

## GCSE Double Award (Unitised) Science Specimen Mark Schemes

For first teaching from September 2011

For first assessment from November 2011

For first award in Summer 2013

Subject Code: 1370

# science

*double award - unitised*

*mark schemes*

# Foreword

The awarding bodies have prepared new specifications to comply with revised GCSE and subject criteria. The specimen assessment materials\* accompanying new specifications are provided to give centres guidance on the structure and character of the planned assessments in advance of the first assessment. It is intended that the specimen mark schemes contained in this booklet will help teachers and students to understand, as fully as possible, the types of tasks and questions set at GCSE level. These specimen mark schemes should be used in conjunction with CCEA's GCSE Double Award Science specification, and CCEA GCSE Double Award Science specimen papers.

**\*The specimen assessment materials are published in three separate publications:**

- **Specimen Papers;**
- **Specimen Mark Schemes; and**
- **Specimen Controlled Assessment.**

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# GCSE Double Award Science

## Specimen Mark Schemes

The contents and page numbers below refer to those across three related publications. **Black** text has been used to indicate content and page numbers in this publication and pale **grey** text for content in the other two publications.

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## **MARK SCHEMES**





**General Certificate of Secondary Education**

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**Double Award Science: Biology**

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**GENERAL  
MARKING  
INSTRUCTIONS**

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## **General Marking Instructions and Mark Grids**

### ***Introduction***

Mark schemes are intended to ensure that the GCSE examination is marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria that they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these marking instructions.

### ***Quality of candidates' responses***

In marking the examination papers, examiners should be looking for a quality response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

### ***Flexibility in marking***

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

### ***Positive marking***

Examiners must be positive in their marking, giving appropriate credit for description, explanation and analysis, using knowledge and understanding and for the appropriate use of evidence and reasoned argument to express and evaluate personal responses, informed insights and differing viewpoints. Examiners should make use of the whole of the available mark range of any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

### ***Awarding zero marks***

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

### ***Types of mark scheme***

Mark Schemes for questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.



**General Certificate of Secondary Education  
2011**

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**Double Award Science: Biology**

Unit B1

Foundation Tier

[CODE]

**SPECIMEN**

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**MARK  
SCHEME**

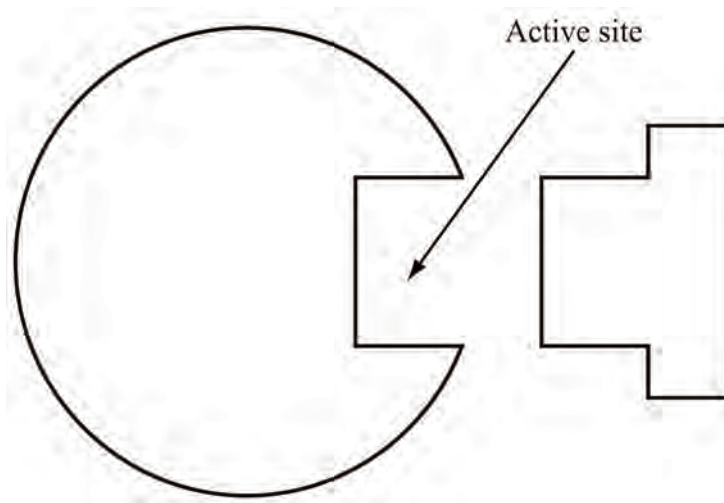
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- 1 (a) Phototropism [1]
- (b) More light therefore more photosynthesis/growth [1]
- [2]
- 2 (a) Chlorophyll [1]
- (b) (i) It was placed in a dark cupboard for 1–2 days [1]
- (ii) Step 2: remove the chlorophyll/decolourise the leaf  
Step 3: remove the alcohol/soften the leaf [2]
- (iii) Alcohol is flammable [1]
- (iv) Flask 1: orange/brown  
Flask 2: blue/black [2]
- [7]
- 3 (a) (i) A: Respiration  
B: Photosynthesis  
C: Feeding/Digestion [3]
- (ii) Starch/sugar [1]
- (iii) Deforestation/less photosynthesis/more burning/more respiration [1]
- (iv) Any **two** from:  
  - plant more trees
  - reduced use of fossil fuels
  - greater use of renewable energy sources
[2]

- (b) (i) decreases immediately [1]  
(ii) tubificid worms [1]  
(iii) rat-tailed maggots and tubificid worms [1]  
(iv) bacteria [1]  
(v) artificial fertiliser [1]  
[12]

4 (a) (i) Biological catalyst [1]

(ii)



[1]

(iii) Lock and key

[1]

**(b) (i) Indicative content:**

- 0 min, blue/black as starch present (in all test-tubes)

Test-tube A:

- After 10 mins amylase had broken down starch to glucose
- So iodine doesn't change colour

Test-tube B:

- Boiling denatures amylase enzyme
- Starch is not broken down to glucose
- So iodine changes colour (brown to blue-black)

Test-tube C:

- Enzyme required for digestion of starch
- So iodine changes colour (brown to blue-black)

<b>Response</b>	<b>Mark</b>
Candidates must use appropriate specialist terms throughout to describe the results they would expect and account, in a logical sequence, for the results. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates must use some appropriate specialist terms throughout to describe the results they would expect and partially account, in a logical sequence, for these results. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe the results they would expect or account for these results using some or all of the above points however these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

[9]

- 5 (a) (i) Both blood glucose levels increase 15 mins after eating meal or continue to increase until 45 mins after meal [1]  
 Any **two** from:
- Person A's resting blood glucose level is lower than B or converse
  - Person B may have diabetes
  - Person B's blood glucose level goes higher because it started off higher/both absorb same amount of glucose
- [3]

- (ii) **Indicative content:**
- In A insulin is produced by pancreas
  - Insulin acts in the liver
  - And causes lowering of blood glucose levels
  - By conversion of glucose to glycogen
  - In B less insulin is produced
  - Therefore it takes longer for the glucose levels to return to resting levels

Response	Mark
Candidates use specialist terms and knowledge to explain in a logical sequence both how blood glucose is returned to resting levels and why there are differences in person B's response. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use specialist knowledge and understanding to explain in a logical sequence what happens to return the blood glucose levels to resting. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard	[3–4]
Candidates indicate that the pancreas is involved and that the hormone acts in the liver but apart from this there is not a sequence of the operation of the hormone or of differences between the responses of the two people. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

- (b) Difficulty in completely burning the food [1]  
 Heat lost to the air [1]  
 Inaccurate recordings of temperatures [1]
- [3]  
**[12]**

- 6 (a) Axes correct way round (x = temperature, y = number of bubbles) and appropriate scaling on both axes [1]  
 Labels and units on axes [1]  
 Accurate plots [1]  
 Line [1] [4]
- (b) So that the plant is carrying out photosynthesis at the desired temperature [1]
- (c) 30°C [1]
- (d) 19 [1]
- (e) Light [1]  
 Move the light source further away from the apparatus and repeat the experiment [1] [2]
- (f) Set up the apparatus without the plant and record the number of bubbles given off [1]  
 [10]
- 7 (a) (i) spiral wrack decreases from upper to lower  
 bladderwrack increases from upper to lower  
**Need both** [1]
- (ii) waves/tides/desiccation/time covered by H<sub>2</sub>O/time exposed/wind [1]
- (iii) light/temperature [1]  
 light meter/thermometer [1]

**(b) Indicative content**

- Set out transect line
- Use quadrats
- Identified seaweeds/used keys
- Counted % cover in each quadrat
- Repeated for several quadrats in each area
- Average for each seaweed
- Repeated for different areas of seashore

<b>Response</b>	<b>Mark</b>
Candidates must use appropriate specialist terms throughout to describe how they would have carried out this investigation and explain, in a logical sequence how the pupils would have obtained these results. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates must use some appropriate specialist terms throughout to describe how they would have carried out this investigation and partially explain, in a logical sequence how the pupils would have obtained these results. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe how they would have carried out this investigation or explain how the pupils would have obtained these results, using some or all of the above points however these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

- (c) (i)** pyramid in blocks and symmetrical  
large seaweeds at bottom with correct number + scale  
others in order + correctly labelled + numbers correct [3]
- (ii)** animals move/can be eaten [1]
- (d) (i)**  $\frac{30}{10} = 3$  [1]
- (ii)**  $3 \times 4 = 12$  [1]

- (iii)** Any **two** from:
- death
  - eaten by crabs
  - removed by people
  - disease
  - emigration

[2]

[18]

Total [70]



