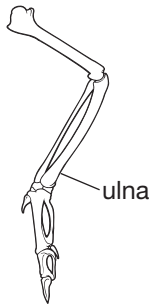
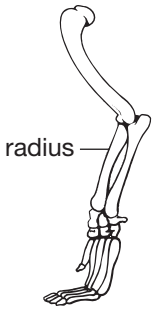
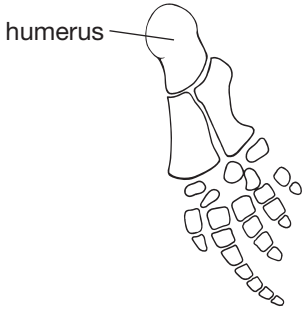
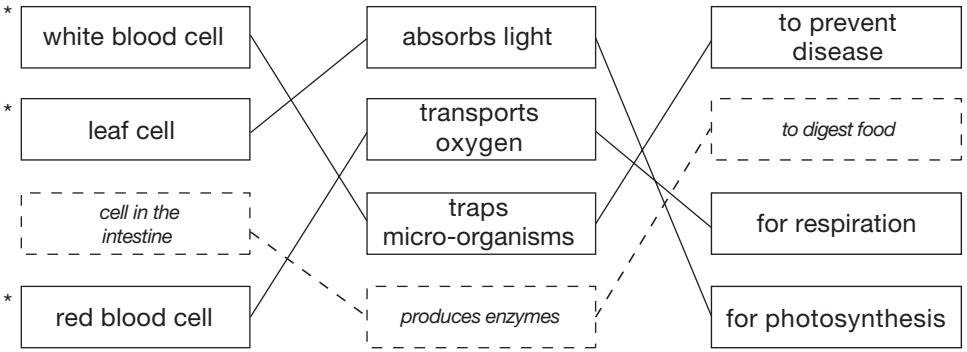
| Tier 3–6 5–7 | Q No 11 1 | | | Tier 3–6 5–7 | Q No 11 1 |
|---|---|---|---|---|---|
| | | 1/2j | use diagrams, tables, charts and graphs, including lines of best fit, to identify and describe patterns or relationships in data | | |
| | | 2/2e | the role of the skeleton and joints and the principle of antagonistic muscle pairs, *for example*, *biceps and triceps*, in movement | | |
| | | 2/4b | to classify living things into the major taxonomic groups | | |
| | | 2/5c | how some organisms are adapted to survive daily and seasonal changes in their habitats | | |

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| (a) | 1 | * vertebrates | accept 'animals with backbones' | *do **not** accept* 'warm blooded' |
| (b) | 3 | * (i)   * (ii)   * (iii)   | | award one mark for each correct label |
| (c) | 1 | any **one** from<br>* paddle shaped<br>* fin-like<br>* wide bones<br>* streamlined | accept 'large surface'<br>accept 'it is thick'<br>accept 'it is a big fin'<br>accept 'big bones' | *do **not** accept* 'it is big' **or** 'it is strong'<br>*do **not** accept* 'it can paddle in water'<br>'it is flexible' is insufficient |
| (d) | 1 | * they are light | accept 'they make the bird lighter' | |
| **Total** | **6** | | | |

| Tier 3–6 5–7 | Q No 12 2 | | | Tier 3–6 5–7 | Q No 12 2 |
|---|---|---|---|---|---|
| | | 1/2k | use observations, measurements and other data to draw conclusions | | |
| | | 2/2i | the role of lung structure in gas exchange, including the effect of smoking | | |
| | | 3/2i | about possible effects of burning fossil fuels on the environment, *for example, production of acid rain, carbon dioxide and solid particles*, and how these effects can be minimised | | |

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| | | | | answers may be in either order |
| (a) (i) | 1 | * Amy *and* Kisham | | **both** answers are required for the mark |
| (ii) | 1 | any **one** from<br>* traffic pollution **or** air pollution<br>* passive smoking<br>* faulty gas fires **or** faulty gas heaters | | 'pollution' is insufficient |
| (b) | 2 | any **two** from<br>* smokers have a higher concentration of carbon monoxide in the blood<br>* the blood of smokers contains **or** transports less oxygen<br>* smokers breathe more quickly to try to get enough oxygen **or** air | accept 'they have a lot of carbon monoxide in their blood'<br>accept 'not enough oxygen gets to the muscles **or** to other parts of the body **or** to the other cells'<br><br>accept 'smoke contains carbon monoxide'<br>**or**<br>accept 'smokers breathe in more carbon monoxide' | *do **not** accept* 'stops the blood taking up oxygen'<br><br>*do **not** accept* 'less oxygen gets into the lungs' |
| **Total** | **4** | | | |

| Tier 3–6 5–7 | Q No 13 3 | 2/1b 2/1e | the functions of chloroplasts and cell walls in plant cells and the functions of the cell membrane, cytoplasm and nucleus in both plant and animal cells<br>to relate cells and cell functions to life processes in a variety of organisms | Tier 3–6 5–7 | Q No 13 3 |
|---|---|---|---|---|---|

