

Mark Schemes Summer 2008

GCSE

360 Science

Science (2101)

Additional Science (2103)

Biology (2105)

Chemistry (2107)

Physics (2109)

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Summer 2008

Publications Code UG019950

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Unit 5005 / 5025 (B1a) Mark Scheme

| Unit B1a - 5005/5025 | |
|----------------------|---|
| Topics 1 & 2 | |
| 1 | A |
| 2 | C |
| 3 | B |
| 4 | B |
| 5 | A |
| 6 | C |
| 7 | C |
| 8 | C |
| 9 | D |
| 10 | B |
| 11 | C |
| 12 | D |
| 13 | A |
| 14 | D |
| 15 | C |
| 16 | A |

| Unit B1a - 5005/5025 | |
|----------------------|---|
| Topics 1 & 2 | |
| 17 | C |
| 18 | A |
| 19 | D |
| 20 | A |
| 21 | C |
| 22 | B |
| 23 | A |
| 24 | B |

| Unit B1a - 5005/5025 | |
|----------------------|---|
| Topics 1 & 2 | |
| 25 | A |
| 26 | D |
| 27 | D |
| 28 | C |
| 29 | D |
| 30 | C |
| 31 | B |
| 32 | C |
| 33 | C |
| 34 | A |
| 35 | A |
| 36 | D |
| 37 | D |
| 38 | B |
| 39 | B |
| 40 | D |

Unit 5006 / 5026 (B1b) Mark Scheme

| Unit B1b - 5006/5026 | |
|----------------------|---|
| Topics 3 & 4 | |
| 1 | D |
| 2 | A |
| 3 | B |
| 4 | A |
| 5 | B |
| 6 | A |
| 7 | C |
| 8 | B |
| 9 | D |
| 10 | C |
| 11 | C |
| 12 | A |
| 13 | B |
| 14 | C |
| 15 | A |
| 16 | D |

| Unit B1b - 5006/5026 | |
|----------------------|---|
| Topics 3 & 4 | |
| 17 | C |
| 18 | B |
| 19 | A |
| 20 | D |
| 21 | B |
| 22 | C |
| 23 | B |
| 24 | D |

| Unit B1b - 5006/5026 | |
|----------------------|---|
| Topics 3 & 4 | |
| 25 | D |
| 26 | C |
| 27 | A |
| 28 | B |
| 29 | B |
| 30 | C |
| 31 | D |
| 32 | C |
| 33 | A |
| 34 | C |
| 35 | D |
| 36 | B |
| 37 | D |
| 38 | D |
| 39 | D |
| 40 | A |

Unit 5007 / 5035 (C1a) Mark Scheme

| Unit C1a - 5007/5035 | |
|----------------------|---|
| Topics 5 & 6 | |
| 1 | D |
| 2 | C |
| 3 | D |
| 4 | B |
| 5 | A |
| 6 | D |
| 7 | B |
| 8 | A |
| 9 | C |
| 10 | A |
| 11 | C |
| 12 | D |
| 13 | D |
| 14 | B |
| 15 | C |
| 16 | A |

| Unit C1a - 5007/5035 | |
|----------------------|---|
| Topics 5 & 6 | |
| 17 | B |
| 18 | A |
| 19 | C |
| 20 | D |
| 21 | B |
| 22 | C |
| 23 | D |
| 24 | C |

| Unit C1a - 5007/5035 | |
|----------------------|---|
| Topics 5 & 6 | |
| 25 | B |
| 26 | C |
| 27 | A |
| 28 | D |
| 29 | C |
| 30 | A |
| 31 | D |
| 32 | B |
| 33 | C |
| 34 | C |
| 35 | B |
| 36 | D |
| 37 | C |
| 38 | D |
| 39 | C |
| 40 | B |

Unit 5008 / 5036 (C1b) Mark Scheme

| Unit C1b - 5008/5036 | |
|----------------------|---|
| Topics 7 & 8 | |
| 1 | B |
| 2 | D |
| 3 | C |
| 4 | B |
| 5 | D |
| 6 | D |
| 7 | A |
| 8 | C |
| 9 | C |
| 10 | D |
| 11 | C |
| 12 | D |
| 13 | D |
| 14 | B |
| 15 | A |
| 16 | B |

| Unit C1b - 5008/5036 | |
|----------------------|---|
| Topics 7 & 8 | |
| 17 | A |
| 18 | A |
| 19 | B |
| 20 | D |
| 21 | C |
| 22 | C |
| 23 | C |
| 24 | A |

| Unit C1b - 5008/5036 | |
|----------------------|----|
| Topics 7 & 8 | |
| 25 | A |
| 26 | D* |
| 27 | B |
| 28 | A |
| 29 | D |
| 30 | C |
| 31 | B |
| 32 | D |
| 33 | C |
| 34 | C* |
| 35 | D |
| 36 | C |
| 37 | A |
| 38 | D |
| 39 | D* |
| 40 | B |

* Please note that this answer key has been amended since the first publication of this mark scheme. Unfortunately there was a mis-print in the original published mark scheme.

Unit 5009 / 5045 (P1a) Mark Scheme

| Unit P1a - 5009/5045 | |
|----------------------|---|
| Topics 9 & 10 | |
| 1 | D |
| 2 | C |
| 3 | A |
| 4 | A |
| 5 | B |
| 6 | B |
| 7 | C |
| 8 | C |
| 9 | B |
| 10 | D |
| 11 | A |
| 12 | A |
| 13 | D |
| 14 | B |
| 15 | C |
| 16 | C |

| Unit P1a - 5009/5045 | |
|----------------------|---|
| Topics 9 & 10 | |
| 17 | C |
| 18 | B |
| 19 | A |
| 20 | B |
| 21 | D |
| 22 | D |
| 23 | A |
| 24 | C |

| Unit P1a - 5009/5045 | |
|----------------------|---|
| Topics 9 & 10 | |
| 25 | C |
| 26 | C |
| 27 | B |
| 28 | D |
| 29 | D |
| 30 | A |
| 31 | B |
| 32 | A |
| 33 | B |
| 34 | D |
| 35 | C |
| 36 | D |
| 37 | D |
| 38 | B |
| 39 | B |
| 40 | A |

Unit 5010 / 5046 (P1b) Mark Scheme

| Unit P1b - 5010/5046 | |
|----------------------|---|
| Topics 11 & 12 | |
| 1 | A |
| 2 | A |
| 3 | C |
| 4 | B |
| 5 | B |
| 6 | D |
| 7 | C |
| 8 | B |
| 9 | B |
| 10 | B |
| 11 | A |
| 12 | B |
| 13 | D |
| 14 | B |
| 15 | D |
| 16 | C |

| Unit P1b - 5010/5046 | |
|----------------------|---|
| Topics 11 & 12 | |
| 17 | B |
| 18 | D |
| 19 | C |
| 20 | A |
| 21 | C |
| 22 | A |
| 23 | D |
| 24 | D |

| Unit P1b - 5010/5046 | |
|----------------------|---|
| Topics 11 & 12 | |
| 25 | D |
| 26 | C |
| 27 | C |
| 28 | B |
| 29 | B |
| 30 | B |
| 31 | B |
| 32 | B |
| 33 | C |
| 34 | A |
| 35 | C |
| 36 | D |
| 37 | A |
| 38 | A |
| 39 | A |
| 40 | B |

