BTEC

L3 Lead Examiner Report 2001

January 2020

L3 Qualification in Applied Science

Unit 1: Principles and Applications of Science I (31617H)

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Grade Boundaries

What is a grade boundary?

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade, at Distinction, Credit and Pass.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the external assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark is for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments

Each external assessment we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each assessment, because then it would not take accessibility into account.

Grade boundaries for this, and all other papers, are on the website via this link:

http://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html

Unit 1: Principles and Applications of Science I

Grade	Unclassified	Level 3			
		N	P	M	D
Boundary Mark	0	15	30	47	64

Introduction to the Overall Performance of the Unit

Biology

Exam technique and the understanding of the command verbs is continuing to improve. It is beneficial for learners to appreciate the requirement of each of the command verbs so that they can target their response and provide appropriate credit worthy answers. Explain is the command verb which seems least understood. Learners' explanations require a justification/ exemplification of a point. The answer must contain some element of reasoning/justification – this can include mathematical explanations. Centres need to fully prepare learners for the exam by practising exam technique, especially in relation to reading the question carefully and not repeating the stem of the question. Learners should also be taught that when they have answered the question to reread their response in order to ensure that the question set has been addressed in the answer they have given, and that they have used appropriate scientific knowledge and vocabulary. Learners should show that they understand the relationship between the structure and function of cells and tissues. Learners still struggle to recall definitions and find it difficult to provide links between different related aspects of the specification. The extended response question demonstrated that learners could use the information provided to develop a well structured discussion, but didn't necessarily realise that they were also required to bring in their own knowledge to identify the issue that is being assessed in the question and then explore all aspects of an issue through reasoning or argument.

Chemistry

This was the sixth sitting of the level 3 applied science Unit 1 chemistry section and the third time the paper has been sat separately to the other disciplines that makes up the unit. It is clear that centres are being more proactive with their learners, ensuring that they are aware of the content being tested using the additional guidance document and practising questions using the past papers available. This approach with learners has meant that fewer blank spaces were seen and many more learners were achieving marks across the whole of the paper.

Learners that were successful this year were able to perform the given calculations using clear and logical working. They were able to understand and use scientific vocabulary in the correct context and apply their knowledge of chemistry explain trends in data and ideas. Their knowledge of basic scientific terminology allowed them to access questions and apply ideas.

Physics

The examination paper tested knowledge of applications of science and the ability of learners to understand, interpret and analyse scientific information in the context of waves and communication. The majority of learners were able to substitute in to equations and set out calculations so that the substitution and rearrangement could be easily identified however the use of standard form requires more practise as does the use of prefixes on units, such as n meaning 'nano'. Learners then need to know how these units are converted to SI units for use in equations. The symbol λ was recognised by most learners as the wavelength of a wave. Learners are still giving answers to a large number of decimal places and should be encouraged to use standard form and no more than three significant figures.

Learners need to be more accurate in both descriptions and sketches for although most learners were able to roughly sketch an analogue signal there was not enough care taken to make sure that parts of the wave did not reverse with time or had no vertical or horizontal sections. Similarly in explaining effects the correct scientific words must be used and they must be referenced to particular points when a diagram is used.

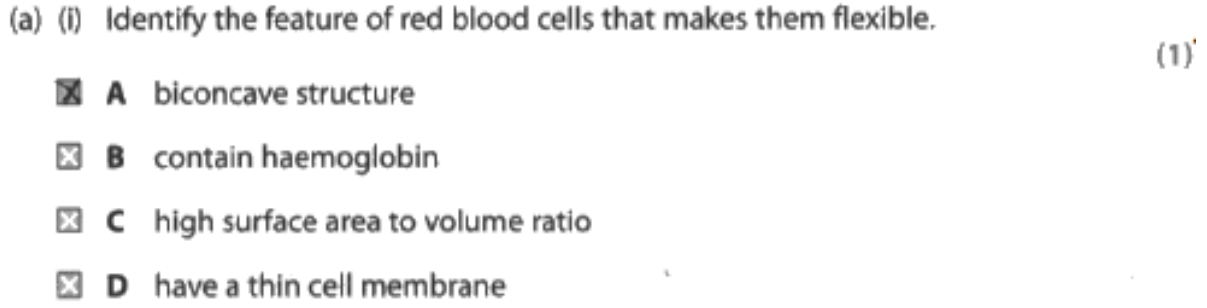
Only a few learners were able to explain why hydrogen atoms produce light of different frequencies although the explanation is given briefly in the additional guidance document for the unit. The majority of learners did not realise that electrons were essential to this process. Learners will find it helpful to use the additional guidance to amplify the essential content in the specification.

Individual Questions: Biology

Q1(a)(i)

The majority of learners were able to correctly identify the feature of red blood cells which flexibility from the multiple choice responses.

This response was awarded 1 mark.


(a) (i) Identify the feature of red blood cells that makes them flexible.

(1)

☒ A biconcave structure

☒ B contain haemoglobin

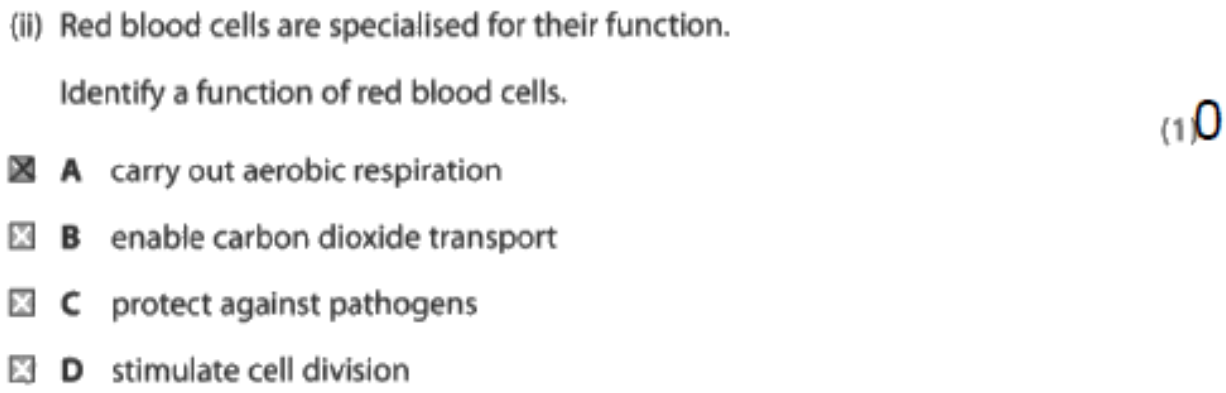
☒ C high surface area to volume ratio

☒ D have a thin cell membrane

There were quite a few students who attempted to make an educated guess at endoplasmic reticulum.

Q1(a)(ii)

Learners are more familiar with the more obvious primary function of enabling oxygen transport and overlooked the role of red blood cells in gaseous exchange. Therefore some learners gave the incorrect response, usually selecting option A, for the link to aerobic respiration.


(ii) Red blood cells are specialised for their function.

Identify a function of red blood cells.

(1) 0

☒ A carry out aerobic respiration

☒ B enable carbon dioxide transport

☒ C protect against pathogens

☒ D stimulate cell division

Q1(b)(i)

This question was answered quite well overall. Many learners correctly calculated the percentage decrease and the vast majority at least calculated the difference between the two diameters to achieve Marking Point 1.

This response was awarded 3 marks. As 20 is the correct response and so is awarded full marks. Any positive or negative sign can be ignored as we presume the decrease is being calculated.

(i) Calculate the percentage **decrease** in the diameter of the lumen in artery B compared with the lumen in artery A.

Show your working.

$3.40 - 2.72 = 0.68$

-20% (3)

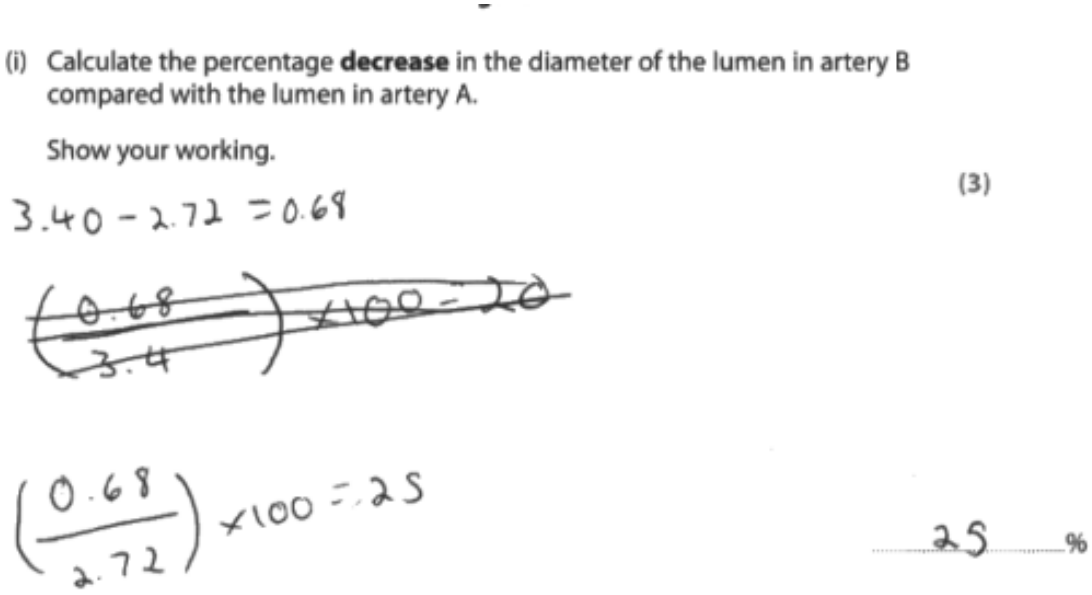
$\frac{0.68}{3.40} \times 100 = 20\%$

20 %

Common incorrect answers included:
80% - working out what was left rather than what was gone;
25% - dividing by the new diameter rather than the original diameter;
68% - simply working out the difference and multiplying by 100.

Other sources of error include students rounding numbers prior to performing the calculations, dividing the difference by the diameter of artery B rather than by artery A and, among those learners who used the second method of working out the diameter of artery B as a percentage of artery A, failing to complete the final processing step of subtracting this percentage from 100% to work out the percentage decrease.

This response was awarded 2 marks. The learner has correctly calculated the difference. They haven't divided this value by the original- they have divided by 2.72 instead of 3.40 but they have then multiplied this by 100.



(i) Calculate the percentage **decrease** in the diameter of the lumen in artery B compared with the lumen in artery A.

Show your working.

(3)

$3.40 - 2.72 = 0.68$

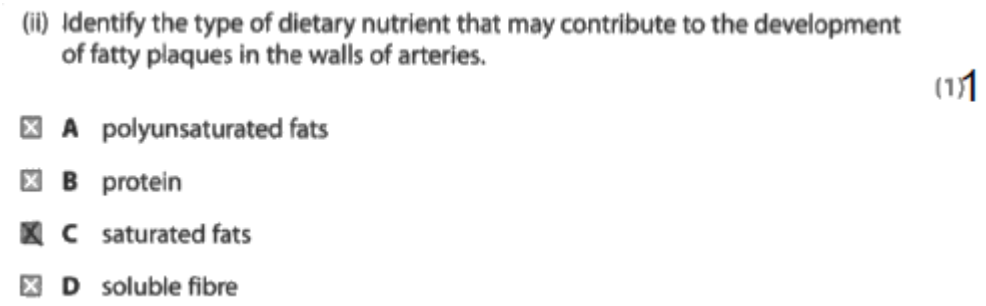
$\left(\frac{0.68}{3.4}\right) \times 100 = 20$

$\left(\frac{0.68}{2.72}\right) \times 100 = .25$

25 %

Q1(b)(ii)

A high proportion of learners could use their knowledge for the development of atherosclerosis and correctly identify saturated fats from the multiple choice responses.



(ii) Identify the type of dietary nutrient that may contribute to the development of fatty plaques in the walls of arteries.

(1) 1

☒ **A** polyunsaturated fats

☒ **B** protein

☒ **C** saturated fats

☒ **D** soluble fibre

Q1(b)(iii)

Most candidates managed to achieve at least Marking Point 1 on this question with a good amount achieving Marking Point 2 as well.
It was very common to see Marking Point 1 repeated, often by rewording the credit-worthy information or by applying it to a different part of the graph, for example saying that smoking increased the risk of atherosclerosis in the aorta and then saying the same for the coronary arteries.

This response was awarded 2 marks. The learner has made a correct statement about the increased risk of atherosclerosis in the aorta for smokers. The learner has also made a further statement about the more frequent diagnosis in the coronary arteries. The learner has also given a third creditworthy statement about the higher proportionally in the aorta, which would have gained a mark but maximum marks have already been given.

State, using information from Graph 1, **two** observations about the effect of smoking on the development of atherosclerosis.

(2)

1 That the percentage of smokers at risk to aortic atherosclerosis is higher than the non smokers (from 17% to 33%)

2 People (Non Smoking + Smoking) are more frequently diagnosed with atherosclerosis of the Coronary arteries however Smoking increases the risk significantly from 30 to nearly 50%

(Total for Question 1 = 8 marks)

Knowledge was often poor, with some candidates confusing coronary arteries and the aorta for diseases. Some students either did not understand the question or were unable to read a graph so just described arthrosclerosis and its development.

This response was awarded 1 mark. The learner has stated the smokers have a higher risk of atherosclerosis for 1 mark but has not given a sufficient comparison between the arteries for mp2. Therefore they have given mp1 twice.

State, using information from Graph 1, **two** observations about the effect of smoking on the development of atherosclerosis.