**General Certificate of Secondary Education  
2011**

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**Double Award Science: Biology**

Unit B1

Higher Tier

[CODE]

**SPECIMEN**

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**MARK  
SCHEME**

- 1 (a) (i) spiral wrack decreases from upper to lower  
bladderwrack increases from upper to lower  
**need both** [1]
- (ii) waves/tides/desiccation/time covered by water/time exposed/wind [1]
- (b) **Indicative content**
- set out transect line
  - use quadrats
  - identify seaweeds/used keys
  - counted % cover in each quadrat
  - repeated for several quadrats in each area
  - average for each seaweed
  - repeated for different areas of seashore

<b>Response</b>	<b>Mark</b>
Candidates must use appropriate specialist terms throughout to describe how they would have carried out this investigation and explain, in a logical sequence, how the pupils would have obtained these results. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates must use some appropriate specialist terms throughout to describe how they would have carried out this investigation and partially explain, in a logical sequence, how the pupils would have obtained these results. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe how they would have carried out this investigation or explain how the pupils would have obtained these results using some or all of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

(c) largest block at base  
seaweeds at bottom and gulls at top [2]

(d) (i) 16.18% [2]

(ii) Any **two** from:  
• movement  
• excretion  
• reproduction [2]

(iii) not enough energy left to be passed on [1]

**[15]**

2 (a) pancreas [1]

(b) An increase in blood sugar level causes the pancreas to produce insulin [1]  
which then converts excess glucose to glycogen which reduces the  
blood sugar levels [1] [2]

(c) diabetes [1]

(d) glucose present in urine/lethargy/thirst [1]

(e) eye damage/kidney failure/heart disease/stroke [1]

**[6]**



5 (a) (i) **Indicative content**

- record initial temperature of water
- burn the food
- record the final temperature of water
- calculate the temperature increase of the water
- repeat with other food
- one named controlled variable e.g. volume of water, same distance of food sample from apparatus

Response	Mark
Candidates must use appropriate specialist terms throughout to describe how you would collect data and explain, in a logical sequence, how they would calculate and compare the energy released from equal masses of biscuit and bacon. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates must use some appropriate specialist terms throughout to describe how you would collect data and partially explain, in a logical sequence, how they would calculate and compare the energy released from equal masses of biscuit and bacon. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe how they would collect data or explain how they would calculate and compare the energy released from equal masses of biscuit and bacon using some or all of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

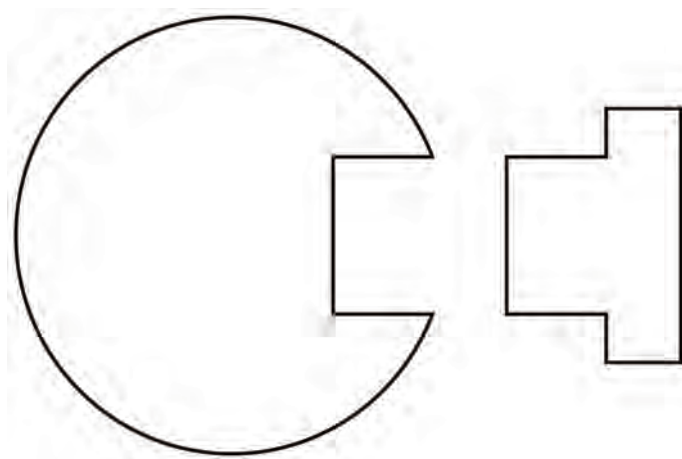
(ii) bacon will contain more energy than biscuit

[1]

- (b) (i) oxygen is available [1]  
(ii) more energy [1]  
(iii) boil the glucose to remove oxygen [1]  
(iv) cover with a layer of oil [1]  
(v) the yeast will run out of food/the alcohol produced may kill the yeast [1]  
[12]

6 (a) (i) chemicals which speed up the rate at which a reaction occurs inside cells [1]

(ii)



[1]

(iii) Lock and key theory [1]

**(b) Indicative content:**

- 0 min, blue/black as starch present (in all test-tubes)

Test-tube A:

- After 10 mins amylase had broken down starch to glucose
- So iodine doesn't change colour

Test-tube B:

- Boiling denatures amylase enzyme
- Starch is not broken down to glucose
- So iodine changes colour (brown to blue-black)

Test-tube C:

- Enzyme required for digestion of starch
- So iodine changes colour (brown to blue-black)

<b>Response</b>	<b>Mark</b>
Candidates must use appropriate specialist terms throughout to describe the results he would expect and account, in a logical sequence, for these results. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates must use some appropriate specialist terms throughout to describe the results he would expect and partially account, in a logical sequence, for these results. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe the results he would expect or account for these results using some or all of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

(c) (i) protease [1]

(ii) stomach [1]

(iii) breaks down proteins to amino acids [1]

[12]

7

yellow [1]	not photosynthesis but is respiration [1]
	rate of photosynthesis = rate of respiration [1]
purple [1]	more photosynthesis than respiration [1]

[5]

[5]

**Total [70]**



**General Certificate of Secondary Education  
2013**

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**Double Award Science: Biology**

Unit B2

Foundation Tier

[CODE]

**SPECIMEN**

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**MARK  
SCHEME**

- 1**
- (a)**
    - (i)** UV light [1]
    - (ii)** More holidays/More use of sunbeds [1]
  - (b)**
    - (i)** Nucleus-chromosome-gene-DNA  
All correct = 3, 2/3 correct = 2, 1 correct = 1 [3]
    - (ii)** DNA [1]
- [6]**
- 2**
- (a)**
    - (i)** Gonorrhoea/TB [1]
    - (ii)** White [1]
    - (iii)** Stage 2: Surrounds the bacterium  
Stage 3: Digest the bacterium [2]
  - (b)**
    - (i)** Antigens [1]
    - (ii)** Antibodies would not fit/shapes are different [1]
    - (iii)** antibodies remain  
memory cells present/  
white blood cells remember how to make antibodies [2]
- [8]**



5 (a) (i) The rubber tubing must be well sealed

[1]

(ii) **Indicative content**

- measure the distance water moves/bubble moves at 20°C
- in a given time
- repeat with same plant at 30°C
- name at least one controlled variable that should be kept the same
- reset the bubble (using the reservoir) to zero
- leave for given time
- measure the distance the water moves/bubble moves at 30°C
- calculate rate to compare

Response	Mark
Candidates must use appropriate specialist terms throughout to describe how they could use this apparatus and explain, in a logical sequence, how to compare the rate of water uptake for a plant shoot at two different temperatures (20°C and 30°C). They use good spelling, punctuation and grammar and the form and style are of a high standard	[5–6]
Candidates must use some appropriate specialist terms throughout to describe how they could use this apparatus and partially explain, in a logical sequence, how to compare the rate of water uptake for a plant shoot at two different temperatures (20°C and 30°C). They use satisfactory spelling punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe how they could use this apparatus or how to compare the rate of water uptake for a plant shoot at two different temperatures (20°C and 30°C) using some or all of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

- (b) (i)  $12 \div 10 = 1.2$  [1]  
mm per min [1] [2]
- (ii) Rate of water loss at 30°C is higher (1.2mm per minute) than at 20°C (0.6mm per minute) [1] The greater loss of water causes the plant to wilt [1] Therefore there is a greater need for frequent watering at 30°C to replace water lost. [1] [3]
- [12]
- 6 (a) Correct gametes [1] offspring genotype [1] [2]
- (b) 50% [1]
- (c) One dominant and one recessive allele [1] Bb [1] [2]
- (d) Male XY/female XX [1] only one chromosome/allele in each gamete [1]  
50% gametes have X/50% Y [1] [3]
- [8]
- 7 (a) Mitosis = B [1]  
Meiosis = C [1]
- (b) (i) Testes [1]
- (ii) Testosterone [1]
- (iii) Mitosis [1]
- (c) (i) On the lining of the uterus [1]
- (ii) Differentiation [1]
- (iii) Amnion: cushions the foetus. [1]  
Placenta: exchange of gases and substances [1]
- (iv) Larger surface area [1]
- [10]

- 8 (a) (i) Just one area/side brain affected [1]
- (ii) Bigger size → more symptoms  
Location differs → different symptoms [1]
- (iii) **Indicative content**
- Blockage/reduced blood flow
  - In blood vessel/or part of brain
  - Less O<sub>2</sub> or glucose to brain
  - Less respiration in cells of brain
  - Cells die in brain/reduced brain activity
  - Results in reduced body part function