Unit 5015 / 5027 (B2) Mark Scheme

| Unit B2 - 5015/5027 | |
|---------------------|---|
| Topics 1, 2, 3 & 4 | |
| 1 | B |
| 2 | A |
| 3 | D |
| 4 | C |
| 5 | C |
| 6 | D |
| 7 | B |
| 8 | A |
| 9 | B |
| 10 | A |
| 11 | C |
| 12 | B |
| 13 | C |
| 14 | C |
| 15 | A |
| 16 | C |

| Unit B2 - 5015/5027 | |
|---------------------|---|
| Topics 1, 2, 3 & 4 | |
| 17 | B |
| 18 | A |
| 19 | B |
| 20 | D |
| 21 | C |
| 22 | C |
| 23 | A |
| 24 | B |

| Unit B2 - 5015/5027 | |
|---------------------|---|
| Topics 1, 2, 3 & 4 | |
| 25 | C |
| 26 | D |
| 27 | D |
| 28 | B |
| 29 | B |
| 30 | B |
| 31 | D |
| 32 | D |
| 33 | B |
| 34 | C |
| 35 | A |
| 36 | D |
| 37 | A |
| 38 | D |
| 39 | B |
| 40 | C |

Unit 5017 / 5037 (C2) Mark Scheme

| Unit C2 - 5017/5037 | |
|---------------------|---|
| Topics 5, 6, 7 & 8 | |
| 1 | A |
| 2 | D |
| 3 | B |
| 4 | C |
| 5 | D |
| 6 | C |
| 7 | B |
| 8 | C |
| 9 | B |
| 10 | C |
| 11 | A |
| 12 | A |
| 13 | D |
| 14 | D |
| 15 | C |
| 16 | D |

| Unit C2 - 5017/5037 | |
|---------------------|---|
| Topics 5, 6, 7 & 8 | |
| 17 | A |
| 18 | C |
| 19 | C |
| 20 | C |
| 21 | B |
| 22 | B |
| 23 | A |
| 24 | D |

| Unit C2 - 5017/5037 | |
|---------------------|---|
| Topics 5, 6, 7 & 8 | |
| 25 | B |
| 26 | C |
| 27 | D |
| 28 | C |
| 29 | B |
| 30 | B |
| 31 | A |
| 32 | C |
| 33 | D |
| 34 | A |
| 35 | D |
| 36 | C |
| 37 | D |
| 38 | A |
| 39 | D |
| 40 | B |

Unit **5019 / 5047 (P2) Mark Scheme**

| Unit P2 - 5019/5047 | |
|-----------------------|---|
| Topics 9, 10, 11 & 12 | |
| 1 | C |
| 2 | A |
| 3 | A |
| 4 | C |
| 5 | B |
| 6 | C |
| 7 | D |
| 8 | D |
| 9 | D |
| 10 | C |
| 11 | D |
| 12 | B |
| 13 | C |
| 14 | A |
| 15 | D |
| 16 | B |

| Unit P2 - 5019/5047 | |
|-----------------------|---|
| Topics 9, 10, 11 & 12 | |
| 17 | B |
| 18 | A |
| 19 | C |
| 20 | B |
| 21 | B |
| 22 | B |
| 23 | A |
| 24 | A |

| Unit P2 - 5019/5047 | |
|-----------------------|---|
| Topics 9, 10, 11 & 12 | |
| 25 | B |
| 26 | A |
| 27 | D |
| 28 | B |
| 29 | B |
| 30 | D |
| 31 | C |
| 32 | D |
| 33 | C |
| 34 | D |
| 35 | C |
| 36 | C |
| 37 | A |
| 38 | A |
| 39 | D |
| 40 | C |

USING THE MARK SCHEME FOR STRUCTURED PAPERS

1. This mark scheme gives you;
 - * an idea of the type of response expected
 - * how individual marks are to be awarded
 - * the total mark for each question
 - * examples of responses that should not receive credit.
2. ; separates points for the award of each mark.
3. / means that the responses are **alternatives** and either answer should receive full credit.
4. () means that a phrase/word is not essential for the award of the mark but helps the examiner to get the sense of the expected answer.
5. Phrases/words in **bold** indicate that the meaning of the phrase/word is **essential** to the answer.
6. OWTTE (or words to that effect) and eq (equivalent) indicate that valid alternative answers (which have not been specified) are acceptable.
7. 'Ignore' means that this answer is not worth a mark but does not negate an additional correct response.
8. 'Reject' means that the answer is wrong and negates any additional correct response for that specific mark.
9. ORA (or reverse argument) indicates that the complete reverse is also valid for the award of marks.
10. ecf (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

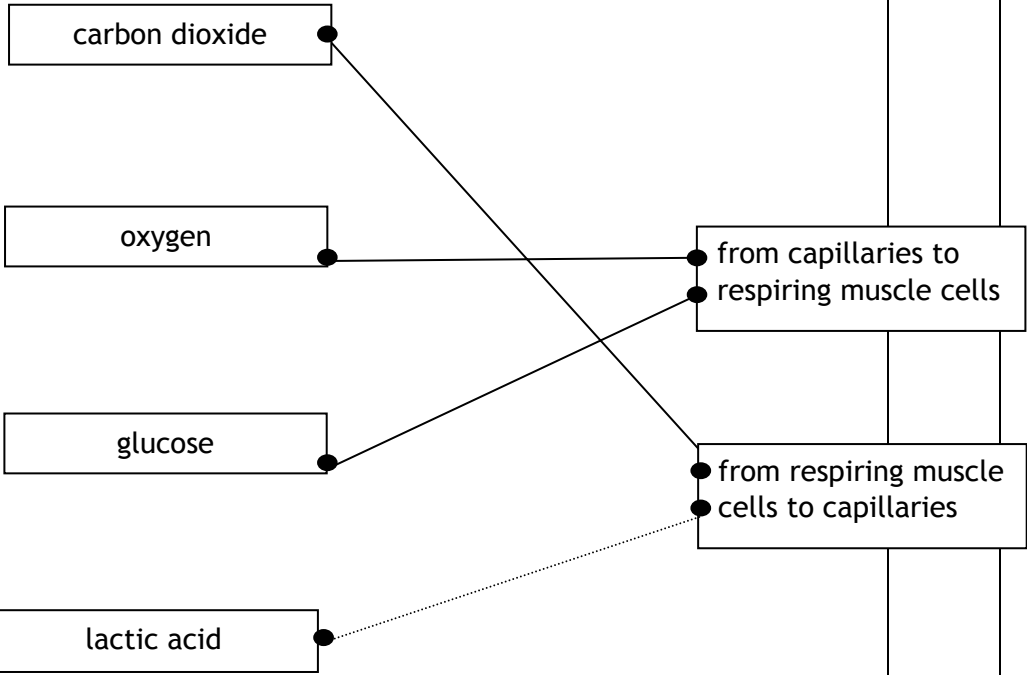
MARKING

1. Suggestion/explanation questions should be marked correct even when the suggestion is contained within the explanation.
2. **Do not** award marks for repetition of the stem of the question.
3. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct scientific context.

AMPLIFICATION

1. In calculations, full credit must be given for a bold, correct answer. If a numerical answer is incorrect, look at the working and award marks according to the mark scheme.
2. Consequential marking should be used in calculations. This is where a candidate's working is correct but is based upon a previous error. When consequential marks have been awarded write "ecf" next to the ticks.
3. If candidates use the mole in calculations they must be awarded full marks for a correct answer even though the term may not be on the syllabus at their level.
4. If candidates use chemical formulae instead of chemical names, credit can only be given if the formulae are correct.

