OCR
RECOGNISING ACHIEVEMENT

F
A216/01

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
ADDITIONAL SCIENCE A
UNIT 2 – Modules B5 C5 P5 (Foundation Tier)
SAMPLE ASSESSMENT MATERIAL
(from 2010 onwards)

Time: 40 minutes

Candidates answer on the question paper
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES
- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES
- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- A list of physics equations is printed on page two.
- The Periodic Table is printed on the back page.

FOR EXAMINER'S USE

Qu.	Max.	Mark
1	3	
2	8	
3	4	
4	3	
5	3	
6	2	
7	4	
8	6	
9	5	
10	4	
TOTAL	42	

This document consists of **18** printed pages and **2** blank pages.

SP (SJF4636/CG) T50950/2 **Turn over**

TWENTY FIRST CENTURY SCIENCE EQUATIONS

Useful Relationships

Explaining Motion

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

momentum = mass × velocity

change of momentum = resultant force x time for which it acts

work done by a force = force x distance moved by the force

change in energy = work done

change in GPE = weight x vertical height difference

kinetic energy = ½ × mass x $[\text{velocity}]^2$

Electric Circuits

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\frac{\text{Voltage across primary coil}}{\text{Voltage across secondary coil}} = \frac{\text{Number of turns in primary coil}}{\text{Number of turns in secondary coil}}$$

energy transferred = power x time

power = potential difference x current

$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

The Wave Model of Radiation

wave speed = frequency × wavelength

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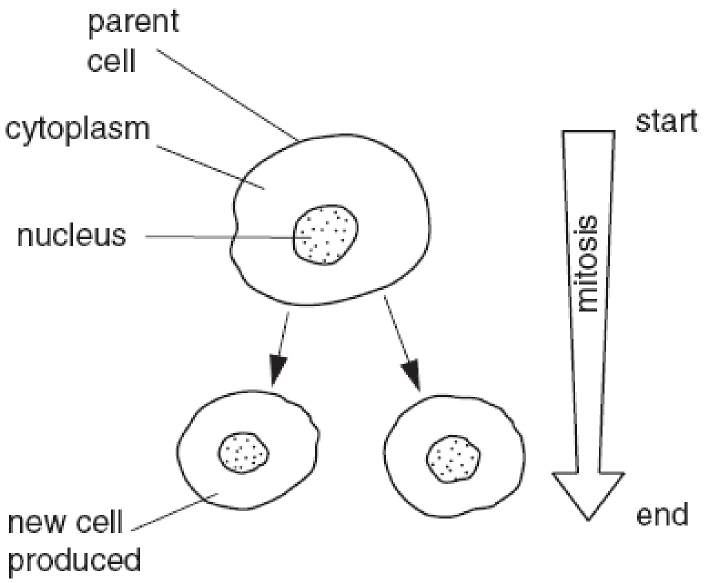
Question 1 begins on page 4.

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

1 James is studying cells which are undergoing mitosis.



(a) James counts the number of chromosomes in the nuclei at the start and at the end of mitosis.

What does he notice about the number of chromosomes in each nucleus?

Put a tick (✓) in the correct box.

The chromosome number had decreased at the end of mitosis. ☐

The chromosome number had increased at the end of mitosis. ☐

The chromosome number had stayed the same at the end of mitosis. ☐

[1]

(b) Here are some statements about mitosis.

Some statements are true. Some are false.

Write **true** or **false** in the box next to each statement.

statement	**true** or **false**
The new cells produced are gametes.	
The new cells produced are identical to each other.	
There are four new cells produced from each complete mitosis.	
The new cells produced are identical to the parent cell.	

[2]

[Total: 3]

2 This question is about genes.

(a) Explain how the genetic code in a cell is used to make proteins.

....

....