Response	Mark
Candidates use appropriate terms throughout to explain, in a logical sequence, how a stroke occurs. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms throughout to partially explain, in a logical sequence, how a stroke occurs. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe how a blood vessel is blocked or the effects on the brain using some or all of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

- (b) (i) Any **two** from:
- Genetic factors
  - High blood pressure
  - Age
- (ii) Any **three** from:
- Reduce blood pressure
  - Reduce weight
  - More exercise
  - Reduce salt intake
  - Reduce sugar intake
  - Reduce their chances of diabetes
  - Reduce alcohol consumption
  - Stop smoking
- (c) (i) Arteries [1]
- (ii) Permeable/Thin wall/Large surface area [1]

[15]

- 9 (a) (i) One mark for correct bars and one each for each correctly labelled axis [3]
- (ii) Distinct categories [1]

(b) **Indicative content**

- in absence of antibiotic, normal bacteria fitter
- some antibiotic resistant bacteria still present due to mutation
- in presence of antibiotic, antibiotic-resistant bacteria fitter (can survive)
- antibiotic-resistant bacteria reproduce
- pass on the antibiotic resistant gene to the offspring
- therefore the numbers of antibiotic resistant bacteria increase in the population
- meanwhile, normal bacteria killed by antibiotic (differential survival)

Response	Mark
Candidates must use appropriate specialist terms throughout to use their knowledge of natural selection to explain in a logical sequence how the change in numbers of antibiotic resistant bacteria came about. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates must use some appropriate specialist terms throughout to use their knowledge of natural selection to partially explain, in a logical sequence how the change in numbers of antibiotic resistant bacteria came about. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe the results of natural selection or the effects of antibiotics on the bacteria using some or all of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

[10]

**Total [90]**

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General Certificate of Secondary Education  
2013

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**Double Award Science: Biology**

Unit B2

Higher Tier

[CODE]

**SPECIMEN**

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**MARK  
SCHEME**

- 1 (a) (i) Punnett square drawn  
Both parents = heterozygous  
Each gamete only has 1 allele  
Correct cross [4]
- (ii) Both have wing bars [1]
- (iii) As one recessive allele must be passed on when crossed with a homozygous recessive parent [1]  
then if all offspring have wing bars the unknown parent was homozygous dominant [1]  
and if any offspring have no wing bars the unknown parent was heterozygous [1] [3]
- (b) (i) **Indicative content**
- human gene for insulin removed from human chromosome
  - plasmid removed from bacterium and spliced open
  - the gene for insulin is inserted to the plasmid
  - the modified plasmid is re-inserted into the bacterium
  - the bacterium is provided with the correct requirements for growth
  - the bacteria multiply
  - the bacteria produce human insulin
  - reference to purification for human use

Response	Mark
Candidates use appropriate specialist terms throughout to describe how a human gene for insulin can be removed and then inserted into the plasmid of a bacterium and explain, in a logical sequence how human insulin can then be produced. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use appropriate specialist terms throughout to describe how a human gene can be removed and then inserted into the plasmid of a bacterium and partially explain, in a logical sequence how human insulin can then be produced. They use satisfactory spelling punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe how a human gene for insulin can be removed and then inserted into the plasmid of a bacterium or explain how human insulin can then be produced using some or all of the above points however these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

- (ii) Any **two** from:
- Can produce larger quantities
  - Can produce human insulin
  - No side effects

[2]

[16]

- 2 (a) (i) **Indicative content**
- measure the distance water moves/bubble moves at 20°C
  - in a given time
  - repeat with some plant at 30°C
  - name at least one controlled variable that should be kept the same
  - reset the bubble (using the reservoir) to zero
  - leave for given time measure the distance the water moves/bubble moves at 30°C

Response	Mark
Candidates use appropriate specialist terms throughout to describe how they could use this apparatus and explain, in a logical sequence how to compare the rate of water uptake for a plant shoot at two different temperatures (20°C and 30°C). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms throughout to describe how they could use this apparatus and partially explain, in a logical sequence, how to compare the rate of water uptake for a plant shoot at two different temperatures (20°C and 30°C). They use satisfactory spelling punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe how they could use this apparatus or how to compare the rate of water uptake for a plant shoot at two different temperatures (20°C and 30°C) using some or all of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

(b) (ii)  $12 \div 10 = 1.2$  [1]  
mm per min [1] [2]

(ii) Rate of water loss at 30°C (1.2mm per minute) than at 20°C  
(0.6mm per minute) [1] The greater loss of water causes the plant to  
wilt [1] Therefore there is a greater need for frequent watering at 30°C  
to replace water lost [1] [3]

[11]

3 Mitosis: Cell B [1]: Reason = identical to parent [1]

Meiosis: Cell C [1]: 1. Half the number of chromosomes [1]

2. One of each pair [1] [5]

[5]

4 (a) **Indicative content**

- Swabbing down the bench with alcohol
- Glassware/equipment must be sterile/flamed to prevent unwanted bacteria contaminating plates
- Working in an area beside a lit Bunsen burner
- Plates should be carefully labelled
- Wearing a lab coat/gloves
- Not eating/drinking in the lab
- All plates should be sealed when the experiment has been set up to prevent any human contact with potentially harmful bacteria
- Washing hands with soap and water before and after working with micro-organisms
- All plates should be autoclaved before being disposed of to kill any harmful bacteria present

Response	Mark
Candidates use appropriate specialist terms throughout to describe some aseptic techniques they would use in the laboratory when culturing microbes and explain, how each of these techniques would prevent contamination. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms throughout to describe some aseptic techniques they would use in the laboratory when culturing microbes and partially explain, how each of these techniques would prevent contamination. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe some aseptic techniques they would use in the laboratory when culturing microbes or explain how each of these techniques would prevent contamination using some or all of the above points however these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

(b) (i) C

[1]

(ii) Concentration of antibiotic

[1]

[8]



**(iii) Indicative content**

- Blockage/reduced blood flow
- In blood vessel/or part of brain
- Less O<sub>2</sub> or glucose to brain
- Less respiration in cells of brain
- Cells die in brain/reduced brain activity
- Results in reduced body part function

<b>Response</b>	<b>Mark</b>
Candidates use appropriate terms throughout to explain, in a logical sequence how a stroke occurs. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms throughout to partially explain, in a logical sequence, how a stroke occurs. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe how a blood vessel is blocked or the effects on the brain using some or all of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

- (b) (i)** Any **two** from:
- Genetic factors
  - High blood pressure
  - Age
- [2]
- (ii)** Any **three** from:
- Reduce blood pressure
  - Reduce weight
  - More exercise
  - Reduce salt intake
  - Reduce sugar intake
  - Reduce their chances of diabetes
  - Reduce alcohol consumption
  - Stop smoking
- [3]
- (c) (i)** Arteries
- [1]
- (ii)** Permeable/thin wall/large surface area
- [1]

[15]

- 7**
- (a)** The first vaccine contains antibodies [1]
  - (b)** Passive [1]
  - (c)** The levels of antibodies have fallen below the level required to produce immunity [1]
  - (d)** It takes time for the correct antibodies to be produced; in response to the antigens present in the second vaccine [2]
  - (e)** Active [1]
- [6]**
- 8**
- (a)** The sugar molecules are too big to pass across the selectively permeable membrane [1] therefore only water molecules can pass across the selectively permeable membrane [1] because water moves from an area of high water concentration to an area of low water concentration/down a concentration gradient [1] [3]
  - (b)**
    - (i)**  $-12/3 = -4$  [1]
    - (ii)** The decrease in length is caused by water moving out of the potato; [1] as there is a more concentrated sugar solution outside the potato than in the potato tissue [1] [2]
    - (iii)** Volume of the solutions/Acceptable alternatives [1]
    - (iv)** Cell will have plasmolysed/Absence of chloroplasts  
Same contents/Smaller vacuole at end  
Vacuole will be smaller/Cell membrane pulled away from cell  
(Labels not required)/Label for cell wall and membrane (both correct) [4]
- [11]**

9 (a) **Indicative content:**

- in absence of antibiotic, normal bacteria fitter;
- some antibiotic resistant bacteria still present due to mutation;
- in presence of antibiotic, antibiotic-resistant bacteria fitter (can survive);
- antibiotic-resistant bacteria reproduce;
- pass on the antibiotic resistant gene to the offspring;
- therefore the numbers of antibiotic resistant bacteria increase in the population;
- meanwhile, normal bacteria killed by antibiotic (differential survival)

