Advanced Level  
In Chemistry (WCH13)  
Paper 01 Practical Skills in Chemistry I

Question Number	Answer	Additional guidance	Mark
1(a)(i)	<ul style="list-style-type: none"> <li>• <math>\text{Na}^+</math> / <math>\text{Na}1^+</math> / <math>\text{Na}^{+1}</math></li> <li>•</li> </ul>	Ignore sodium and sodium ion Ignore brackets Do not award Na	(1)

Question Number	Answer	Additional guidance	Mark
1(a)(ii)	<ul style="list-style-type: none"> <li>• Oxygen / <math>\text{O}_2</math> (1)</li> <li>• <math>\text{NO}_3^-</math> (1)</li> </ul>	Do not award just O  Allow $\text{O}_2^{2-}$ / $\text{ClO}_3^-$ / $\text{ClO}_4^-$ / $\text{MnO}_4^-$  Do not award $\text{NO}_2^-$ / $\text{O}^{2-}$ / $\text{O}^-$ / $\text{O}_2^-$  Ignore nitrate(V) / any names	(2)

Question Number	Answer	Additional guidance	Mark
1(b)(i)	<ul style="list-style-type: none"> <li>• Hydrogen / <math>\text{H}_2</math> (1)</li> <li>• <math>\text{H}^+</math> / <math>\text{H}_3\text{O}^+</math> / <math>\text{H}^{+1}</math> / <math>\text{H}^{1+}</math> / <math>^+\text{H}</math> (1)</li> </ul>	Do not award just H  Ignore names	(2)

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	<ul style="list-style-type: none"> <li>• <b>M1</b> silver chloride / AgCl(s) (1)</li> <li>• <b>M2</b> hydrochloric acid / HCl(aq) (1)</li> </ul>	<p>Do not award silver bromide</p> <p>Allow HCl / hydrogen chloride</p> <p>Ignore concentration of the acid</p> <p>Allow TE on HBr/hydrobromic acid if AgBr given as the ppt</p>	(2)

(Total for Question 1 = 7 Marks)

Question Number	Answer	Additional guidance	Mark
2(a)	<ul style="list-style-type: none"> <li>HCl(aq) / hydrogen chloride / hydrochloric acid</li> </ul>	Ignore gas or fumes	(1)

Question Number	Answer	Additional guidance	Mark
2(b)	<ul style="list-style-type: none"> <li>Carbon dioxide/CO<sub>2</sub></li> </ul>	Ignore gas/ (g)	(1)

Question Number	Answer	Additional guidance	Mark
2(c)(i)	<ul style="list-style-type: none"> <li>C = CH<sub>3</sub>CH<sub>2</sub>COOH (1)</li> <li>D = CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>OH (1)</li> </ul>	Allow skeletal, displayed  Ignore connectivity of the OH  Allow (1) for two correct formulae with the incorrect number of carbon atoms  Allow (1) for two correct formulae the wrong way round  Ignore names even if incorrect	(2)

Question Number	Answer	Additional guidance	Mark
2(c)(ii)	<ul style="list-style-type: none"> <li>E = CH<sub>3</sub>CH<sub>2</sub>CHO</li> </ul>	Allow skeletal, displayed  Ignore names even if incorrect	(1)

Question Number	Answer	Additional guidance	Mark
2(c)(iii)	<p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>test (1)</li> <li>observation (1)</li> </ul>	<p>Example of test:</p> <p>Benedict's / Fehling's Ignore heat</p> <p>Red ppt / solid Allow brown or orange for red</p> <p>Allow Tollens'/silver mirror test</p> <p>Silver mirror / solid</p> <p>Award (1) for acidified dichromate(VI) turns green OR Bradys reagent gives red/orange/yellow <b>and</b> solid/precipitate</p> <p><b>Allow TE</b> on propanone <b>only</b> in (c)(ii) Benedict's / Fehling's No reaction scores 1/2 Tollens'/silver mirror test No reaction scores 1/2 Acidified dichromate(VI) No reaction scores 1/2 Iodoform reaction Yellow ppt scores 2/2</p>	(2)

Question Number	Answer	Additional guidance	Mark
2(d)(i)	<p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> <li> <b>M1</b> mass/volume of water (1) </li> <li> <b>M2</b> starting temperature of water  <b>and</b>  final temperature of water (1) </li> <li> <b>M3</b> mass of burner at the start  <b>and</b>  mass of burner at the end (1) </li> </ul>	<p>Ignore any reference to the mass/volume at the end/during the experiment  Allow the mass/volume of the beaker and the mass/volume of the beaker plus water  Do not award just the amount of water</p> <p>Allow just temperature change/difference (of the water)  Ignore any reference to the temperature during the experiment</p> <p>Allow just mass change of the alcohol burner</p> <p>Allow just mass of alcohol/C/D/E before and after heating</p> <p>Do not award measure the volume of the liquid in the burner at the start and end</p> <p>Ignore any reference to time/SHC of water  Ignore any reference to liquids/alcohols instead of C, D or E</p>	(3)

