

Mark Schemes March 2009

GCSE

360Science

Science (2101)

Additional Science (2103)

Biology (2105)

Chemistry (2107)

Physics (2109)

Edexcel is one of the leading examining and awarding bodies in the UK and throughout the world. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers.

Through a network of UK and overseas offices, Edexcel's centres receive the support they need to help them deliver their education and training programmes to learners.

For further information, please call our GCE line on 0844 576 0025, our GCSE team on 0844 576 0027, or visit our website at www.edexcel.com.

If you have any subject specific questions about the content of this Mark Scheme that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

Ask The Expert can be accessed online at the following link:

<http://www.edexcel.com/Aboutus/contact-us/>

Alternately, you can speak directly to a subject specialist at Edexcel on our dedicated Science telephone line: **0844 576 0037**

March 2009

Publications Code UG021047

All the material in this publication is copyright
© Edexcel Ltd 2009

Contents

	Page
Multiple Choice Papers	
Unit 5005 / 5025 (B1a) Mark Scheme.....	5
Unit 5006 / 5026 (B1b) Mark Scheme.....	5
Unit 5007 / 5035 (C1a) Mark Scheme.....	6
Unit 5008 / 5036 (C1b) Mark Scheme.....	6
Unit 5009 / 5045 (P1a) Mark Scheme.....	7
Unit 5010 / 5046 (P1b) Mark Scheme.....	7
Unit 5015 / 5027 (B2) Mark Scheme.....	8
Unit 5017 / 5037 (C2) Mark Scheme.....	8
Unit 5019 / 5047 (P2) Mark Scheme.....	9
Structured Papers	
Using the Mark Scheme for Structured Papers.....	10
Unit 5016F / 5028F / 1F (B2) Mark Scheme.....	11
Unit 5016H / 5028H / 1H (B2) Mark Scheme.....	17
Unit 5018F / 5038F / 1F (C2) Mark Scheme.....	23
Unit 5018H / 5038H/ 1H (C2) Mark Scheme.....	29
Unit 5020F / 5048F / 1F (P2) Mark Scheme.....	33
Unit 5020H / 5048H / 1H (P2) Mark Scheme.....	41

Mark Schemes for Multiple Choice Papers

5005 / 5025 (B1a)

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

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

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

5006 / 5026 (B1b)

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

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

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

5007 / 5035 (C1a)

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

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

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

5008 / 5036 (C1b)

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

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

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

5009 / 5045 (P1a)

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

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

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

5010 / 5046 (P1b)

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

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

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

5015 / 5027 (B2)

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

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

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

5017 / 5037 (C2)

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

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

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

5019 / 5047 (P2)

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

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

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

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.

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

Question Number	Answer	Mark
1(a)(i)	A - nucleus; B - cytoplasm;	(2)

Question Number	Answer	Mark
1(a)(ii)	A;	(1)

Question Number	Answer	Mark
1(b)	wall;	(1)

Question Number	Answer	Mark
2	<p>Note: 1mark for each correct line.</p>	(3)

Question Number	Answer	Mark
3(a)	oxygen /O ₂ ; Reject O ₂ /O ²	(1)

Question Number	Answer	Mark
3(b)	diffusion ; higher than ;	(2)

Question Number	Answer	Mark
3(c)(i)	anaerobic (respiration) ;	(1)

Question Number	Answer	Mark
3(c)(ii)	(build up) of lactic acid/cause cramp/ accept oxygen debt ;	(1)

Question Number	Answer	Mark
4(a)	14 ; 18 and 6 ;	(2)

Question Number	Answer	Mark
4(b)	Two of: 1. number of lichens increases ; 2. number of types of lichens increases and then stays roughly constant/ accept there are more different shapes and colours up to 50/75 km onwards; 3. accept any correct manipulation of figures; 4. accept 1 correct statement describing actual lichens e.g. the clear oval lichens are only found less than 100km from the power station;	(2)

Question Number	Answer	Mark
4(c)	same age/same type of rock/ all of one type of named rock/same aspect/same size or height or position/same amount of shelter/(receive) same amount of sunlight /(are) same temperature;	(1)

Question Number	Answer	Mark
5(a)	<p>(in Britain there are)</p> <ol style="list-style-type: none"> 1. predators/more hunting/no natural predators in Australia/named predators; 2. disease (specific to Britain) 3. limited number of burrow sites; 4. less food or water (per hectare compared to Britain); 5. environment differences/temperature e.g. colder winters in Britain; 	(1)