Response	Mark
Candidates use appropriate specialist terms throughout to use their knowledge of natural selection to explain in a logical sequence how the change in numbers of antibiotic resistant bacteria came about. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms throughout to use their knowledge of natural selection to partially explain, in a logical sequence how the change in numbers of antibiotic resistant bacteria came about. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe the results of natural selection or the effects of antibiotics on the bacteria using some or all of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

- (b) (i) Adenine–thymine (or guanine–cytosine) or base pairs link together [1]
- (ii) Franklin/Wilkins–Worked out overall helical shape of DNA  
Watson and Crick–Worked out double helix arrangement/How bases fit together [2]
- (c) (i) GCT [1]
- (ii) 90 [1]

<b>(d)</b>	<b>(i)</b>	Abortion or keep child	[1]
	<b>(ii)</b>	If abortion, destroys foetus/If no abortion, child will be born with Down Syndrome	[1]
			[13]
		<b>Total</b>	<b>[90]</b>



**General Certificate of Secondary Education  
2011**

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**Double Award Science: Chemistry**

Unit C1

Foundation Tier

[CODE]

**SPECIMEN**

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**MARK  
SCHEME**

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- 1 (a) Any **two** from:
- Idea that symbols are internationally understood
  - Idea that symbols are eye-catching
  - Idea that symbols can be understood by those who cannot read
  - Do not accept idea of 'warning' as it is in the stem
- [2]
- (b) (i) Barium chloride [1]
- (ii) Ethanol [1]
- (iii) Idea based on the dangers of storing explosive materials in a shed [1]
- [5]

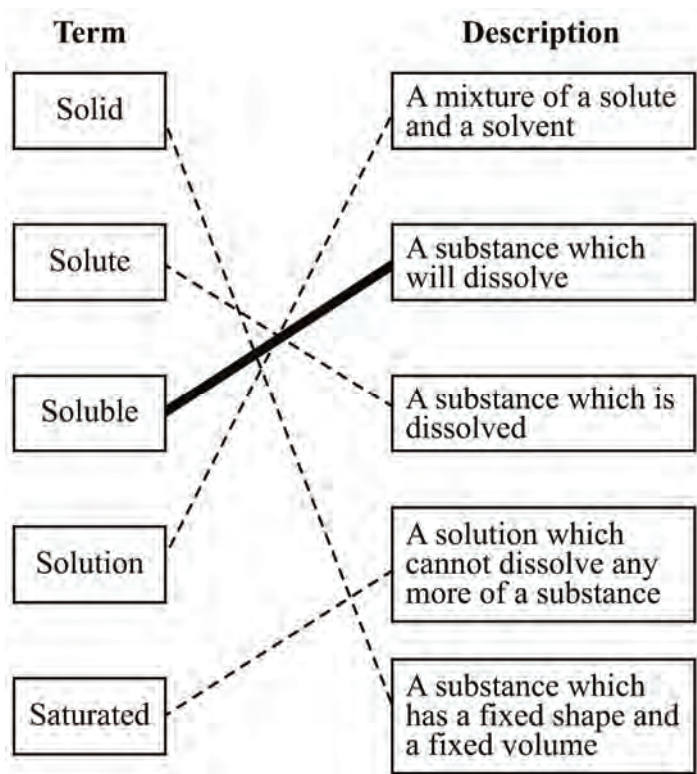
2

Chemical	Element	Compound	Mixture
Silver	✓		
Salt solution			✓
Aluminium	✓		
Sulfur dioxide		✓	
Water		✓	
Crude oil			✓

One mark for each correctly identified chemical [5]

[5]

3



4 correct = 3 marks, 2-3 correct = 2 marks, 1 correct = 1 mark

[3]

[3]

#### 4 Indicative content

- Dissolving the mixture in water and stirring
- Filter
- To separate the salt solution from the undissolved sand
- Idea that sand is the residue/salt solution is filtrate
- Evaporate water from solution
- Allow to crystallize

Response	Mark
Candidates use specialist terms throughout to describe how a mixture of sand and salt can be separated in a logical sequence (all 6 points required). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some specialist terms to describe how a mixture of sand and salt can be separated in a logical sequence (at least 4 points required). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe how a mixture of sand and salt can be separated (at least 2 points). However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

[6]



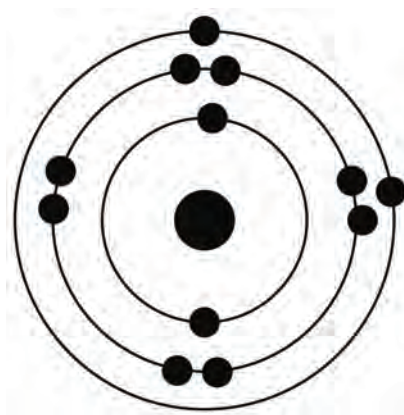
- 7 (a) **Indicative content**
- The mass of a solute
  - Which will saturate
  - 100g of water
  - At a particular temperature
  - As temperature increases, solubility (of potassium nitrate) increases
  - Slow increase (in solubility) at start; faster at higher temperatures

Response	Mark
Candidates must use appropriate specialist terms throughout to describe fully the trend in solubility (points 5 and 6) and explain, in a logical sequence, what is meant by the term solubility (all points 1 to 4). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms to describe the trend in solubility (points 5 and 6) and partially explain, in a logical sequence, what is meant by the term solubility (using 2 or 3 of points 1 to 4). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe the trend in solubility or explain what is meant by the term solubility using some or all of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1–2]
Response not worthy of credit	[0]

- [6]
- (b) (i) Potassium nitrate [1]
- (ii) 43 (accept 42–44) [1]
- (iii) 46 (accept 45–47) [1]
- [9]

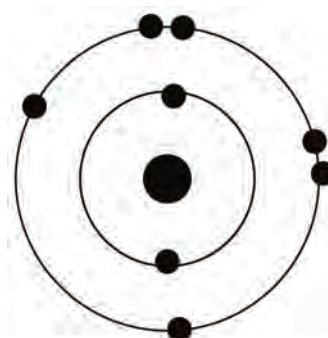
- 8** (a) A/C [1]
- (b) B and D both needed [1]
- (c) Any appropriate test, for example, testing the heat conductivity/  
ductility/malleability [1]
- 9** (a) Red Litmus [3]
- (b) (i) Red/Orange/Yellow [1]
- (ii) pH meter [1]
- (c) Name of Ion: Hydrogen [1]  
Formula of Ion:  $H^+$  [1]
- 10** (a) Calcium, Hydrogen, Phosphorous, Oxygen [3]  
4 elements = 3 marks  
3 elements = 2 marks  
2 or 1 element = 1 mark
- (b) (i) 3 [1]
- (ii) 9 [1]
- (c) Magnesium sulphate [1]
- (d) (i)  $CuSO_4$  [1]
- (ii) blue [1]
- [8]

11 (a) (i)



[1]

(ii)



[1]

(b) There are strong forces between the ions [1] These forces are electrostatic [1]  
A lot of energy is required to overcome these forces [1]

[3]

[5]

12 (a) (i) Carbon [1] 4 [1]

Apply consequential marking (CM) to group number

[2]

(ii)

Atomic number	Name of element	State at room temperature (20°C)
4		solid [1]
9	fluorine [1]	gas [1]

[3]

(iii) 2, 8, 4

[1]

(b) (i) The alkaline earth metals

[1]

(ii) Group 8/0

[1]

(iii) Sodium

[1]

[9]

Total [70]



**General Certificate of Secondary Education  
2011**

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**Double Award Science: Chemistry**

Unit C1

Higher Tier

[CODE]

**SPECIMEN**

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**MARK  
SCHEME**

---

1 (a) Calcium, Hydrogen, Phosphorous, Oxygen  
4 elements = 3 marks  
3 elements = 2 marks  
2 or 1 element = 1 mark [3]

(b) (i) 3 [1]

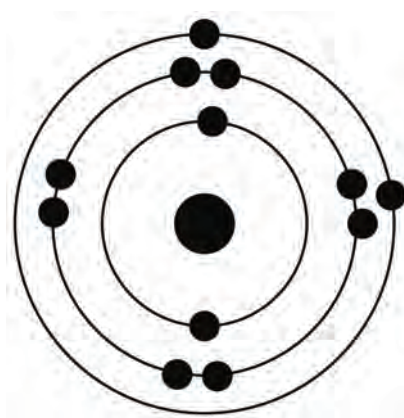
(ii) 9 [1]

(c) (i)  $\text{CuSO}_4$  [1]

(ii) Blue [1]