Unit 5016F / 5028F / 1F(B2) Mark Scheme

| Question Number | Answer | Mark |
|-----------------|---|------|
| 1 | carbon dioxide; water; (may be reversed) glucose; oxygen; | (4) |
| 2 |  <p>2 marks for all 3 solid lines 1 mark for 1 or 2 correct solid lines</p> | (2) |
| 3 (a) (i) | 94 - 96; | (1) |
| 3 (a) (ii) | 6 minutes; | (1) |
| 3 (b) (i) | the rate increased/speeds up/gets faster/eq; | (1) |
| 3 (b) (ii) | Any two from: 1. respiration increased/ more energy is used or needed (in muscles); 2. remove more carbon dioxide(CO ₂); 3. take in more oxygen(O ₂)/ more oxygen(O ₂)/to the muscles or around body; 4. to avoid/stop cramp/reduce anaerobic respiration/ reduce lactic acid build up; | (2) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 4 (a) | 1. (new) trees planted; [Accept named trees] 2. in area where forest was destroyed/after deforestation has occurred; [Accept cut down a tree and plant another one for 2 marks] | (2) |
| 4 (b) (i) | provide more habitats/space/OWTTE (for more species/animals/plants); | (1) |
| 4 (b) (ii) | Any two from: 1. store carbon/remove carbon dioxide; 2. make oxygen; 3. reduce flooding; 4. stabilise the soil; 5. help to improve air quality/reduces air pollution; 6. reduce global warming; 7. credit aesthetic answers e.g. recreation and use; If no marks for (b)(i) then can credit reference to more habitats/space/OWTTE here | (2) |
| 5 (a) | increases muscle growth/performance/stamina; | (1) |
| 5 (b) | Any two from: 1. facial hair growth in women; 2. a deepening of the voice in women; 3. impotence/testicles shrink/reduced sperm count; 4. development of breasts in men; 5. liver failure/liver cancer; 6. strokes; 7. cardiovascular damage; 8. increased aggression/mood swings; | (2) |
| 5 (c) | gives an unfair advantage; | (1) |
| 6 (a) | (name) chloroplast; photosynthesis/ <u>absorb</u> light/to make glucose; | (2) |
| 6 (b) | Any two from: 1. supply oxygen; 2. remove carbon dioxide; 3. supply food (for humans); 4. correct reference to processing wastes e.g nitrates/stop build up of nitrates in soil/water; | (2) |
| 6 (c) | Either 1. not enough light/too cold; 2. not enough photosynthesis/growth/oxygen/food/CO ₂ removed; Or 1. too cold; 2. not enough photosynthesis/growth/oxygen/food/CO ₂ removed/enzyme activity reduced; | (2) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 7 (a) | Any two from: 1. technology/‘medicine’ has now improved; 2. (now) fetus can survive if born at earlier age/ at or less than 24 weeks/ORAs; 3. this will reduce the number of terminations; | (2) |
| 7 (b) | Any one from: 1. if the life of the mother would be at (physical/mental) risk without termination; [Accept ectopic pregnancy] 2. evidence of severe fetus/baby abnormality; [Accept death of baby] | (1) |
| 7 (c) | Any one from: 1. qualified ethical argument e.g. Catholics/Buddhists believe that life is sacred; 2. terminations can cause physical/mental problems for mothers; 3. right to life from conception; 4. unwanted babies could be adopted; 5. handicapped children can have quality of life; | (1) |

TOTAL MARK 30

Unit 5016H / 5028H / 1H (B2) Mark Scheme

| Question Number | Answer | Mark |
|-----------------|--|--------------------------|
| 1 (a) | (name) chloroplast; photosynthesis/ <u>absorb</u> light/to make glucose; | (2) |
| 1 (b) | Any two from: 1. supply oxygen; 2. remove carbon dioxide; 3. supply food (for humans); 4. correct reference to processing wastes e.g. nitrates/stop build up of nitrates in soil/water; | (2) |
| 1 (c) | Either 1. not enough light/too cold; 2. not enough photosynthesis/growth/oxygen/food/CO ₂ removed; Or 1. too cold; 2. not enough photosynthesis/growth/oxygen/food/ CO ₂ removed/enzyme activity reduced; | (2) |
| 2 (a) | Any two from: 1. technology/‘medicine’ has now improved; 2. (now) fetus can survive if born at earlier age/ at or less than 24 weeks/ORA; 3. this will reduce the number of terminations; | (2) |
| 2 (b) | Any one from: 2. if the life of the mother would be at (physical/mental) risk without termination; [Accept ectopic pregnancy] 2. evidence of severe fetus/baby abnormality; [Accept death of baby] | (1) |
| 2 (c) | Any one from: 2. qualified ethical argument e.g. Catholics/Buddhists believe that life is sacred; 2. terminations can cause physical/mental problems for mothers; 3. right to life from conception; 4. unwanted babies could be adopted; 5. handicapped children can have quality of life; | (1) |
| 3 | protein/polypeptide/RNA; helix; bases; Guanine; [Accept phonetically correct spellings] | (1) (1) (1) (1) |

Unit 5018F /5038F / 1F (C2) Mark Scheme

| Question Number | Answer | Mark | | | | | | | | | | | | | | | |
|---------------------------|---|-----------------------|--------------------------|---------------------------|--|----------------------|-------------|--------------------------|---------|-----|---|---|----------|---|--|---|-----|
| 1 (a) | three; four; | (2) | | | | | | | | | | | | | | | |
| 1 (b) | three; | (1) | | | | | | | | | | | | | | | |
| 1 (c) | seven; | (1) | | | | | | | | | | | | | | | |
| 1 (d) | electron; | (1) | | | | | | | | | | | | | | | |
| 1 (e) | neutrons; | (1) | | | | | | | | | | | | | | | |
| 2 (a) | <table border="1"> <tr> <td>does not conduct heat</td> <td></td> </tr> <tr> <td>good electrical insulator</td> <td></td> </tr> <tr> <td>low density</td> <td>X;</td> </tr> <tr> <td>waterproof</td> <td>X;</td> </tr> </table> | does not conduct heat | | good electrical insulator | | low density | X; | waterproof | X; | (2) | | | | | | | |
| does not conduct heat | | | | | | | | | | | | | | | | | |
| good electrical insulator | | | | | | | | | | | | | | | | | |
| low density | X; | | | | | | | | | | | | | | | | |
| waterproof | X; | | | | | | | | | | | | | | | | |
| 2 (b) (i) | aluminium is light/low density/conductor/ductile/ does not corrode; [Ignore cheap/strong/does not rust] | (1) | | | | | | | | | | | | | | | |
| 2 (b) (ii) | mixture of metals/ mixture of metal and another (relevant) element; | (1) | | | | | | | | | | | | | | | |
| 2 (b) (iii) | strength/strong/stronger/rusts less; [Ignore cost argument] [Ignore does not rust] [Reject does not conduct electricity] | (1) | | | | | | | | | | | | | | | |
| 3 (a) | carbon/C; | (1) | | | | | | | | | | | | | | | |
| 3 (b) | <table border="1"> <thead> <tr> <th rowspan="2">structure</th> <th colspan="3">property</th> </tr> <tr> <th>conducts electricity</th> <th>transparent</th> <th>has a high melting point</th> </tr> </thead> <tbody> <tr> <td>diamond</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>graphite</td> <td>✓</td> <td></td> <td>✓</td> </tr> </tbody> </table> <p>1 mark for each correct column;;;</p> | structure | property | | | conducts electricity | transparent | has a high melting point | diamond | | ✓ | ✓ | graphite | ✓ | | ✓ | (3) |
| structure | property | | | | | | | | | | | | | | | | |
| | conducts electricity | transparent | has a high melting point | | | | | | | | | | | | | | |
| diamond | | ✓ | ✓ | | | | | | | | | | | | | | |
| graphite | ✓ | | ✓ | | | | | | | | | | | | | | |
| 3 (c) | shared electrons/OWTTE; pair; (conditional on first mark being awarded) | (2) | | | | | | | | | | | | | | | |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 4 (a) | zinc + sulphuric acid; → zinc sulphate + hydrogen; reactants; products; | (2) |
| 4 (b) (i) | exothermic; | (1) |
| 4 (b) (ii) | (rate) increases/speeds up/faster/OWTTE; | (1) |
| 4 (b) (iii) | (rate) increases/speeds up/faster/OWTTE; | (1) |
| 5 (a) | carbon dioxide/ethane/propene 3 correct;; 2 correct; [Reject ethene or propane] | (2) |
| 5 (b) (i) | (molecule/compounds/substances) containing carbon and hydrogen (only); [Reject reference to carbon and hydrogen molecules] | (1) |
| 5 (b) (ii) | B and C; | (1) |
| 5 (c) | C/propene; alkene/double bond/unsaturated; [marking independently] [Ignore spare bonds/extra electrons] | (2) |
| 5 (d) | C ₂ H ₄ ; C ₈ H ₁₈ ; [Allow structural and displayed formulae] [Allow 1 mark for two hydrocarbon molecules that add to 10 carbon atoms and 22 hydrogen atoms - each molecule must contain C and H but does not need to be a real molecule] | (2) |