Question Number	Answer	Mark
5(b)	<p>most food eaten/drought/increased competition OWTTE/disease/overgrazing/increase or introduction of predators/hunters;</p>	(1)

Question Number	Answer	Mark
5(c)	<p>Two from :</p> <ol style="list-style-type: none"> 1. competition ; 2. both herbivores/rabbits eat sheep's food/grass; 3. sheep not get enough food ; 4. so lower weight/wool not as thick/less healthy/more likely to catch disease ; 5. accept rabbit diseases can be passed to sheep ; 	(2)

Question Number	Answer	Mark
6(a)	any time between 06:00 and 18:00 (inclusive)/ accept midday/noon;	(1)

Question Number	Answer	Mark
6(b)	any time between 04:00 and 05:00 (inclusive);	(1)

Question Number	Answer	Mark
6(c)	all the time/24 hours/00:00 - 00:00/ midnight to midnight/ all day;	(1)

Question Number	Answer	Mark
6(d)	Two from: <ol style="list-style-type: none"> 1. line similar shape but lower maximum ; 2. line indicates shorter day time length (must be within day length for summer as shown on the paper) ; 3. line indicates lower rate of respiration ; 	(2)

Question Number	Answer	Mark
7(a)	unable to compete with human population/loss of habitat/deforestation/climate change/reduced food supply/hunting/poaching/disease/inability to find a mate/population fragmented/low reproduction rate ;	(1)

Question Number	Answer	Mark
7(b)	link up the different areas again/plant bamboo/ restrict access/ set up reserves/breeding programmes; (accept reverse answers from 2a)	(1)

Question Number	Answer	Mark
7(c)	protection of / careful management of / maintaining the environment / habitat / ecosystem / natural resources; (as environmental conditions change/so species are protected)	(1)

Question Number	Answer	Mark
7(d)	to maintain biodiversity/maintain gene pool /prevent extinction ; accept answers related to maintaining food chains/interdependence of organisms	(1)

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

Question Number	Answer	Mark
1(a)	any time between 06:00 and 18:00 (inclusive)/ accept midday/noon;	(1)

Question Number	Answer	Mark
1(b)	any time between 04:00 and 05:00 (inclusive);	(1)

Question Number	Answer	Mark
1(c)	all the time/24 hours/00:00 - 00:00/ midnight to midnight/ all day;	(1)

Question Number	Answer	Mark
1(d)	Two from: 4. line similar shape but lower maximum ; 5. line indicates shorter day time length (must be within day length for summer as shown on question paper); 6. line indicates lower rate of respiration ;	(2)

Question Number	Answer	Mark
2(a)	unable to compete with human population/loss of habitat/deforestation/climate change/reduced food supply/hunting/poaching/disease/inability to find a mate/population fragmented/low reproduction rate ;	(1)

Question Number	Answer	Mark
2(b)	link up the different areas again/plant bamboo/ restrict access/ set up reserves/breeding programmes; (accept reverse answers from 2a)	(1)

Question Number	Answer	Mark
2(c)	Protection of / careful management of / maintaining the environment / habitat / ecosystem / natural resources; (as environmental conditions change/so species are protected)	(1)

Question Number	Answer	Mark
2(d)	to maintain biodiversity/maintain gene pool /prevent extinction ; accept answers related to maintaining food chains/interdependence of organisms	(1)

Question Number	Answer	Mark
3(a)	mitosis ;	(1)

Question Number	Answer	Mark
3(b)	differentiation ;	(1)

Question Number	Answer	Mark
3(c)	1. cells absorb water ; 2. get longer (accept bigger/expand) ; ignore refs to stretch/grow	(2)

Question Number	Answer	Mark
3(d)	temperature/light/water/carbon dioxide/oxygen (correct formula only) minerals/nutrients/hormones(auxins)/space/rate of photosynthesis/respiration ;	(1)

Question Number	Answer	Mark
4(a)	<p>A maximum of three from the following providing the context and order is correct:</p> <ol style="list-style-type: none"> 1. DNA unzips ; 2. coding strand ; 3. read in sets of three bases triplet (codon); 4. mRNA ; 5. ribosome's ; 6. tRNA ; 7. a triplet determines/codes for an amino acid in the protein ; 8. protein assembled from amino acids ; 	(3)