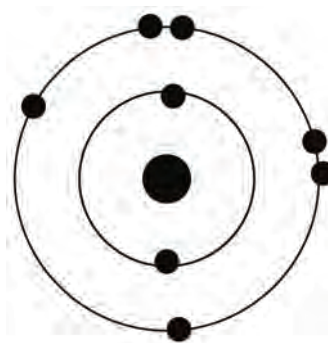
[7]

2 (a) (i)



[1]

(ii)



[1]

**(b) Indicative content**

- Correct electronic configuration of oxygen atom
- Correct electronic configuration of magnesium atom
- Correct direction of transfer
- Correct number of electrons transferred
- Correct electronic configuration of magnesium ion
- Correct electronic configuration of oxide ion
- Statement to describe attraction between oppositely charged ions

<b>Response</b>	<b>Mark</b>
Candidates must use specialist terms throughout to explain, using electronic structures, how magnesium and oxygen bond to form the compound magnesium oxide in a logical sequence (6–7 points required). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some specialist terms to explain, using electronic structures, how magnesium and oxygen bond to form the compound magnesium oxide in a logical sequence (at least 5 points required). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe using electronic structures, how magnesium and oxygen bond to form the compound magnesium oxide using at least 2 of the above points, however these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

- (c)** There are strong forces between the ions [1] These forces are electrostatic [1]  
A lot of energy is required to overcome these forces [1]

[3]

[11]

3 (a) (i) Carbon [1] 4 [1]  
Apply consequential marking (CM) to group number [2]

(ii)

Atomic number	Name of element	State at room temperature (20°C)
4		solid [1]
9	fluorine [1]	gas [1]

[3]

(iii) 2,8,4 [1]

(b) (i) The alkaline earth metals [1]

(ii) Group 8/0 [1]  
[8]

4 (a) Red Litmus [1]

(b) (i) Red/Orange/Yellow [1]

(ii) pH meter [1]  
[3]

5 (a) The solubility of a solid is the maximum mass of a solid/solute [1]  
Which will dissolve in [1] 100g of water [1] At a given temperature [1]  
**Or** [4]  
The solubility of a solid is the mass of solid/solute which will dissolve  
in [1] and saturate [1] 100g of water [1] At a given temperature [1]

- (b) (i) 40.5 +/- 1 [1]
- (ii) 6–7 points plotted correctly 2 marks  
 4–5 points plotted correctly 1 mark  
 Less than four points plotted correctly 0 marks  
 Smooth curve 1 mark [3]
- (iii) Solubility at 58°C/100g water = 101+/-1 [1]  
 Solubility at 24°C/100g water = 37+/-1 [1]  
 101–37 = 64/100g water [1]  
 64 × 10 = 640 [1] [4]
- [12]
- 6 Diagram should show:  
 Positive ions but no negative ions [1]  
 Regular arrangements of positive ions only [1]  
 Sea/cloud/delocalised electrons [1]  
 Fourth mark – diagram which is correctly labelled [1]  
 (electrons at least) [4]
- [4]
- 7 (a) Correct sharing of four electrons in a double bond [1]  
 Correct number of electrons [1]  
 Valence electrons only need to be shown  
 Do not penalise correct inner shells  
 Second mark dependent on the first [2]
- (b) Correct sharing of three pairs of electrons in three single bonds between H and N [1]  
 Correct number of electrons [1]  
 Valence electrons only need to be shown  
 Do not penalise correct inner shells  
 Second mark dependent on the first [2]
- [4]
- 8 (a) A [1]
- (b) D [1]
- (c) Giant molecular [1]
- (d) B [1]
- [4]

- 9 (a) An allotrope is an element which has two different forms; in the same physical state [1] [2]
- (b) Graphite contains free electrons [1]  
Which can move and carry the charge [1] [2]
- (c) Idea that **all** the bonds in diamond are strong [1] [5]
- 10 (a) (i) Idea that the ions need to be free to move to carry the charge [1]
- (ii)  $\text{Pb}^{2+} + 2\text{e}^{-} \rightarrow \text{Pb}$   
[1] LHS [1] RHS [2]

**(b) Indicative Content**

- Cryolite
- Idea of lowering the melting point (of aluminium oxide)/idea of increase of conductivity
- Idea of aluminium ions moving to cathode
- $\text{Al}^{3+} + 3\text{e} \rightarrow \text{Al}$
- Idea of oxide ions moving to anode
- Oxygen formed (at anode)
- Idea of anodes/electrodes being made of carbon/graphite
- Idea of carbon (anodes) reacting with oxygen
- To give carbon dioxide
- Idea that aluminium formed is molten/tapped off
- Explicit idea that aluminium sinks/is more dense (than aluminium oxide)

<b>Response</b>	<b>Mark</b>
Candidates must use specialist terms throughout to describe how aluminium is produced industrially by electrolysis in a logical sequence (at least 9 points including 1 equation). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[7–9]
Candidates use some specialist terms to describe how aluminium is produced industrially by electrolysis in a logical sequence (at least 7 points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[4–6]
Candidates describe how aluminium is produced industrially by electrolysis (at least 4 points). However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–3]
Response not worthy of credit	[0]

[9]

[12]

**Total [70]**

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General Certificate of Secondary Education  
2013

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**Double Award Science: Chemistry**

Unit C2

Foundation Tier

[CODE]

**SPECIMEN**

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**MARK  
SCHEME**

<b>Substance</b>	<b>Test</b>	<b>Result</b>
Hydrogen	Lighted splint	<b>Pops</b>
Carbon dioxide	<b>Limewater</b>	Colour changes from colourless to milky
Oxygen	<b>Glowing splint</b>	Relights
Water	Anhydrous copper sulphate	White to blue

[4]

(b) (i) oxygen [1]

(ii) Carbon dioxide [1]

(iii) Oxygen and hydrogen [1]

[7]

2 (a) Idea of local production of useful materials  
Creation of local jobs/increase in local economy/or other suitable [2]

(b) Idea expressed of specific detrimental effect on the local residents  
Idea expressed of specific detrimental effect on environment  
For example, noise produced by the blasting causes difficulty for local residents [2]

[4]

3 (a) Carbon [1]

(b) Carbon dioxide [1]

(c) Wood [1]

(d) Heat [1]

(e) Oxygen [1]

[5]

**4 Indicative content**

- Rust is caused by reacting iron with
- Water
- Oxygen

Candidates choose two bicycle parts which are made from iron and give a suitable method of rust prevention for each part.

<b>Response</b>	<b>Mark</b>
Candidates must use specialist terms throughout to explain how rust is formed, choose two parts of the bicycle and give an appropriate method for rust prevention for each part. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some specialist terms to state the 3 substances needed for rust to form, choose one part of the bicycle and give an appropriate method for rust prevention. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates state at least 2 of the substances needed for rust to form and give a method for rust prevention. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

[6]

- 5**
- (a) Any suitable safety precaution except use of safety glasses e.g. burn off the excess hydrogen/use a fume cupboard [1]
- (b) Copper [1] + water [1] [2]
- (c) Black [1]
- (d) Salmon Pink/pinky brown or other correct Expression of the colour of copper [1]
- (e) Copper oxide loses oxygen [1]
- [6]

6 (a)

<b>Chemical Substance</b>	<b>No Chemical reaction on heating in air</b>	<b>An oxide formed on heating in air</b>	<b>The substance breaks down into simpler substances on heating in air</b>
Aluminium oxide	✓		
Magnesium		✓	
Limestone			✓
Sodium Chloride	✓		
Sulfur		✓	

[4]

(b) Decomposition

[1]

(c)

<b>Name of Gas</b>	<b>% in the air</b>
Oxygen	20%
Nitrogen	Approx 80%
Carbon Dioxide/any Noble gas	Less than 1%

[2]

(d) Carbon dioxide

[1]

[8]

7 (a) **Indicative content**

**Explanation**

- Water containing calcium and/or magnesium (ions)
- does not lather easily with soap/forms a scum with soap

**Description of test**

- Same volume of water
- Addition of soap solution
- 1cm<sup>3</sup> at a time/idea of same volume of soap/idea of keep adding soap
- Shaken/lather
- Addition repeated until a lasting lather is formed/hard water sample does not give a lather
- Correct statement of result

Response	Mark
Candidates must use specialist terms throughout to fully explain definition of hard water and describe a fair test which you could carry out to find which is a hard water sample in a logical sequence (all 8 points required). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some specialist terms to explain the definition of hard water and describe a fair test which you could carry out to find which is a hard water sample in a logical sequence (1 explanation point and 4 description points required). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates explain the definition of hard water or describe a fair test which you could carry out to find which is a hard water sample some or all of the above points, however these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