TOTAL MARK 30

Unit 5018H / 5038H / 1H (C2) Mark Scheme

| Question Number | Answer | Mark |
|-----------------|---|------|
| 1 (a) | carbon dioxide/ethane/propene 3 correct;; 2 correct; [Reject ethene or propane] | (2) |
| 1 (b) (i) | (molecule/compounds/substances) containing carbon and hydrogen (only); [Reject reference to carbon and hydrogen molecules] | (1) |
| 1 (b) (ii) | B and C; | (1) |
| 1 (c) | C/propene; alkene/double bond/unsaturated; [marking independently] [Ignore spare bonds/extra electrons] | (2) |
| 1 (d) | C_2H_4 ; C_8H_{18} ; [Allow structural and displayed formulae] [Allow 1 mark for two hydrocarbon molecules that add to 10 carbon atoms and 22 hydrogen atoms - each molecule must contain C and H but does not need to be a real molecule] | (2) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 2 (a) | 11 electrons and 11 protons; 12 neutrons; | (2) |
| 2 (b) | one outer electron; from Na to Cl; [Allow arrow on diagram from electron on outer shell of sodium; to chlorine's outer shell;] [Reject reference to covalent bond] | (2) |
| 2 (c) | strong forces of attraction between ions/ strong (ionic) bonds/ high energy needed to overcome forces of attraction/ OWTTE; [Reject reference to covalent bond] | (1) |
| 2 (d) | ions can move; [Reject electrons] | (1) |
| 3 (a) | may be toxic/harmful/cause side effects/ to check that it works; [Ignore dangerous/unsafe] | (1) |
| 3 (b) | drug reduced (risk of) heart attacks/drug was effective; | (1) |
| 3 (c) | 75%; | (1) |
| 4 (a) | exothermic/energy released/heat given out/OWTTE; [Ignore references to light energy] | (1) |
| 4 (b) | $2\text{Fe} + 3\text{Cl}_2 \rightarrow 2\text{FeCl}_3$ correct formulae; balancing of correct formulae; | (2) |
| 4 (c) | atoms larger/greater number of shells/ outer shell further from nucleus; (added) electron less attracted/increased shielding; [Ignore references to numbers of electrons in outer shells] | (2) |
| 4 (d) | larger surface area/more iron exposed; more (frequent) collisions; | (2) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 5 (a) | less/decreased yield/favours back reaction/ equilibrium moves to left; equilibrium moves to endothermic side/ back reaction is endothermic; [1 st mark for what happens/effect 2 nd mark for reason the equilibrium shifts] | (2) |
| 5 (b) | higher energy costs/higher plant costs/ risk of explosion/stronger container required; [reason for higher cost has to be specified] [Ignore less safe] | (1) |
| 5 (c) | bonds broken requires heat or energy/endothermic; bonds made releases heat or energy/exothermic; more heat or energy released than required; [Note: 3 rd mark to be awarded for idea that more energy is given out than taken in; so, if the first two points are reversed can still score third mark] | (3) |

TOTAL MARK 30

Unit 5020F / 5048F / 1F (P2) Mark Scheme

| Question Number | Answer | Allow/comments | Ignore | Reject | Mark |
|-----------------|---|--|--|---|------|
| 1 (a) (i) | 4. atomic mass/mass number/ (number of) protons and neutrons; 2. (number of) protons/ atomic number; | 4. (number of) nucleons/ particles in <u>nucleus</u> / nuclear mass; 2. (number of) electrons; | | | (2) |
| 1 (a) (ii) | 0/zero/neutral/none; | no charge/nothing; | | | (1) |
| 1 (b) (i) | alpha has no electrons/ helium (atom) has electrons/ helium (atom) neutral/ alpha (particle) has charge; | (2) electrons; | | | (1) |
| 1 (b) (ii) | + / positive / plus / +ve / +2; | | 2 | | (1) |
| 1 (c) | ioniser; | | | | (1) |
| 2 (a) (i) | any valid reason in terms of: storage of waste/ accidents/ health concerns/ terrorist (activity); | bad for health/ difficult to store waste/ radioactive pollution/ dangerous to work in or live nearer/ explosions/leaks/meltdown/ (nuclear) power is radioactive; | can lead to pollution (must be qualified by reference to radioactivity) | acid rain/ global warming/ CO ₂ / ozone layer | (1) |
| | | | | | |

| | | | | | |
|------------|--|--|---|--|-----|
| 2 (a) (ii) | any valid reason; (eg no carbon dioxide/CO ₂ / finite fossil fuels/ does not contribute to global warming/diversity of supply) | cheaper/ greener than coal burning stations/ fossil fuel burning etc/pollution without qualification/it won't run out as quickly as fossil fuels or for a long time; | supplying power in our homes/ greener without qualification/it won't run out without qualification | | (1) |
| 2 (b) | thermal energy produce warming 2 electrical energy is produced 8 turbines turned; 6 water is heated 4 1 correct = 1 mark, 2 correct = 2 marks, 3 or 4 correct = 3 marks | | | | (3) |
| 3 (a) | any two sensible suggestions: less driving force needed/ prevent overheating the engine/ to make less steep/ safer;; | ORA allowed for all harder for tyres to grip on steep slope/ easier to choose a safe route /avoiding obstacles/ less likely to skid or slip/ gravity argument IF correct/lowers the speed (of descent) | reference to energy | | (2) |
| 3 (b) | (gpe) = 1300 x 10 x 1500; 19 500 000/19.5M (J) | units if seen must be correct | | | (2) |
| 4 (a) (i) | Stewart; (same force but) less (total) mass/ (Stewart's bike is) light(er)/Charlie's (bike) is heavier; | (bike) weighs less/less weight | Do not award any marks if the answer to the first part is Charlie | | (2) |