Question Number	Answer	Mark
4(b)(i)	<p>Insulin/enzymes (named enzyme) / mycoprotein/haemoglobin/human growth hormone/antibodies/penicillin/soya protein ;</p> <p>accept any other useful proteins that is produced by GM</p>	(1)

Question Number	Answer	Mark
4(b)(ii)	<p>Two from:</p> <ol style="list-style-type: none"> 1. cultivated in a fermenter ; 2. optimum conditions 3. large increase in numbers (multiplying/growing rapidly ; 4. protein purified <p>ignore "large amounts of (useful) protein obtained/produced as this is in the stem"</p>	(2)

Question Number	Answer	Mark									
5(a)	<p>These are 4 separate marking points</p> <table border="1" data-bbox="344 322 1297 833"> <thead> <tr> <th data-bbox="344 322 552 353"></th> <th data-bbox="557 322 815 353">Mitosis</th> <th data-bbox="820 322 1297 353">Meiosis</th> </tr> </thead> <tbody> <tr> <td data-bbox="344 360 552 562">number of chromosomes in each cell at end of process</td> <td data-bbox="557 360 815 562">46(23 pairs)/full set/diploid/2n</td> <td data-bbox="820 360 1297 562">23/ half set/haploid/ n</td> </tr> <tr> <td data-bbox="344 568 552 833">purpose of the process</td> <td data-bbox="557 568 815 833">Growth /repair/maintain genetic number/identical cells</td> <td data-bbox="820 568 1297 833">Reproduction/gamete/production of sex cells/halve the genetic number/non identical cells</td> </tr> </tbody> </table>		Mitosis	Meiosis	number of chromosomes in each cell at end of process	46(23 pairs)/full set/diploid/2n	23/ half set/haploid/ n	purpose of the process	Growth /repair/maintain genetic number/identical cells	Reproduction/gamete/production of sex cells/halve the genetic number/non identical cells	(4)
	Mitosis	Meiosis									
number of chromosomes in each cell at end of process	46(23 pairs)/full set/diploid/2n	23/ half set/haploid/ n									
purpose of the process	Growth /repair/maintain genetic number/identical cells	Reproduction/gamete/production of sex cells/halve the genetic number/non identical cells									

Question Number	Answer	Mark
6(a)	<p>Three from:</p> <ol style="list-style-type: none"> 1. Credit one correct reading from the graph e.g. 1900-1920 lower (than average)/ 1920-1955/60 higher (than average)/ trend increases from 1900-1935 trend decreases from 1935 to 1965 2. The trend is fluctuating (this mark can be awarded if increases and decreases have been stated correctly in marking point 1) 3. The overall trend is up <p>Ignore misreading of scale which infers that 0 is an arctic temperature of 0⁰ C, however mark point 2 (fluctuating) could still be awarded</p>	(3)

Question Number	Answer	Mark
6(b)	<p>Two from:</p> <ol style="list-style-type: none"> 1. ice melting / raised sea levels/flooding; ignore refs to water levels rising 2. changes in ocean currents/changes in salinity/gulf stream/North Atlantic conveyor; 3. impact on (named) wildlife e.g. polar bear / seals / migration patterns ; 	(3)

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

Question Number	Answer	Mark
1(a)(i)	hydrogen; Ignore H ₂ or H Reject Nitrogen or N	(1)

Question Number	Answer	Mark
1(a)(ii)	covalent;	(1)

Question Number	Answer	Mark
1(b)(i)	1. protons - in nucleus/ centre (of atom); 2. neutrons -in nucleus/ centre (of atom); 3. electron - around the nucleus/ outside the nucleus/ in shell(s)/ in orbits/ orbiting nucleus [Reject outer shells, around the edge OWTTE];	(3)

Question Number	Answer	Mark
1(b)(ii)	14;	(1)

Question Number	Answer	Mark
1(b)(iii)	number of protons;	(1)

Question Number	Answer	Mark
2(a)	$\begin{array}{c} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{C}=\text{C} & \\ & / & \diagdown \\ \text{H} & & \text{H} \end{array};$ $\begin{array}{cc} \text{Cl} & \text{H} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array};$ <p>[Note: must have all 7 bonds as shown]</p> <p>poly(ethene); Accept polyethene/ polythene</p>	(3)