(b) Temporary/permanent

[1]

(c) A disadvantage of hard water [1] related to extra cost [1]

Example:

More soap is needed to form a permanent lather [1]

Householder spends more money on soap [1]

Or

Limescale builds up on pipes [1] pipes may have to be replaced [1]

[2]

[9]



- 10 (a)** Carbon dioxide [1]
- (b) (i)** Recognisable diagram with apparatus correctly positioned [1]  
 And any **two** of the following correct labels on the diagram [2]
- Conical flask on balance
  - Cotton wool plug
  - Water and tables
  - Stopclock/stopwatch [3]
- (ii)** Gas produced [1]  
 Lost from container [1] [2]
- (c) (i)** 5 or 6 points plotted correctly [2]  
 3 or 4 points plotted correctly [1]  
 2 or less points plotted correctly [0]  
 Curve [1] [3]
- (ii)** 78 seconds [1]
- (iii)**  $101.33 - 100.90 = 0.43$  [1]  
 Divided by 2 = 0.215 [1] [2]
- [12]
- 11 (a) (i)** Idea of copper colour/salmon pink [1]
- (ii)** Idea of copper displacing the silver  
 Idea of copper compounds are blue [2]
- (iii)** Zinc, iron, copper, silver [3]
- (iv)** Zinc [1]
- (v)** HCl [1]

(b) (i) Wear safety glasses/use a safety screen [1]

(ii) **Indicative content**

Sodium will:

- Float
- Move about
- Form a ball
- Of molten metal
- Fizz/hiss/idea of appropriate sound
- Disappear/get smaller
- May burn with a yellow flame
- Idea of exothermic

Response	Mark
Candidates must use specialist terms throughout to describe what you would observe happening when sodium is added to water (at least 6 points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some specialist terms to describe what you would observe happening when sodium is added to water (at least 4 points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe what you would observe happening when sodium is added to water using at least 2 points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

(iii) Sodium Hydroxide  
Hydrogen  
Any order

[2]

(iv) Any group 1 element below sodium in the group

[1]

[18]

**Total [90]**



General Certificate of Secondary Education  
2013

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**Double Award Science: Chemistry**

Unit C2

Higher Tier

[CODE]

**SPECIMEN**

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**MARK  
SCHEME**

- 1**
- (a) (i) Sulfur dioxide [1]
- (ii) Any two from kills fish/acidifies rivers/kills trees/  
corrodes limestone (buildings) [2]
- (iii) Remove sulfur from fossil fuels before burning [1]
- (iv) Vulcanisation of rubber/manufacture of sulfuric acid/fungicide [1]
- (v) Yellow [1] Solid [1] [2]
- (b) Lack of oxygen produces carbon monoxide [1] which is toxic [1] [2]
- (c) (i) Idea of very low density [1]
- (ii) Idea of not supporting combustion [1]
- (iii) Idea of unreactivity [1]
- [12]
- 2**
- (a) (i) Idea of copper colour/salmon pink [1]
- (ii) Idea of copper displacing the silver [1]  
Idea of copper compounds are blue [1] [2]
- (iii) Zinc, iron, copper, silver [3]
- (iv) Zinc [1]
- (b) (i) Wear safety glasses/use a safety screen [1]

**(ii) Indicative content**

Sodium will:

- Float
- Move about
- Form a ball
- Of molten metal
- Fizz/hiss/idea of appropriate sound
- Disappear/get smaller
- May burn with a yellow flame
- Idea of exothermic

<b>Response</b>	<b>Mark</b>
Candidates must use specialist terms throughout to describe what you would observe happening when sodium is added to water (at least 6 points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some specialist terms to describe what you would observe happening when sodium is added to water (at least 4 points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe what you would observe happening when sodium is added to water using at least 2 points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

**(iii) Sodium hydroxide**

Hydrogen  
Any order

[2]

**(iv) Any group 1 element below sodium in the group**

[1]

**[17]**

- 3 (a) (i) Hydrogen [1]
- (ii)  $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$  [3]
- (iii) Individual marks are awarded for correctly labelled and recognisable drawing  
 At least 3 labels [1]  
 Conical flask as a reaction vessel [1]  
 Connecting tube [1]  
 Sealed vessel/system [1]  
 Syringe or other suitable collection system [1] essential  
 Collection system which can measure the volume of the gas [1]  
 Stopclock [1]
- Maximum [5] for a system that works [5]
- (b) 122 [1]
- (c) (i) Steeper curve [1]  
 Levels off at same volume –  $110\text{cm}^3$  [1] [2]

**(ii) Indicative content**

- Particles in this reaction have more energy
- Move faster
- More collisions
- Idea of more successful collisions in a given period of time
- Increased rate of reaction

**Other Factors**

- Concentration of reactants
- The higher the concentration, the faster the rate of reaction (or converse)
- Surface area
- The greater the surface area, the faster the rate of reaction (or converse)

<b>Response</b>	<b>Mark</b>
Candidates use specialist terms throughout to state and explain in terms of particles, what happens to the rate of the reaction when the temperature is increased in a logical sequence; and explain the effects of 2 factors affecting the rate of reaction (all points needed). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some specialist terms to state and partially explain in terms of particles, what happens to the rate of the reaction when the temperature is increased in a logical sequence (at least 3 points from first section) and explain one other factor that affects the rate of reaction. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates state or partially describe what happens to the rate of the reaction when the temperature is increased or explain a factor that affects the rate of reaction using some or all of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

- (d)** Idea of changing the concentration of the acid/idea of increasing the surface area of the magnesium

[1]

[19]



## 5 Indicative content

- Bond breaking requires energy
  - Bonds broken in methane and oxygen
  - Bond making releases energy
  - Bonds made in carbon dioxide and water
  - Comparison of endothermic and exothermic processes to give overall result
- For example; there is more energy released when the bonds in carbon dioxide and water are made than is required when the bonds in methane and oxygen are broken. Therefore the reaction is exothermic

Response	Mark
Candidates use specialist terms throughout to explain, in terms of the bonds involved, why the reaction between methane and oxygen is exothermic in a logical sequence (all 5 points required). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some specialist terms to partially explain in terms of the bonds involved, why the reaction between methane and oxygen is exothermic in a logical sequence (at least 3 points required). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates begin to explain, in terms of the bonds involved, why the reaction between methane and oxygen is exothermic (at least 2 points). However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]



7 (a) (i) A hydrocarbon is a substance which contains hydrogen and carbon [1] only [1] [2]

(ii) Propane – alkane [2]  
Propene – alkene

(iii) No C=C (double) bond [1]

(iv)

Propane	$C_3H_8$	<pre>       H   H   H                 H — C — C — C — H                       H   H   H           </pre>
Propene	$C_3H_6$	<pre>       H           H                     H — C — C = C — H                   H   H           </pre>

[4]

(v) Test: add bromine water [1]  
With propane: no colour change [1]  
With propene: colour change from red/brown [1] to colourless [1] [4]

(b) Addition [1] Polymerisation [1] [2]

(c)  $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$   
1 mark for LHS  
1 mark for RHS  
1 mark for balancing [3]

[18]

**Total [90]**

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General Certificate of Secondary Education  
2011

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**Double Award Science: Physics**

Unit P1

Foundation Tier

[CODE]

**SPECIMEN**

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**MARK  
SCHEME**





## 8 Indicative Content

- Solids, liquids and gases are made up of atoms/molecules
- In solids the atoms/molecules are vibrating
- Heat gives them more kinetic energy
- This causes more vigorous vibrating
- When some of them overcome the bonds the solid turns to liquid
- As more energy is given to the liquid the remaining atoms/molecules overcome the bonds and a gas is formed.

