



Ghada omar
chemistry tutor

O LEVEL CHEMISTRY


0971
0620 **CLASSIFIED** (Paper 4)

CAMBRIDGE IGCSE O-LEVEL

MARK SCHEME



For more information

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 CamScanner

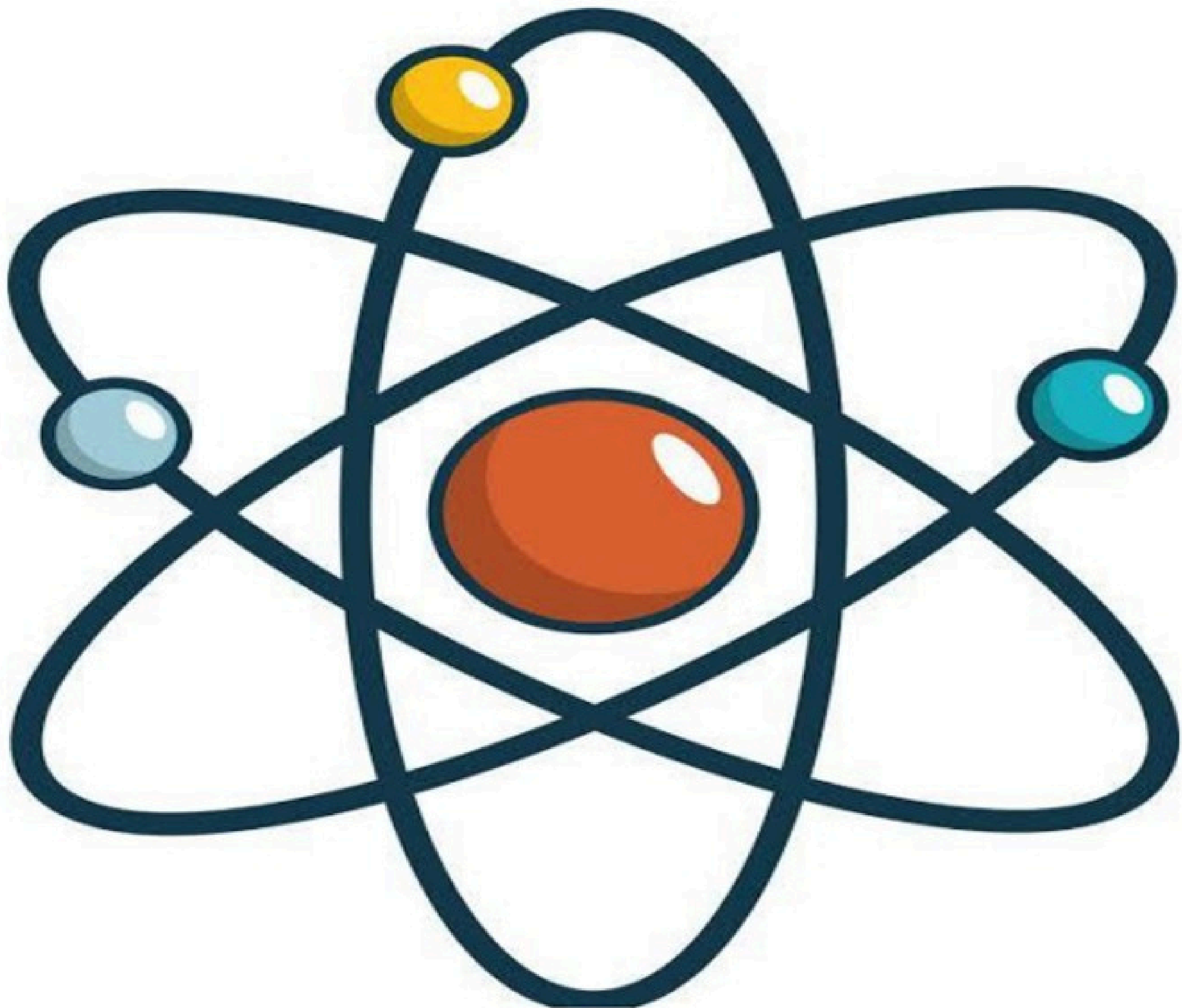
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Topic 2

Atomic Structure



Question 1

Question	Answer	Marks
1	${}_{19}^{39}\text{K}$; 26p 26e 30n All three for 1 mark; ${}_{3}^{7}\text{Li}^{+}$ numbers and symbol; charge +; 31p 28e 39n All three for 2 marks, any two for 1 mark; ${}_{34}^{79}\text{Se}^{2-}$ numbers and symbol; charge 2^{-} ;	8

Question 2

Question	Answer	Marks
1(a)(i)	Na^{+} /sodium and O^{2-} /oxide;	1
1(a)(ii)	Ca^{2+} /calcium;	1
1(a)(iii)	P /phosphorus;	1
1(a)(iv)	Si /silicon;	1
1(b)(i)	<ul style="list-style-type: none"> number of protons = 29; number of neutrons = 35; number of electrons = 27; three correct = [2]; two correct = [1]	2
1(b)(iii)	number of nucleons = 45; number of charged particles = 42;	1 1
1(c)(i)	have same proton number /same element /same atomic number; different number of neutrons /nucleons /mass number;	1 1
1(c)(ii)	magnesium /Mg;	1