Question Number	Answer	Additional guidance	Mark
2(d)(ii)	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> <li>• putting a lid on the beaker (1)</li> <li>• putting a lid on the burner (before and after combustion) (1)</li> <li>• adding a draught shield around the apparatus / insulating the beaker (1)</li> <li>• using copper instead of a glass beaker (1)</li> </ul>	<p>Allow top or bung for lid</p> <p>Allow reweigh burner as soon as possible to prevent loss of liquid</p> <p>Do not award insulating the beaker with flammable material</p> <p>Do not award polystyrene cup</p> <p>Ignore any reference to changing apparatus or adding oxygen</p> <p>Ignore stirring the water</p> <p>Ignore changing the volumes of water</p> <p>Ignore burning more (or less) fuel</p> <p>Ignore not allowing the thermometer to touch the beaker</p> <p>Ignore distance of burner from the beaker</p> <p>Do not award drawing a temperature time graph</p> <p>Do not award a closed environment</p>	(2)

(Total for Question 2 = 12 Marks)

Question Number	Acceptable answers	Additional guidance	Mark
3(a)	<p>An answer that makes reference to one of the following points:</p> <ul style="list-style-type: none"> <li>to ensure all the air / oxygen has been removed from the test tube or</li> <li>to ensure only / pure hydrogen is in the test tube or</li> <li>hydrogen-air mixture is explosive</li> </ul>	<p>Allow to give time for the hydrogen to fill the test tube</p> <p>Allow to prevent an explosion/blast</p> <p>Ignore just hydrogen is flammable / explosive</p> <p>Ignore any reference to hazards other than explosions</p>	(1)

Question Number	Answer		Additional guidance	Mark
3(b)(i)	Measurement	Mass / g	Both correct for the mark	(1)
	Mass of test tube	40.27		
	Mass of test tube and copper oxide	43.42		
	Mass of test tube and copper	42.79		
	Mass of copper in copper oxide	2.52		
	Mass of oxygen in copper oxide	0.63		



Question Number	Answer	Additional guidance	Mark
3(b)(ii)	<ul style="list-style-type: none"> <li>• <b>M1</b> calculation of moles of copper (1)</li> <li>• <b>M2</b> calculation of moles of oxygen (1)</li> <li>• <b>M3</b> (calculation of ratio 1:1) formula of copper oxide (1)</li> </ul> <p><b>OR</b></p> <ul style="list-style-type: none"> <li>• <b>M1</b> % of Cu and O (1)</li> <li>• <b>M2</b> % divided by <math>A_r</math> (1)</li> </ul>	<p>Example of calculation:</p> <p><math>2.52/63.5 = 0.039685/3.9685 \times 10^{-2}</math>  Allow fractions  Ignore rounding</p> <p><math>0.63/16 = 0.039375/3.9375 \times 10^{-2}</math>  Allow fractions  Ignore rounding</p> <p><math>(0.039685/0.039375 = 1:1)</math> CuO</p> <p>If the mole calculation is reversed only M3 can be awarded</p> <p><math>2.52/3.15 \times 100 = 80\%</math></p> <p><math>0.63/3.15 \times 100 = 20\%</math>  Ignore rounding</p> <p><math>80/63.5 = 1.256984</math></p> <p><math>20/16 = 1.25</math>  Ignore rounding</p> <p><math>(1.26/1.25 = (1:1.(008))</math> CuO</p>	(3)

	<ul style="list-style-type: none"> <li><b>M3</b> (calculation of ratio 1:1) formula of copper oxide (1)</li> </ul>	<p>TE on incorrect masses and at each stage.</p> <p>Allow any correct rounding to whole numbers in <b>M3</b></p> <p>Ignore SF (including 1 SF)</p>	
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Question Number	Answer	Additional guidance	Mark
3(c)(i)	<ul style="list-style-type: none"> <li>(pink / red copper) turns black/dark(er)/returns to its original colour</li> </ul>	<p>Do not award just turns brown</p> <p>Do not award duller</p>	(1)

Question Number	Answer	Additional guidance	Mark
3(c)(ii)	<p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> <li><b>M1</b> (it appeared that) less mass of oxygen/ less oxygen was lost or (it appeared that) more mass copper was present (1) <b>M2</b> because (some of) the copper has been reoxidised (to copper oxide)/now copper oxide not fully reduced or calculated ratio contained more copper / less oxygen or The formula of the oxide contained more copper eg Cu<sub>2</sub>O (1)</li> </ul>	<p>Allow (some) copper oxide has been formed</p>	(2)