| | | | | | |
|-------------|--|--|--|-------------------------|--------------------|
| 4 (a) (ii) | Any two from: 1. less air resistance; 2. less road resistance; 3. better gearing/design; 4. skills/fitness/stamina; | 1. Stewart's profile more streamlined; 2. thinner tyres; 3. larger wheels; | reference to mass of bike/ acceleration | | (2) |
| 4 (b)(i) | 2; | | | | (1) |
| 4 (b) (ii) | 8; | | | | (1) |
| 4 (b) (iii) | selection of two suitable numbers from Charlie's graph - range ± 0.1 on both axes; making the correct substitution; bald answer 0.4 scores two marks bald answer of 0.5 scores 1 mark (Stewart's graph) | ecf only for making an error in reading off the scale of the graph or choosing data for Stewart; Accept answers in the range 0.39 - 0.42 for 2 marks if working is shown | | | (2) |
| 5 (a) | (work done = force X distance...no mark - given) <ul style="list-style-type: none"> • (work =) 500 x 6; • 3000; • J; | for 1 mark, 500 X 10 or 5000 <ul style="list-style-type: none"> • independent unit mark • Nm or in words • j • multiples, kJ,etc <i>check for correct physics—do not allow confusion between force and mass</i> | | 500kg (instead of 500N) | 1 1 1 (3) |

| | | | | | |
|-------|---|--|--|--|------------------------------|
| 5 (b) | <p>(E=l.t.V.....no mark--- given)</p> <ul style="list-style-type: none"> • (Energy=)220 x 4.5 x 5; • 4950 (J); | <p>IF equation is seen allow ecf from incorrect substitution</p> <p><i>units if seen must be correct</i></p> | | | <p>1</p> <p>1</p> <p>(2)</p> |
| 5 (c) | <ul style="list-style-type: none"> • any sensible/relevant reason; • second named reason and place; <p><i>allow for 2 marks 'heat lost in suitable named place due to friction'</i></p> | <p>allow</p> <ul style="list-style-type: none"> • correct efficiency statement • friction • named energy • energy needed to move the conveyor belt. • <p>examples are</p> <ul style="list-style-type: none"> • heat in wires • friction at bearings • heat in motor <p><i>if the same energy is named twice, two places must be seen in order to award 2 marks</i></p> | | | <p>1</p> <p>1</p> <p>(2)</p> |

TOTAL MARK 30

Unit 5020H / 5048H / 1H (P2) Mark Scheme

| Question Number | Answer | allow/comments | ignore | reject | Mark |
|-----------------|---|---|--------|-------------------------|--------------------|
| 1 (a) | (work done = force X distance...no mark - given) <ul style="list-style-type: none"> • (work =) 500 x 6; • 3000; • J; | <ul style="list-style-type: none"> • for 1 mark, 500 X 10 or 5000 • independent unit mark • Nm or in words • j • multiples, kJ,etc <p><i>check for correct physics—do not allow confusion between force and mass</i></p> | | 500kg (instead of 500N) | 1 1 1 (3) |
| 1 (b) | (E=l.t.V.....no mark--- given) <ul style="list-style-type: none"> • (Energy=)220 x 4.5 x 5; • 4950 (J); | <p>IF equation is seen allow ecf from incorrect substitution</p> <p><i>units if seen must be correct</i></p> | | | 1 1 (2) |

| | | | | | |
|-------|--|--|--|--|------------------------------|
| 1 (c) | <ul style="list-style-type: none"> • any sensible/relevant reason; • second named reason and place; <p><i>allow for 2 marks 'heat lost in suitable named place due to friction'</i></p> | <p>allow</p> <ul style="list-style-type: none"> • correct efficiency statement • friction • named energy • energy needed to move the conveyor belt. • <p>examples are</p> <ul style="list-style-type: none"> • heat in wires • friction at bearings • heat in motor <p><i>if the same energy is named twice, two places must be seen in order to award 2 marks</i></p> | | | <p>1</p> <p>1 (2)</p> |
|-------|--|--|--|--|------------------------------|

| | | | | | |
|------------|---|--|-------------------------|--|---------------------------------------|
| 2 (b) (i) | <p>labels and scales;</p> <p>points;; tolerance= $\frac{1}{2}$ sq on activity axis, zero for time axis</p> <p>best fit line;</p> | <ul style="list-style-type: none"> • graph should fill over 1/4 of the area • min of 3 labels/units • linear scales <p><i>(-1 for each mistake to max -2)</i></p> <p>ecf -plotting onto non linear scale</p> <p>ecf- plotting onto transposed axes</p> <p>line should be smooth</p> <p><i>ignore attempts to extrapolate beyond plotted points</i></p> <p><i>look for good line</i></p> | 1 missing unit or label | <ul style="list-style-type: none"> • non-linear scale • transposed axes <p>‘tram’ lines/multi lines/series of st lines</p> | <p>1</p> <p>2</p> <p>1</p> <p>(4)</p> |
| 2 (b) (ii) | range 87-93 (years) | ecf from graph <i>check graph for 980/2</i> | | answers based on 1000/2 | (1) |
| 2 (c) (i) | (heat energy =) 0.56 x 2.7 ; OR 1.5; | 1.512 1.51 | any units | | (1) |

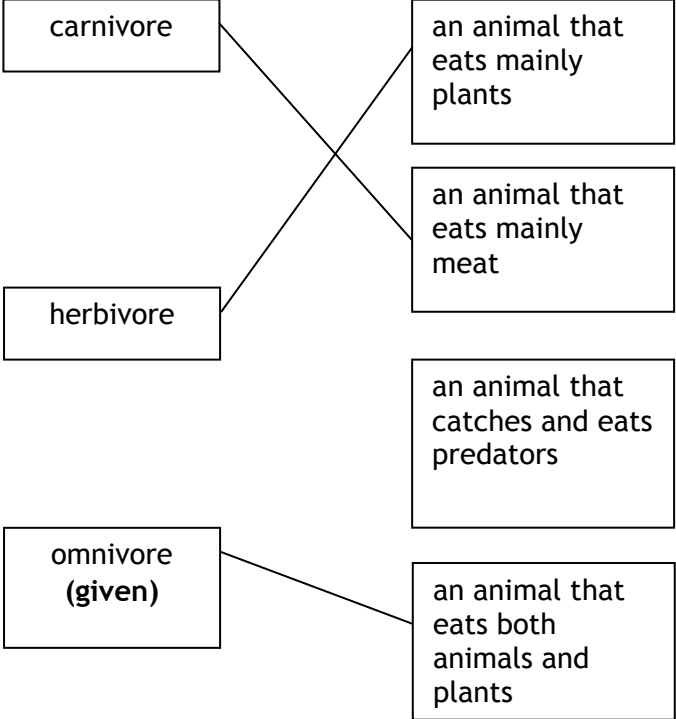
| | | | | | |
|------------|---|--|---|-------------------|--|
| 2 (c) (ii) | idea of • small α range OR • lower penetration; idea of • low power OR • energy output; | α absorbed by ceramic ORA will be warm but not hot | • ionisation idea • α will not penetrate skin | | 1 1 (2) |
| 2 (d) (i) | any one sensible reason; | long life don't need replacing low mass greater energy density greater energy density per vol smaller reliable battery would freeze | efficiency stronger | | (1) |
| 2 (d) (ii) | any one sensible reason that is <i>always</i> true; | • (O/P) not dependent on light (level) • smaller than solar cells | • efficiency • would need to replace the isotope | no light in space | (1) |