(2)

1 for coronary arteries if you smoke you are likely to develop artherosclerosis ~~more as~~ 27% more

2 for aorta if you smoke you are more likely to develop as around 33% have and only 27% have who don't smoke

(Total for Question 1 = 8 marks)

Q2(a)

Learners tended to be able to correctly identify the organelle from an electron micrograph. This response was awarded 1 mark.

2 Figure 3 shows an electron micrograph of a plant cell.

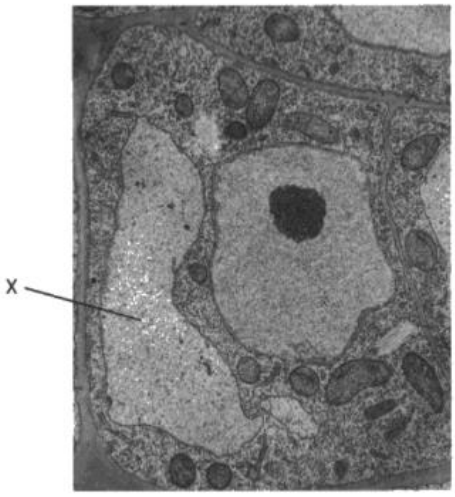


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Figure 3

(a) Name the structure labelled X in Figure 3.

Vacuole

Q2(b)(i)

Unfortunately learners are often unable to recall the definitions of key terms and phrases from the specification. In this item the learner was required to complete the sentence using their knowledge of cell theory. Organelle was accepted but some learners even gave membrane bound organelle. The most common incorrect response seen was "cell" indicating that the learner had not sense checked their word by reading the whole statement.

This response was awarded 1 mark.

(b) Palisade cells in a plant contain a large number of chloroplasts.

(i) Complete Sentence 1.

(1)

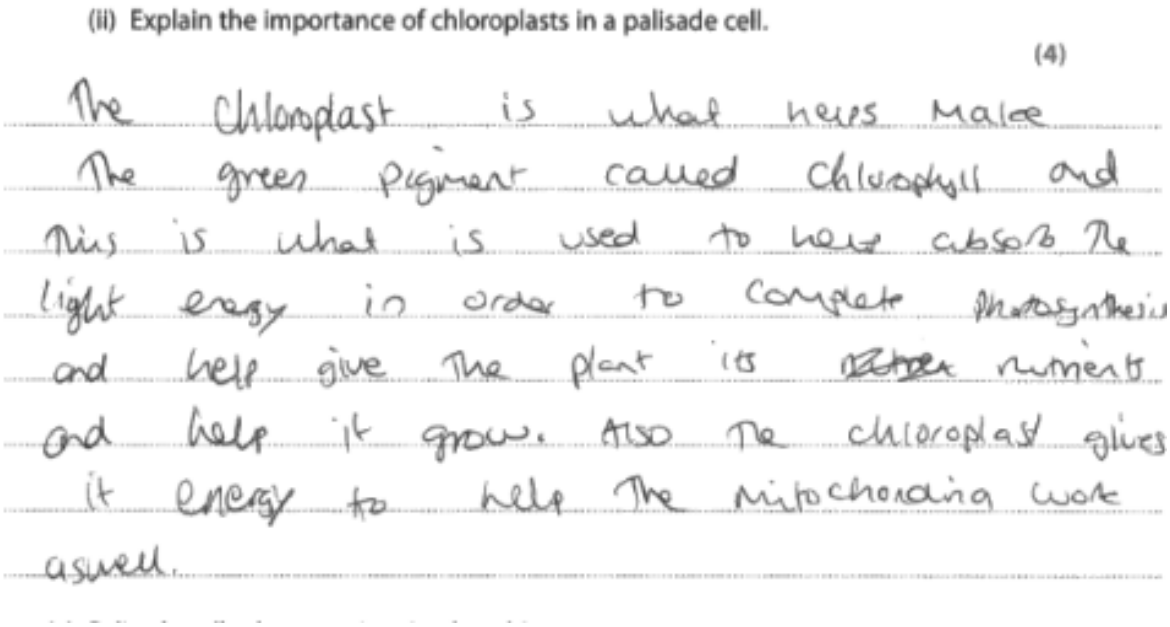
A chloroplast is a type of membrane bound ~~cell~~ organelle. found in palisade cells.

Sentence 1

Q2(b)(ii)

This question was generally well answered with most candidates achieving at least 2 marks and many achieving 3 or 4. The most commonly achieved marking points were MP1, 2, 3, 4, 6. Many candidates referred to chloroplasts being the site of photosynthesis (mp 4) and described their role in taking in / absorbing light energy (mp3). Some candidates were able to include all the details of the equation for photosynthesis which covered a number of marking points and was sufficient for an explanation.

This response was awarded 4 marks. The learner has stated that the chloroplast contains chlorophyll (Mp1) and carries out photosynthesis (mp4)
The learner has also stated that light energy is absorbed for MP2.
Light alone would be acceptable but unqualified energy (like towards the end of this response "gives it energy to help) could be too vague to award a mark, so unless the context is clear the type of energy should be stated. The learner has also stated that this helps it grow (mp9) and so 4 marks are awarded.



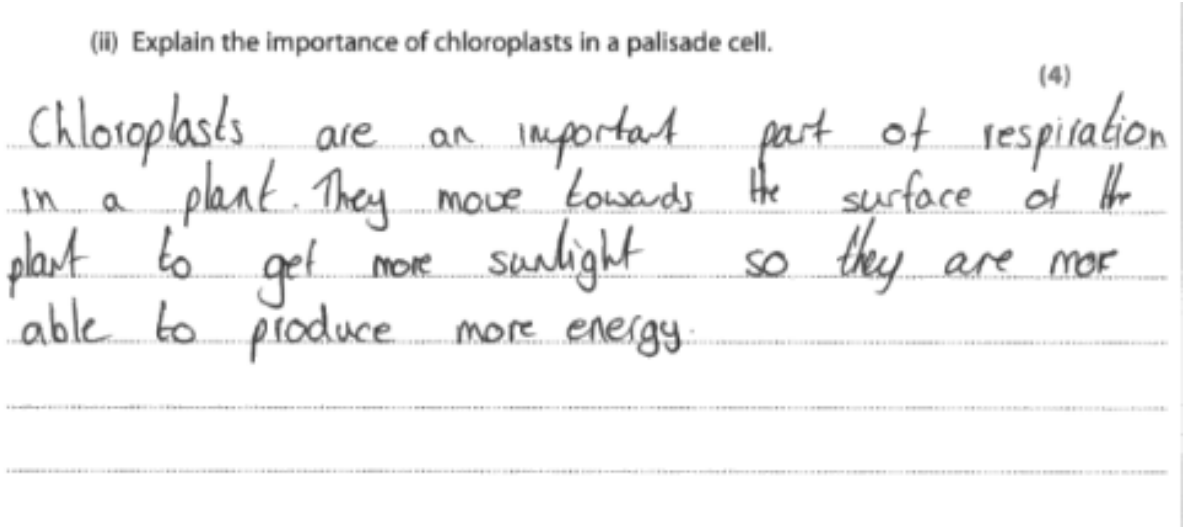
(ii) Explain the importance of chloroplasts in a palisade cell.

(4)

The Chloroplast is what helps Make The green pigment called Chlorophyll and this is what is used to help absorb the light energy in order to complete photosynthesis and help give the plant its nutrients and help it grow. Also the chloroplast gives it energy to help the Mitochondria work aswell.

Of the observed errors, the most common were the reference to glucose as food and stating that photosynthesis directly released energy, either by mistaking chloroplasts for mitochondria, or missing out a large number of steps between photosynthesis and respiration. A significant number of learners appear to have misunderstood the question and provided information about the structure of the leaf, which was not credit-worthy.

This response was awarded 1 mark. Unfortunately the learner's response seems to confuse respiration with photosynthesis and without the linkage of the products from photosynthesis being available for respiration a mark cannot be awarded. The learner has given enough in "get more sunlight" to allow for MP 2 to be awarded.



(ii) Explain the importance of chloroplasts in a palisade cell.

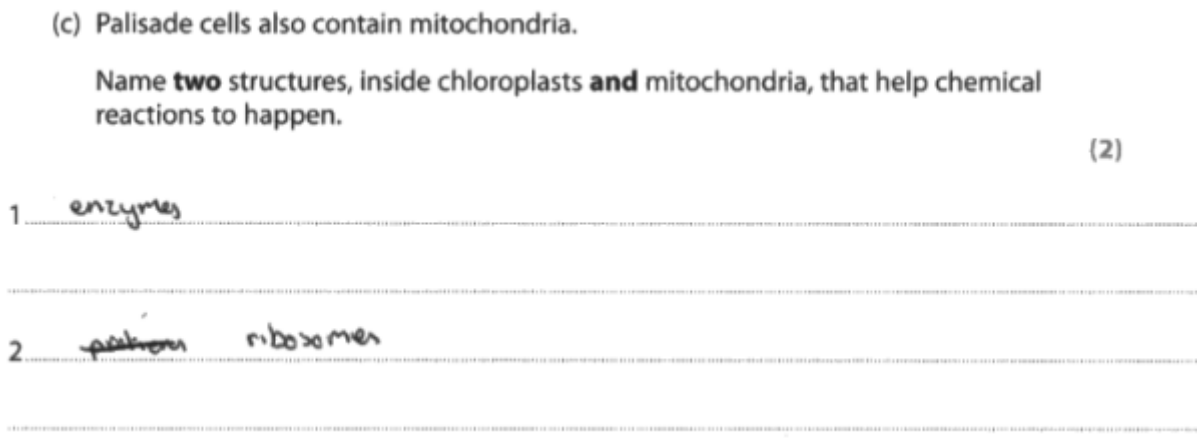
(4)

Chloroplasts are an important part of respiration in a plant. They move towards the surface of the plant to get more sunlight so they are more able to produce more energy.

Q2(c)

This question was very poorly answered in general, with the majority of observed answers failing to achieve the full two marks and many left this question blank. Of those candidates who were able to provide a credit-worthy answer, it was almost exclusively either MP5 or MP6 that was obtained for 'enzymes' or 'ribosomes'. Less frequently obtained were MPs 1 for 'matrix' and MP2 for 'folded membrane', 'cristae' and 'granum'.

This response was awarded 2 marks. The learner has given 2 acceptable responses from the list of possible responses.


(c) Palisade cells also contain mitochondria.

Name **two** structures, inside chloroplasts **and** mitochondria, that help chemical reactions to happen.

(2)

1 enzymes

2 ~~protein~~ ribosomes

Many respondents misunderstood the questions, referring to substances such as chlorophyll and ATP, or describing roles and functions of organelles instead of structure.

This response was awarded 0 marks. Unfortunately "large circular surface area" is insufficient as it refers to the circumference of the organelles and not the folded membranes.

(c) Palisade cells also contain mitochondria.

Name **two** structures, inside chloroplasts **and** mitochondria, that help chemical reactions to happen.

(2)

1 thin cell wall

2 ~~circular~~ large circular surface area

Q3(a)

Some learners struggled to recall the name of the stains involved in Gram staining. This requirement is outlined in the additional guidance which supports the specification.

Learners were more likely to recall iodine. This response was awarded 2 marks.

3 Gram staining is a technique used to classify bacteria as either Gram-positive or Gram-negative.

Figure 4 shows part of the method for the Gram staining technique.

- Prepare a heat-fixed smear of the bacterial culture on a slide.
- Add about five drops of crystal violet to the smear.
- Wash off any excess crystal violet.
- Add about five drops of X solution to the smear.
- Tilt the slide and decolourise with solvent (e.g. acetone-alcohol solution) until the purple colour stops running.
- Add about five drops of Y .
- Use a Z to observe the bacteria.

Figure 4

(a) Name chemicals X and Y in Figure 4.

(2)

X Iodine

Y Safronin

Q3(b)

Learners were able to identify the piece of equipment which is used to observe bacteria cells. Microscope alone was credited, but electron microscope was

rejected as colour would not be seen and therefore would be inappropriate for the Gram stain method.

This response was awarded 1 mark.

(b) Name the piece of equipment labelled Z in Figure 4.

(1)

z Light microscope

Q3(c)

Most learners were able to access at least MP1 in this question for mentioning a thick cell wall, while others obtained MP2 for identifying the lack of an outer membrane. Unfortunately very few scored both. It was not uncommon to see these two mixed up leading to some candidates failing to score a mark by referring to a thick membrane and an absence of a cell wall. Any references to peptidoglycan which were not qualified with 'lots of or thick' failed to achieve the marking point as the cell wall in Gram negative bacteria also consists of peptidoglycan.

This response was awarded 2 marks. Thick cell wall is correct for one mark and an under layer of single plasma membrane is sufficient for MP2 for the equivalent of describing one membrane/no outer membrane

(c) The Gram-positive bacterial cell walls appear violet/purple after the Gram staining.

Describe **two** features of Gram-positive bacterial cell walls that cause the bacteria to appear violet/purple.

(2)

1 Gram positive have a thice cell wall of peptidoglycan to absorb the crystal violet.
2 They have an under layer of single plasma membrane.

Learners often confused gram-positive and gram-negative bacteria or providing an irrelevant response such as referencing penicillin .
This response was awarded 0 marks. Unfortunately, as this was often seen, the reference to "outer layer" is too vague and so is not creditworthy.

(c) The Gram-positive bacterial cell walls appear violet/purple after the Gram staining.

Describe **two** features of Gram-positive bacterial cell walls that cause the bacteria to appear violet/purple.

(2)

1 They dont have an outer layer protecting them

2 Penecilin ~~is~~ can kill a Gram-Positive bacteria.

Q4(a)

Despite a few excellent answers, the vast majority of responses to this question failed to exhibit the scientific knowledge required to access the marks. Most of the creditworthy answers managed to identify MPs 3, 4, and 5, while fewer candidates made the reference to receptors required for MP2.