(Total for Question 3 = 8 Marks)

Question Number	Acceptable answers	Additional guidance	Mark
4(a)	<p>A description that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>• <b>M1</b> dissolve solid in a beaker using distilled / deionised water (1)</li> <li>• <b>M2</b> use of volumetric flask (1)</li> <li>• <b>M3</b> add washings and make up to mark with distilled / deionised water (1)</li> <li>• <b>M4</b> mix the solution in the flask (1)</li> </ul> <p>If the solution is made up directly into the volumetric flask</p>	<p>Allow conical flask Allow solid disappears Do not award test-tube Do not award if no vessel mentioned</p> <p>Distilled / deionised water only needs to be mentioned once for M1 and M3 Do not award just pure water</p> <p>Allow volume flask Can be shown in an unlabelled diagram</p> <p>Do not award if the solution is filtered into the volumetric flask</p> <p>Allow any indication of mixing e.g. invert / shake / swirl If M3 is scored M4 must follow M3.</p> <p>Ignore any mention of weighing</p> <p>Distilled / deionised water only needs to be mentioned once for M1 and M3 Do not award just pure water</p>	(4)

	<ul style="list-style-type: none"> <li>• <b>M1</b> dissolve solid using distilled / deionised water (1)</li> <li>• <b>M2</b> in a volumetric flask (1)</li> <li>• <b>M3</b> rinse weighing boat/ funnel and make up to mark with distilled / deionised water (1)</li> <li>• <b>M4</b> mix the solution in the flask (1)</li> </ul>	<p>Allow any indication of mixing e.g. invert / shake / swirl If M3 is scored M4 must follow M3. Ignore any mention of weighing</p>	
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Question Number	Acceptable answers	Additional guidance	Mark
4(b)(i)	<ul style="list-style-type: none"> <li>• colourless to (pale) pink</li> </ul>	<p>Both colours required Do not award red Ignore clear</p>	(1)

Question Number	Acceptable answers	Additional guidance	Mark
4(b)(ii)	<ul style="list-style-type: none"> <li>• <math>(11.90 + 11.70/2) = 11.8(0) \text{ (cm}^3\text{)}</math></li> </ul>		(1)

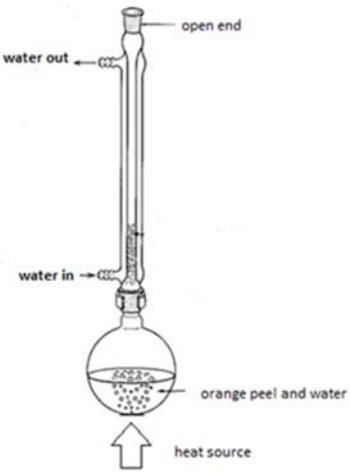
Question Number	Acceptable answers	Additional guidance	Mark
<b>4(b)(iii)</b>	<ul style="list-style-type: none"> <li>calculation of moles of NaOH (1)</li> <li>calculation of moles of H<sub>2</sub>X in 25 cm<sup>3</sup> (1)</li> <li>calculation of moles of H<sub>2</sub>X in 250 cm<sup>3</sup> (1)</li> </ul>	<p>Example of calculation:</p> <p><math>(11.80 \times 0.213 / 1000)</math>  <math>= 2.5134 \times 10^{-3} / 0.0025134 \text{ (mol)}</math></p> <p><math>2.5134 \times 10^{-3} / 2</math>  <math>= 1.2567 \times 10^{-3} / 0.0012567 \text{ (mol)}</math></p> <p><math>1.2567 \times 10^{-3} \times 10</math>  <math>= 1.2567 \times 10^{-2} / 0.012567 \text{ (mol)}</math></p> <p>Allow TE for each stage  Ignore incorrect rounding throughout  Ignore SF except 1SF</p> <p>Correct answer with or without working scores 3</p>	<b>(3)</b>

Question Number	Acceptable answers	Additional guidance	Mark
4(b)(iv)	<ul style="list-style-type: none"> <li>correct expression (1)</li> <li>molar mass to 2 or 3 SF (1)</li> </ul>	<p>Example of calculation:</p> $1.13 / 1.2567 \times 10^{-2}$ <p>(= 89.918)  = 90 / 89.9  Allow TE from (b)(iii)  Allow commas for decimal points  Answer must be to 2 or 3 SF  Correct answer with or without working scores 2</p> <p>Ignore units even if incorrect</p>	(2)