Question 3

Question	Answer	Marks									
1(a)	B = 17; C = 18; D = 2,8; 2^{-} / 2^{-} ;	4									
1(b)	Substance that cannot be broken down into anything simpler /substance that cannot be broken down (by chemical means) /substance containing atoms with the same atomic number or proton number;	1									
1(c)	<table border="1"> <thead> <tr> <th>number of protons</th> <th>number of neutrons</th> <th>number of electrons</th> </tr> </thead> <tbody> <tr> <td>31</td> <td>38</td> <td>31</td> </tr> <tr> <td>31</td> <td>40</td> <td>31</td> </tr> </tbody> </table> M1 column one; M2 column two; M3 column three;	number of protons	number of neutrons	number of electrons	31	38	31	31	40	31	3
number of protons	number of neutrons	number of electrons									
31	38	31									
31	40	31									



Question 4

Question	Answer	Marks																
1(a)	<table border="1"> <thead> <tr> <th>particle</th> <th>relative mass</th> <th>relative charge</th> </tr> </thead> <tbody> <tr> <td>proton</td> <td>1</td> <td>+1</td> </tr> <tr> <td>neutron</td> <td>1</td> <td>nil</td> </tr> <tr> <td>electron</td> <td>1/1840</td> <td>-1</td> </tr> </tbody> </table>	particle	relative mass	relative charge	proton	1	+1	neutron	1	nil	electron	1/1840	-1	3				
particle	relative mass	relative charge																
proton	1	+1																
neutron	1	nil																
electron	1/1840	-1																
1(b)(i)	<p>M1 <u>atom(s)</u> of the same element; M2 with different number of neutrons;</p>	2 1 1																
1(b)(ii)	<p>M1 (both have) the same number of electrons; M2 in the outer shell;</p>	2 1 1																
1(c)	<table border="1"> <thead> <tr> <th>particle</th> <th>number of protons</th> <th>number of neutrons</th> <th>number of electrons</th> </tr> </thead> <tbody> <tr> <td>${}^7_3\text{Li}$</td> <td>3</td> <td>4</td> <td>3</td> </tr> <tr> <td>${}^{34}_{16}\text{S}^{2-}$</td> <td>16</td> <td>18</td> <td>18</td> </tr> <tr> <td>${}^{41}_{19}\text{K}^+$</td> <td>19</td> <td>22</td> <td>18</td> </tr> </tbody> </table>	particle	number of protons	number of neutrons	number of electrons	${}^7_3\text{Li}$	3	4	3	${}^{34}_{16}\text{S}^{2-}$	16	18	18	${}^{41}_{19}\text{K}^+$	19	22	18	5
particle	number of protons	number of neutrons	number of electrons															
${}^7_3\text{Li}$	3	4	3															
${}^{34}_{16}\text{S}^{2-}$	16	18	18															
${}^{41}_{19}\text{K}^+$	19	22	18															

Question 5

Question	Answer	Marks																				
2(a)(i)	<u>number of protons</u> in one atom of an element;	1																				
2(a)(ii)	<p>M1 <u>number of protons and neutrons</u> in one atom of an element; M2 in one atom of an element;</p>	2 1 1																				
2(b)	<table border="1"> <tbody> <tr> <td>A</td> <td>6</td> <td>6</td> <td>6</td> <td>${}^{12}_6\text{C}$</td> </tr> <tr> <td>B</td> <td>12</td> <td>12</td> <td>12</td> <td>${}^{24}_{12}\text{Mg}$;</td> </tr> <tr> <td>C</td> <td>8</td> <td>10;</td> <td>8;</td> <td>${}^{16}_8\text{O}^{2-}$</td> </tr> <tr> <td>D</td> <td>11</td> <td>10</td> <td>13</td> <td>${}^{24}_{11}\text{Na}^+$ 11, 24; Na;+;</td> </tr> </tbody> </table>	A	6	6	6	${}^{12}_6\text{C}$	B	12	12	12	${}^{24}_{12}\text{Mg}$;	C	8	10;	8;	${}^{16}_8\text{O}^{2-}$	D	11	10	13	${}^{24}_{11}\text{Na}^+$ 11, 24; Na;+;	6
A	6	6	6	${}^{12}_6\text{C}$																		
B	12	12	12	${}^{24}_{12}\text{Mg}$;																		
C	8	10;	8;	${}^{16}_8\text{O}^{2-}$																		
D	11	10	13	${}^{24}_{11}\text{Na}^+$ 11, 24; Na;+;																		



Question 6

Question	Answer	Mark
2(a)	(total) number of protons and neutrons in a nucleus (of an atom)	2
2(b)	Na 2 : 8 : 1 P ³⁻ 2 : 8 : 8	2
2(d)	<u>average</u> mass of (naturally occurring) <u>atom(s)</u> (of an element) (compared to an atom of) ¹² C	2
Question	Answer	Mark
2(e)	chlorine must have more than one isotope the masses of these isotopes / (any given) mass numbers are averaged	2