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| (a) (i) | 1<br>1 | * cell membrane<br>* cytoplasm | accept 'membrane' | answers must be in the correct order |
| (ii) | 2 | any **two** from<br>* cell wall<br>* chloroplast<br>* large vacuole | <br><br>accept 'chlorophyll'<br>accept 'vacuole' | |
| (b) | 1<br>1<br>1 |  | | if more than one line is drawn from any cell **or** function, award no mark for those linkages |
| **Total** | **7** | | | |

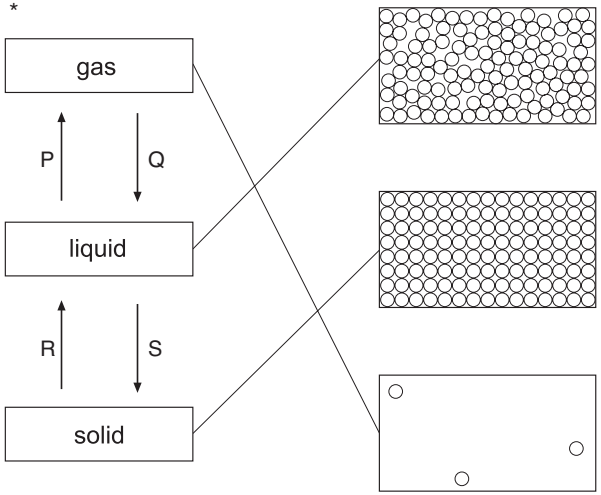
| Tier | Q No | | | Tier | Q No |
|---|---|---|---|---|---|
| 3–6<br>5–7 | 14<br>4 | 3/1e<br>3/2a<br>3/2g<br>3/3a | how elements combine through chemical reactions to form compounds, *for example, water, carbon dioxide, magnesium oxide, sodium chloride, most minerals*, with a definite composition<br>that when physical changes, for example, changes of state, formation of solutions, take place, mass is conserved<br>how mass is conserved when chemical reactions take place because the same atoms are present, although combined in different ways<br>how metals react with oxygen, water, acids and oxides of other metals, and what the products of these reactions are | 3–6<br>5–7 | 14<br>4 |

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| (a) (i) | 2 | *magnesium* + * oxygen → * magnesium oxide | | *do **not** accept* formulae |
| (ii) | 1 | any **one** from<br>* the oxygen had mass<br>* oxygen was added to the magnesium<br>* the magnesium has reacted with oxygen | <br><br>accept 'magnesium has gained an element'<br>accept 'magnesium is now part of a compound' | <br>*do **not** accept* 'air' for oxygen |
| (b) | 1 | * oxygen | accept '$O_2$' | |
| (c) | 1 | * zinc oxide | accept 'ZnO' | |
| (d) | 1 | * | | **all three** ticks are required for the mark |

| | chemical change | physical change |
|---|---|---|
| A | ✓ | |
| B | ✓ | |
| C | | ✓ |

| Total | 6 | |
|---|---|---|

| Tier | Q No | | | Tier | Q No |
|---|---|---|---|---|---|
| 3–6<br>5–7 | 15<br>5 | 3/1a<br>3/1b<br><br>3/1c<br>3/2c<br>3/2i | how materials can be characterised by melting point, boiling point and density<br>how the particle theory of matter can be used to explain the properties of solids, liquids and gases, including changes of state, gas pressure and diffusion<br>that the elements are shown in the periodic table and consist of atoms, which can be represented by symbols<br>to relate changes of state to energy transfers<br>about possible effects of burning fossil fuels on the environment, *for example, production of acid rain, carbon dioxide and solid particles*, and how these effects can be minimised | 3–6<br>5–7 | 15<br>5 |