This response was awarded 3 marks. Although the order of the marking points is a little confused the learner has stated that sodium ions flood in (MP4), that this increases the mV of the cell, which is just sufficient for a reference to charge for MP5 and that sodium channels open for MP3 and so is credited with 3 marks.

(a) Explain how an excitatory neurotransmitter causes depolarisation of a post-synaptic membrane.

(3)

Depolirisation is where ~~potassium and~~ sodium ions flood in and increase the mv of the cell. The neurotransmitter causes this when it is released and opens the sodium channels in the post-synaptic membrane. This triggers depolorisation.

Many candidates confused sodium with potassium or even calcium ions, and often mixed up positive/negative membrane potential.
This response was awarded 0 marks. The learner's response is incorrect.

Reference to depolarisation on its own is not creditworthy as it is a repeat of the stem.

(a) Explain how an excitatory neurotransmitter causes depolarisation of a post-synaptic membrane. (3)

when depolarisation happens ~~the~~ the Na (sodium) Channels ~~have started~~ are nearly to closed and are only open a little. Therefore only ~~a~~ K (Potasstium) is coming in. this is how excitatory neurotransmitter causes depolarisation of a post-synaptic membrane through this.

Q4(b)

Most learners were able to give a response for this question, indicating their time was well managed. Almost every learner who attempted the question referred to L-Dopa being more effective than Drug M, correctly interpreting the stem and information in the table. Many were able to link this effect to dopamine. Unfortunately the majority of pupils were then unable to apply any further science to their answer to discuss the action of dopamine as a neurotransmitter or discuss how L-Dopa is a precursor to dopamine and the comparison of being able to cross the blood-brain barrier. Comments on the experimental method were common and mainly focused on the time length rather than any other possible responses.

This response was awarded level 3, 6 marks. The learner has given a number of relevant correct statements about L-dopa and dopamine. They have also given some ideas and suggestions for how Drug M could affect dopamine and the pre-synaptic membrane. The question requires the learner to make connections and analyse the data given, which they may not have been presented with before, and so "educated guesses" for the action of drug M are valid. The response has a well-developed structure which is clear and logical.

(b) Dopamine is a neurotransmitter found in the brain.

Abnormal brain activity may occur when dopamine levels decrease.

Decreased levels of dopamine can cause visible shaking, called tremors, in people with Parkinson's disease.

Two drugs, L-Dopa and Drug M, were tested in a clinical trial to investigate how they affect tremors.

Two groups of patients, A and B, were each treated with one of the drugs for a month.

Table 1 shows the results of the clinical trial.

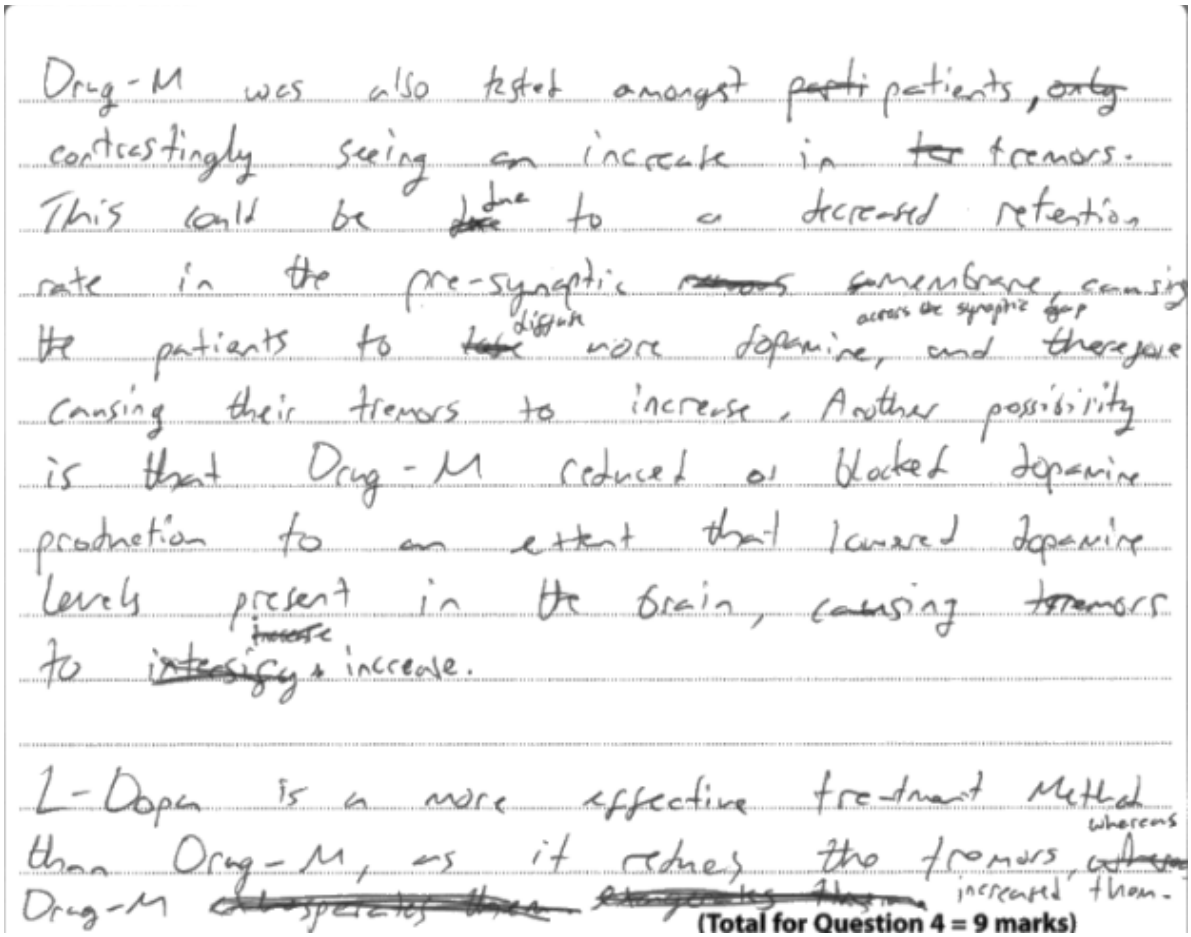
Group	Drug	Effect on tremors
A	L-Dopa	decreased tremors
B	Drug M	increased tremors

Table 1

Discuss the effectiveness of L-Dopa and Drug M to treat the tremors of people with Parkinson's disease.

(6)

L-Dopa, when tested on group A, saw ~~a~~ patients decreased level of ~~ten~~ tremors amongst ~~participants~~. This could be due to L-Dopa increasing the amount of dopamine produced, therefore the patients dopamine levels ~~returned to a normal~~ were ~~wrong~~ brighter increased and ~~ten~~ tremors decreased. Alternatively, L-Dopa could increase the retention of dopamine in the brain (pre-synaptic membrane), meaning that less dopamine is ~~transported across~~ diffused across the synaptic gap and more is retained in the pre-synaptic membrane. This would mean increased dopamine levels in the brain, and the patient would see a decrease in tremors.


Drug-M was also tested amongst ~~parti~~ patients, ~~only~~ contrastingly seeing an increase in ~~the~~ tremors. This could be ~~due~~ due to a decreased retention rate in the pre-synaptic ~~neuron~~ membrane, causing the patients to ~~take~~ diffuse more dopamine across the synaptic gap, and therefore causing their tremors to increase. Another possibility is that Drug-M reduced or blocked dopamine production to an extent that lowered dopamine levels present in the brain, causing ~~tremors~~ to ~~intensify~~ increase.

L-Dopa is a more effective treatment Method whereas Drug-M ~~decreases~~ increases tremors, ~~whereas~~ than.

(Total for Question 4 = 9 marks)

This response was awarded Level 2, 4 Marks. The learner has given some detail about the effect of the drugs using information from the table. They have then given suggestions about the validity of the experimental method.
The discussion shows a structure and so this is a level 2 response.

(b) Dopamine is a neurotransmitter found in the brain.

Abnormal brain activity may occur when dopamine levels decrease.

Decreased levels of dopamine can cause visible shaking, called tremors, in people with Parkinson's disease.

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Table 1

Discuss the effectiveness of L-Dopa and Drug M to treat the tremors of people with Parkinson's disease.

(6)

Group A clearly saw a decrease in tremors with the L-Dopa drug. Group B saw an increase in tremors with Drug M. This should prove that L-Dopa is the better drug. Parkinson's is untreatable at this current moment so L-Dopa clearly had a very good effect and reduced these tremors. However, this could of time period of one month is not long enough to determine if the drugs worked. The 'effect on tremors' is not measured as a quantity and the patient could 'feel' as if they had

less tremors because they were taking a medicine This is the placebo effect. In reality they could of either thought they had less tremors or believed it was working and said the tremors had lowered. Group B's medicine has not worked at all and this could be because they are starting to struggle more with the disease. If it was the same group of people on different drugs then it would prove that L-Dopa was better. But since the tremors are not only as described as 'more' or 'less' with no quantities then you cannot say for sure. If this was taken out the equation then L-Dopa is clearly more effective.

A significant number of candidates incorrectly inferred that a decrease in dopamine would cause a decrease in tremors and some candidates posited that drug M was more effective as increasing tremors was the desirable outcome. Further, it was common to find learners misidentifying L-Dopa as an agonist of dopamine and, in some cases, as dopamine itself.

This response was awarded 1 mark. The learner has used the information in the table to form a very brief discussion about the effectiveness of the drugs. Therefore 1 mark has been awarded.

(b) Dopamine is a neurotransmitter found in the brain.

Abnormal brain activity may occur when dopamine levels decrease.

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Table 1

Discuss the effectiveness of L-Dopa and Drug M to treat the tremors of people with Parkinson's disease.

(6)

Group A (L-Dopa drug) was more effective than group B (Drug M) because L-Dopa decreased tremors whereas Drug M increased tremors.

Individual Questions: Chemistry

The first question on the paper was based on tetrachloromethane, part (a) was a multiple choice question testing learners understanding of why tetrachloromethane has a tetrahedral shape. Just over half of all learners we able to select the correct answer.

In part (b) learners were asked to complete a dot and cross diagram of the covalent molecule.
The majority of learners scored 1 or 2 marks on this question, this example gained 2 marks.

(b) Complete the dot and cross diagram, in Figure 2, for tetrachloromethane, CCl_4.

Show outer electrons only.

C = 4
Cl = 7

(2)

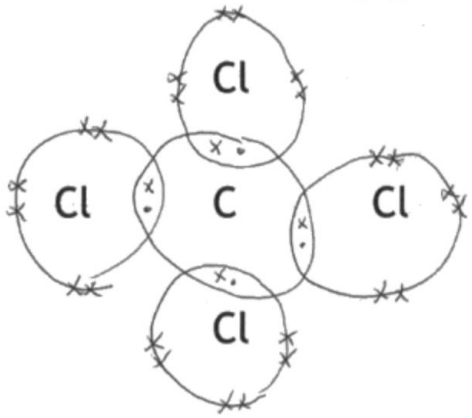


Figure 2

Of those that did not score the full two marks available, a good proportion were able to score at least 1 mark for showing their understanding of covalent bonding and drawing a shared pair of electrons between a carbon and a chlorine atom in the molecule as in this example.

(b) Complete the dot and cross diagram, in Figure 2, for tetrachloromethane, CCl_4.

Show outer electrons only.

(2)

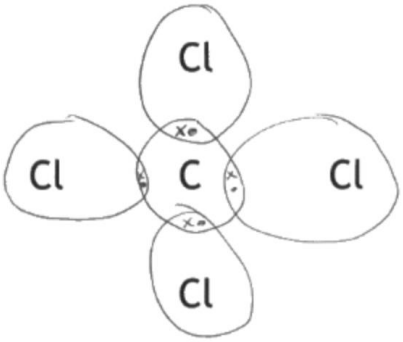


Figure 2

Learners should ensure that they follow instructions given in the paper, whilst any inner electron shells drawn were ignored, at times where learners had drawn these it tended to overcomplicate their drawing. In some cases, this confused learners and they came close to giving an incorrect drawing.

Part (c) of question 1 asked learners to name the intermolecular forces present between molecules of tetrachloromethane. Learners found this more difficult with fewer gaining a mark.
A large proportion of learners that did not score here did not understand the term intermolecular and referred to covalent or ionic bonds rather than any

(c) CCl_4 is a liquid at room temperature.

There are intermolecular forces between the molecules.

Name the intermolecular force between the CCl_4 molecules.

(1)

Covalent bond

intermolecular forces.
The most common answer that scored was London dispersion forces.

(c) CCl_4 is a liquid at room temperature.

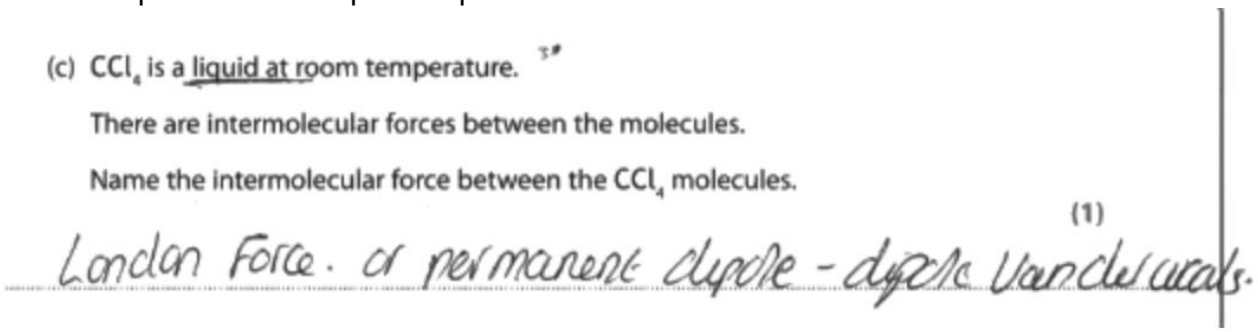
There are intermolecular forces between the molecules.