Question 7

Question	Answer	Marks									
1(a)	<table border="1"> <tr> <td>proton</td> <td>+1</td> <td>1</td> </tr> <tr> <td>neutron</td> <td>0</td> <td>1</td> </tr> <tr> <td>electron</td> <td>-1</td> <td>¹/₁₈₄₀</td> </tr> </table>	proton	+1	1	neutron	0	1	electron	-1	¹ / ₁₈₄₀	2
proton	+1	1									
neutron	0	1									
electron	-1	¹ / ₁₈₄₀									
1(b)(i)	(same) number of protons and electrons / 6 protons and six electrons (different) neutron (number) / 6, 7 and 8 neutrons	2 1									
1(b)(ii)	same <u>number</u> of electrons / electron configuration	1									

Question 8

Question	Answer	Marks
2(a)	2,2/2.2	1



Question 9

Question	Answer																				
1(a)	<i>proton number</i> : the number of protons																				
	<i>nucleon number</i> : the total number of protons and neutrons																				
	<i>nucleon number</i> : in the nucleus / nuclei (of an atom)																				
1(b)	(hydrogen is the only atom to have) no neutrons																				
1(c)	<table border="1"> <thead> <tr> <th></th> <th>number of protons</th> <th>number of neutrons</th> <th>number of electrons</th> </tr> </thead> <tbody> <tr> <td>^{19}F</td> <td>9</td> <td>10</td> <td>9</td> </tr> <tr> <td>^{26}Mg</td> <td>12</td> <td>14</td> <td>12</td> </tr> <tr> <td>$^{31}\text{P}^{3-}$</td> <td>15</td> <td>16</td> <td>18</td> </tr> <tr> <td>$^{87}\text{Sr}^{2+}$</td> <td>38</td> <td>49</td> <td>36</td> </tr> </tbody> </table> <p>fluorine protons AND neutrons correct</p> <p>magnesium neutrons AND electrons correct</p> <p>phosphorus protons AND neutrons correct</p> <p>phosphorus electrons correct</p> <p>strontium protons AND neutrons correct</p> <p>strontium electrons correct</p>		number of protons	number of neutrons	number of electrons	^{19}F	9	10	9	^{26}Mg	12	14	12	$^{31}\text{P}^{3-}$	15	16	18	$^{87}\text{Sr}^{2+}$	38	49	36
	number of protons	number of neutrons	number of electrons																		
^{19}F	9	10	9																		
^{26}Mg	12	14	12																		
$^{31}\text{P}^{3-}$	15	16	18																		
$^{87}\text{Sr}^{2+}$	38	49	36																		

Question 10

1(b)(i)	(substance that) cannot be split up / broken down into (two or more) simpler substances by chemical means OR (substance) made of atoms with the same atomic number / number of protons / proton number	1
1(b)(ii)	(two or more) elements joined or combined or bonded (together)	1
1(b)(iii)	(particle) containing different numbers of protons and electrons OR atom or group of atoms that has gained or lost an electron / electrons	1

Question 11

Question	Answer	Marks																				
2(a)	<u>atoms</u> of the same element / <u>atoms</u> with the same proton number / <u>atoms</u> with the same atomic number	1																				
	different neutron number / different nucleon number / different mass number	1																				
2(b)	<table border="1"> <thead> <tr> <th></th> <th>carbon</th> <th>silicon</th> <th></th> </tr> </thead> <tbody> <tr> <td>proton number</td> <td>6</td> <td>14</td> <td>M1</td> </tr> <tr> <td>electronic structure</td> <td>2,4</td> <td>2,8,4</td> <td>M2</td> </tr> <tr> <td>nucleon number</td> <td>12</td> <td>28</td> <td></td> </tr> <tr> <td>number of neutrons in one atom</td> <td>6</td> <td>14</td> <td>M3</td> </tr> </tbody> </table>		carbon	silicon		proton number	6	14	M1	electronic structure	2,4	2,8,4	M2	nucleon number	12	28		number of neutrons in one atom	6	14	M3	3
	carbon	silicon																				
proton number	6	14	M1																			
electronic structure	2,4	2,8,4	M2																			
nucleon number	12	28																				
number of neutrons in one atom	6	14	M3																			



Question 12

Question	Answer
1(a)(i)	J
1(a)(ii)	E
1(a)(iii)	D
1(a)(iv)	J
1(a)(v)	L
1(a)(vi)	D
1(b)(i)	(atoms with) same number of protons / atomic number / of same element different number of neutrons / different mass number / different nucleon number
1(b)(ii)	E AND G
1(b)(iii)	they have the same number of electrons in their outer shell