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| (a) (i) | 1 | *  | | **all three** lines must be correct for the mark |
| (ii) | 1<br>1 | * *evaporation*: P<br>* *melting*: R | | |
| (b) (i) | 1 | * liquid | | |
| (ii) | 1<br>1 | * carbon<br>* hydrogen | | answers must be in the correct order |
| (iii) | 1 | * carbon dioxide | accept '$CO_2$'<br>accept 'carbon monoxide' **or** 'CO'<br>accept 'carbon' **or** 'soot' | |
| **Total** | **7** | | | |

| Tier 3–6 5–7 | Q No 16 6 | | | Tier 3–6 5–7 | Q No 16 6 |
|---|---|---|---|---|---|
| | | 3/1b | how the particle theory of matter can be used to explain the properties of solids, liquids and gases, including changes of state, gas pressure and diffusion | | |
| | | 4/1a | how to design and construct series and parallel circuits, and how to measure current and voltage | | |
| | | 4/1b | that the current in a series circuit depends on the number of cells and the number and nature of other components and that current is not 'used up' by components | | |
| | | 4/5e | ways in which energy can be usefully transferred and stored | | |

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| (a) (i) | 1 | * *circuit A*: series<br>*circuit B*: parallel | | **both** answers are required for the mark |
| (b) (i) | 1 | * the circuit **or** heating element will stop working | accept 'it will not work' **or** 'it will be off'<br>accept 'the whole circuit has no current through it'<br>accept 'it becomes cooler' | *do **not** accept* 'it breaks the heater **or** element **or** it' |
| (ii) | 1 | any **one** from<br>* the circuit **or** element will continue to work<br>* one wire will not heat the window | accept 'the bottom one has no current through it'<br>accept 'it will work less well'<br>accept 'the bottom wire becomes cooler' | 'nothing' **or** 'it will not be affected' are insufficient<br><br>*do **not** accept* 'it becomes cooler'<br>*do **not** accept* 'it does not work properly' |
| (c) (i) | 1 | * thermal | accept 'heat' | |
| (ii) | 1 | * *from* solid *to* liquid *to* gas | accept '*from* solid *to* liquid *to* vapour **or** steam'<br>accept '*from* ice *to* water *to* vapour **or** gas' | **all three** states are required for the mark |
| **Total** | **5** | | | |

| Tier 3–6 5–7 | Q No 17 7 | 4/4c about the movements of planets around the Sun and to relate these to gravitational forces<br>4/4d that the Sun and other stars are light sources and that the planets and other bodies are seen by reflected light | | Tier 3–6 5–7 | Q No 17 7 |
|---|---|---|---|---|---|
| **Part** | **Mark** | **Answer** | **Accept** | **Additional guidance** | |
| (a) | 1 | * gravitational pull of the Sun<br>**or** the Sun's gravity | accept 'gravity'<br>accept 'weight' | | |
| (b) | 2 | any **two** from<br>* its average speed is lower<br>* for most of its orbit the Sun's gravity is less<br>* its orbit is longer<br>* for most of its orbit it is further from the Sun | <br>accept 'its speed is slower' **or** 'it travels more slowly'<br>accept 'the pull of the Sun is weaker' **or** 'gravity is less'<br>accept 'it travels further' **or** 'the orbit is bigger'<br>accept 'it is further from the Sun' **or** 'further away' | | |
| (c) (i) | 1 | * light from the Sun | | | |
| | 1 | * reflects off Pluto and Neptune **or** the planets **or** them | accept for two marks 'sunlight reflects off them' | award the second mark only for 'the Sun reflects off the planets' | |
| (ii) | 1 | any **one** from<br>* it is smaller<br>* it reflects less light<br>* it absorbs more light | <br>accept 'it is small'<br><br><br>accept 'it is darker and smaller' | <br><br>*do **not** accept* 'it is further away (from the Earth)' **or** 'it is further from the Sun'<br>*do **not** accept* 'it is darker' | |
| **Total** | **6** | | | | |

| Tier 3–6 5–7 | Q No 18 8 | 1/2k 1/2l 1/2o | use observations, measurements and other data to draw conclusions<br>decide to what extent these conclusions support a prediction or enable further predictions to be made<br>consider whether the evidence is sufficient to support any conclusions or interpretations made | Tier 3–6 5–7 | Q No 18 8 |
|---|---|---|---|---|---|