Response	Mark
Candidates use appropriate specialist terms throughout to describe and explain fully all the changes of state using all above points in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms to partially describe and explain the changes of state using 4-5 of the above points in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates make limited use of specialist terms to describe or explain the changes of state using some or all of the above points. However, these are not presented in a logical sequence. Their spelling, punctuation and grammar and the form and style are of a limited standard.	[1–2]
Response not worthy of credit	[0]

[6]

[6]

- 9 (a) (i) Electron [1]  
Proton [1] [2]
- (ii) 3 [1]  
He  
2 [1] [2]
- (b) (i) The nucleus [1]
- (ii) Alpha – Helium nucleus/2 protons combined with 2 neutrons [1]  
Beta – electron [1]  
Gamma – electromagnetic radiation [1] [3]

**(iii) Indicative Content:**

- Alpha emitted
- Thin piece of paper reduces the count rate significantly
- Beta not emitted
- Aluminium sheet makes little (no) difference to count rate
- Gamma emitted
- Significant count rate present even with lead

<b>Response</b>	<b>Mark</b>
Candidates use appropriate specialist terms throughout to explain fully which radiations were emitted. They clearly link each radiation to an appropriate explanation. They use good spelling, punctuation and grammar throughout and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms to partially explain which radiations were emitted. They identify all the radiations but only partially link each radiation to an appropriate explanation. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates use limited specialist terms to identify at least one of the radiations emitted. However, the radiations identified are not linked to an appropriate explanation. Their spelling, punctuation and grammar are of a limited standard.	[1–2]
Response not worthy of credit	[0]

[6]

**(iv) Naturally occurring radiation**

[1]

[15]

- 10 (a) (i)** Average values of S: 110 and 120cm [1] each S [2]
- (ii)** 4 points correctly plotted [2]  
½ each round down  
Smooth curve through the points [1] [3]
- (iii)** S is not proportional to H [1]  
Reason – a straight line passing through origin cannot be drawn through  
the points [1]  
**or** S does not double when H doubles [1] [2]
- [7]
- Total [70]**



General Certificate of Secondary Education  
2011

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**Double Award Science: Physics**

Unit P1

Higher Tier

[CODE]

**SPECIMEN**

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**MARK  
SCHEME**

- 1**      **(a)**    **(i)**      Oil/coal/gas/nuclear [1] [2]  
                                 Explanation – have a limited supply [1]
- (ii)**      Hydroelectric/wind [1] [2]  
                                 Explanation – have an infinite supply/will not run out [1]
- (iii)**      Hydroelectric [1]
- (iv)**      More reliable/constant supply/always available when required [2]
- (b)**               $KE = \frac{1}{2}mv^2$  [1]  
                                  $= \frac{1}{2} \times 750 \times 4$  [1]  
                                  $= 1500 \text{ (J)}$  [1] [3]
- [10]**

**2 Indicative Content:**

- Solids, liquids and gases are made up of atoms/molecules
- In solids the atoms/molecules are vibrating
- Heat gives them more kinetic energy
- This causes more vigorous vibrating
- When some of them overcome the bonds the solid turns to liquid
- As more energy is given to the liquid the remaining atoms/molecules overcome the bonds and a gas is formed

<b>Response</b>	<b>Mark</b>
Candidates use appropriate specialist terms throughout to describe and explain fully all the changes of state using all the above points in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms to partially describe and explain the changes of state using 4–5 of the above points in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates make limited use of specialist terms to describe or explain the changes of state using some or all of the above points. However, these are not presented in a logical sequence. Their spelling, punctuation and grammar and the form and style are of a limited standard.	[1–2]
Response not worthy of credit	[0]

[6]

[6]

- 3**
- (a)**
- (i)** Electron [1]  
Proton [1] [2]
- (ii)** 3 [1]  
He  
2 [1] [2]
- (b)**
- (i)** The nucleus [1]
- (ii)** Alpha – Helium nucleus/2 protons combined with 2 neutrons [1]  
Beta – electron [1]  
Gamma – electromagnetic radiation [1] [3]
- (c)**
- (i)** Gamma [1] with lead present it is detected [1]  
Alpha [1] Paper reduces the count rate [1] [4]
- (ii)** To minimize the effect of the air [1]
- (iii)** Naturally occurring radiation [1]  
Rocks/sun/nuclear power stations/hospital x-ray departments/nuclear  
medicine departments/nuclear weapons testing [1] [2]
- (d)** Gamma radiation [1]  
Alpha and beta are unable to penetrate the thick metal plate [1] [2]
- (e)**
- (i)** It breaks up into less massive nuclei [1] plus neutrons [1] [2]
- (ii)** Two (light) nuclei join together [1]  
To make a heavier nucleus [1] [2]
- [21]
- 4**
- (a)** 3 (N) [1]
- (b)**  $F = ma$  [1]  
 $3 = 0.5 \times a$  [1]  
 $a = 6$  [1]  
 $m/s^2$  [1] [4]
- [5]

**5 Indicative Content**

- Creates employment for building and operation
- High technology industry
- Reduction in Carbon Dioxide emissions
- NIMBY (Not in my back yard) argument or problem of waste disposal
- Pollution dangers to population and employees
- Unemployment for those involved in fossil fuel stations
- Investment in nuclear would reduce investment in renewable energy resources

Response	Mark
Candidates use appropriate specialist terms throughout to discuss in detail all of the points shown in the indicative content above. They use good spelling, punctuation and grammar throughout and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms to discuss in detail 5–6 of the points shown in the indicative content above. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates use limited specialist terms to discuss some of the points shown in the indicative content above. Their spelling, punctuation, grammar, form and style are of a limited standard.	[1–2]
Response not worthy of credit	[0]

[6]

[6]

**6 (a)** 30 [1] J [1]

[2]

**(b)** 30 (J)

[1]

**(c)** 0

[1]

**(d)** PE = m g h [1]  
 30 = 0.25 × 10 × h [1]  
 h = 12 [1] m [1]

[4]

[8]

- 7 (a) When a body is in equilibrium [1]  
 Clockwise moments = anticlockwise moments [1] [2]
- (b)  $ACM = CM$  [1]  
 $W \times 40$  [1] =  $4 \times 60$  [1]  
 $W = 6$  [1]  
 $X = 3$  (N) [1] [5]
- [7]
- 8 (a) Average values of S: 110 and 120cm [1] each S [2]
- (b) 4 points correctly plotted [2]  
 $\frac{1}{2}$  each round down  
 Smooth curve through the points [1] [3]
- (c) S is not proportional to H [1]  
 Reason – a straight line passing through origin cannot be drawn  
 through the points [1]  
**or** S does not double when H doubles [1] [2]
- [7]
- Total [70]**



General Certificate of Secondary Education  
2013

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**Double Award Science: Physics**

Unit P2

Foundation Tier

[CODE]

**SPECIMEN**

---

**MARK  
SCHEME**

- 1**
- (a)**
- (i)** Transverse [1] Longitudinal [1] [2]
- (ii)** Energy [1] [1]
- (iii)** Vibrates [1] at right angles to direction of wave travel [1] [2]
- (iv)** 0.3 [1]
- (v)** 0.4 [1]
- (vi)** 3 [1]
- (vii)**  $v = \text{frequency} \times \text{wavelength}$  [1]  
 $= 3 \times 0.4$  [1]  
 $= 1.2$  [1] [3]
- (b)** Speed = distance/time or equivalent [1]  
Speed =  $(675 \times 2)/0.9$  [2]  
1 mark for substitution, 1 mark for  $\times 2$   
Speed = 1500 (m/s) [1] [4]
- [15]
- 2**
- (a)**
- (i)** Shows refraction at AB [1]  
Reflection at DC [1]  
Refraction at AB [1] [3]
- (ii)** Speed of light changes [1]  
And faster in air or slower in glass [1] [2]
- (b)**
- (i)** Heating food/remote controls [1]  
Radio [1]  
Detection of broken bones [1]  
Microwaves [1] [4]
- (ii)** Brain [1]  
Headaches/memory loss/cancer [1] [2]
- [11]

- 3** (a) Electrons move [1]  
From balloon into hair [1] [2]
- (b) (i) Similar (or negative) charges repel [1]  
(ii) Positive [1]  
(iii) Positive charge attracts negative paint drops [1]
- (c) (i) One cell connected incorrectly [1]  
(ii) Electron(s) [1]  
(iii) Arrow pointing LEFT to RIGHT [1]  
[8]
- 4** (a) 60 [1] 30 [1] 60 [1] [3]  
(b) 6 [1] 12 [1] 6 [1] [3]  
[6]
- 5** (a) (i) Circuit showing variable PSU or battery [1] rheostat [1]  
With ammeter in series with wire and [1]  
Voltmeter across wire [1] [4]  
(ii) Adjust rheostat or PSU [1] and record I – V pairs [1] [2]  
(iii) Switch off apparatus between readings [1]
- (b) (i) All points plotted correctly [2]  
(ii) Straight line of best fit avoiding (6.0, 1.1) [1]  
(iii)  $2.8 \pm 0.2$  (V) from candidate's line [1]