Question Number	Answer	Mark
2(b)	a plasticizer;	(1)

Question Number	Answer	Mark
2(c)(i)	<p>toxic/ poisonous/ harmful fumes may be formed/ releases carbon dioxide/ greenhouse gases/ may lead to global warming;</p> <p>Ignore pollution</p>	(1)

Question Number	Answer	Mark
2(c)(ii)	<p>not biodegradable/ doesn't rot/ takes long time to decompose OWTTE/ uses up (landfill) space;</p> <p>Ignore references to emitted gases/ leaching</p>	(1)

Question Number	Answer	Mark
3(a)	mixture of metals; Accept compound of metals	(1)

Question Number	Answer	Mark
3(b)	alloy is strong(er)/ copper is (too) soft/ alloy (more) hardwearing; Ignore corrosion/ cost arguments/ density Reject rusting	(1)

Question Number	Answer	Mark
3(c)(i)	electrolysis/ electroplating/ copper plating;	(1)

Question Number	Answer	Mark
3(c)(ii)	<ol style="list-style-type: none"> 1. Reference to charge: positive copper ions/ negative electrode/ negative disc/ negative steel; 2. Attraction of opposite charges; Reject any answers involving magnetic attraction	(2)

Question Number	Answer	Mark
4(a)	temperature rise ; Accept heat evolved	(1)

Question Number	Answer	Mark
4(b)	repeat experiment (to achieve similar results);	(1)

Question Number	Answer	Mark
4(c)	powder had greater surface area/ more contact or collisions between magnesium and acid ;	(1)

Question Number	Answer	Mark
4(d)	dilute the acid more/ cooler temperature of acid/ fold magnesium ribbon; Reject changes in amount of magnesium or acid	(1)

Question Number	Answer	Mark
5(a)(i)	heat/ high temperature/ catalyst (can be specified); Ignore pressure	(1)

Question Number	Answer	Mark
5(a)(ii)	alkene; Ignore named alkenes	(1)

Question Number	Answer	Mark
5(a)(iii)	contains C=C/ double bond/ not bonded with the maximum number of atoms or groups/ triple bond; Ignore spare bonds	(1)

Question Number	Answer	Mark
5(b)	molecule B with explanation: contains more (than one) C=C or double bond/ 2 double bonds;	(1)

Question Number	Answer	Mark
5(c)(i)	weaker (inter-molecular forces) (in polyunsaturates) ORA;	(1)

Question Number	Answer	Mark
5(c)(ii)	hydrogen/ H ₂ ;	(1)

Question Number	Answer	Mark
5(d)(i)	(biological) catalyst/ controls reactions; Ignore references to break down of food (in question)	(1)

Question Number	Answer	Mark
5(d)(ii)	Lack of food breakdown, energy release etc leads to explained impact on body / body systems shut down/ metabolism slows OWTTE; Ignore references to disease fighting/ bacteria etc	(1)

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

Question Number	Answer	Mark
1(a)(i)	heat/ high temperature/ catalyst (can be specified); Ignore pressure	(1)

Question Number	Answer	Mark
1(a)(ii)	alkene ; Ignore named alkenes	(1)

Question Number	Answer	Mark
1(a)(iii)	contains C=C/ double bond/ not bonded with the maximum number of atoms or groups/ triple bond; Ignore spare bonds	(1)

Question Number	Answer	Mark
1(b)	molecule B with explanation: contains more (than one) C=C or double bond/ 2 double bonds;	(1)

Question Number	Answer	Mark
1(c)(i)	weaker (inter-molecular forces) (in polyunsaturates) / ORA ;	(1)

Question Number	Answer	Mark
1(c)(ii)	hydrogen/ H ₂ ;	(1)

Question Number	Answer	Mark
1(d)(i)	(biological) catalyst/ controls reactions; Ignore references to break down of food (in question)	(1)

Question Number	Answer	Mark
1(d)(ii)	Lack of food breakdown, energy release etc leads to explained impact on body/ body systems shut down/ metabolism slows OWTTE ; Ignore references to disease fighting/ bacteria etc	(1)

Question Number	Answer	Mark
2(a)	1. 9 protons in nucleus ; 2. 10 neutrons in nucleus ; 3. 9 electrons in shells /orbits /around nucleus; OR 1. Three sub-atomic particles named; 2. Particles in correct places in atom; 3. Numbers of each particle;	(3)