Name the intermolecular force between the CCl_4 molecules.

(1)

London dispersion

In some cases, learners were unsure and so gave more than one answer in a list, as in this example. Unfortunately, even though the learner here has given two answers that would have scored the mark, as they have also given an incorrect answer of permanent dipole-dipole no credit could be awarded.


(c) CCl_4 is a liquid at room temperature.

There are intermolecular forces between the molecules.

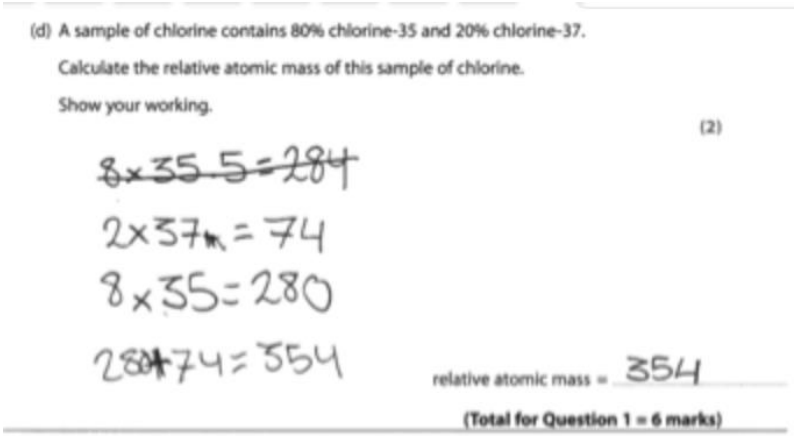
Name the intermolecular force between the CCl_4 molecules.

(1)

London Force. or permanent dipole - dipole Van der waals.

The last part of question 1, asked learners to calculate the relative atomic mass of a simple of chlorine. Learners found this hard with over half of all learners not scoring.
In many cases, learners did not use the information in the stem of the question or engage with the command word, calculate, and simply used the periodic table at the back of the paper to copy the common relative atomic mass of 35.5 onto the answer line, this did not score.

In some cases, learners carried out part of the calculation, but incorrectly calculated the percentages and so gained just 1 mark as in this example.


(d) A sample of chlorine contains 80% chlorine-35 and 20% chlorine-37.

Calculate the relative atomic mass of this sample of chlorine.

Show your working.

(2)

~~8 x 35.5 = 284~~

2 x 37 = 74

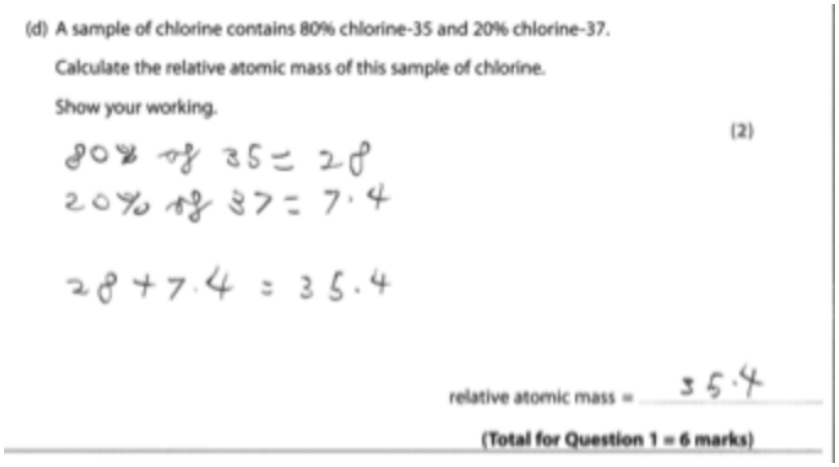
8 x 35 = 280

280 + 74 = 354

relative atomic mass = 354

(Total for Question 1 = 6 marks)

Learners that scored both marks, often carried out their calculations using different methods.
These different methods, and others, were credited and the full two marks awarded.



(d) A sample of chlorine contains 80% chlorine-35 and 20% chlorine-37.

Calculate the relative atomic mass of this sample of chlorine.

Show your working.

(2)

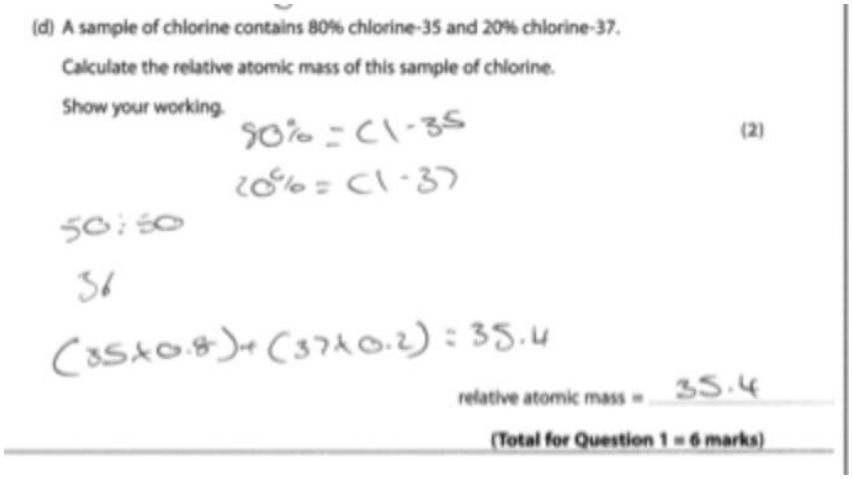
80% of 35 = 28

20% of 37 = 7.4

28 + 7.4 = 35.4

relative atomic mass = 35.4

(Total for Question 1 = 6 marks)



(d) A sample of chlorine contains 80% chlorine-35 and 20% chlorine-37.

Calculate the relative atomic mass of this sample of chlorine.

Show your working.

(2)

80% = Cl-35

20% = Cl-37

50:50

35

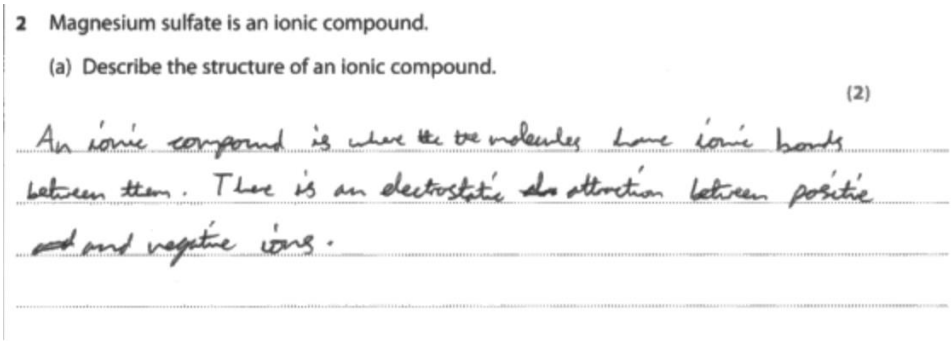
(35x0.8)+(37x0.2) = 35.4

relative atomic mass = 35.4

(Total for Question 1 = 6 marks)

Question 2 focused on the ionic compound, magnesium sulfate.

In part (a) of the question, learners were asked to describe the structure of an ionic compound. Only the best learners were able to give a full description here to gain the two marks as in this example.



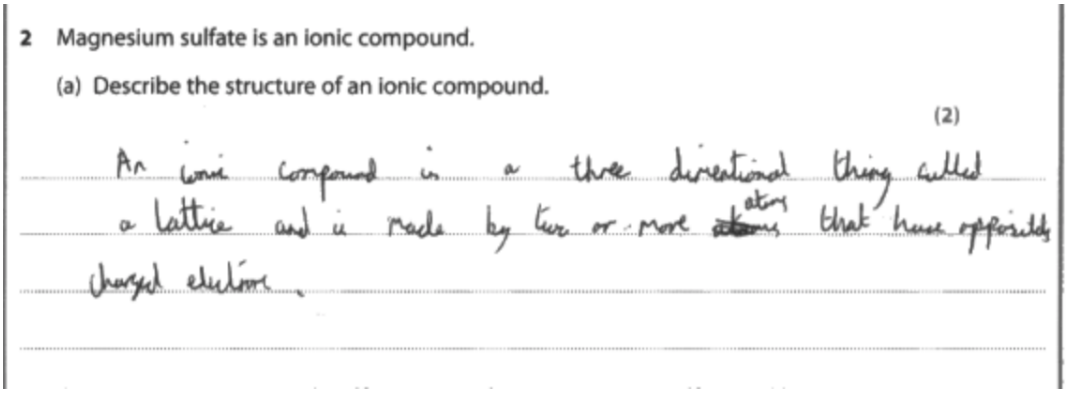
2 Magnesium sulfate is an ionic compound.

(a) Describe the structure of an ionic compound.

(2)

An ionic compound is where the molecules have ionic bonds between them. There is an electrostatic ~~sha~~ attraction between positive and negative ions.

Some learners were able to score one mark, but issues in correct scientific terminology, as in this example using the term electrons rather than ions, meant that the second mark could not be scored.

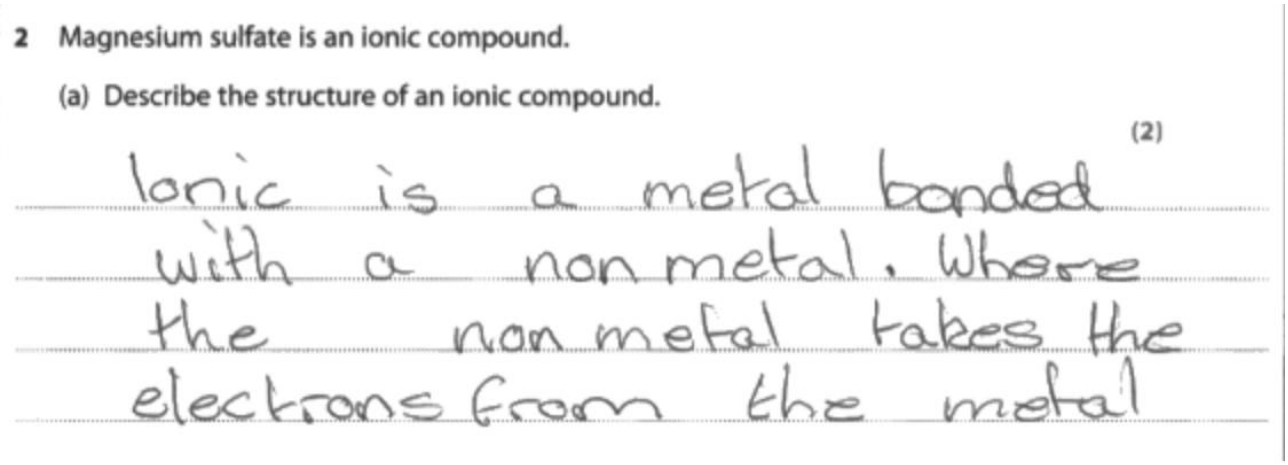

2 Magnesium sulfate is an ionic compound.

(a) Describe the structure of an ionic compound.

(2)

An ionic compound is a three directional thing called a lattice and is made by two or more ~~atoms~~ ating that have oppositly charged electrons.

In other cases, learners did to engage with the command word describe and instead tried to explain how an ionic compound was formed in terms of loss and gain of electrons, this did not gain credit.


2 Magnesium sulfate is an ionic compound.

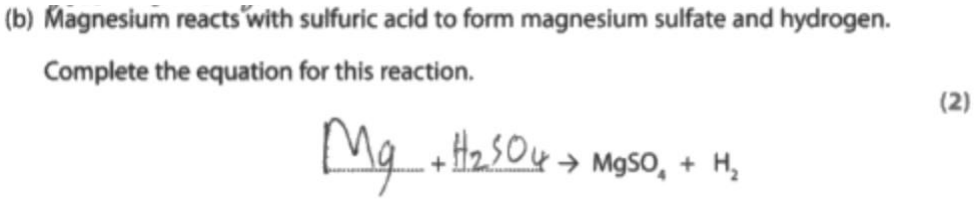
(a) Describe the structure of an ionic compound.

(2)

Ionic is a metal bonded with a non metal. Where the non metal takes the electrons from the metal

Part (b)(i) asked learners to complete an equation for the reaction of magnesium to form the magnesium sulfate.
Whilst learners found writing the formula for magnesium quite straightforward, recalling the formula of sulfuric acid proved much more of a challenge.

Around one third of learners were able to complete the equation correctly to gain both marks as in this example.

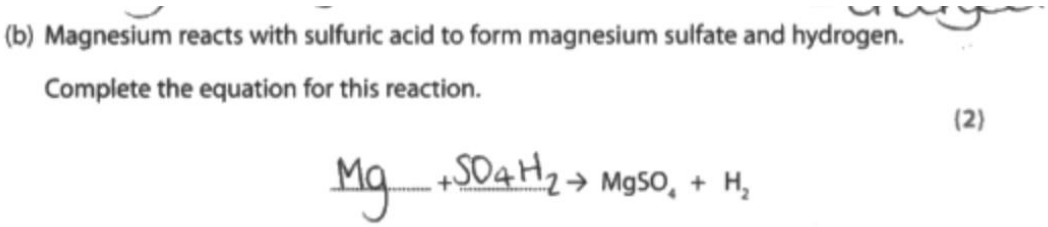

(b) Magnesium reacts with sulfuric acid to form magnesium sulfate and hydrogen.

Complete the equation for this reaction.

(2)

$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

In some cases, learners wrote the sulfuric acid in a different form, but this was accepted and both marks were scored here also.