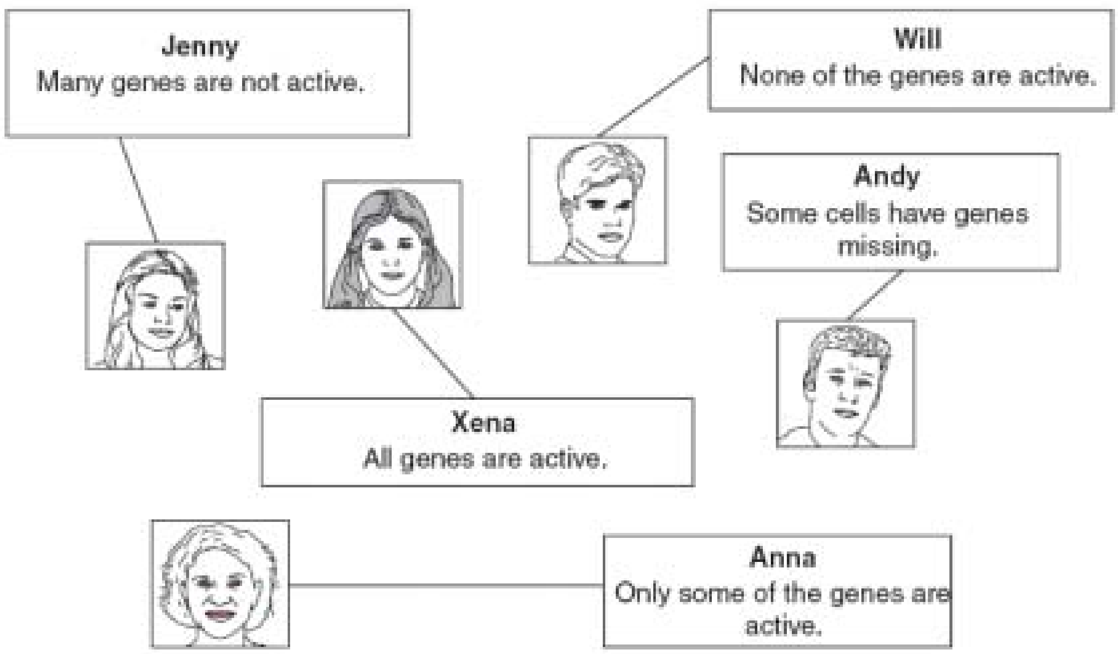
....

....

.... **[3]**

(b) Body cells inside one human contain the same genes but they produce different proteins.

Five people were asked to suggest how this might happen.



Which **two** people gave the best answers?

Put a ring around each of their names.

Jenny **Anna** **Xena** **Will** **Andy** **[2]**

(c) Some of these statements are **true** and some are **false**.

Put a tick (✓) in the correct box for each statement.

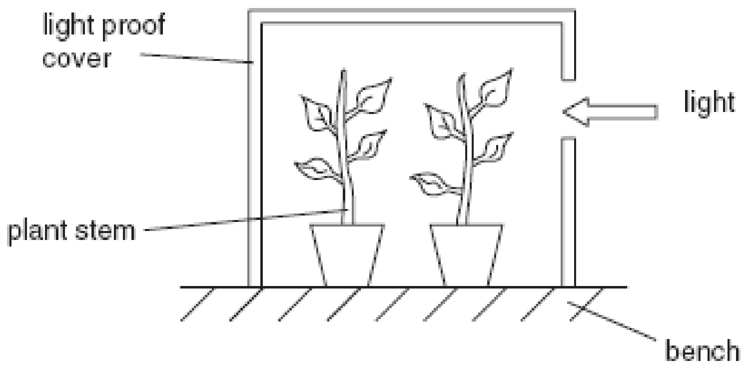
statement	**true**	**false**
DNA bases always pair up in the same way.		
DNA contains three different types of bases.		
DNA in different gametes is always the same.		
DNA is identical in new cells produced from the same parent cell by mitosis.		
DNA has a double helix structure.		

[3]

[Total: 8]

3 Theo is carrying out some experiments using plants.

He puts some young plants in a box and shines a light through a hole in the side of the box.



(a) In which direction will the stems bend?

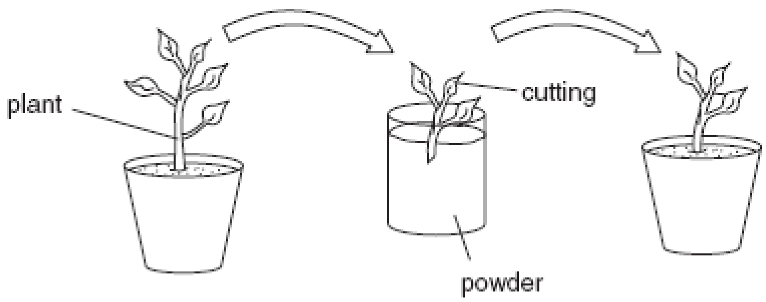
Put a tick (✓) in the correct box.

away from the light	☐
towards the light	☐
not at all	☐

[1]

(b) Theo's teacher asks him to take some cuttings from an older plant.