Question 13

Question	Answer
1(a)(i)	B
1(a)(ii)	A
1(a)(iii)	C
1(a)(iv)	E
1(b)	O ²⁻ M1 O M2 2-

Question 14

Question	Answer
2(a)	Si: 2 : 8 : 4 Ca ²⁺ : 2 : 8 : 8 N ³⁻ : 2 : 8



Question 15

Question	Answer
1(a)	mixture
1(b)	element
1(c)	compound
1(d)	mixture

Question 16

Question	Answer												
2(a)(i)	(two or more) atoms combined / joined / sharing electrons (by a covalent bond) / bonded												
2(a)(ii)	substance that cannot be split up / broken down / decomposed (into anything simpler) OR (substance) made of atoms with the same atomic number / number of protons / proton number												
2(b)(i)	10												
2(b)(ii)	22												
2(b)(iii)	A AND B												
2(b)(iv)	A AND B												
2(b)(v)	C AND D												
2(c)	<table border="1"> <thead> <tr> <th></th> <th>number of protons</th> <th>number of electrons</th> </tr> </thead> <tbody> <tr> <td>Na</td> <td>11</td> <td>11</td> </tr> <tr> <td>S²⁻</td> <td>16</td> <td>18</td> </tr> <tr> <td>Cl₂</td> <td>34</td> <td>34</td> </tr> </tbody> </table>		number of protons	number of electrons	Na	11	11	S ²⁻	16	18	Cl ₂	34	34
	number of protons	number of electrons											
Na	11	11											
S ²⁻	16	18											
Cl ₂	34	34											



Question 17

Question	Answer
1(a)	a substance made from two (or more) elements chemically combined

Question 18

Question	Answer
2(a)	calcium / Ca
2(b)	7
2(c)	4
2(d)(ii)	^{286}Fl 114p 172n 114e
	^{289}Fl 114p 175n 114e

Question 19

Question	Answer				
3	particles	number of protons	number of electrons	number of neutrons	number of nucleons
				12 (1)	
		17 (1)	18 (1)		37 (1)
	Fe (1) 2+ (1)				



Question 20

Question	Answer
2(a)(i)	similarities: number of protons and electrons
	differences: number of neutrons
2(a)(ii)	nucleons: 27
	neutrons: 14
	electrons: 10

Question 21

Question	Answer
2(a)	M1 11 M2 18 M3 2.8.8 M4 -1
2(b)	A and B
2(c)	Li / Lithium
2(d)	it has a complete or full or 8 electrons in the outer shell

Question 22

Question	Answer
2(a)	2 : 8 : 8 : 2
2(b)(i)	M1 Same number of (or 2) outer electrons
2(b)(ii)	M2 (Sr has) outer electrons are in the 5th shell



Question 23

Question	Answer			
2(a)	number of protons	electrons	electronic structure	charge on particle
	11	10	2,8	M4 1+ / +1(1)
	M1 18(1)	18	M3 2,8,8(1)	0
	M2 9(1)	10	2,8	1-
2(b)(i)	<i>element</i> EITHER (substance) made of atoms with the same atomic number / number of protons / proton number OR a substance that cannot be split up / broken down into two or more simple(r) substances by chemical means			
2(b)(ii)	M1 6 protons in all three rows(1) M2 6,7 and 8 neutrons(1)			

Question 24

Question	Answer
1(a)	number of protons (1) protons in the nucleus (of an atom) (1)
1(b)(i)	12p 12n 12e (1) 12p 14n 12e (1)
1(b)(ii)	isotope(s)
1(b)(iii)	same number of electrons (1) (same number) of electrons in the outer shell (1)
1(c)	${}^9_4\text{Be}$ any element symbol with a single negative charge (1) use of Cl (1) use of ${}^{37}_{17}$ (1)
1(d)	2 8 3 (1) 2 8 8 (1)



Question 25

Question	Answer
2(a)(i)	M1 protons (are the same) / 11 protons (1) M2 electrons (are the same) / 11 electrons (1) M3 neutrons (are different) / 11,12,13 neutrons (1)
2(a)(ii)	same number of protons and electrons (1)
2(a)(iii)	M1 same number of electrons (1) M2 (same number of) electrons in outer shell (1)
2(a)(iv)	(they all have) 1 more proton than electrons / 11 protons and 10 electrons

Question 26

Question	Answer																
1(a)	<table border="1"> <thead> <tr> <th>particle</th> <th>where found in an atom</th> <th>relative mass</th> <th>relative charge</th> </tr> </thead> <tbody> <tr> <td>electron</td> <td>orbiting nucleus</td> <td>1/1840</td> <td>-1</td> </tr> <tr> <td>proton</td> <td>(in the) nucleus</td> <td>1</td> <td>+1</td> </tr> <tr> <td>neutron</td> <td>in the nucleus</td> <td>1</td> <td>0 / nil</td> </tr> </tbody> </table>	particle	where found in an atom	relative mass	relative charge	electron	orbiting nucleus	1/1840	-1	proton	(in the) nucleus	1	+1	neutron	in the nucleus	1	0 / nil
particle	where found in an atom	relative mass	relative charge														
electron	orbiting nucleus	1/1840	-1														
proton	(in the) nucleus	1	+1														
neutron	in the nucleus	1	0 / nil														
1(b)	M1 electrons 18 M2 neutrons 24 M3 protons 20																

Question 27

Question	Answer
2(a)	difference: M1 (number of) neutrons similarities: M2 (number of) protons M3 (number of) electrons
2(b)(i)	M1 same number of electrons M2 (same number of) electrons in outer shell