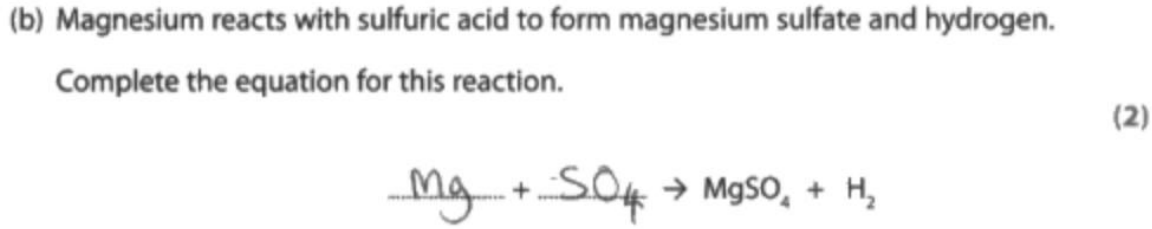

(b) Magnesium reacts with sulfuric acid to form magnesium sulfate and hydrogen.

Complete the equation for this reaction.

(2)

$Mg + SO_4H_2 \rightarrow MgSO_4 + H_2$

A common error seen, was to simply break down the magnesium sulfate into the magnesium and sulfate, this answer gained just 1 mark for the magnesium.
Learners should be taught the formula of commons substances such as sulfuric acid.


(b) Magnesium reacts with sulfuric acid to form magnesium sulfate and hydrogen.

Complete the equation for this reaction.

(2)

$Mg + SO_4 \rightarrow MgSO_4 + H_2$

Part (c) of question 2 focused on some calculations based around magnesium sulfate , in

part (i) learners were asked to find the number of moles of magnesium sulfate in 6.02g. A large proportion of learners were able to correctly calculate the number of moles as 0.05 to gain the mark as in this example.

(c) (i) A learner is given 6.02 g of magnesium sulfate.

Calculate the number of moles of magnesium sulfate.

(relative formula mass of $MgSO_4$ = 120.4)

(1)

number of moles = 0.05

Where learners did not score the mark, it was often as they inverted the numbers to give an incorrect answer of 20 or multiplied the numbers to give an answer of 724.08. Learners should be taught to look at their answers to calculations and see if they think their answer is realistic given the context of the question.

(c) (i) A learner is given 6.02 g of magnesium sulfate.

Calculate the number of moles of magnesium sulfate.

(relative formula mass of $MgSO_4$ = 120.4)

(1)

mole = $\frac{Mr}{Mass}$

number of moles = 20

$\frac{120.4}{6.02g}$ =

(c) (i) A learner is given 6.02 g of magnesium sulfate.

Calculate the number of moles of magnesium sulfate.

(relative formula mass of $MgSO_4$ = 120.4)

(1)

n m / Mr

6.02g × 120.4

= 724.808

number of moles = 724.808

In Part (ii) of 2(c) learners were asked to use their answer to part (i) to them calculate the molar concentration of a solution of magnesium sulfate. Approximately half of all learners were able to score at least one mark on this question, and a good proportion of these scoring the full three marks available as in this example

(ii) The learner dissolves the magnesium sulfate in distilled water to make [redacted] of solution.

Calculate, using your answer to (c)(i), the [redacted]n of this magnesium sulfate solution.

0.5 dm^3

If you did not get an answer for (c)(i), use the value 0.04 for the number of moles.

Show your working. $1dm^3 = 1000cm^3$ $c = \frac{n}{v}$

(3)

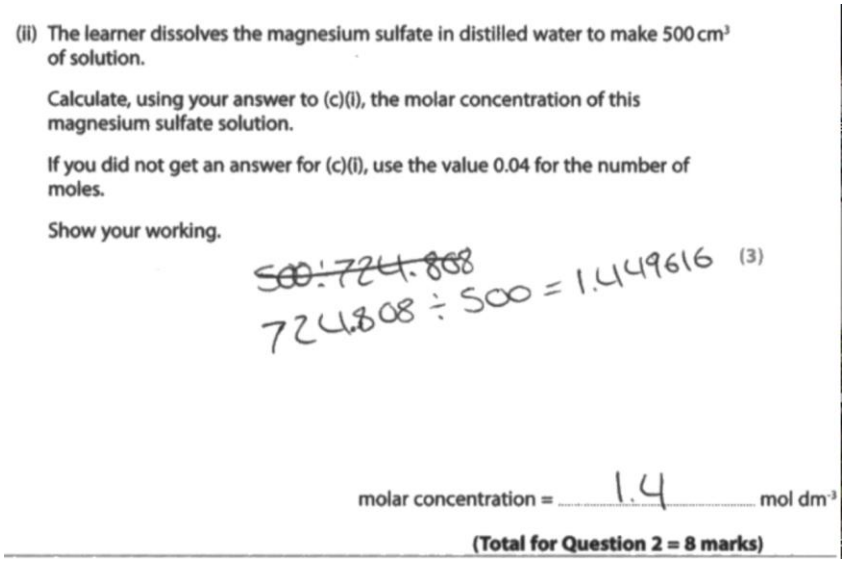
$\frac{0.05}{500} = 1 \times 10^{-4}$

$1 \times 10^{-4} \times 1000 = 0.1$

molar concentration = 0.1 mol dm^{-3}

(Total for Question 2 = 8 marks)

Where learners lost marks, it was often because they did not remember to convert the volume to dm-3 and so therefore gained 2 marks.
Where learners had the incorrect answer in part (i) the error was carried forward and this did not effect the mark awarded in part (ii), therefore this answer scored 2 marks, as the only error the learner has made was to not convert the volume.



(ii) The learner dissolves the magnesium sulfate in distilled water to make 500 cm^3 of solution.

Calculate, using your answer to (c)(i), the molar concentration of this magnesium sulfate solution.

If you did not get an answer for (c)(i), use the value 0.04 for the number of moles.

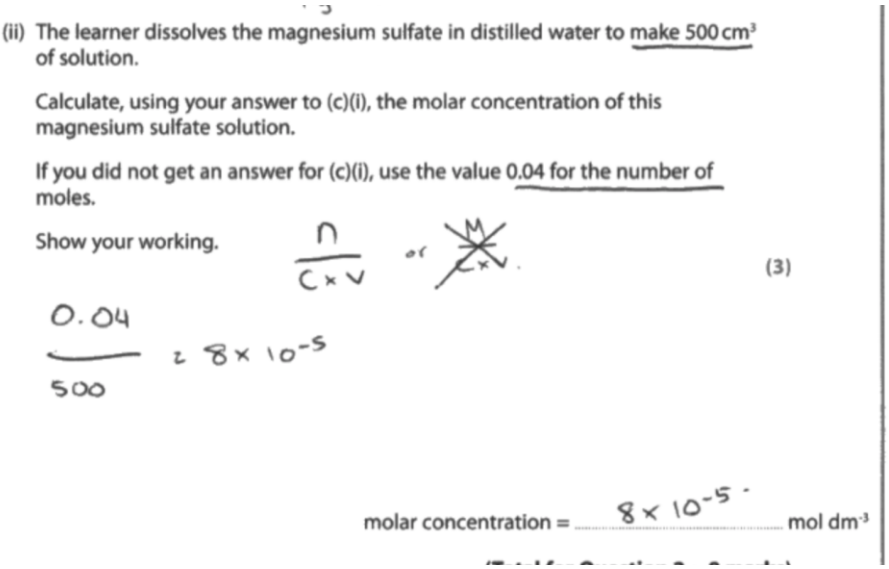
Show your working.

~~500 : 724.808~~
724.808 ÷ 500 = 1.449616 (3)

molar concentration = 1.4 mol dm^{-3}

(Total for Question 2 = 8 marks)

If learners did not gain an answer to part (i) a value of 0.04 was given for use in part (ii) some learners used this number and went on to score credit. In this example 2 marks were scored as they did not convert their volume.



(ii) The learner dissolves the magnesium sulfate in distilled water to make 500 cm^3 of solution.

Calculate, using your answer to (c)(i), the molar concentration of this magnesium sulfate solution.

If you did not get an answer for (c)(i), use the value 0.04 for the number of moles.

Show your working. $\frac{n}{c \times v}$ or $\frac{M}{c \times v}$ (3)

$\frac{0.04}{500} = 8 \times 10^{-5}$

molar concentration = 8×10^{-5} mol dm^{-3}

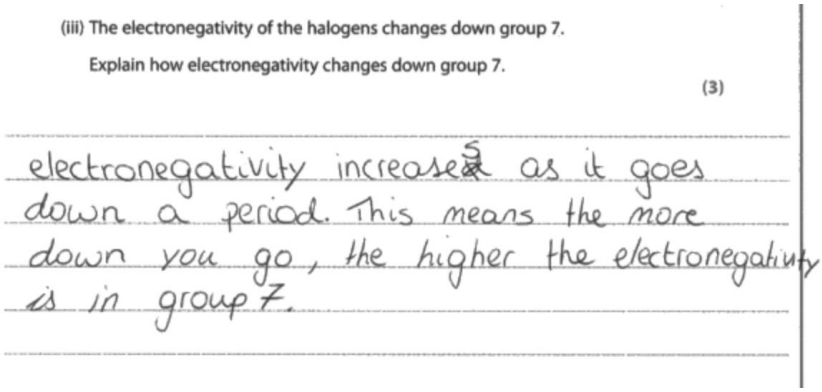
Question 3 focused on the halogens, fluorine, chorine, bromine and iodine.
The first question was a multiple choice question asking learners to identify the halogen with the lowest ionisation energy. Around half of all learners were able to identify iodine as the halogen with the lowest ionisation energy to gain the mark.

The second question was also multiple choice, here a much larger proportion of candidates were able to analyse the diagrams to identify the correct electronic configuration for an atom of fluorine.

In part, b of question 3, learners were asked to identify the correct word from a list to define electron affinity. A good proportion were able to score one mark, often for recalling that in an electron affinity the fluorine atom gains an electron to become an ion. Fewer were able to recall that the fluorine needs to be in a gaseous state.

Part b(ii) was a longer open response question in which learners were asked to explain how electronegativity changes down a group.

In some cases, learners basic chemistry let them, down as they seemed confused

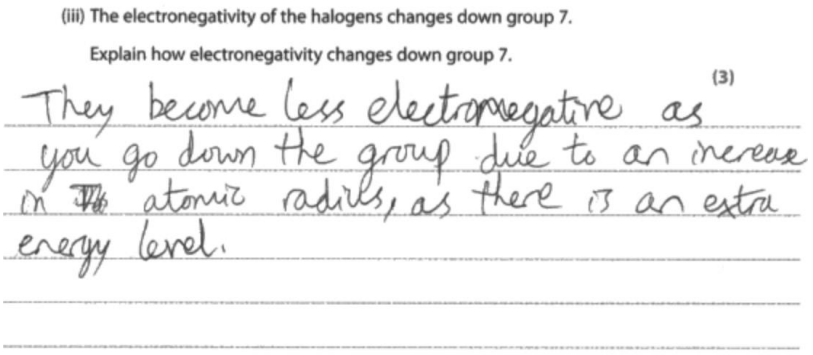

(iii) The electronegativity of the halogens changes down group 7.

Explain how electronegativity changes down group 7. (3)

electronegativity increases as it goes down a period. This means the more down you go, the higher the electronegativity is in group 7.

between the terms groups and periods. This example gained no marks.

In this example, the learner gained 2 marks for understanding that the electronegativity becomes less as you go down the group and that this is due to an increase in atomic radius because of the extra energy level.



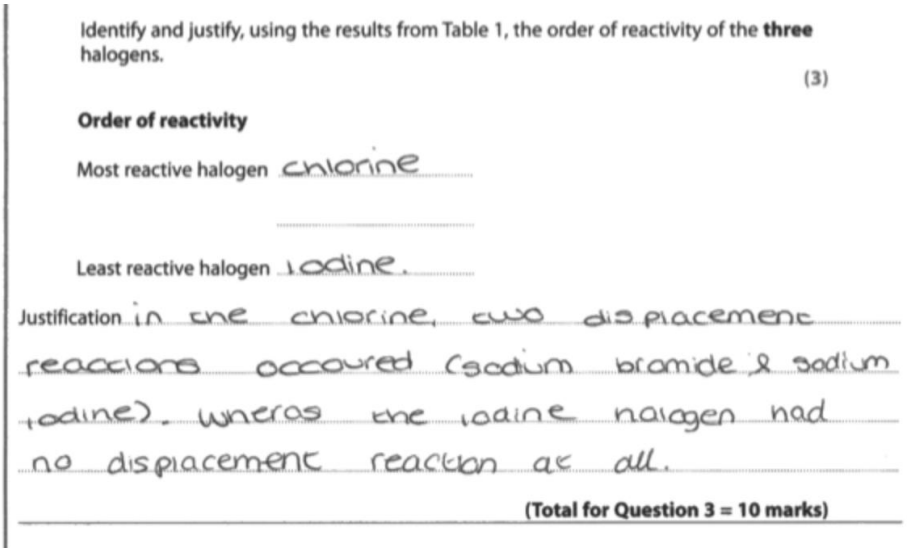
(iii) The electronegativity of the halogens changes down group 7.

Explain how electronegativity changes down group 7.

(3)

They become less electronegative as you go down the group due to an increase in the atomic radius, as there is an extra energy level.

The last part of question 3 focused on the displacement reactions of the halogens. Learners were asked to identify the order of reactivity of the three halogens and justify this using the information on the displacement reactions from the table.
A good proportion of learners were able to answer the question well, giving the correct with the appropriate justification from the table.
The following example gained the full 3 marks available.



Identify and justify, using the results from Table 1, the order of reactivity of the **three** halogens.