He dips the cut surface of the stem in powder before planting it in some soil.



(i) What does the powder contain?

Put a ring around the correct answer.

fertiliser **hormones** **pesticides** **[1]**

(ii) The cutting grows into a new plant.

Complete the sentences using words from the list below.

leaf **phloem** **root** **unspecialised**

The cut stem grows to form new .... cells.

New xylem tissue forms from .... cells. **[2]**

[Total: 4]

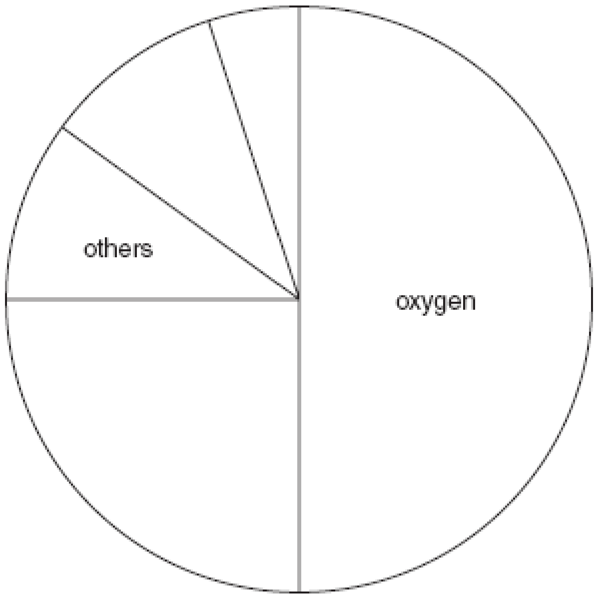
4 The rocks in the Earth's crust are made of many different elements.

The table shows approximate amounts of some of these elements.

element	**percentage by mass (%)**
oxygen	50
silicon	25
aluminium	10
iron	5
others	10

(a) Use the names of the various elements to **label the pie chart** to show this information.

The labels for two of the elements have been completed for you.



[2]

(b) Which element is there the most of?

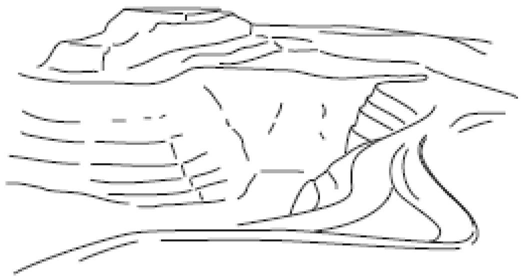
Write the name of the element in the space below.

....**[1]**

[Total: 3]

5 Some rocks contain copper.

Copper mines are very big.



Explain why copper mines are very big.

....

....

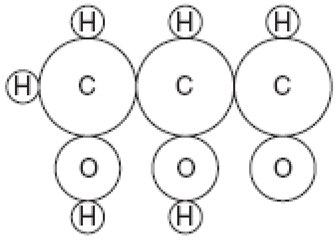
....

....

.... **[3]**

[Total: 3]

6 Mary draws a diagram of a chemical compound.



(a) Put a ring around the number of **different elements** in this compound.

3 **4** **6** **10** **[1]**

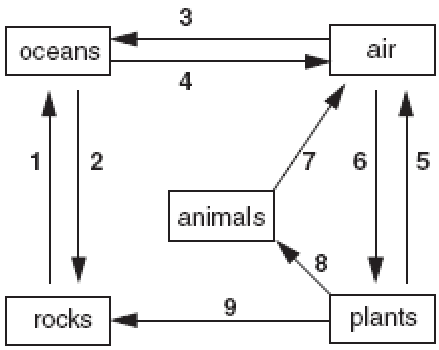
(b) What is the **formula** of this compound?

Put a ring around the correct answer.