Question Number	Answer	Mark
2(b)(i)	atom / particle/ group of atoms that has gained/ lost electron(s)/ has a (positive/ negative) charge;	(1)

Question Number	Answer	Mark
2(b)(ii)	CaF_2 ; Reject CA instead of Ca Reject F2 or CaF^2 instead of F_2	(1)

Question Number	Answer	Mark
2(b)(iii)	$\text{Ca} + \text{F}_2 \rightarrow \text{CaF}_2$; Accept multiples Ignore state symbols Reject word equations and incorrect symbols eg CA, F2	(1)

Question Number	Answer	Mark
3(a)	Carbon can form carbon-carbon bonds in a chain/ forms stable/ strong (covalent) bonds;	(1)

Question Number	Answer	Mark
3(b)	tests to confirm findings/ further experiments/ test new substance to see if new/ research to check other scientists' work;	(1)

Question Number	Answer	Mark
3(c)(i)	Layers or similar (of ions/ atoms), atoms or ions can slide or move/ ions can move in sea of electrons; [Reject any answer involving molecules or covalent bonding]	(1)

Question Number	Answer	Mark
3(c)(ii)	sea/ delocalised/ free electrons can move; [Reject spare electrons or ion movement / covalent bonding]	(1)

Question Number	Answer	Mark
3(d)(i)	1. shared electrons; 2. two (electrons)/ pair; [Note: carefully explained multiple bonds can score both marks]	(2)

Question Number	Answer	Mark
3(d)(ii)	1. layers/ sheets/ plates (of carbon atoms); 2. arranged in hexagons/ each carbon forms 3 bonds; 3. delocalised electrons/ sea of electrons / free electrons or electrons can move; [Marks could be scored from diagram]	(3)

Question Number	Answer	Mark
4(a)(i)	$2 \text{H}_2\text{O}_2 \rightarrow 2 \text{H}_2\text{O} + \text{O}_2$; ; formulae; balancing of correct formulae; Ignore state symbols, accept multiples Reject words	(2)

Question Number	Answer	Mark
4(a)(ii)	<p>Temperature mark</p> <p>1. heat to required temperature/ surround by water bath at required temperature/ measure temperature (of solution);</p> <p>Volume/time reading mark</p> <p>2. after fixed time(s) take volume reading/ measure time to produce given volume/ take time for gas to stop evolving;</p> <p>Further experiment mark</p> <p>3. repeat at different temperatures/ repeat to check results;</p>	(3)

Question Number	Answer	Mark
4(b)	<p>1. X / Y not catalyst(s) because time similar;</p> <p>2. Z (best) catalyst become faster/ shorter time;</p> <p>X and Z (catalysts) as time reduced scores 1 only</p>	(2)

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

Q1a		Correct Answer	Mark												
	1a	x rays----photographing bones; gamma rays-----killing cancer cells;	2												
Q1b		Correct Answer	Mark												
	1b	x rays ----a high voltage machine; gamma rays----the nucleus of an atom;	2												
Q2a		Correct Answer	Mark												
	2a	<p>1 mark for each correct tick BUT if 4 ticks, deduct 1 mark from the total if 5 ticks, then 0 marks ;;;</p> <table border="1"> <thead> <tr> <th>quantity</th> <th>must measure to calculate acceleration</th> </tr> </thead> <tbody> <tr> <td>direction</td> <td></td> </tr> <tr> <td>final velocity</td> <td>✓</td> </tr> <tr> <td>starting position</td> <td></td> </tr> <tr> <td>starting velocity</td> <td>✓</td> </tr> <tr> <td>time taken</td> <td>✓</td> </tr> </tbody> </table>	quantity	must measure to calculate acceleration	direction		final velocity	✓	starting position		starting velocity	✓	time taken	✓	3
quantity	must measure to calculate acceleration														
direction															
final velocity	✓														
starting position															
starting velocity	✓														
time taken	✓														

