



# **Cambridge Technicals Laboratory Skills**

## **Unit 1: Science Fundamentals**

Level 3 Cambridge Technical in Laboratory Skills

## **Mark Scheme for June 2018**

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

© OCR 2018

Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
<b>BOD</b>	Benefit of doubt given
<b>CON</b>	Contradiction
<b>RE</b>	Rounding error
<b>SF</b>	Error in number of significant figures
<b>ECF</b>	Error carried forward
<b>L1</b>	Level 1
<b>L2</b>	Level 2
<b>L3</b>	Level 3
<b>NBOD</b>	Benefit of doubt not given
<b>SEEN</b>	Noted but no credit given
<b>I</b>	Ignore

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

<b>Annotation</b>	<b>Meaning</b>
/	alternative and acceptable answers for the same marking point
<b>DO NOT ALLOW</b>	Answers which are not worthy of credit
<b>IGNORE</b>	Statements which are irrelevant
<b>ALLOW</b>	Answers that can be accepted
( )	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
<b>ECF</b>	Error carried forward
<b>AW</b>	Alternative wording
<b>ORA</b>	Or reverse argument

Question		Answer	Marks	Guidance	
1	(a)	Protons – 19 ✓ Electrons - 19 ✓ Neutrons - 20 ✓	3		
	(b)	(i)	1 ✓	1	
		(ii)	4 ✓	1	
	(c)	(i)	<b>FIRST CHECK ANSWER ON ANSWER LINE</b> If answer = $4.24 \times 10^{-15}$ (m) award 2 marks  = $1.25 \times 10^{-15} \times 39^{1/3}$ ✓  = $4.24 \times 10^{-15}$ (m) ✓	2	<b>ALLOW</b> ecf $3.34 \times 10^{-15}$ m (use of $19^{1/3}$ ) <b>OR</b> 39 seen in working = 1 mark  <b>ALLOW</b> 4.2 OR $4.239 \times 10^{-15}$ = 2 marks
		(ii)	Any two from:  strong <b>nuclear</b> force ✓  <b>attraction</b> between protons and neutrons ✓  <b>greater</b> than repulsion of protons ✓  strong nuclear force is much greater (x 200 to 50) than repulsion force ✓  neutrons weaken the repulsive force between protons ✓	4	<b>ALLOW</b> nucleon - nucleon interaction / residual strong force  <b>IGNORE</b> ref. to force between protons and neutrons
		(iii)	<b>greater</b> increase in protons ✓  <b>greater</b> attraction from nucleus to electrons ✓	2	<b>ALLOW</b> 'atomic number' = 'protons'  <b>ALLOW</b> 'force' = 'attraction'
	(d)	Isotopes have different number of neutrons ✓	1	3 <sup>rd</sup> box	
		<b>Total</b>	<b>14</b>		

Question			Answer	Marks	Guidance
2	(a)	(i)	reactants = <u>HCl</u> ✓ products = <u>NaCl</u> ✓	2	<b>DO NOT ALLOW</b> incorrect case / words / numbers
		(ii)	 ✓✓	2	correct formula = 2 marks <b>OR</b> <b>ALLOW</b> left side correct (incl. N) = 1 mark <b>ALLOW</b> right side correct (-NO) = 1 mark  <b>ALLOW</b> -N=O <b>not</b> -N-O
		(iii)	<b>Any three from:</b> reduction ✓ addition ✓ polymerisation ✓ radical ✓ displacement ✓	3	<b>ALLOW</b> thermal decomposition  <b>IGNORE</b> oxidation and substitution
	(b)		2 x O=C ✓ 1 x C-C ✓   ascorbic acid                      dehydroascorbic acid	2	<b>ALLOW</b> removal of H from left and right HO = 1 mark max.  <b>IGNORE</b> any changes to other parts of molecule

Question		Answer	Marks	Guidance
(c)	(i)	<p><b>factor</b></p> <p>solvent</p> <p>pressure</p> <p>enzyme</p> <p>surface area</p> <p><b>feature</b></p> <p>affects the chance of exposing one reactant to another</p> <p>acts as an organic catalyst</p> <p>changes the space available for reactants to move</p> <p>changes the solubility and stability of reactants</p> <p>✓ ✓ ✓</p>	3	<p>4 correct lines = 3 marks</p> <p>2 or 3 correct lines = 2 marks</p> <p>1 correct line = 1 mark</p>
	(ii)	<p><b>Any two from:</b></p> <p>physical state ✓</p> <p>temperature ✓</p> <p>light intensity ✓</p> <p>light wavelength/frequency ✓</p> <p>electromagnetic radiation ✓</p> <p>concentration (of reactants) ✓</p> <p>catalyst/enzyme ✓</p>	2	<p><b>IGNORE</b> unqualified 'light'</p> <p><b>IGNORE</b> density</p> <p><b>ALLOW</b> (inorganic) catalyst</p>
		<b>Total</b>	<b>14</b>	