$\mathbf{C_3H_60_3}$ $\mathbf{C_3H_8}$ $\mathbf{C_2H_5OH}$ $\mathbf{C_2H_5COOH}$ **[1]**

[Total: 2]

7 **(a)** Wilhelmina draws part of the carbon cycle.



(i) Which stage of the cycle (**1 to 9**) shows carbon being transferred to animals?

.... **[1]**

(ii) Carbon can get from the **air** into the **rocks** by two different routes.

Put **numbers** from the carbon cycle in the boxes to show **both** of these routes.

	first stage	**second stage**
Route A		
Route B		

[1]

(b) Wilhelmina finds out the composition of some of the molecules involved in the carbon cycle.

	% composition by mass			
	carbon	hydrogen	oxygen	nitrogen
fat	76.9	12.4	10.7	-
carbohydrate	40	6.7	53.3	-
DNA	33.2	4	44.3	8.6
protein	32	6.7	42.7	18.6

(i) Which **two** types of molecules contain **only** carbon, hydrogen and oxygen?

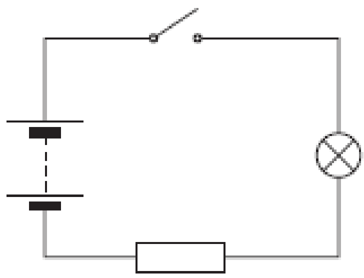
.... and .... **[1]**

(ii) Name **all** the elements in protein.

.... **[1]**

[Total: 4]

8 Karen makes this electric circuit.



(a) She completes the circuit by closing the switch.

This action makes the filament lamp glow.

Explain closing the switch makes the lamp glow.

....

....

....

....

.... **[3]**

(b) The lamp only glows dimly when Karen presses the switch.

Describe **three** changes to the circuit which would allow the same lamp to glow more brightly.

....

....

....

.... **[3]**

[Total: 6]

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Question 9 starts on page 16

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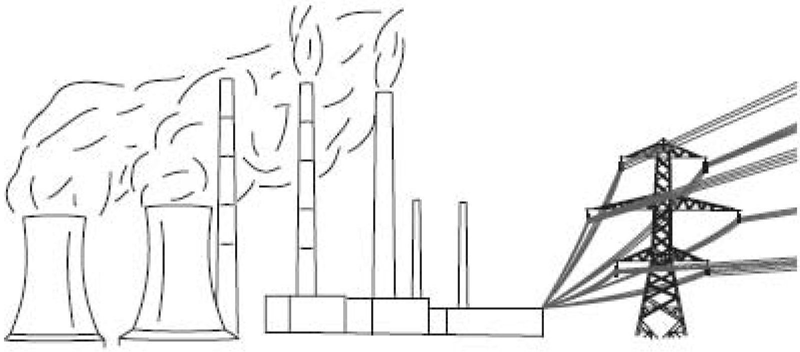
9 Most of our mains electricity is made in power stations.

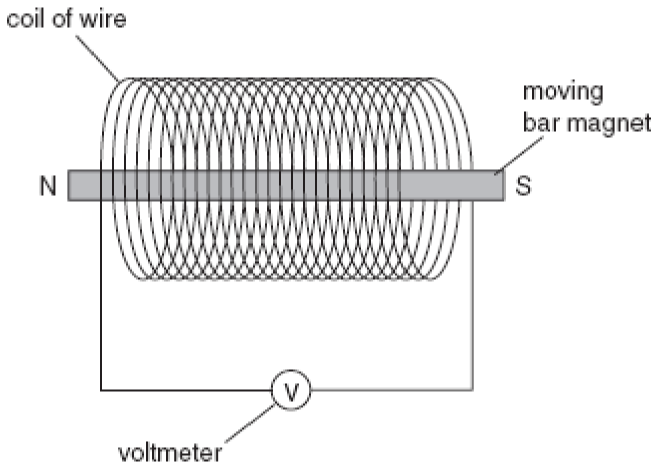


(a) What is the name of the machine which produces electricity in a power station?

Put a ring around the correct answer.

generator **reactor** **transformer** **[1]**

(b) Jake produces electricity by moving a bar magnet into a coil of wire.



Complete the sentences.

Choose the correct **numbers** from this list.

You may use each number once, more than once or not at all.