Q2b		Correct Answer		Mark
	2b	IGNORE GIVEN TICK 1 mark for each correct tick BUT if 3 ticks, deduct 1 mark from the total if 4 ticks or more ticks, then 0 marks		2
		controls	can cause acceleration	
		accelerator pedal	✓	
		air conditioning		
		brake pedal	✓	
		steering wheel	✓ given	
		turn indicator		
		windscreen wiper		
		∴		
Q3a		Correct Answer	Further Instruction	Mark
	3a	labels in order are neutron; nucleus; electron;	ignore incorrect spelling allow plurals, e.g. neutrons, 'nucleuses' /nuclei electrons,	3
Q3b/c		Correct Answer		Mark
	3b/c	-1; gamma; alpha;		1 1 1

Q4a/b		Correct Answer	Acceptable Answers	Ignore	Reject	Mark
	4a	any ONE sensible e.g. <ul style="list-style-type: none"> no fumes no atmospheric pollutants no CO₂ / SO₂ OWTTE does not contribute to global warming does not contribute to climate change does not pollute/damage (the environment) as much does not damage landscape; 	look for ORA fossil fuels are limited resource	idea of greener without suitable qualification cheaper/ dearer idea of diversity of supply references to nuclear fuel reserves	idea of nuclear power as dangerous/polluting without qualification	1
	4b	any ONE sensible e.g. <ul style="list-style-type: none"> mention of previous incident or bombs perception of 'radiation' or radioactivity as dangerous possibility of meltdown or going critical waste is dangerous / toxic/ radioactive small chance of catastrophic incident radiation/radioactivity can cause cancer; 	<ul style="list-style-type: none"> idea of nuclear power stations exploding or imploding waste is hard to dispose of chance of terrorist activity/leaks 	'it'/'nuclear power' is dangerous 'waste'	contradictions with ans in 4a	1

Q4c		Correct Answer	Mark												
	4c	<p>1 mark for each correct tick BUT if 3 ticks, deduct 1 mark from the total if 4 ticks or more ticks, then 0 marks</p> <table border="1" data-bbox="472 379 1659 754"> <thead> <tr> <th data-bbox="472 379 1440 443">method</th> <th data-bbox="1444 379 1659 443">suitable?</th> </tr> </thead> <tbody> <tr> <td data-bbox="472 446 1440 502">burn it</td> <td data-bbox="1444 446 1659 502"></td> </tr> <tr> <td data-bbox="472 505 1440 561">bury it down a deep mine</td> <td data-bbox="1444 505 1659 561">✓</td> </tr> <tr> <td data-bbox="472 564 1440 620">pump it out with the cooling water</td> <td data-bbox="1444 564 1659 620"></td> </tr> <tr> <td data-bbox="472 624 1440 679">put it in a landfill site</td> <td data-bbox="1444 624 1659 679"></td> </tr> <tr> <td data-bbox="472 683 1440 738">turn it into glass and sink it in an ocean</td> <td data-bbox="1444 683 1659 738">✓</td> </tr> </tbody> </table> <p data-bbox="452 758 488 790">;;</p>	method	suitable?	burn it		bury it down a deep mine	✓	pump it out with the cooling water		put it in a landfill site		turn it into glass and sink it in an ocean	✓	2
method	suitable?														
burn it															
bury it down a deep mine	✓														
pump it out with the cooling water															
put it in a landfill site															
turn it into glass and sink it in an ocean	✓														

Q5a,b,c		Correct Answer		Acceptable Answers		Reject	Mark
	5a	0.135(m)				13.5 cm	1
	5b	subst.;	$250\,000 \times 0.135$	ecf from incorrect ans in (a)			3
		ans;	33 750	bald correct answer (allowing for ecf from (a) if appropriate) gains 2 marks (if (a) is omitted a bald 3 375 000 =1 mark)			
		units;	J / joules / Nm	independent mark		nm / NM / Js	
	5c	33750 (J);		allow ecf from 5b Can give credit for correct unit mark if <i>missing</i> in (b) but correctly written in response to (c)			1

Q5d/e		Correct Answer		Acceptable Answers	Ignore	Reject	Mark
	5d	subst.;	230 × 21 × 12		units (note: units were tested in Qib)	KE PE chemical	2
		ans;	57960(J)				
	5e	idea of transferred into heat / thermal /sound or named E type AND named place or 'dissipated to the surroundings'		changed/dissipated / OWTTE e.g. the motor/bearings heat(s) up (overcome) friction in named place	wasted to the surroundings		1
Q6a	6	Correct Answer		Acceptable Answers	Ignore	Reject	Mark
	6a	subst;	18/2.4	7 ½ 7.50 bald correct answer gains both marks		incorrect units in the answer	2
		ans;	7.5 (m/s)				