Question			Answer	Marks	Guidance
3	(a)	(i)	A - plasma membrane ✓  B - nucleus ✓	2	
		(ii)	<b>Golgi apparatus</b> – stacks of folded membranes (with vesicles pinching off) ✓  <b>Lysosome</b> - simple and single-membrane vesicle/circular shape ✓	2	<b>ALLOW</b> written statement OR diagram <b>IGNORE</b> organelle contents  <b>ALLOW</b> 'like a vesicle'
		(iii)	site of protein/polypeptide synthesis ✓	1	<b>ALLOW</b> correct descriptions of protein synthesis
	(b)	(i)	site of (aerobic) respiration / ATP/energy production/release ✓  release <b>energy</b> needed (for contraction) ✓	2	<b>DO NOT ALLOW</b> anaerobic respiration  AWTTE <b>IGNORE</b> muscles becomes weak without mitochondria
		(ii)	storage/ delivery of calcium ions / receive calcium ions from tissue fluid ✓  calcium ions, dislodge the apparatus connecting the thick and thin filaments / allow the thick and thin filaments to slide over each other ✓	2	<b>ALLOW</b> calcium through  AWWTE

Question		Answer	Marks	Guidance
	(c)	(i)		
		<p><b>Any one from:</b>            Hold/bind/stick bundles/fibres together ✓            packing tissue, OWTTE ✓            support / protection ✓            transmits forces involved in contraction and restoration to original shape ✓</p>	1	<p><b>ALLOW</b> to enable bundles to slide over each other  <b>IGNORE</b> to hold onto bone / tendons</p> <p><b>IGNORE</b> shock absorption</p>
		(ii)		
		<p><b>Any two from:</b>            bundles occupy smaller area / bundles smaller ✓            bundles rounder / less polygonal ✓            increase in connective tissue / endomysium ✓            more bundles ✓            more/smaller blood vessels (TS) ✓            lower/reduced magnification (used) ✓            less-clear / darker / less contrast (any realistic qualitative description of image quality) ✓</p>	2	<p><b>ALLOW</b> visa versa responses</p> <p><b>ASSUME</b> responses refer to the 'patient' unless qualified</p>
		(iii)		
		<p>collagen ✓            elastic fibres ✓            matrix ✓</p>	3	
<b>Total</b>			<b>15</b>	

Question			Answer	Marks	Guidance
4	(a)	(i)	ketone ✓	1	
		(ii)	(circle drawn around functional group) C=O ✓	1	<b>ALLOW</b> C=O plus adjacent C1 and C3 <b>ALLOW</b> =O (without C highlighted)
		(iii)	structural ✓  geometric ✓	2	
		(iv)	<i>Any two from:</i> similar molecular formula ✓  different, chemical/physical <b>structure</b> / arrangement of atoms / side branches ✓  different spatial arrangement / asymmetric carbon atoms (eg. Chiral) ✓	2	AWWTE <b>ALLOW</b> same number <b>AND</b> type of atoms  <b>IGNORE</b> references to geometric, optical, physical/chemical characteristics
	(b)		benzaldehyde – <b>aldehyde / alkene</b> ✓ ionone – <b>ketone / alkene</b> ✓ isoamyl acetate – <b>ester</b> ✓ phenylethanol – <b>alcohol</b> ✓ 1,3,5-undecatriene – <b>alkene</b> ✓	5	<b>ALLOW only</b> options from the list provided <b>ALLOW</b> either ketone or alkene as the functional group for ionone
	(c)	(i)	Ester /covalent ✓	1	
		(ii)	phospholipid ✓	1	2 <sup>nd</sup> box
			<b>Total</b>	<b>13</b>	

Question		Answer	Marks	Guidance															
5	(a)	Ca <sup>2+</sup> ✓ Mn <sup>2+</sup> ✓ Ni <sup>2+</sup> ✓ Na <sup>+</sup> ✓ Cu <sup>2+</sup> ✓	5	<b>IGNORE</b> absence of / incorrect use of <sup>2+</sup> or <sup>+</sup> .															
	(b)	<table border="1"> <thead> <tr> <th></th> <th>True</th> <th>False</th> </tr> </thead> <tbody> <tr> <td>Platinum is a structural component of bone.</td> <td></td> <td>✓</td> </tr> <tr> <td>Potassium has a role in creating nerve impulses.</td> <td>✓</td> <td></td> </tr> <tr> <td>Iron is a component of cytochromes in the electron transport chain.</td> <td>✓</td> <td></td> </tr> <tr> <td>Lithium is found in haemoglobin molecules.</td> <td></td> <td>✓</td> </tr> </tbody> </table>		True	False	Platinum is a structural component of bone.		✓	Potassium has a role in creating nerve impulses.	✓		Iron is a component of cytochromes in the electron transport chain.	✓		Lithium is found in haemoglobin molecules.		✓	4	<b>MARK</b> each row
	True	False																	
Platinum is a structural component of bone.		✓																	
Potassium has a role in creating nerve impulses.	✓																		
Iron is a component of cytochromes in the electron transport chain.	✓																		
Lithium is found in haemoglobin molecules.		✓																	
	(c)	amino acids ✓ liver ✓ ammonium ✓ DNA ✓ phospholipids ✓	5	<b>ALLOW</b> DNA and phospholipids in <b>either order</b>															