Question 28

Question	Answer
2(a)	<u>atoms</u> with same number of protons or <u>atoms</u> of the same element or <u>atoms</u> with same atomic number (1) <u>atoms</u> with different number of neutrons or <u>atoms</u> with different mass number or <u>atoms</u> with different nucleon number (1)
2(b)(i)	18
2(b)(ii)	gain of two electrons
2(b)(iii)	Ca / calcium

Question 29

Question	Answer	Marks																
1(a)	<table border="1"> <thead> <tr> <th>particle</th> <th>charge</th> <th>relative mass</th> </tr> </thead> <tbody> <tr> <td>electron</td> <td>M1 -1</td> <td></td> </tr> <tr> <td>neutron</td> <td>M2 0</td> <td>M3 1</td> </tr> <tr> <td>proton</td> <td></td> <td>M4 1</td> </tr> </tbody> </table> <p style="text-align: center;">(1) (1)</p> <p>Mark by column</p>	particle	charge	relative mass	electron	M1 -1		neutron	M2 0	M3 1	proton		M4 1	2				
particle	charge	relative mass																
electron	M1 -1																	
neutron	M2 0	M3 1																
proton		M4 1																
1(b)	<table border="1"> <thead> <tr> <th>number of electrons</th> <th>number of neutrons</th> <th>number of protons</th> <th>symbol</th> </tr> </thead> <tbody> <tr> <td>M1 13 (1)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>M2 10 (1)</td> <td>M3 13 (1)</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>M4 19 9 (1) M5 F (1) M6 - (1)</td> </tr> </tbody> </table>	number of electrons	number of neutrons	number of protons	symbol	M1 13 (1)				M2 10 (1)	M3 13 (1)						M4 19 9 (1) M5 F (1) M6 - (1)	6
number of electrons	number of neutrons	number of protons	symbol															
M1 13 (1)																		
M2 10 (1)	M3 13 (1)																	
			M4 19 9 (1) M5 F (1) M6 - (1)															

Question 30

Question	Answer	Marks
1(a)(i)	protons	1
	neutrons	1
1(a)(ii)	nucleon number	1
1(a)(iii)	34	1
1(a)(iv)	2 : 8 : 8	1
1(a)(v)	Al_2X_3	1
1(b)(i)	isotopes	1
1(b)(ii)	^{12}C	1



Question 31

Question	Answer			Marks	
3(a)(i)	same number of electrons same electronic configuration			2	
3(a)(ii)		number of electrons	number of neutrons	number of protons	3
	$^{35}_{17}\text{Cl}$	17	18	17	
	$^{37}_{17}\text{Cl}^-$	18	20	17	

Question 32

Question	Answer	Marks
2(a)	11	1
2(b)	38	1
2(c)	2,8,8	1
2(d)(i)	B, C and E	1
2(d)(ii)	A	1
2(d)(iii)	D	1
2(d)(iv)	B and C	1

Question 33

Question	Answer	Marks
1(a)(i)	E	1
1(a)(ii)	A I	2
1(a)(iii)	D G	2
1(a)(iv)	F	1
1(a)(v)	H	1
1(v)(i)	G and I	1
1(v)(ii)	A	1
1(v)(iii)	B	1
1(b)	same proton number different neutron number	2



Question 34

Answer
Mg: 12 and 13 (1) Cu ²⁺ : 29 and 27 (1) 37(above) and 17(below) (1) Cl (1) 1- (1)

Question 35

Question	Answer												
2(a)(i)	isotopes												
2(a)(ii)	mark by row <table border="1" data-bbox="340 1228 690 1495"> <thead> <tr> <th></th> <th>¹⁰⁷Ag</th> <th>¹⁰⁹Ag⁺</th> </tr> </thead> <tbody> <tr> <td>p</td> <td>47</td> <td>47</td> </tr> <tr> <td>n</td> <td>60</td> <td>62</td> </tr> <tr> <td>e</td> <td>47</td> <td>46</td> </tr> </tbody> </table>		¹⁰⁷ Ag	¹⁰⁹ Ag ⁺	p	47	47	n	60	62	e	47	46
	¹⁰⁷ Ag	¹⁰⁹ Ag ⁺											
p	47	47											
n	60	62											
e	47	46											

Question	Answer
2(a)(iii)	average / mean ¹² C 12

Question 36

Answer
B: 5 and 6 (1) Cl ⁻ : 18 and 18 (1) 54 and 24 (1) Cr (1) 3 ⁺ (1)