(3)

Order of reactivity

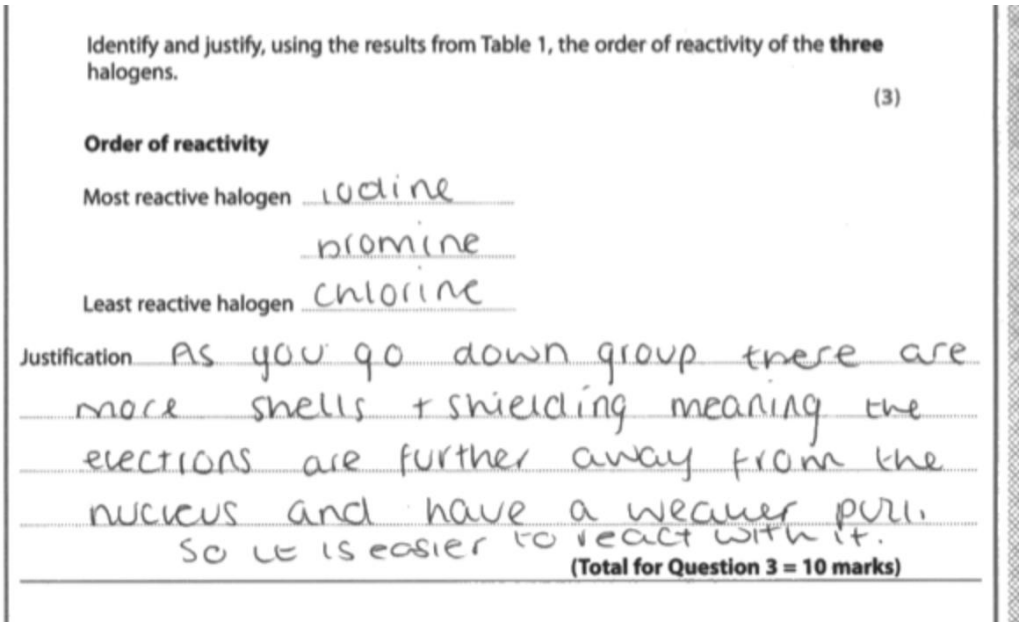
Most reactive halogen chlorine

Least reactive halogen iodine.

Justification in the chlorine, two displacement reactions occoured (sodium bromide & sodium iodine). wheras the iodine halogen had no displacement reaction at all.

(Total for Question 3 = 10 marks)

In some cases, learners did not engage with question and instead of justifying their answer using the results from the table, they instead tried to explain in terms of electrons. This often confused learners and this example scored no marks.



Identify and justify, using the results from Table 1, the order of reactivity of the **three** halogens.

(3)

Order of reactivity

Most reactive halogen iodine

bromine

Least reactive halogen chlorine

Justification As you go down group there are more shells + shielding meaning the electrons are further away from the nucleus and have a weaker pull. So it is easier to react with it.

(Total for Question 3 = 10 marks)

The last question on the paper was the six mark open response with a level based mark scheme. Learners were asked to study the properties of two substances, X and Y and explain which was ionic and which was metallic.
The question produced a good range of answers.
Many learners were able to state which substance was which and back this up with some simple statements to gain a mark in level 1.
In this example. The learner has identified substance X as metallic and Y as ionic. They start to try to explain that the reason that X can conduct as a metal is due to its delocalised electrons but they talk about these electrons being gained by an empty orbital which is contradictory to the idea of the electrons moving. The explanation for the ionic substance does not contain any creditworthy material. Therefore, this example gained a mark 2 of level 1.

4 Table 2 shows two substances, **X** and **Y**, and their ability to conduct electricity when in different states.

substance	state	ability to conduct electricity
X	solid	good
	liquid	good
Y	solid	poor
	liquid	good

Table 2

Explain, using the information in Table 2, which substance is ionic and which substance is metallic.

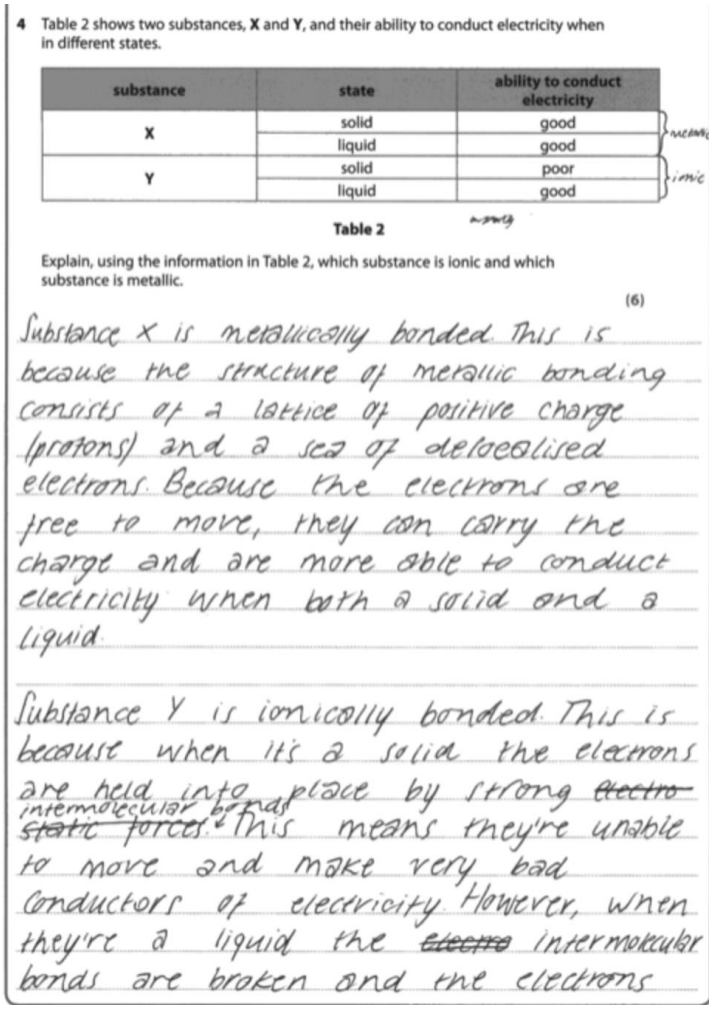
(6)

clearly, from the Table 2, we can deter that the substance X is Metallic and substance Y is ionic. Substance X is clearly obtains a metallic bond due to the ability to conduct electricity in a liquid and solid, due to delocalised electrons being able to ~~be~~ be gained by an empty orbital, making the intermolecular forces of the metal very strong. The metal is also very malleable and can be drawn into wire for these reasons.

However, substance Y is clearly ionic due to the fact that it is a poor electrical conductor as a solid, however not as a liquid. This can only mean that ~~it~~ it is ionic due to the fact that it must lose or gain electrons to become bonded / between a metal and a non-metal).

In this example, the learner has identified substance X as metallic and, later, substance Y as ionic. Their explanation for why X is metallic in terms of moving, delocalised electrons, carrying the charge when both solid and liquid is good for full marks in level 2.
Their explanation for why Y is ionic is flawed with reference to strong intermolecular bonds and reference to electrons, rather than ions being able to move to carry charge, therefore the explanation for this section was ignored. The learner was awarded 4 marks in level 2.

It was a common misconception that ionic substances conduct electricity due to free moving electrons rather than ions.



4 Table 2 shows two substances, **X** and **Y**, and their ability to conduct electricity when in different states.

substance	state	ability to conduct electricity
X	solid	good
	liquid	good
Y	solid	poor
	liquid	good

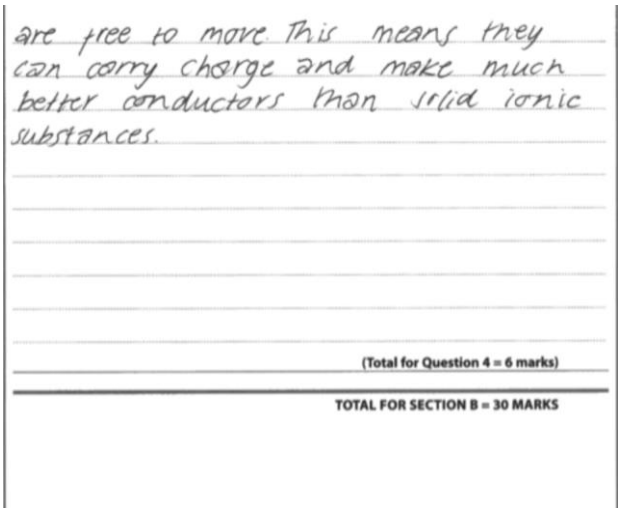
Table 2

Explain, using the information in Table 2, which substance is ionic and which substance is metallic.

(6)

Substance X is metallically bonded. This is because the structure of metallic bonding consists of a lattice of positive charge (protons) and a sea of delocalised electrons. Because the electrons are free to move, they can carry the charge and are more able to conduct electricity when both a solid and a liquid.

Substance Y is ionically bonded. This is because when it's a solid the electrons are held into place by strong ~~electro static forces~~ intermolecular bonds. This means they're unable to move and make very bad conductors of electricity. However, when they're a liquid the ~~electro~~ intermolecular bonds are broken and the electrons



are free to move. This means they can carry charge and make much better conductors than solid ionic substances.

(Total for Question 4 = 6 marks)

TOTAL FOR SECTION B = 30 MARKS

The learner has correctly identified X as metallic and Y as ionic.
They have given a full and good explanation of why Y is ionic, they also go on to give an explanation of why X is metallic, although they do not refer to the delocalised electrons moving and talk about positive 'atoms' - there is still sufficient for 6 marks to be awarded.

4 Table 2 shows two substances, **X** and **Y**, and their ability to conduct electricity when in different states.

substance	state	ability to conduct electricity
X Metallic	solid	good
	liquid	good
Y Ionic	solid	poor
	liquid	good

+ atoms / ions

Table 2

Explain, using the information in Table 2, which substance is ionic and which substance is metallic.

(6)

Substance Y is ionic as it can only conduct electricity in a liquid (molten) state, due to the lattice being broken up which means ions are free to move (they carry a charge), substance Y can't conduct electricity in a solid state as the ions aren't free to move, due to the lattice not being broken up.
Substance X, however, can conduct electricity in a solid state which is why I know it's not an ionic compound. Substance X is metallic as it has positive atoms surrounded by delocalised electrons which carry a charge. Even when liquid, the delocalised electrons are still present so it can still conduct electricity

Individual Questions: Physics

1ai The majority of learners were able to identify the time for one complete oscillation as being 2 seconds.

1aii Almost all learners were able to identify the amplitude of the oscillation as decreasing.

1b The majority of learners gained 2 marks and many showed the calculation well presented as in the example below.

(b) A learner uses a different pendulum.

The time for one complete oscillation (T) is 5.0 seconds.

Calculate the frequency (f).

Use the equation: f = 1/T

(2)

$f = \frac{1}{T}$

$f = \frac{1}{5}$

$f = 0.2$

frequency = 0.2 Hz

2a Learners are now familiar with how gases can be identified from an emission spectrum Many learners were able to identify the elements contained in the unknown substance by looking for the spectral lines that were common to the spectral lines of the elements.

2b. The question was ' Explain why hydrogen atoms only produce light of specific frequencies'. However, this was sometimes misinterpreted by learners as 'How does a diffraction grating produce the lines of an emission spectrum'. Answers relating to the splitting up of light by the diffraction grating could not be credited for this question. Learners need to know that hydrogen like all other elements only produces light of specific frequencies and then explain how the light is emitted. The majority of learners did not know that it was an electron moving between energy levels in the hydrogen atom that emitted light of a specific frequency equivalent to the energy that was lost by the electron. The learners that understood the process of how the light was produced often gave very good answers.

An example of an answer that gained three marks is given below. This example also includes a diagram which if the electron had been labelled would have gained all three marks. Learners need to appreciate that it is often easier to describe a process using a diagram.

Explain why hydrogen atoms only produce light of specific frequencies.

You may include diagrams to support your answer.

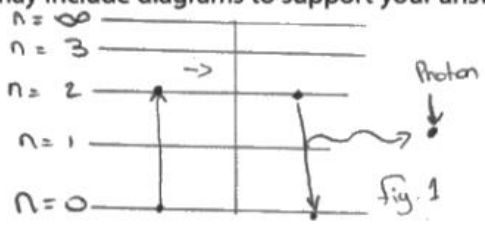


fig. 1

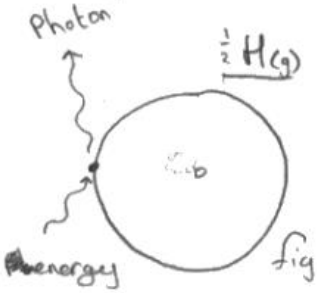


fig. 2

(3)

When an electron in orbit of a hydrogen atom gets a sudden burst of excitment from energy (shown in fig 2) and raises to a higher energy level as shown in fig. 1 the electron will then want to return to a stable level and will fall back to ground level and in the process emitting a photon particle, based on the energy which was initially absorbed by the electron. Differing elements will emmit various combinations of coloured light.