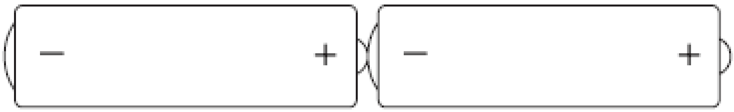
–0.5 **0.0** **+0.5**

As Jake moves the magnet into the coil, the voltmeter reads –0.5 V.

When Jake leaves the magnet in the coil, the voltmeter reads ....V.

As Jake moves the magnet back out of the coil, the voltmeter reads ....V. **[2]**

(c) Jake knows that batteries also make electricity.



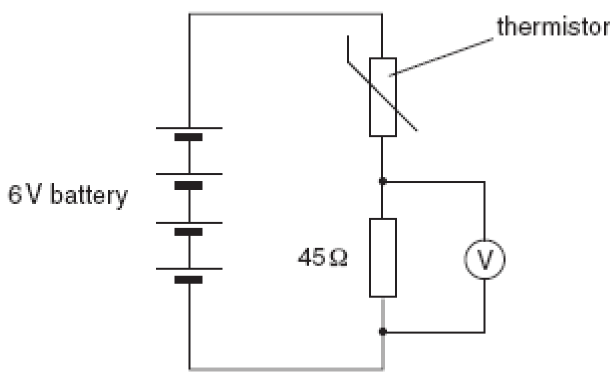
Draw lines to join the **source of electricity** to its **type of current** and **how it behaves**.

source of electricity	type of current	how it behaves
The current from a battery is ...	... a.c. ...	... and regularly changes direction.
	... d.c. ...	... and always goes round in circles.
	... p.c. ...	... and always goes in the same direction.

[2]

[Total: 5]

10 This circuit uses a thermistor.



(a) What affects the **resistance** of a thermistor?

Put a ring around the correct answer.

light intensity **pressure** **temperature** **[1]**

(b) The battery provides a potential difference of 6V for the circuit.

Complete the sentences.

Choose correct words from this list.

current **energy** **force** **power** **voltage**

Potential difference is another term for ....

It is a measure of the .... transferred from charge as it passes through a component. **[2]**

(c) Two of the cells are removed from the battery.

This reduces the reading of the voltmeter to only 1V.

Put a tick (✓) in the box next to the correct reason.

The voltmeter reading goes down because ...

... there is more current in the resistor. ☐

... there is less resistance in the thermistor. ☐

... there is less potential difference across the battery. ☐

[1]

[Total: 4]

END OF QUESTION PAPER

The Periodic Table of the Elements

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number

RECOGNISING ACHIEVEMENT

CONFIDENTIAL

GCSE Unit

MARK SCHEME

SAMPLE ASSESSMENT MATERIAL
(from 2010 onwards)

Additional Science A (J631)
Modules B5, C5 and P5
Foundation Tier

A216/01

Maximum Mark: 42

Guidance for Examiners

Additional Guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, e.g. mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	=	alternative and acceptable answers for the same marking point
(1)	=	separates marking points
not/reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant - applies to neutral answers
allow/accept	=	answers that can be accepted
(words)	=	words which are not essential to gain credit
<u>words</u>	=	underlined words must be present in answer to score a mark
ecf	=	error carried forward
AW/owtte	=	alternative wording
ORA	=	or reverse argument

   E.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)
   work done = 0 marks
   work done lifting = 1 mark
   change in potential energy = 0 marks
   gravitational potential energy = 1 mark

5. If a candidate alters his/her response, examiners should accept the alteration.
6. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.
7. The list principle:
   If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

8. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.
Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third <u>should be blank</u> (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

Question			Expected Answers	Marks	Rationale
1	a		number had stayed the same ✓	1	If more than one response = 0 marks
	b		new cells produced are gametes – false new cells produced are identical – true four new cells produced – false identical to the parent cell – true	2	Accept F and T In this case, accept ✓ = true and X = false 4 correct (2) 3 / 2 correct (1) 1 correct (0)
			Total	**3**	