Question 37

Question	Answer	Marks												
2(a)(i)	isotopes	1												
2(a)(ii)	1 mark for each correct row <table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th>^{63}Cu</th> <th>$^{65}\text{Cu}^{2+}$</th> </tr> </thead> <tbody> <tr> <td>p</td> <td>29</td> <td>29</td> </tr> <tr> <td>n</td> <td>34</td> <td>36</td> </tr> <tr> <td>e</td> <td>29</td> <td>27</td> </tr> </tbody> </table>		^{63}Cu	$^{65}\text{Cu}^{2+}$	p	29	29	n	34	36	e	29	27	3
	^{63}Cu	$^{65}\text{Cu}^{2+}$												
p	29	29												
n	34	36												
e	29	27												
2(a)(iii)	<p>M1 = $(70 \times 63) + (30 \times 65)$ or $[(4410) + (1950)]$ or 6360 (1)</p> <p>M2 = $M1 / 100 = 63.6$ (1)</p> <p>OR</p> <p>M1 = $(0.7(0) \times 63) + (0.3(0) \times 65)$ or $[(44.1(0)) + (19.5(0))]$ (1)</p> <p>M2 = 63.6 (1)</p>	2												

Question 38

Question	Answer	Marks																
3(a)	1 mark for each correct row <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Name</th> <th>Relative mass</th> <th>Relative charge</th> </tr> </thead> <tbody> <tr> <td>Proton</td> <td>1</td> <td>+1</td> </tr> <tr> <td>Neutron</td> <td>1</td> <td>0</td> </tr> <tr> <td>Electron</td> <td>1 / 1840</td> <td>-1</td> </tr> </tbody> </table>	Name	Relative mass	Relative charge	Proton	1	+1	Neutron	1	0	Electron	1 / 1840	-1	3				
Name	Relative mass	Relative charge																
Proton	1	+1																
Neutron	1	0																
Electron	1 / 1840	-1																
3(b)	<table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Particle</th> <th>Number of protons</th> <th>Number of neutrons</th> <th>Number of electrons</th> </tr> </thead> <tbody> <tr> <td>$^{32}_{16}\text{S}$</td> <td>16</td> <td>16</td> <td>16</td> </tr> <tr> <td>$^{39}_{19}\text{K}^+$</td> <td>19</td> <td>20</td> <td>18</td> </tr> <tr> <td>$^{79}_{35}\text{Br}^-$</td> <td>35</td> <td>44</td> <td>36</td> </tr> </tbody> </table> <p>M1 = row 1 (1) M2 = row 2 (1) M3 = Br (1) M4 = $^{79}_{35}$ (on left of any symbol) (1) M5 = charge (on any symbol) (1)</p>	Particle	Number of protons	Number of neutrons	Number of electrons	$^{32}_{16}\text{S}$	16	16	16	$^{39}_{19}\text{K}^+$	19	20	18	$^{79}_{35}\text{Br}^-$	35	44	36	5
Particle	Number of protons	Number of neutrons	Number of electrons															
$^{32}_{16}\text{S}$	16	16	16															
$^{39}_{19}\text{K}^+$	19	20	18															
$^{79}_{35}\text{Br}^-$	35	44	36															



Question 39

Question	Answer	Marks						
4(a)	1 mark for each row <table border="1" style="margin-left: 20px;"> <tr> <td>6</td> <td>6</td> <td>6</td> </tr> <tr> <td>6</td> <td>6</td> <td>7</td> </tr> </table>	6	6	6	6	6	7	2
6	6	6						
6	6	7						

Question 40

Question	Answer	Marks						
2(a)(ii)	<table border="1" style="margin-left: 20px;"> <tr> <td>12</td> <td>12</td> <td>12 (1)</td> </tr> <tr> <td>12</td> <td>13</td> <td>12 (1)</td> </tr> </table> <p>Mark by row</p>	12	12	12 (1)	12	13	12 (1)	2
12	12	12 (1)						
12	13	12 (1)						
2(a)(iii)	(they have) 2 more protons than electrons OR (they have) 2 fewer electrons than protons OR (they have) 12 protons and 10 electrons	1						
2(b)	Na ⁺ or Al ³⁺ (1) F ⁻ or O ²⁻ or N ³⁻ (1) Ne (1)	3						

Question 41

Question	Answer	Marks
3(a)(i)	atom(s) of the same element with different number of neutrons	2
3(a)(ii)	55	1
3(a)(iii)	24 protons; 28 neutrons; 21 electrons	3



Question 42

Question	Answer	Marks
2(a)(i)	number of protons (are the same) / 16 protons (1) number of electrons (are the same) / 16 electrons (1) number of neutrons (are different) / 16,17 neutrons (1)	3
2(a)(ii)	number of protons is the same as (the number of) electrons	1
2(a)(iii)	same number of (outer shell) electrons	1
2(b)(i)	(they have) two more electrons than protons	1
2(b)(ii)	P ³⁻ OR Cl ⁻ (1) K ⁺ OR Ca ²⁺ (1)	2

Question 43

2(c)(i)	isotope(s)	1												
2(c)(ii)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>⁶Li</th> <th>⁷Li⁺</th> </tr> </thead> <tbody> <tr> <td>protons</td> <td>3</td> <td>3</td> </tr> <tr> <td>neutrons</td> <td>3</td> <td>4</td> </tr> <tr> <td>electrons</td> <td>3</td> <td>2</td> </tr> </tbody> </table> <p>each row ✓</p>		⁶ Li	⁷ Li ⁺	protons	3	3	neutrons	3	4	electrons	3	2	3
	⁶ Li	⁷ Li ⁺												
protons	3	3												
neutrons	3	4												
electrons	3	2												
2(c)(iii)	M1 $(6 \times 10) + (7 \times 90) (= 690)$ (1) M2 $690 / 100 = 6.9$ (1)	2												