Q6b		Correct Answer	Acceptable Answers	Ignore	Reject	Mark
	6b	either idea that ball does not travel at constant speed; or idea that path of ball is not straight;	<ul style="list-style-type: none"> • speed decreases • velocity changes/varies/alters spin/swerve of ball	<ul style="list-style-type: none"> • references to possible experimental error • differences in bowlers • need to repeat the experiment etc. • references to the bowling action 	<ul style="list-style-type: none"> • increase in speed • speed fluctuates (implies goes up as well as down) 	1

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

Q1a,b,c		Correct Answer		Acceptable Answers	Ignore	Reject	Mark
	1a	0.135(m)				13.5 cm	1
	1b	subst. ;	$250\,000 \times 0.135$	ecf from incorrect ans in (a)			3
		ans;	33 750	bald correct answer (allowing for ecf from (a) if appropriate) gains 2 marks			
		units;	J / joules / Nm	(if (a) is omitted a bald 3 375 000 =1 mark) independent mark		nm / NM / Js	
	1c	33 750 (J);		allow ecf from 1b Can give credit for correct unit mark if <i>missing</i> in (b) but correctly written in response to (c)			1

Q1d/e		Correct Answer		Acceptable Answers	Ignore	Reject	Mark
	1d	subst. ; ans;	230 × 21 × 12 57960(J)	bald correct answer gains 2 marks	units (note: units were tested in Qib)		2
	1e	idea of transferred into heat / thermal /sound or named E type AND named place or 'dissipated to the surroundings'		changed/dissipated / OWTTE e.g. the motor/bearings heat(s) up (overcome) friction in named place	wasted to the surroundings	KE PE chemical	1
Q2a		Correct Answer		Acceptable Answers	ignore	Reject	Mark
	2a	subst; ans;	18/2.4 7.5 (m/s)	7 ½ 7.50 bald correct answer gains both marks		incorrect units in the answer	2

Q2b		Correct Answer		Acceptable Answers	Ignore	Reject	Mark
	2b	either idea that ball does not travel at constant speed; or idea that path of ball is not straight;		<ul style="list-style-type: none"> • speed decreases • velocity changes/varies/ alters spin/swerve of ball	<ul style="list-style-type: none"> • references to possible experimental error • differences in bowlers • need to repeat the experiment etc. • references to the bowling action 	<ul style="list-style-type: none"> • increase in speed • speed fluctuates (implies goes up as well as down) 	1
Q2c		Correct Answer		Acceptable Answers	Ignore	Reject	Mark
	2c	subst or rearrangement; ans;	$90 = 1.5 \times a$ OR $a = F/m$ OR $a = 90/1.5;$ $a = 60$	bald correct answer gains both marks		incorrect units in the answer	2

Q3a	3	Correct Answer			Further Instruction		Mark									
	3a	<table border="1"> <thead> <tr> <th>particle</th> <th>charge sign</th> <th>charge size</th> </tr> </thead> <tbody> <tr> <td>alpha</td> <td>positive /+</td> <td>2</td> </tr> <tr> <td>beta</td> <td>- given</td> <td>1given</td> </tr> </tbody> </table>			particle	charge sign	charge size	alpha	positive /+	2	beta	- given	1given	both needed for mark		1
particle	charge sign	charge size														
alpha	positive /+	2														
beta	- given	1given														
Q3bi		Correct Answer	Acceptable Answers	Ignore	Reject	Mark										
	3bi	(neutral source) becomes positive;	allow symbols e.g. +ve	size of the charge if mentioned	Source goes negative to positive	1										
Q3bii		Correct Answer	Acceptable Answers	Ignore	Reject	Mark										
	3bii	any TWO from <ul style="list-style-type: none"> action at a distance i.e. attraction between strip and source; copper strip becomes negative; (source and strip) oppositely charged; 	one is positive the other is negative		arguments based on non-electric forces such as magnetic or gravitational for both marks for 3 rd marking point copper positive	2										