- (c) (i) 3(A) [1]
- (ii) 8( $\Omega$ ) [1]
- (iii)  $V = IR$  [1]  
 $V = 3 \times 8$  [1]  
 $V = 24(V)$  [1] [3]
- [16]

- 6 (a) 18 [1] 3 [1] [2]
- (b) (i) 123 [1] [1]
- (ii) Energy =  $2.5 \times 8$  [1]  
 $= 20$  [1] [2]
- (iii) 220 [1] [1]  
 accept £2.20
- [6]

- 7 (a) (i) Earth [1]  
Mars [1]  
Saturn [1] [3]
- (ii) Gravity [1]
- (iii) Inner planets – rocky  
Outer planets – gaseous [2]
- b) Light from distant galaxies is red-shifted [1]  
The galaxies are moving away from us [1] [2]
- c) **Indicative content**
- Crust is composed of plates
  - These plates can move
  - Plates move against each other
  - The sudden
  - Movement causes earthquakes

Response	Mark
Candidates use appropriate specialist terms throughout to discuss fully and in a logical sequence all of the points shown in the indicative content above. They use good spelling, punctuation and grammar throughout and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms to discuss in a logical sequence three to four points shown in the indicative content above. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates use limited specialist terms to discuss one or two points shown in the indicative content above. Their spelling, punctuation, grammar, form and style are of a limited standard.	[1–2]
Response not worthy of credit	[0]

[6]

[14]

8

**Indicative Content:**

- White light consists of 7 (different) colours
- Different colours travel at different speeds in glass
- They take different paths through the glass
- Violet (blue) slowed down most – so refracted most
- Red slowed down least – so refracted least

<b>Response</b>	<b>Mark</b>
Candidates use appropriate specialist terms throughout to explain fully the dispersion of white light. Explanation of refraction in terms of change of speed must be clearly linked with the amount refraction and the colour. They use good spelling, grammar and punctuation and the form and style are of a high quality.	[5-6]
Candidates use some appropriate specialist terms to explain partially the dispersion of white light. The explanation of refraction in terms of change of speed may not be clearly linked with amount of refraction and the colour. They use satisfactory spelling, grammar and punctuation and the form and style are of a satisfactory standard.	[3-4]
Candidates describe some of the observations but fail to link the explanation of refraction with the change of speed and the colour. Their spelling, grammar, punctuation, form and style are of a limited standard and little use is made of appropriate specialist terms.	[1-2]
Response not worthy of credit	[0]

[6]

9

- (a) X – axis: Distance [1]  
Y – axis: Speed [1] [2]
- (b) 5 points including 0,0 plotted, ½ each round down [2]  
Best line fit [1] [3]
- (c) Hubble’s law is valid [1]  
Straight line [1]  
Passing through the origin [1] [3]

[8]

**Total [90]**



**General Certificate of Secondary Education  
2013**

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**Double Award Science: Physics**

Unit P2

Higher Tier

[CODE]

**SPECIMEN**

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**MARK  
SCHEME**

- 1**
- (i) Longitudinal/sound [1]
- (ii) Amp = 2.5 [1] cm [1] [2]
- (iii) Period = 0.5s [1]  
 Frequency = 1/period [1]  
 Frequency = 2 [1] (Hz) [3]
- (iv)  $v = \text{frequency} \times \text{wavelength}$  [1]  
 $v = 2 \times 50$  [1]  
 $v = 100$  (cm/s) [1] [3]
- [9]**
- 2**
- (a) (i) Vibrations [1] [1]
- (ii) Particles vibrate [1] in the same direction [1]  
 As direction of travel of wave [1] [3]
- (iii)  $v = \text{frequency} \times \text{wavelength}$  or equivalent [1]  
 wavelength = 300/500 [1]  
 wavelength = 0.6 (m) [1] [3]
- (b) Speed = distance/time or equivalent [1]  
 Speed =  $(675 \times 2)/0.9$  [2]  
 1 mark for substitution 1 mark for  $\times 2$   
 Speed = 1500 (m/s) [1] [4]
- [11]**

- 3**
- (a) (i) Bending of light [1]  
away from normal [1]  
Direction correctly shown [1] [3]
- (ii) Speed increases [1]
- (b) (i) Red [1] violet [1] [2]
- (ii) Different colours travel at different speeds [1]  
And are therefore refracted by different amounts [1] [2]
- (c) (i) G [1]
- (ii) Shading to the left and right of D [1] shading of D [1] [2]
- [11]
- 4**
- (a) (i) Circuit showing variable PSU or battery [1] rheostat [1]  
With ammeter in series with lamp [1] and  
Voltmeter across lamp [1] [4]
- (ii) Curve through origin [1]  
Curve has increasing gradient [1] [2]
- (iii) Resistance increases [1]
- (b) (i)  $V = IR$  [1]  
 $V = 0.75 \times (2 + 6)$  [1]  
 $V = 6 \text{ (V)}$  [1] [3]
- (ii) Increases [1]  
Because total circuit resistance decreases [1] [2]
- [12]

**5 Indicative Content**

- Current flows in earth wire to Earth
- Earth wire resistance low
- So current is large
- Current large enough to blow fuse

<b>Response</b>	<b>Mark</b>
Candidates use appropriate specialist terms throughout to explain fully and in a logical sequence how the earth wire and fuse protect the user, using all the points shown in all the indicative content above. They use good spelling, punctuation and grammar throughout and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms to partially explain, in a logical sequence, how the earth wire and fuse protect the user, using 3 of the points shown in the indicative content above. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates use limited specialist terms to explain how the earth wire and fuse protect the user. They have used some of the points shown above however these are not in a logical sequence. Their spelling, punctuation, grammar, form and style are of a limited standard.	[1–2]
Response not worthy of credit	[0]

[6]

[6]

- 6**
- (a)**
    - (i)** All points correctly plotted [2]
    - (ii)** Straight line of fit avoiding (60,1.1) [1]
    - (iii)**  $28 \pm 1$  (cm) from candidate's line [1]
  - (b)**
    - (i)**  $I = P/V$  (or equivalent) [1]  
 $I = 2640/240$  [1]  
 $I = 11$  [1] A [1] [4]
    - (ii)** Electrons [1]  
Increase KE of Ions [1]  
By collisions [1] [3]
  - (c)**
    - (i)** Moving magnet INTO coil [1]
    - (ii)** Keeping magnet stationary (in coil) [1]
    - (iii)** Withdrawing magnet from coil [1]
- [14]**

- 7 (a) **Indicative Content**
- A gas cloud forms a nebula
  - Gravity acts
  - Increases density
  - Increase in temperature
  - Protostar formed
  - Smaller clumps become planets/moons/asteroids

<b>Response</b>	<b>Mark</b>
Candidates use appropriate specialist terms throughout to describe and explain fully, in a logical sequence, the various stages of formation of the Solar System (using all of the points shown above). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms to partially describe and explain (in a logical sequence) the various stages of the formation of the Solar System (using 4–5 of the points shown above). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates use limited specialist terms to describe and explain the various stages of the formation of the Solar System (using some of the points shown above). These however are not expressed in a logical sequence. They use limited spelling, punctuation and grammar and the form and style are of a limited standard.	[1–2]
Response not worthy of credit	[0]

- (b) All planets orbit Sun in same direction [1] [6]  
 All planetary orbits lie in same plane [1] [2]
- (c) Gravity [1]
- (d) Inner planets – rocky [2]  
 Outer planets – gaseous [2]
- (e) Light from distant galaxies is red-shifted [1]  
 The galaxies are moving away from us [1] [2]
- [13]

## 8 Indicative Content

- Crust is composed of plates
- These plates can move
- Plates move against each other
- The sudden
- Movement causes earthquakes

Response	Mark
Candidates use appropriate specialist terms throughout to discuss fully and in a logical sequence all of the points shown in the indicative content above. They use good spelling, punctuation and grammar throughout and the form and style are of a high standard.	[5–6]
Candidates use some appropriate specialist terms to discuss in a logical sequence three or four points shown in the indicative content above. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates use limited specialist terms to discuss one or two points shown in the indicative content above. Their spelling, punctuation, grammar, form and style are of a limited standard.	[1–2]
Response not worthy of credit	[0]

[6]

[6]

9

- (i) X – axis: Distance [1]  
Y – axis: Speed [1] [2]
- (ii) 5 points including 0,0 plotted, ½ each round down [2]  
Best line fit [1] [3]
- (iii) Hubble’s law is valid [1]  
Straight line [1]  
Passing through the origin [1] [3]

[8]

**Total [90]**



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