Question		Answer	Marks	Guidance
	(d)	<p>Any four from:</p> <p>(actual) lung cancer deaths at higher levels than expected ✓</p> <p>level quantified between actual and expected values (e.g. approx. 6.2x, 3.1x, 1.4x, 1.2x, 1.4x) ✓</p> <p>declining trend / correlation cancer ✓</p> <p>lung cancer <b>appears</b> to increase beyond 1953 ✓</p> <p>but rate is actually lower (due to 40 year period) ✓</p> <p>one value for number of deaths for any one period ✓</p> <p>greatest decline between 1920 – 1939 <b>OR</b> period 1920 – 1929 and period 1930 – 1939 ✓</p>	4	<p>AWTTE</p> <p><b>ALLOW</b> any realistic, correct statement in relation to table of data</p> <p><b>ALLOW</b> correct ref. to any one set of data</p> <p><b>DO NOT ALLOW</b> unqualified refs. to an increase</p>
		<b>Total</b>	<b>18</b>	

Question		Answer	Marks	Guidance
6		<p><b>[Level 3]</b> Candidate shows a high level of understanding of the two methods and how they change the properties of the polymer. <i>(5 – 6 marks)</i></p> <p><b>[Level 2]</b> Candidate shows an understanding of the <b>both</b> methods and how they change the properties of the polymer. <i>(3 – 4 marks)</i></p> <p><b>[Level 1]</b> Candidate shows a basic understanding of the one <b>or</b> both methods and how they change the properties of the polymer, but with little or no explanation. <i>(1 – 2 marks)</i></p> <p><b>[Level 0]</b> Candidate includes <b>fewer than two</b> valid points. <i>(0 marks)</i></p>	6	<p><b>Valid points:</b></p> <p><b>Method 1</b></p> <ul style="list-style-type: none"> <li>• = crosslinking</li> <li>• chemical bonds (introduced) between the molecular chains</li> <li>• <b>decrease</b> ductility</li> <li>• <b>increase</b> strength/stiffness/hardness</li> <li>• <b>increase</b> in intermolecular forces</li> <li>• <b>decreased</b> potential for chains to slide past each other</li> <li>• gives <b>thermosetting</b> property</li> </ul> <p><b>Method 2</b></p> <ul style="list-style-type: none"> <li>• = plasticising</li> <li>• plasticising agents (introduced) between the molecular chains</li> <li>• <b>increase</b> ductility</li> <li>• <b>decrease</b> strength/stiffness/hardness</li> <li>• <b>decrease</b> in intermolecular forces</li> <li>• <b>increased</b> potential for chains to slide past each other</li> <li>• gives <b>thermoplastic</b> property</li> </ul>
		<b>Total</b>	<b>6</b>	

Question			Answer	Marks	Guidance
7	(a)	(i)	<b>FIRST CHECK ANSWER ON ANSWER LINE</b> <b>If answer = 16.8 (C) award 3 marks</b>  7 x 60 ✓  0.04 x 420 ✓  16.8 (C) ✓	3	<b>ALLOW 17</b>   <b>ALLOW 0.28 (C) = 1 max.</b>
		(ii)	<b>FIRST CHECK ANSWER ON ANSWER LINE</b> <b>If answer = 0.144W OR 0.14J/S award 3 marks</b>  3.6 x 0.04 ✓  0.144 <b>or</b> 0.14 ✓  W <b>or</b> J/S ✓	3	
	(b)		<b>FIRST CHECK ANSWER ON ANSWER LINE</b> <b>If answer = 57.78 (Ω) award 4 marks</b>  Rearrange equation to give:  resistance = potential difference ÷ current  <b>OR</b> $R = \frac{V}{I}$ ✓  5.2 ÷ 0.09 ✓  57.78 (Ω) ✓  two decimal places (only with correct value) ✓	4	<b>ALLOW 57.8 or 58.0 or 57.77 or 57.777 for 3 marks</b>         <b>ALLOW 5.2 ÷ 0.09 without rearranged equation = 2 marks</b>   <b>ALLOW 57.77<sup>•</sup> = 57.78</b>
			<b>Total</b>	<b>10</b>	

**OCR (Oxford Cambridge and RSA Examinations)**  
**The Triangle Building**  
**Shaftesbury Road**  
**Cambridge**  
**CB2 8EA**

**OCR Customer Contact Centre**

**Education and Learning**

Telephone: 01223 553998

Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

[www.ocr.org.uk](http://www.ocr.org.uk)

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

**Oxford Cambridge and RSA Examinations**  
is a Company Limited by Guarantee  
Registered in England  
Registered Office; The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA  
Registered Company Number: 3484466  
OCR is an exempt Charity

**OCR (Oxford Cambridge and RSA Examinations)**  
Head office  
Telephone: 01223 552552  
Facsimile: 01223 552553

© OCR 2018