Q3b iii 1,2		Correct Answer	Acceptable Answers	Ignore	Reject	Mark
	3biii 1	lifespan is dependant on the activity of the source or <i>solely</i> dependant on half life of source;	<ul style="list-style-type: none"> • (no of) particles emitted (per sec) is not affected by gap size • half life has not changed so battery life has not changed • allow other references to the half life of the source <i>if</i> suitably qualified and in sufficient detail 			1
	3biii2	idea of time-being reduced or shorter; alpha has/transfers twice as much charge or +2 or more charge ;	time is less time is halved/reduced to $\frac{1}{4}$	<ul style="list-style-type: none"> • reference to ionising effect of alpha • sign of charge • stronger 		2

Q3b iv 1,2,3		Correct Answer	Acceptable Answers	Ignore	Reject	Mark
	3biv 1	hydrogen 3 PLUS energy emitted is lowest;	comparative is needed allow suitably correct ORA 'less' for lowest' 0.02 (MeV) is (very) small only 0.02(MeV)		do not allow the term 'radiation' as a alternative to 'energy'	1
	3b iv 2	half life too short OR consequences of short half life; high level of energy emitted (per beta particle) OR consequences of high level energy emitted;	only 50 days decays quickly/runs out quickly needs replacing does not last long enough E is quite high/ too much need for shielding causes/risk of harm to humans	powerful	do not allow the term 'radiation' as a alternative to 'energy'	2
	3biv 3	nickel PLUS TWO from <ul style="list-style-type: none"> • long half life • low energy emitted • consequence of long half life 	$\frac{1}{2}$ life is 100years 'will last for his life (time)'		do not allow the term 'radiation' as a alternative to 'energy'	1

		<ul style="list-style-type: none"> consequence of low E; 	'does not require shielding'			
Q4ai		Correct Answer	Acceptable Answers	Ignore	Reject	Mark
	4ai	<p>good description of fusion to include 2 or more named/small/light element PLUS one from</p> <ul style="list-style-type: none"> join together/combine forms heavier 'atom' /He; <p>good description of fission to include any TWO from</p> <ul style="list-style-type: none"> neutron collides with 'heavy' /high mass/named atom splits up/ breaks apart forms 2 or more smaller/lighter/daughter atoms; <p>minimum of TWO conditions for fusion from</p> <ul style="list-style-type: none"> high pressure very high temperature high particle density; 	<p>nucleus/nuclei/ion/atom for element</p> <p>nucleus/nuclei for atom in fission</p> <p>LOOK FOR CONDITIONS FOR FUSION IN DESCRIPTION OF FUSION</p>	<p>particles</p> <p>references to energy released</p> <ul style="list-style-type: none"> references to energy released chain reactions extra neutrons released particles 	<p>molecules</p> <p>collide (without sticking together)</p> <p>molecules</p>	3

Q4aii		Correct Answer	Acceptable Answers	Ignore	Reject	Mark
	4a ii	description of difficulty in maintaining any specified condition or (currently) more E in than E out;	<ul style="list-style-type: none"> credit explanations of current progress / status e.g. magnetic bottles contain plasma for up to 6 mins can't contain plasma can't <i>maintain</i> the (high) temperatures needs high temperature AND high pressure/particle density 	<ul style="list-style-type: none"> Can't reach the temps required is not enough creation of energy economic arguments 	<ul style="list-style-type: none"> answers for fission 'dangerous' 	1
Q4bi/ii		Correct Answer	Acceptable Answers	Ignore	Reject	Mark
	4b i	any sensible e.g. <ul style="list-style-type: none"> possible supply of more environmentally friendly energy potentially large amounts of energy with minimal equipment could get fusion to work at low temps/conditions easier to achieve excitement over/curious about new ideas/contradictory theories no-one had ever done it before 	renewable if qualified cheap if qualified normally needs high temps	vague statements such as "solve our energy problems" references to energy in v energy out safety arguments	more energy out than put in	1
	4b ii	any sensible e.g. <ul style="list-style-type: none"> seems to contradict existing theories no existing theory of cold fusion not yet consistently reproducible lack of proper peer review 	not enough evidence	not yet proven		1

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts NG18 4FN

Telephone 01623 467467
Fax 01623 450481

Email publications@linneydirect.com

Order Code UG021047 March 2009

For more information on Edexcel qualifications, please visit www.edexcel.com/quals

Edexcel Limited. Registered in England and Wales no.4496750
Registered Office: 190 High Holborn, London WC1V 7BH