| | | | | | |
|-------------|---|---|---|----------|--------------------|
| 2 (d) (iii) | shorter life; higher electrical (power) output; | | <ul style="list-style-type: none"> • less/more energy or heat • danger when replacing unit • more isotope needed | | (2) |
| 3 (a) (i) | (momentum= mass X velocity.....no mark—given) 0.15 x 3; 0.45; kg.m/s; | 0.75 for 1 mark (large puck) 150g X 3 m/s for 1 mark independent unit mark Ns <i>units if seen must be correct</i> | | | 1 1 1 (3) |
| 3 (a) (ii) | (KE = ½ X m X v ² ...no mark---given) 0.5 x 0.15 x 3 ² ; 0.675 (J) | allow 0.68 allow for 1 mark 1.125 (large puck) ½ X 150g X 3 ² for 1 mark <i>units if seen must be correct</i> | | bald 0.7 | 1 1 (2) |

| | | | | | |
|------------|--|---|---|--|-------------------|
| 3 (b) | to reduce <u>friction</u> | <i>read the entire ans</i> | idea of floating make puck move further idea of moving easily | idea of increasing KE/ momentum/speed | (1) |
| 3 (c) (i) | 20N in opposite direction; | equal force backwards NW towards smaller puck away from larger puck <i>BOTH needed</i> | arrows | | (1) |
| 3 (c) (ii) | (F=m.a....no mark---given) 20 = 0.25 x a; a = 80 (m/s ²); | seen in original form or as a=20/0.25 allow 1 for 133 <i>units if seen must be correct</i> | | mass of 0.4–sticky pucks | 1 1 (2) |

TOTAL MARK 30

Unit 5029 / 01 (B3) Mark Scheme

| Question Number | Answer | Mark |
|---------------------------------|---|---|
| <p>1 (a)</p> |  <p>1 mark for each correct line</p> | <p>(2)</p> |
| <p>1 (b)</p> | <p>less;</p> | <p>(1)</p> |
| <p>2 (a)(i) and (ii)</p> | <p>grilled fish ticked; less fat (fattening)/additive/cholesterol/calories/ more protein/ source of omega 3; [Accept less energy for less calories for 1 mark]</p> <p>apple ticked; less calories/fat (fattening)/ more fibre/ source of vitamins; [Accept less energy for less calories for 1 mark] [Ignore less sugar]</p> <p>semi skimmed milk ticked; less additives/acid/ source of minerals/vitamins/protein;</p> | <p>(1)</p> <p>(1)</p> <p>(1)</p> <p>(1)</p> |
| <p>3 (a)</p> | <p>courtship;</p> | <p>(1)</p> |
| | | |

| Question Number | Answer | Mark |
|-----------------|--|------------|
| 3 (b) | healthy/suited; suited; only credit suited once | (1) (1) |
| 3 (c) | genes; | (1) |
| 4 | Any three from: 1. spray crop with herbicide; 2. which kills weeds and not crop; [Reject immune to spray] 3. (so) less competition (for light/water/mineral/etc); 4. therefore higher (crop) yield ; | (3) |
| 5 (a) (i) | the pheromone becomes less (concentrated)/ particles are further apart/more spread out/ concentration weaker/less dense; | (1) |
| 5 (a) (ii) | flies up a concentration gradient (low to high); | (1) |
| 5 (b) | Any two from: 1. many other chemicals/pheromones around; 2. would not know which way to go/confused/ would fly to wrong species. 3. wouldn't find a mate/mating not successful/ no point in female - female attraction; | (2) |
| 6 (a) | learned; harmless; | (1) (1) |
| 6 (b) | test very young/new born squirrels from London with loud sounds; if they react to them or show habituation then behaviour is not inherited/ not innate/ORA; OR bring squirrels from village to London/expose to loud sounds; see if they show habituation eg if after few days the squirrels stop reacting then it supports not inherited ; | (2) |
| | | |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 8 (b) | <p>Any two from:</p> <ol style="list-style-type: none"> 1. companionship/entertainment; 2. reduce stress/health benefits; 3. protection; 4. assist with work; 5. status; <p>[Accept for use of products eg milk, hair, eggs but not products involving death of pet eg meat]</p> | (2) |
| 8 (c) | <p>Any two from:</p> <ol style="list-style-type: none"> 1. easier to handle; 2. less likely to injure each other; 3. provide transport; 4. provide food/skins (readily accessible); 5. allow settlements to develop; <p>[Ignore selective breeding]</p> | (2) |
| 9 (a) | the bark of the <u>cinchona tree</u> ; | (1) |
| 9 (b) (i) | may be toxic/have side-effects/harmful/allergic reactions/ to see if it is effective; | (1) |
| 9 (b) (ii) | <p>Any three from:</p> <ol style="list-style-type: none"> 1. grow more <i>Artemisia</i>; 2. use genes from <i>Artemisia</i> to genetically modify other plants; 3. genetically modify/selectively breed <i>Artemisia</i> <p>to increase concentration of Artemisinin/grow faster;</p> <ol style="list-style-type: none"> 4. improve efficiency of extraction technique; 5. use GM micro organisms to produce Artemisinin; 6. tissue culture; 7. use of transgenic animals; | (3) |
| | | |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 10 | <p>Any four in correct sequence from:</p> <ol style="list-style-type: none"> 1. cook soya bean; 2. mix with (ground) roasted wheat; 3. ferment with <i>Aspergillus</i> ; 4. brine is added; 5. yeast and/or <i>Lactobacillus</i> added; 6. second fermentation/refermentation; 7. filtered; 8. pasteurisation; 9. use sterile bottle; <p>[Ignore sterilising]</p> <p>Max 3 marks if any points in wrong sequence</p> | (4) |
| 11 (a) | carbohydrates/ oligosaccharides; | (1) |
| 11 (b) | <p>increase/stimulate the growth of (friendly) bacteria; decrease the growth of bad bacteria; health benefits related to above e.g reduction of toxins from bad bacteria/increasing B vitamins from good bacteria;</p> | (3) |
| 12 (a) | imbalance of sexes/change in gene pool; | (1) |
| 12 (b) | <p>Any two from:</p> <ol style="list-style-type: none"> 1. wrong to interfere with nature/qualified groups eg reference to Catholics; 2. cultural variations favour one gender; 3. a family which already has daughters may wish to have a son or vice versa/parents should have the right to choose; 4. 'slippery slope' leading to more genetic selection; 5. may lead to discrimination for one sex/ one sex not valued as another; 6. use to avoid sex linked genetic diseases; 7. reference to increased number of terminations of babies of unwanted gender; | (2) |
| | | |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 13 (a) | <p>Any four from:</p> <ol style="list-style-type: none"> 1. puppy shows desired behaviour e.g sit at curb/ORAs; 2. desired behaviour is rewarded e.g given biscuit/ORAs; 3. this reinforces behaviour/ORAs; 4. desired behaviour increased and becomes the norm; 5. credit correct reference to operant conditioning; <p>[Ignore references to Pavlov's dogs as not 'training' to modify natural behaviour]</p> | (4) |
| 13 (b) | <p>Any four from:</p> <ol style="list-style-type: none"> 1. some behaviour is inherited/innate; 2. imprinting; 3. learn from copying parents/owners/adults; 4. allow offspring to learn species specific behaviour e.g bird song; 5. this allows it to cope socially; 6. increased chance of courtship 7. increase chances of survival e.g finding food; 8. habituation to stimuli in early life (will reduce unnecessary behaviours); 9. credit correct reference to parents 'teaching' children/offsprings; <p>Credit other appropriate responses</p> | (4) |