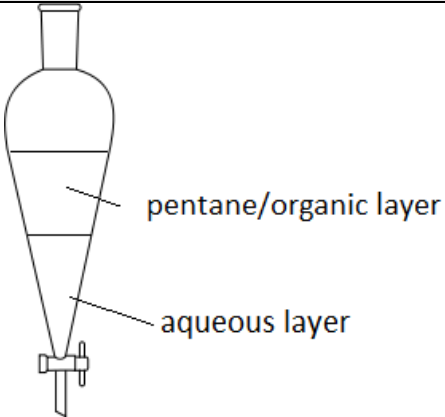
Question Number	Answer	Additional guidance	Mark
4(c)(i)	<ul style="list-style-type: none"> <li>calculation of percentage uncertainty</li> </ul>	<p>Example of calculation:</p> $\frac{0.05 \times 2}{11.70} \times 100 = 0.8547 \text{ (\%)}$ <p>= (+/-) 0.9 / 0.85/0.855 (%)  IGNORE SF  Do not award 0.86%  This is the only place where we penalise incorrect rounding in the paper</p>	(1)

Question Number	Answer	Additional guidance	Mark
4(c)(ii)	<p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>• <b>M1</b> use a more dilute solution of NaOH or use a greater mass of the acid (1)</li> <li>• <b>M2</b> To make titration reading larger (and so reduce the % error) (1 )</li> </ul>	<p>Allow use a greater volume of <b>acid</b></p> <p>Allow just using larger volume</p> <p>Ignore any references to correct procedure</p>	(2)

(Total for question 4 = 14 Marks)

Question Number	Answer	Additional guidance	Mark
5(a)	<ul style="list-style-type: none"> <li>• <b>M1</b> round-bottomed / pear shaped flask containing mixture <b>and</b> heat (1)</li> <li>• <b>M2</b> vertical condenser with water jacket <b>and</b> water flowing in the correct direction (1)</li> <li>• <b>M3</b> no gaps and open condenser and apparatus would work (1)</li> </ul>	<p>Example of diagram:</p>  <p>M1 Allow unlabelled arrow for heat/ electrical heater</p> <p>Do not award conical flask/flask with no liquid in</p> <p>Ignore anti bumping granules</p> <p>M2 The water in and water out do not have to be at the ends of the condenser.</p> <p>M3 Ignore thermometer in the top of the condenser if it does not seal the apparatus.</p> <p>Do not award if the condenser and flask are one piece of apparatus</p> <p>Allow just M2 for distillation apparatus with correct condenser and water flow</p>	(3)



Question Number	Answer	Additional guidance	Mark
5(b)(i)	 <p>The diagram shows a separatory funnel with a stopper at the top and a stopcock at the bottom. It is divided into two horizontal sections. The upper section is labeled 'pentane/organic layer' and the lower section is labeled 'aqueous layer'.</p>	<p>Allow for the top layer pentane and limonene or just limonene</p> <p>Allow the top layer to fill the funnel</p> <p>Allow water for the bottom layer</p> <p>Do not allow water and limonene for the bottom layer</p> <p>Do not award more than 2 layers</p> <p>Both layers must be labelled</p>	(1)

Question Number	Answer	Additional guidance	Mark
5 (b)(ii)	<p>Any <b>two</b> from;</p> <ul style="list-style-type: none"> <li>shake / invert (and release the pressure) (1)</li> <li>(allow to settle) and run off the lower aqueous layer (1)</li> <li>Run off or pour out the pentane layer (into a fresh container) (1)</li> </ul>	<p>Allow TE on incorrect layers in (b)(i)</p> <p>Do no award if the upper layer is decanted off or pipetted out.</p> <p>Do not award if there is no indication of the nature of the layer being run off (or the one left behind)</p> <p>Ignore subsequent distillation/drying etc</p>	(2)

Question Number	Answer	Additional guidance	Mark
5(c)	<ul style="list-style-type: none"> <li>calculation of percentage of limonene in the orange peel</li> </ul>	<p>Example of calculation:</p> $\frac{150 \times 10^{-3}}{23} \times 100$ $= 0.65217 (\%) / 6.5217 \times 10^{-1}$ <p>Ignore SF</p> <p>Ignore rounding errors</p> <p>Correct answer with or without working scores the mark.</p>	(1)

Question Number	Answer	Additional guidance	Mark
5(d)	<ul style="list-style-type: none"> <li>calculation of mol of bromine (1)</li> <li>(calculation of the ratio of limonene to bromine )and state the number of C=C in limonene (1)</li> </ul>	<p>Example of calculation:</p> <p>mol of Br<sub>2</sub> = 0.32 / 160 = 0.002/2.0 X10<sup>-3</sup></p> <p>(ratio of mol of limonene to bromine is 1:2)</p> <p>2 alkene / C=C per molecule of limonene Allow 1 limonene molecule contains a triple bond</p>	(2)

(Total for question 5 = 9 Marks)

(TOTAL FOR PAPER 50 MARKS)