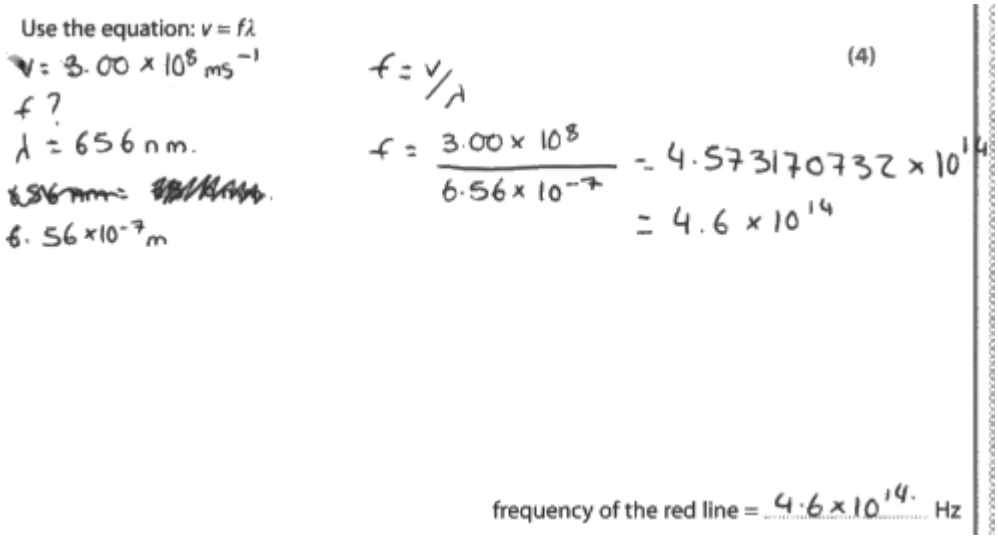
2c Many learners did not know that light passed through the diffraction grating, this may be due to learners not having used diffraction gratings or seen a demonstration. Some learners were able to gain both marks either for knowing that light passed through the slits and was spread out or by starting with the light being spread out and then constructive interference occurring. Again a labelled diagram could be used to help the description. The answer shown below has more than enough correct information to gain both marks.

(c) Describe how a diffraction grating affects the light from a hydrogen lamp.

(2)

The diffraction grating has slits - split up the emmision into spectrums. Curcular waves are formed at the gaps - as they join they overlap - Constructive interference - add up - creates a bright spot (Maximum) and a dark minima - intervals of light/dar

2d Many learners were able to gain 3 marks for this calculation by substitution and rearrangement and an evaluation giving the wrong power of ten. This was either because the conversion from nm to m could not be carried out correctly or the use of standard form had not been mastered. As the final answer was 4.57 x 10^{14} Hz it was unlikely that this could be achieved by other than the use of standard form. The example below shows a correct conversion and use of standard form to gain 4 marks for the correct answer


Use the equation: $v = f\lambda$

(4)

$v = 3.00 \times 10^{8}\ ms^{-1}$

f ?

$\lambda = 656\ nm.$

$6.56 \times 10^{-7}\ m$

$f = v/\lambda$

$f = \frac{3.00 \times 10^{8}}{6.56 \times 10^{-7}} = 4.573170732 \times 10^{14}$

$= 4.6 \times 10^{14}$

frequency of the red line = 4.6×10^{14} Hz

A typical 3 marks answer is shown below.

Use the equation: $v = f\lambda$

(4)

$f = \frac{v}{\lambda}$

$\frac{3.00 \times 10^{8}}{6.56 \times 10^{-7}} =$

$45.73 \ (2dp)$

frequency of the red line = 45.73 Hz

3ai , 3aii. Many learners were able to identify refraction for 3ai but marks were lost for 3aii the effect was often named as reflection and not total internal reflection it must be total internal reflection as it is happening within the glass windscreen

3b A large number of learners were unable to understand why the windscreen wipers turned on probably because they did not compare the two diagrams or notice that no light was reaching the detector when the raindrop was on the screen. The learners that realised that no light reaching the detector would turn the wipers on could gain a mark. However, many were then unable to explain clearly what was happening.' 'There is refraction' or there is 'no internal reflection' did not gain marks because there is both refraction and total internal reflection at various points on the diagram and the answer needed to specify that this was occurring where the raindrop was on the glass. Examples of an answers which gained three marks is shown below

Explain why the windscreen wiper turns on when a raindrop falls on the windscreen.

(3)

when the light hits a raindrop it is refracted into the raindrop. The light is no longer totally internally reflected so it does not hit the light detector which causes the windscreen wipers to turn on

Explain why the windscreen wiper turns on when a raindrop falls on the windscreen.
(3)

The water is more optically dense than the glass and therefore has refracted, making the angle of incidence smaller than the critical angle. This means the light is not being totally internally reflected, therefore it does not reach the light detector, this causes the windscreen wipers to turn on, remove the water droplet, so the light can reflect and ~~reach~~ reach the light detector.

(Total for Question 3 = 5 marks)

The answer below gained two marks. The change of the path of the light is noted with a reason which links the refraction to the raindrop

Explain why the windscreen wiper turns on when a raindrop falls on the windscreen.
(3)

Because when the raindrop falls on the windscreen it changes the path the light follows causing it to refract into the raindrop instead, therefore the light doesn't reach the dectector thereby activating the wipers

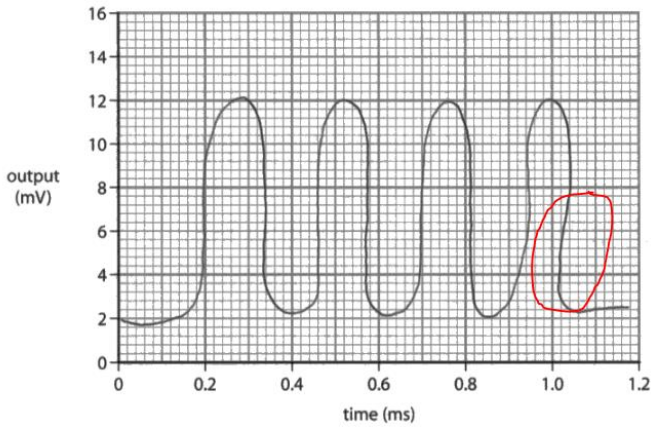
The answer below gained only one mark for the ' the light from the light source has not reached the detector' There is no mention of refraction through the raindrop and the 'increased critical angle ' is given in the stem of the question.

Explain why the windscreen wiper turns on when a raindrop falls on the windscreen.
(3)

The ~~big~~ windscreen wiper ~~does no~~ turns on because the light from the light source hasn't reached the light detector. This is because the raindrop intersected with the light and increased the critical angle ~~of~~ which prevents the light reaching the detector.

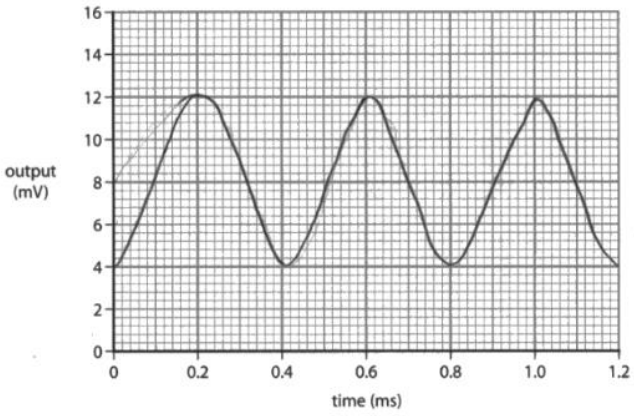
4a Learners often did not gain both marks because of the lack of care taken with the sketch of the analogue signal. The example below shows the wave reversing with time(circled) this is not possible for an analogue signal and only one mark is awarded for showing a continuous change in output

(a) Sketch a graph of an **analogue** signal. (2)



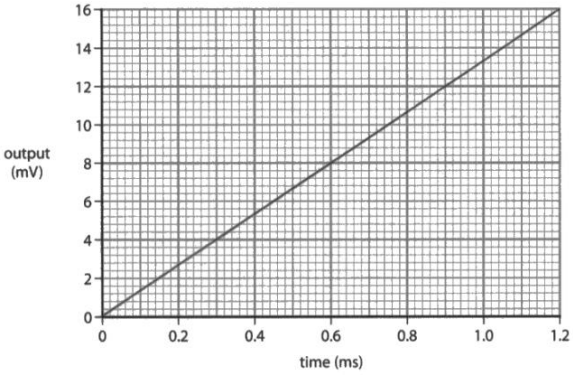
The following examples both gained two marks

(a) Sketch a graph of an **analogue** signal. (2)



A diagonal straight line also gains two marks as there is a continuous variation of output with time

(a) Sketch a graph of an **analogue** signal. (2)



4b Very few learners gained two marks for this question. Even if an advantage of digital signals could be identified the explanation for the advantage was rarely seen. The most popular correct answer which gained a mark was 'digital signals travel further' this was the expansion of the identification of the advantage that 'digital signals can be regenerated ' However , very few learners identified this advantage.

Examples of correct 2 mark answers are given below

(b) Explain **one** advantage of using electronic digital signals instead of using analogue signals for communication.

(2)

One advantage of using digital signals is that signals can be regenerated, meaning that the signal can travel a longer distance, so there's no attentuation.

(b) Explain **one** advantage of using electronic digital signals instead of using analogue signals for communication.

(2)

They're encrypted this means that they're able to securely transmit the data that you're trying to send.

The answer below gains the two marks for the second part of the response linking encryption to improved security

(b) Explain **one** advantage of using electronic digital signals instead of using analogue signals for communication.

(2)

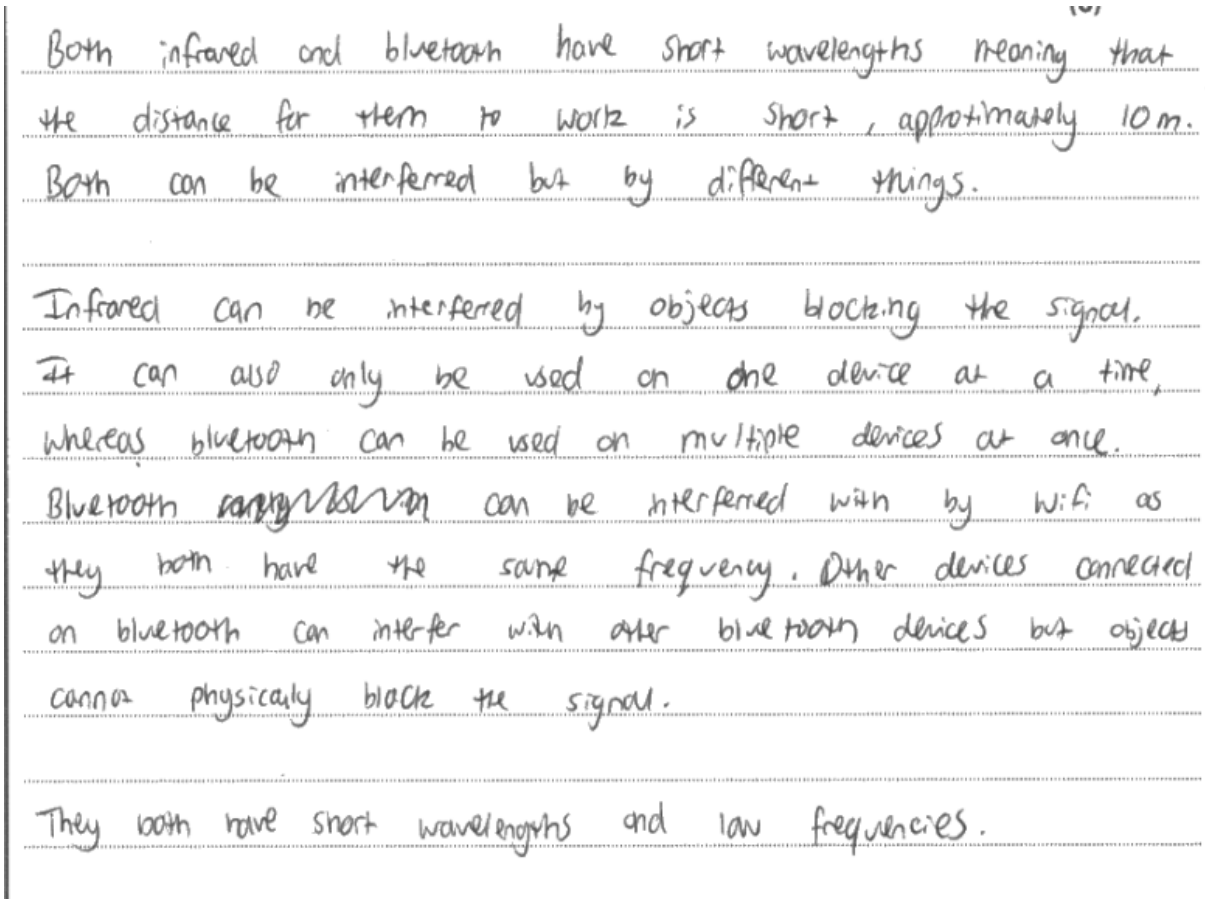
They can travel further distances without interferance becuse they can be encrypted meaning they are also more secure also

4c Most learners were able to identify the correct code for the digital signal.

5 The majority of learners were able to identify a difference between the waves produced by infrared and blue tooth devices. Although, some learners did not read the question properly and described some differences between the devices rather than the waves.

Below is an example of a level 1 response which gained two marks. The question requires a comparison, that is, a similarity or a difference. This example states that the waves 'can be interfered with in different ways' and gives that infrared is blocked by obstacles and Bluetooth© interfered with by WiFi. These are two correct statements rather than a direct comparison but this is sufficient for level 1. At level1 differences rather than similarities are generally given, but a statement in isolation such as 'both the waves are transverse' gains Level 1 2 marks.

Level1 2 marks


Both infrared and bluetooth have short wavelengths meaning that the distance for them to work is short, approximately 10m. Both can be interferred but by different things.

Infrared can be interfered by objects blocking the signal. It can also only be used on one device at a time, whereas bluetooth can be used on multiple devices at once. Bluetooth can be interferred with by Wifi as they both have the same frequency. Other devices connected on bluetooth can interfer with other bluetooth devices but objects cannot physically block the signal.