TOTAL MARK 60

Unit 5039 / 01 (C3) Mark Scheme

| Question Number | Answer | Mark |
|-----------------|--|------|
| 1 (a) | Li; [Reject li/ LI] | (1) |
| 1 (b) | alkali metal(s); [Reject alkaline] | (1) |
| 1 (c) (i) | sodium/ NaOH + water/ H ₂ O; → (sodium hydroxide +) hydrogen/ H ₂ [Reject H]; | (2) |
| 1 (c) (ii) | potassium/ K/ rubidium/ Rb/ caesium/ Cs/ francium/ Fr; | (1) |
| 1 (c) (iii) | soap; | (1) |
| 2 (a) | for drinking/ implied consumption; [Ignore cooking, washing etc.] (impurities/ bacteria) would cause illness etc; [Ignore 'unsafe' etc] | (2) |
| 2 (b) | supplies limited/ droughts etc.; costs money; [Ignore references to non-home country] | (2) |
| 2 (c) (i) | blue litmus goes red / pink ; [Reject use of other indicators] | (1) |
| 2 (c) (ii) | add (dil.) hydrochloric acid/HCl; add barium chloride/ BaCl ₂ ; [1 st two points in either order] white precipitate/goes white; [Ignore any other added reagents] | (3) |
| 2 (c) (iii) | add sodium hydroxide/ NaOH; white ppt/goes white; which dissolves in excess/ with more (NaOH); | (3) |
| 2 (d) | to see if (EU) limits exceeded/ to find out how much (pollution/ Al ³⁺) present; | (1) |
| 3 (a) | transition metals/ transition elements/ d-block; | (1) |
| 3 (b) | Any two from: 1. high mpt; 2. conducts electricity; 3. coloured compounds / coloured ions; [Ignore coloured metals/ boiling point or any other properties] | (2) |
| 3 (c) (i) | copper sulphate (solution)/ CuSO ₄ / copper nitrate (solution) / Cu(NO ₃) ₂ ; | (1) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 3 (c) (ii) | (red-brown) solid/ copper (deposited)/ electrode gets bigger/ OWTTE; | (1) |
| 3 (c) (iii) | (ions) gain electrons/ copper ions reduced; [Ignore number of electrons if stated] | (1) |
| 4 (a) | $S + O_2$; $\rightarrow SO_2$; [Allow correct multiples] | (2) |
| 4 (b) (i) | Any two from: 1. hydrophobic part into grease; 2. hydrophilic part into water; 3. surface tension of grease globule reduced; 4. grease globule (surrounded by detergent) can now dissolve; [Allow explanation of hydrophobic and hydrophilic for 1] | (2) |
| 4 (b) (ii) | no scum/cleans without being wasted/ less detergent (than soap) required/ [detergent better arguments] soap does not lather well/ lot of soap would be required (for lather)/ use of soap gives scum; [soap ineffective arguments implies detergents better] [Ignore cost arguments] | (1) |
| 4 (b) (iii) | 'dissolves' (biological) stains faster/ at lower temperatures/ contain enzymes; | (1) |
| 5 (a) | loss of electrons/ iron gets higher charge; | (1) |
| 5 (b) (i) | red-brown / OWTTE; precipitate/solid/ sludge; [Ignore other observations] | (2) |
| 5 (b) (ii) | $Fe^{3+} + 3 OH^- \rightarrow Fe(OH)_3$;;; Reactant ions; product; balancing of correct formulae [allow multiples]; [Ignore state symbols] | (3) |
| 6 (a) | 500 (dm ³); | (1) |
| 6 (b) | Ring around -O-H; | (1) |
| 6 (c) | hydrogen/ H ₂ ; [Reject H] | (1) |
| 6 (d) (i) | methyl ethanoate; [No alternative spelling accepted] | (1) |

| | | |
|------------|---|-----|
| 6 (d) (ii) | $\begin{array}{c} \text{H} & & \text{O} & & \text{H} \\ & & & & \\ \text{H}-\text{C}-\text{O}-\text{C}-\text{C}-\text{H} \\ & & & & \\ \text{H} & & & & \text{H} \end{array}$ <p>ester group ie R-O-(C=O)-; rest of molecule; [Allow ecf]</p> | (2) |
| 7 (a) | $M_r(\text{CaCO}_3) = 100;$ $M_r(\text{Na}_2\text{CO}_3) = 106;$ $\text{Mass of CaCO}_3 = \frac{100}{106} \times 1 \times 10^6; = 943\,000 \text{ (tonnes)}$ [Mr; Mr; scaling; conversion to tonnes with 3-6 sig fig;] [943,000 = 4 marks 943,396 = 4 marks 0.943... million = 4 marks 1,060,000 = 3 marks 3-6 sig fig allowed for 4 th mark] | (4) |
| 7 (b) | $\text{Na}_2\text{CO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{CO}_2 + \text{H}_2\text{O};;$ Reactants; Na_2SO_4 ; $\text{CO}_2 + \text{H}_2\text{O}$; [cannot score 3 with incorrect balancing] [Ignore state symbols] | (3) |
| 8 (a) | no sharp change of colour/ range of colours/ OWTTE; | (1) |
| 8 (b) | Any four from: <ol style="list-style-type: none"> 1. wash burette with acid, wash pipette with calcium hydroxide; 2. acid in burette, calcium hydroxide in pipette; 3. correct use of conical flask; 4. add drops/ small amount of methyl orange (to calcium hydroxide); 5. add acid slowly; 6. until indicator turns orange/red/pink; 7. swirl / stir to mix; 8. use of white tile; 9. repeat process to obtain reliable / concordant results/ results to within 0.2 cm³ [Ignore to give average]; | (4) |
| 8 (c) (i) | $\frac{8.85 \times 0.05}{1000} = 0.0004425 \text{ moles};$ [=4.425 x 10 ⁻⁴ , allow 2-4 sig fig] | (1) |
| 8 (c) (ii) | $\frac{0.000445}{2} = 0.00022125 \text{ moles};$ [Half of previous answer] [=2.2125 x 10 ⁻⁴ , allow 2-5 sig fig] | (1) |
| | | |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 8 (c) (iii) | $0.00022125 \times 10 = 0.0022125$ moles; [previous answer x 10] [=2.2125 x 10 ⁻³ , allow 2-5 sig fig] | (1) |
| 8 (d) | Mass of Ca(OH) ₂ = $0.0022125 \times 74 = 0.163725$ g; [previous answer x 74] [allow 2-6 sig fig] | (1) |
| 8 (e) | Evaporate (all 100 cm ³ of solution) [if sample, eg 10 cm ³ used, must calculate correctly, eg x10]; Weigh residue [must calculate mass of solid, and not solvent]; | (2) |