Question			Expected Answers	Marks	Rationale
2	a		a <u>copy</u> of the genetic code (1); leaves the <u>nucleus (1);</u> to make proteins in the <u>cytoplasm (1);</u>	3	
	b		Jenny (1) Anna (1)	2	Apply list principle (see item 7 in Guidance for Examiners above)
	c		(T / F) pair up in same way – T ✓ three different types of bases – F ✓ in different gametes always same – F ✓ identical in new cells – T ✓ double helix structure – T ✓	3	4 or 5 correct (3) 2 or 3 correct (2) 1 correct (1)
			Total	**8**	

Question			Expected Answers	Marks	Rationale
3	**a**		towards the light ✓	1	If more than one response = 0 marks
	b	**i**	hormones	1	If more than one response = 0 marks
		ii	root (1) unspecialised (1)	2	Must be in correct order
			Total	**4**	

Question			Expected Answers	Marks	Rationale
4	**a**		iron - 5% section aluminium - 10% section silicon - 25% section	2	3 correct (2) 1 / 2 correct (1)
	b		oxygen	1	
			Total	**3**	

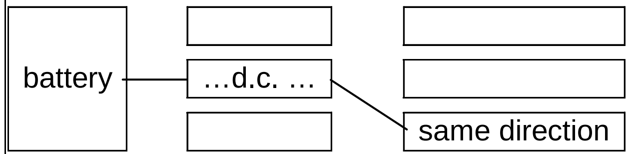
Question			Expected Answers	Marks	Rationale
5			amount of copper in the ore is very small (1); so lots of ore needed (to meet demand for the metal) (1); there is a large demand for copper (1);	3	
			Total	**3**	

Question			Gd	Expected Answers	Marks	Rationale
6	**a**		G	3	1	If more than one response = 0 marks
	b		E	$C_3H_6O_3$ (1)	1	If more than one response = 0 marks
				Total	**2**	

<table>
<tr><th colspan="3">Question</th><th>Gd</th><th>Expected Answers</th><th>Marks</th><th>Rationale</th></tr>
<tr><td>7</td><td>a</td><td>i</td><td>D</td><td>8</td><td>1</td><td>If more than one response = 0 marks</td></tr>
<tr><td></td><td></td><td>ii</td><td>C</td><td>
<table>
<tr><th></th><th>first stage</th><th>second stage</th></tr>
<tr><td>route A</td><td>3</td><td>2</td></tr>
<tr><td>route B</td><td>6</td><td>9</td></tr>
</table>
OR
<table>
<tr><th></th><th>first stage</th><th>second stage</th></tr>
<tr><td>route A</td><td>6</td><td>9</td></tr>
<tr><td>route B</td><td>3</td><td>2</td></tr>
</table>
</td><td>1</td><td>all correct for one mark</td></tr>
<tr><td></td><td>b</td><td>i</td><td>D</td><td>fat and carbohydrate</td><td>1</td><td>Accept any order

‘Hydrocarbon’ is incorrect</td></tr>
<tr><td></td><td></td><td>ii</td><td>D</td><td>carbon
hydrogen
oxygen
nitrogen</td><td>1</td><td>All four needed for (1)
Accept any order
Accept correct symbols: C H O and N</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Total</td><td>4</td><td></td></tr>
</table>

Question			Gd	Expected Answers	Marks	Rationale
8	**a**		CD	closing switch allows current / flow of charge (1); current passes through the filament (1); heats the filament causing it to glow (1)	3	NOT connects lamp to battery / allows voltage to lamp
	b		DD	any three of the following, (1) each: • remove the resistor / connect the lamp directly to the battery • connect a wire in parallel with the resistor • increase the voltage / p.d. of the battery (NOT larger battery) • decrease the resistance of the resistor	3	
				Total	**6**	

Question			Gd	Expected Answers	Marks	Rationale
9	**a**		G	generator	1	If more than one response = 0 marks
	b		FE	0.0 (1) +0.5 (1)	2	Must be in correct order Must have ‘+’ 0.5V i.e. ‘0.5V’ is incorrect
	c		FE		2	More than one line drawn on each side is incorrect
				Total	**5**	

Question			Gd	Expected Answers	Marks	Rationale
10	**a**		G	temperature	1	If more than one response = 0 marks
	b		FE	voltage (1) energy (1)	2	Must be in correct order
	c		F	less potential difference ✓	1	If more than one response = 0 marks
				Total	**4**	

				Section total	**42**	