Question 44

2(b)(i)	M1 different atoms of the same element with the same number of protons (1) M2 different numbers of neutrons (1)	2
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Question	Answer	Marks
2(b)(ii)	M1 $10 \times 20 + 11 \times 80 (= 1080)$ (1) M2 $(1080 \div 100 =) 10.8$ (1)	2



Question 45

Question	Answer	Marks
2(a)	M1 5p and 5e (1) M2 6n (1)	2
2(b)(i)	20%	1

Question 46

Question	Answer	Marks												
2(a)(i)	<table border="1"> <thead> <tr> <th></th> <th>⁵⁹Co</th> <th>⁶⁵Cu²⁺</th> </tr> </thead> <tbody> <tr> <td>protons</td> <td>27</td> <td>29</td> </tr> <tr> <td>neutrons</td> <td>32</td> <td>36</td> </tr> <tr> <td>electrons</td> <td>27</td> <td>27</td> </tr> </tbody> </table> <p>one mark for each correct row</p>		⁵⁹ Co	⁶⁵ Cu ²⁺	protons	27	29	neutrons	32	36	electrons	27	27	3
	⁵⁹ Co	⁶⁵ Cu ²⁺												
protons	27	29												
neutrons	32	36												
electrons	27	27												
2(a)(ii)	M1 $(63 \times 70) + (65 \times 30) = 6360$ (1) M2 $6360 / 100 = 63.6$ (1)	2												

Question 47

Question	Answer	Marks
2(a)(i)	A, B, F	1
2(a)(ii)	D	1
2(a)(iii)	C	1
2(b)	5	1
2(c)	33	1
2(d)	2,8,8	1
2(e)	5	1
2(f)	2	1

Question 48

Question	Answer	Marks
2(a)	2, 8, 8, 2	1
2(b)(i)	same number of (OR 2) outer electrons	1
2(b)(ii)	(Sr has) outer electrons in the 5th shell / different numbers of shells	1



Question 49

1(f)(i)	2,8	1
1(f)(ii)	M1 26 (protons) M2 23 (electrons)	2

Question 50

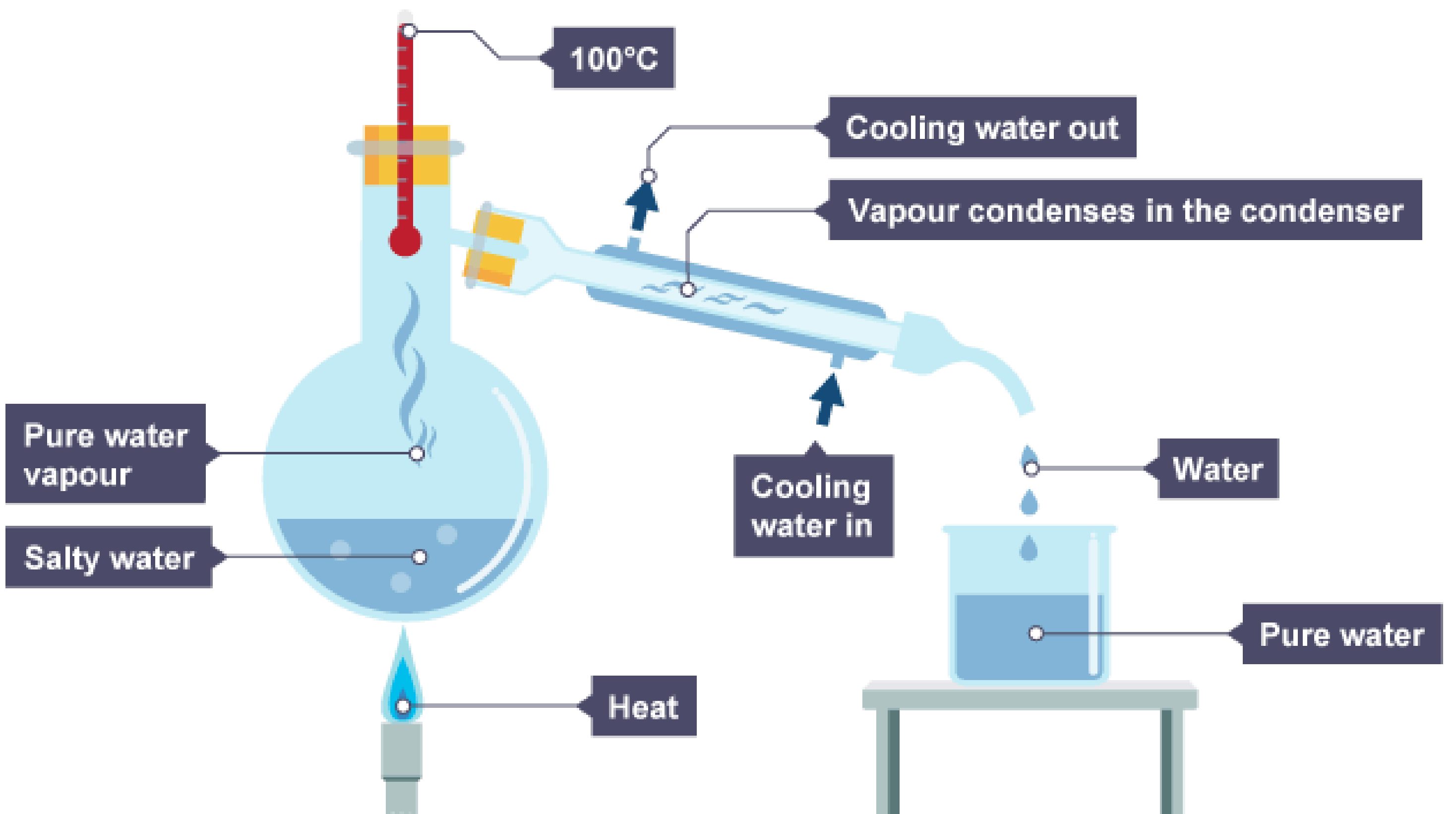
Question	Answer	Marks
2	M1 : Cl: 17 AND 20 (1) M2 Cu ⁺ : 29 AND 28 (1) M3 33(above) and 16(below) on left hand side of symbol (1) M4 S (1) M5 2 ⁻ (1)	5