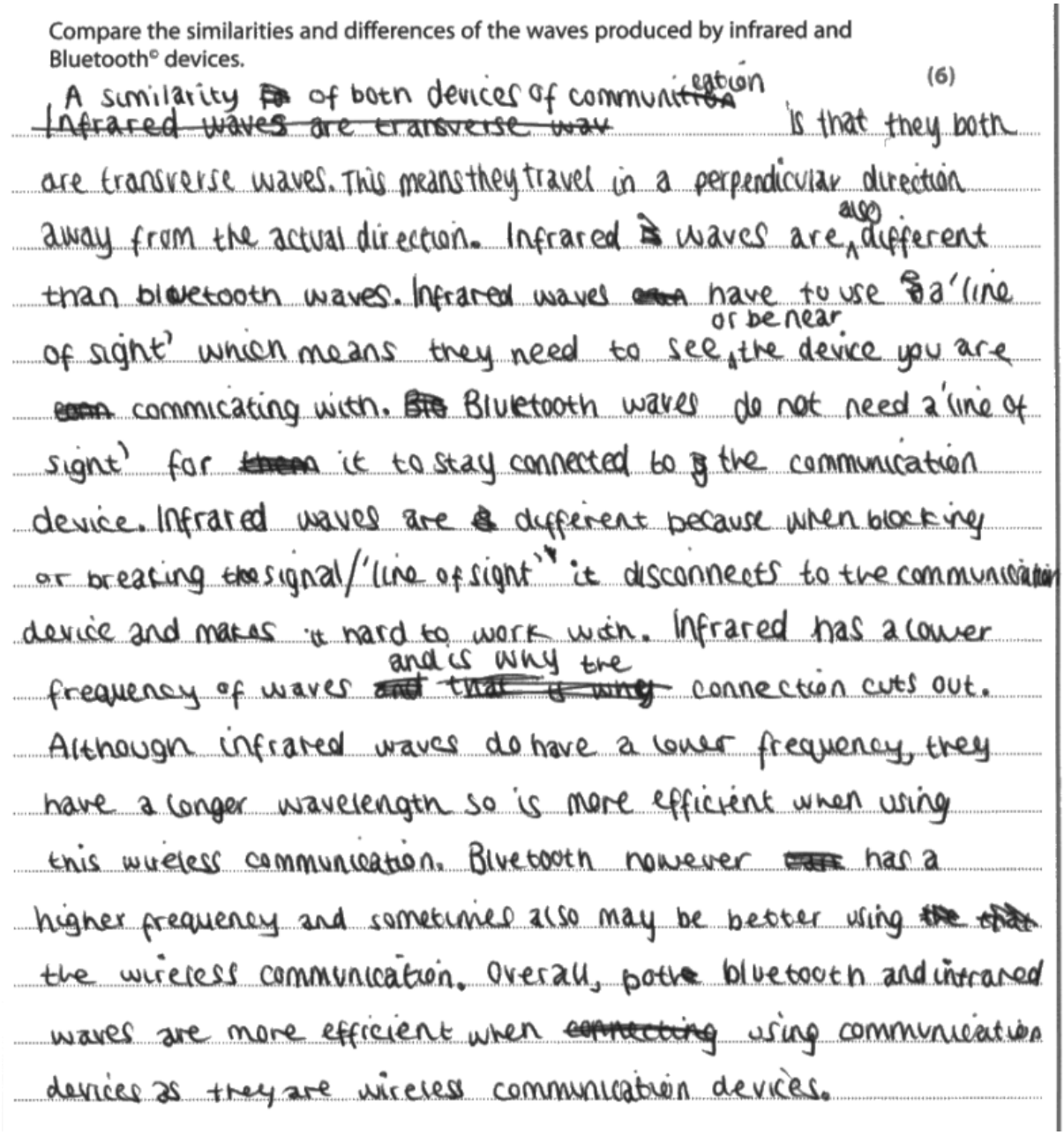
They both have short wavelengths and low frequencies.

Level 2 4 marks

This example has a similarity and a difference but for level 2, two correct difference would have been sufficient. The similarity is in the second line 'they are both transverse'. The next section considers the difference between infrared 'needing line

of sight' and Bluetooth© not needing 'line of sight'. The section on frequency and wavelength is incorrect but does not detract from the previous work and does recognise that there is a difference between the wavelength and frquecy of the waves although the relationship given is incorrect.

Level 2 4 marks



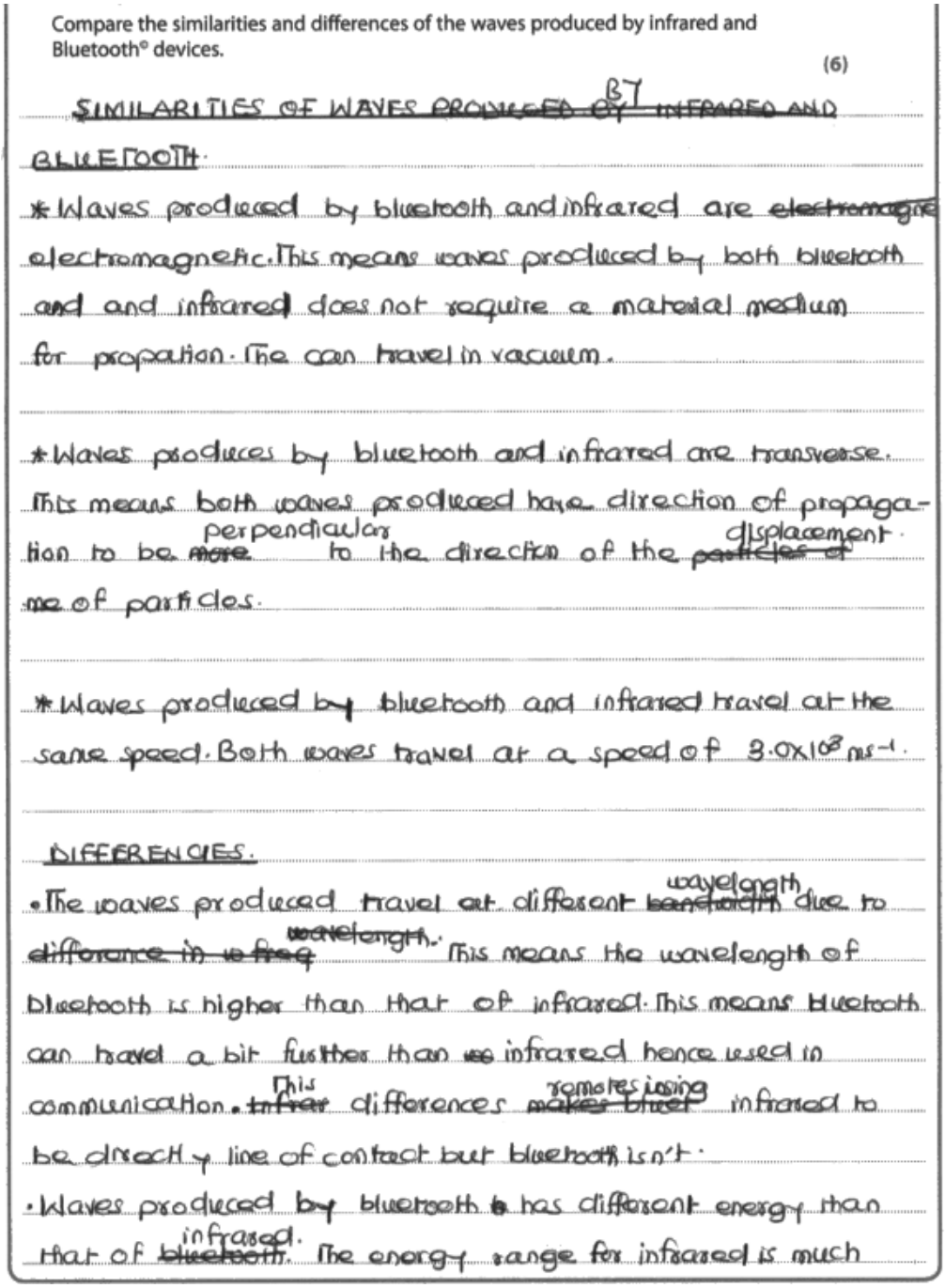
Compare the similarities and differences of the waves produced by infrared and Bluetooth© devices.

(6)

A similarity ~~of~~ of both devices of communication is that they both ~~Infrared waves are transverse wav~~ are transverse waves. This means they travel in a perpendicular direction away from the actual direction. Infrared ~~is~~ waves are also different than bluetooth waves. Infrared waves ~~can~~ have to use a 'line of sight' which means they need to see the device you are or be near ~~com~~ communicating with. ~~Blu~~ Bluetooth waves do not need a 'line of sight' for ~~them~~ it to stay connected to the communication device. Infrared waves are different because when blocking or breaking the signal/'line of sight' it disconnects to the communication device and makes it hard to work with. Infrared has a lower frequency of waves ~~and that is why~~ and is why the connection cuts out. Although infrared waves do have a lower frequency, they have a longer wavelength so is more efficient when using this wireless communication. Bluetooth however ~~has~~ has a higher frequency and sometimes also may be better using ~~the that~~ the wireless communication. Overall, both bluetooth and infrared waves are more efficient when ~~connecting~~ using communication devices as they are wireless communication devices.

Level 3 6 marks

The example below shows comprehensive knowledge of relevant scientific facts , supported by lines of argument and the correct comparison of both similarities and differences The question has been answered in full.



Compare the similarities and differences of the waves produced by infrared and Bluetooth® devices.

(6)

SIMILARITIES OF WAVES ~~PRODUCED BY INFRARED AND~~ BT BLUETOOTH.

* Waves produced by bluetooth and infrared are ~~electromagne~~ electromagnetic. This means waves produced by both bluetooth and and infrared does not require a material medium for propation. The can travel in vacuum.

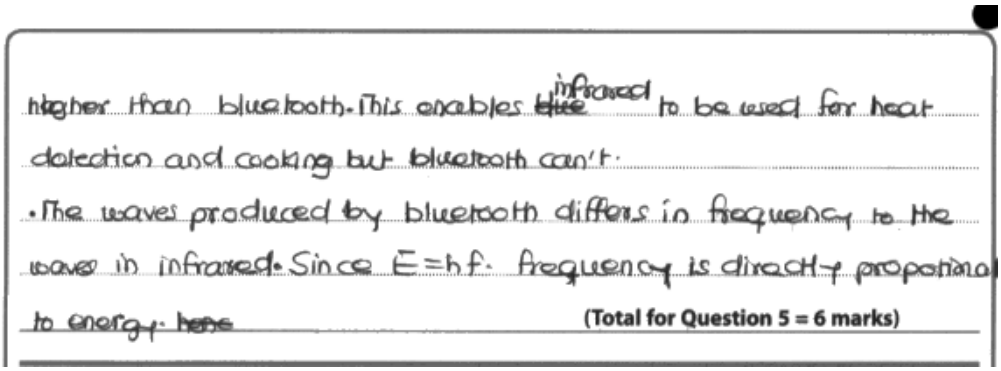
* Waves produces by bluetooth and infrared are transverse. This means both waves produced have direction of propagation to be ~~more~~ perpendicular to the direction of the ~~particles of~~ displacement. me of particles.

* Waves produced by bluetooth and infrared travel at the same speed. Both waves travel at a speed of $3.0 \times 10^8 ms^{-1}$.

DIFFERENCES.

• The waves produced travel at different ~~bandwidth~~ wavelength due to ~~difference in wavelength~~. This means the wavelength of bluetooth is higher than that of infrared. This means bluetooth can travel a bit further than ~~as~~ infrared hence used in communication. ~~infrar~~ This differences ~~makes bluet~~ remotes using infrared to be direct y line of contact but bluetooth is n't.

• Waves produced by bluetooth ~~is~~ has different energy than that of ~~bluetooth~~ infrared. The energy range for infrared is much


higher than bluetooth. This enables ~~blue~~ infrared to be used for heat detection and cooking but bluetooth can't.
• The waves produced by bluetooth differs in frequency to the wave in infrared. Since E=hf. frequency is directly proportional to energy. Hence

(Total for Question 5 = 6 marks)

Summary

Biology

Structure and functions of cells and tissues (Biology)

Based on their performance on this paper, learners should:

- Understand the demand of the command verbs, especially the difference between describe and explain.
- Be familiar with and recognise the ultrastructure and function of organelles in the following cells: prokaryote cells (bacterial cells), eukaryotic cells (plant and animal cells) and eukaryotic cells (plant-cell specific).
- Revise key definitions with level 3 detail, such as tissue, neurotransmitter, etc.
- Show their working out for all calculations to ensure marks can be given for the stages within the calculation even if the final answer is incorrect.
- Use the additional guidance to understand the depth and breadth of the specification

Chemistry

For those learners that did less well, to improve in future exam series learners should ensure that they learn the formula of common compounds that are detailed in the additional guidance document.

They should ensure that they understand basic scientific terminology such electrons versus ions and the difference between groups and periods, so that they can they explain features and trends in the chemistry in more detail.

Learners should practice carrying out calculations from the unit, setting out and showing their workings in a logical manner so that they can arrive at a given answer in a concise way.

Learners should continue to practice exam technique, ensuring that they know what is required by specific command words and know the difference in what is required from commands such as describe and explain and calculate and state.

Centres should ensure that learners understand that they should not give lists with more than one answer for a question unless specifically asked to do so.

Use the past papers and sample assessment materials located on the BTEC First qualification webpage located here.

Physics

To improve their mark for this paper learners should:-

- Learn to use standard form
- Learn how to convert prefixes such as n 'nano' to the SI units that can be used in equations.
- Go through the additional guidance and make sure each point has been covered.
- Use diagrams to help with descriptions.
- Study diagrams given in a question carefully and note the labelling given
- Sketch diagrams and graphs carefully and be as precise as possible.
- Be specific in answers and use scientific terms in descriptions.
- Read questions carefully and note the command word used.

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