TOTAL MARK 60

Unit 5049 / 01 (P3) Mark Scheme

| Question Number | Answer | allow/comments/exemplars | ignore | reject | Mark |
|-----------------|--|---|--------|-------------------------------|------|
| 1(a) | minimum amount of energy to maintain life (per day)(OWTTE); | <ul style="list-style-type: none"> • is the amount of energy expended while at rest • is the number of calories you'd burn if you stayed in bed all day • number of calories needed to do nothing all day and remain alive • minimum amount of energy needed by the body to maintain life | | heart rate | (1) |
| 1 (b) | take more exercise; increase muscle to fat ratio; eat a balanced diet; if 4 ticks, deduct 1 mark from the total if 5 ticks, then 0 marks | | | | (3) |
| 1 (c) (i) | heart and other organs shown correctly; | | | | (1) |
| 1 (c) (ii) | the heart; | | | | (1) |
| 2 (a) (i) | D; | | | anything extra loses the mark | (1) |
| 2 (a) (ii) | B; | | | anything extra loses the mark | (1) |

| | | | | | |
|-------------|---|---|--|--|-----|
| 2 (b) | cathode; vacuum; light waves; increased; | | | | (4) |
| 3 (a) | above the 'line'; | <i>if in doubt for points close to the 'line', look at the distance from the 'line' vertically</i> | | | (1) |
| 3 (b)(i) | beta ⁻ particles; | | | | (1) |
| 3 (b) (ii) | increases; | | | | (1) |
| 3 (b) (iii) | stays the same; | | | | (1) |
| 4 (a) (i) | change of speed (of light); | change of direction /bending when qualified, e.g. bends towards/away the normal, bends when it changes medium, bends when it enters a different medium | light bends / change of direction without qualification | | (1) |
| 4 (a) (ii) | correct angle at first reflection within set tolerance; reasonable attempt to show continuous TIR along the fibre; | <ul style="list-style-type: none"> • tolerance range is vertically between the first pt of impact, and the end of the leader line • straight by eye | | | (2) |
| | | | | | |

| | | | | | |
|------------|--|---|---|---------------------|------------|
| 4 (b) (i) | mechanism is (T)IR; any one from <ul style="list-style-type: none"> • idea of passage of light along a fibre • idea of reflection inside the body; | tube for fibre <i>look for ans that describe mechanism not purpose or description</i> | endoscope | | (2) |
| 4 (b) (ii) | any valid suggestion; | eg more operations (possible) idea of cosmetically better (scarring, hole size) reducing pain less anaesthetic/stay awake less bleeding reduced infection risk fewer complications faster recovery time | any implication of money unqualified ‘safety’ unqualified ‘quicker’ | | (1) |
| 5 (a) | treatment for pain/symptom relief; | improve quality of life improve comfort when cancer/illness is incurable/untreatable | radiotherapy chemotherapy surgery | cure cancer/illness | (1) |
| 5 (b) (i) | destroys/ionises/mutates cells; | DNA, nucleus/nuclei/tissues/living matter/named tissue for cells damages cells known side effect of radiation stops cell division cures/kills/causes cancer | | | (1) |

| | | | | | |
|-------------|--|---|------------|--|------------|
| 5 (b) (ii) | allows normal cells to recover (OWTTE); | DNA, nucleus/nuclei/tissues/living matter/named tissue for cells minimising damage to healthy cells the large dose damages healthy cells more | body 'her' | | (1) |
| 5 (b) (iii) | to limit damage to other cells; Any one from <ul style="list-style-type: none"> • spends less time on healthy cells/ORa • dose given from many directions • target all (parts) of the cancer • to target only the cancerous cells; | <i>Beware waffle or repeat of question look for ORa</i> | | | (2) |
| 5 (c) (i) | gamma; | | | | (1) |
| 5 (c) (ii) | barium-133; <u>half life</u> is <ul style="list-style-type: none"> • (suitably) long OR • quoted correct value from chart; | allow this mark for actinium-227 or for thorium 230 | | reject for both marks actinium-223 , barium 129 or thorium 233 | (1) (1) |
| 6 (a) (i) | particle that cannot be broken down any further; | no substructure not made up of other particles | | | (1) |
| 6 (a) (ii) | accept any correct particle; | Electron /beta particle/e- positron lepton neutrino | antiquark | | (1) |

| | | | | | |
|------------|---|--|--|------------------|------------|
| 6 (b) | proton = $(2 \times \frac{2}{3}) - \frac{1}{3} = 1$; +; neutron = $1u + 2d$; | subst must be shown in some way knowledge that p is positively charged dud allow in words | | | (2) (1) |
| 6 (c) (i) | down quark changes to up quark; | now have udu/uud/duu d becomes u | | | (1) |
| 6 (c) (ii) | (electron) emitted from the <u>nucleus</u> (as a beta particle); | ejected | | | (1) |
| 7 (a) | neutron(s) | 1_0n n^1_0 1n_0 ${}^0n^1$ n | | 0_1n N | (1) |
| 7 (b) (i) | Any 2 correct statements about <ul style="list-style-type: none"> • mass • charge • antimatter • fundamental particle | positive electron is worth 1 | | | (2) |
| | | | | | |

| | | | | | |
|------------|--|---|--------------|--|-----|
| 7 (b) (ii) | <p>advantage <i>described</i>- i.e. consequence mentioned;</p> <p>disadvantage;</p> | <p>does not stay active long-so less damage (to cells) since short half life, patient released sooner</p> <p>radioactive tracer to be produced nearby/on site time between generation and use must be small</p> | | | (2) |
| 7 (c) | <p>any 2 from</p> <p>$E = mc^2$/$E = c^2m$</p> <p>mass of electron and positron</p> <p>KE of electron and positron</p> | | | | (2) |
| 8 (a) (i) | <p>(particles) collide with tyre wall; this produces a force;</p> | | push/pushing | | (2) |
| 8 (a) (ii) | <p>more collisions (/sec);</p> | | | | (1) |

| | | | | | |
|-------------|---|---|--|---------------------------------------|-----|
| 8 (b) | <p>correct conversion into K;</p> $\frac{1.7 \times 10^5 \times 295}{291} = P_2 ;$ $1.72 \times 10^5 = P_2;$ | <p>for 2 marks accept any one of</p> 2.08×10^5 <p>temps swopped over (1.68×10^5)</p> <p>for 1 mark accept 1.39×10^5</p> <p><i>units if seen must be correct</i> <i>do not accept 1.7 unless the working is shown</i></p> | | | (3) |
| 9 (a) (i) | light emitting diode; | | | | (1) |
| 9 (a) (ii) | <p>red 660 IR 920;</p> <p>either ans with correct power of 10 and unit $\times 10^{-9} \text{ m}$ (nm);</p> | <p>range 650-670 range 910-930</p> <p>nm <i>do not credit $\times 10^{-9} \text{ nm}$</i></p> | | | (2) |
| 9 (a) (iii) | <p>any one from red absorbed most by deoxygenated red absorbed least by oxygenated;</p> <p>any one from IR absorbed least by deoxygenated IR absorbed most by oxygenated;</p> | <p>any one from deoxygenated blood absorbs more red deoxygenated blood absorbs least IR</p> <p>any one from oxygenated blood absorbs more IR oxygenated blood absorbs least red</p> <p>haemoglobin for blood</p> <p><i>check that it is the blood doing the absorbing</i></p> | | red or IR absorbing blood/haemoglobin | (2) |

| | | | | | |
|--------------------|--|---|----------------------------------|--|------------|
| 9 (b) (i) | no surgery (OWTTE); | no cutting works (from) outside the body | | | (1) |
| 9 (b) (ii) | a physical 'barrier'; a non-barrier idea; | skin fat muscle bone thickness of finger/nail nail varnish intensity of LED background light state of patient's health blood pressure vol of blood (in finger);; | ignore mention of haemoglobin | | (2) |
| 9 (b) (iii) | description of one of the 3 important features; and explanation; | level drops when attached -(IR & red) absorbed by haemoglobin/flesh/etc wave shape line (sinusoidal)-due to blood pulse/heartbeat average level is constant-not all radiation absorbed trough-corresponds to high blood level peak corresponds to low blood level relevant comment re regularity of pulse/heart beat | purpose of the oximeter | | (2) |

TOTAL MARK 60

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