Question 51

Question	Answer	Marks
2(a)	total number of protons and neutrons in the nucleus of an atom	1
2(b)	they are the same	1
2(c)	M1 2,8,4 M2 2,8,8	2
2(d)	M1 12n + 11e M2 10e M3 Ga M4 69 above 31 and to the left of the symbol M5 charge of 3 +	5
2(e)(i)	M1 atom(s) of the same element M2 with different number of neutrons	2
Question	Answer	Marks
2(e)(ii)	M1 (3 × 203) AND (7 × 205) (= 2044) M2 204.4	2
2(e)(iii)	same number of electrons / same electronic configuration	1



Topic 14



Question 1

1(c)	filtration	1
1(d)	fractional distillation	1 1
1(e)	add / mix / stir / dissolve / shake / heat with water filter / decant heat (filtrate) or (leave filtrate to) evaporate	1 1 1

Question 2

7(c)(i)	$\frac{\text{distance moved by substance}}{\text{distance moved by solvent (front)}}$	1
7(c)(ii)	circle around top spot	1
7(c)(iii)	mixture of amino acids is placed as a spot onto a (pencil) baseline placed into a (suitable) solvent / water a locating agent is added to the (finished) chromatogram (to reveal spots)	

Question 3

6(c)(ii)	hydrolysis chromatography (spray with) locating agent / UV determine R_f values / compare with standards	1 1 1 1
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Question 4

Question	Answer
1(a)(i)	fractional distillation
1(a)(ii)	chromatography
1(a)(iii)	fermentation / ferment
1(a)(iv)	(simple) distillation / distil
1(a)(v)	filtration / decantation / centrifugation

Question 5

5(e)(i)	locating ((re)agent)	1
5(e)(ii)	$\frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$	1
5(e)(iii)	compare to known data	1
5(e)(iv)	similar R_f values	1



Question 6

1(b)	dissolving	1
	filtration	1
	evaporation / crystallisation	1
	three correct stages in the correct order	1
1(c)(i)	condenser	1
	arrow pointing into lower aperture only	1
1(c)(ii)	stopper shown in diagram	1
	gases or vapours escape	1
1(c)(iii)	(mixture is) (in)flammable	1
1(c)(iv)	water bath cannot exceed 100 (°C)	1
	C AND D have a boiling point above 100 (°C)	1

Question 7

Question	Answer	Marks
1(a)	distillation	1
1(b)	electrolysis	1
1(c)	filtration	1
1(d)	fractional distillation / fractionation	1
1(e)	chromatography	1

Question 8

5(c)(i)	(Liebig) condenser	1
5(c)(ii)	arrow at the lower inlet	1

Question 9

4(c)(i)	more than one spot	1
4(c)(ii)	0.8 (circled)	1
4(c)(iii)	use a locating agent	1

Question 10

4(b)(i)	fractional (1)	2
	distillation (1)	
4(b)(ii)	(different) boiling point	1



Question 11

1(d)(i)	dissolving
1(d)(ii)	precipitation

Question 12

4(c)	filtrate
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Question 13

4(c)	residue	1
4(d)(i)	saturated	1
4(d)(ii)	solubility (of MgSO_4 / solid) decreases (as temperature decreases)	1

Question 14

6(c)(iii)	M1 chromatography (1) M2 locating agent (1) M3 R_f (1)
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Question 15

1(c)	filtration	1
1(d)	catalytic addition	1
1(e)	chromatography	1
1(f)	fractional distillation	1

Question 16

6(e)	M1 <u>distance travelled by substance</u> M2 distance travelled by solvent	2
6(f)(i)	pencil is insoluble (in solvent)	1
6(f)(ii)	locating agent	1
6(f)(iii)	same R_f value	1
6(f)(iv)	use a different solvent	1