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| (a) | 1 | * A *and* B | | answers may be in either order<br>**both** answers are required for the mark |
| (b) (i) | 1 | any **one** from<br>* the longer the string, the longer it takes<br>* the longer the string the more time it takes | accept the converse | references to both length and time are required for the mark |
| (ii) | 1 | * A *and* C *and* D | accept 'B *and* C *and* D' if part (a) is correct | answers may be in any order<br>**all three** answers are required for the mark |
| (c) | 1 | * *E*: 10.0<br>*F*: from 18 to 25 | accept '10' | **both** answers are required for the mark |
| **Total** | **4** | | | |

| Tier 5–7 | Q No 9 | 2/2d<br>2/2n | that food is used as a fuel during respiration to maintain the body's activity and as a raw material for growth and repair<br>how the growth and reproduction of bacteria and the replication of viruses can affect health, and how the body's natural defences may be enhanced by immunisation and medicines | Tier 5–7 | Q No 9 |
|---|---|---|---|---|---|

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| (a) | 1 | any **on**e from<br>* for transport **or** for blood **or** plasma<br>* it is needed for sweat **or** for cooling<br><br>* for tears<br>* it is a solvent<br>* for getting rid of waste<br>* it is needed for gas exchange<br>* it is a lubricant<br>* it is part of the cytoplasm | accept 'it stops cells becoming dehydrated'<br><br>accept 'allows chemical reactions to take place'<br>accept 'for digestion' | 'it stops the body becoming dehydrated' **or** 'it keeps us hydrated' are insufficient |
| (b) | 2 | any **two** from<br>* white blood cells<br>* (produce) antibodies **or** antitoxins<br>* prevent further infections **or** destroy the toxin **or** poison | accept 'destroy **or** kill the bacteria' | |
| (c) (i) | 1 | any **one** from<br>* so that the patient does not get cholera<br>* so the poison does not prevent the large intestine from absorbing water | accept 'the person might die'<br>accept 'intestine' for large intestine | *do **not** accept* 'small intestine' |
| (ii) | 1 | any **one** from<br>* no need for injections<br>* some people are afraid of needles<br>* less **or** no risk of infection | accept 'it does not hurt' | *do **not** accept* 'so they can be vaccinated against several diseases' |
| **Total** | **5** | | | |

| Tier 5–7 | Q No 10 | 2/4a<br>2/4c | about environmental and inherited causes of variation within a species<br>that selective breeding can lead to new varieties | Tier 5–7 | Q No 10 |
|---|---|---|---|---|---|

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| (a) | 1 | any **one** from<br>* in the eggs and sperm<br>* on chromosomes | accept 'gametes' **or** 'sex cells'<br>accept 'DNA'<br><br>accept 'at fertilisation' | answers must refer to **both** eggs **and** sperm<br><br>'by sexual reproduction' is insufficient |
| (b) | 3 | any **three** from<br>* choose zebras which look most like quaggas<br>* breed from them **or** cross them<br>* choose the most quagga-like offspring<br>* breed from the offspring<br>* repeat the process | accept for two marks 'mate the zebras with most quagga genes' | |
| **Total** | **4** | | | |

| Tier 5–7 | Q No 11 | | | Tier 5–7 | Q No 11 |
|---|---|---|---|---|---|
| | | 1/2d | consider key factors that need to be taken into account when collecting evidence, and how evidence may be collected in contexts, *for example, fieldwork, surveys*, in which the variables cannot readily be controlled | | |
| | | 1/2k | use observations, measurements and other data to draw conclusions | | |
| | | 3/2g | how mass is conserved when chemical reactions take place because the same atoms are present, although combined in different ways | | |
| | | 3/3e | how metals and bases, including carbonates, react with acids, and what the products of these reactions are | | |
| | | 3/3g | how acids in the environment can lead to corrosion of some metals and chemical weathering of rock, *for example, limestone* | | |

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| (a) | 1 | * calcium chloride | | *do **not** accept* the formula |
| (b) (i) | 1 | any **one** from<br>* a gas **or** carbon dioxide **or** $CO_2$ was given off<br>* water **or** $H_2O$ was formed and drained away **or** evaporated | accept 'the chemicals formed are washed away'<br><br>accept 'calcium chloride is more soluble than calcium carbonate' | *do **not** accept* 'chemical weathering' |
| (ii) | 1 | any **one** from<br>* the soils at B and C contain no acid **or** are not acidic<br>* soil B is neutral and soil C is alkaline<br>* the pH is higher **or** too high | | |
| (iii) | 1 | * acid rain | accept a recognisable method of lowering the pH of the soil | |
| (c) (i) | 1 | * any value greater than 960 but smaller than 984 | | |
| (ii) | 1 | any **one** from<br>* cannot control the environmental variables involved<br>* pH of soil may vary<br>* cannot predict rainfall during this time<br>* cannot predict temperature during this time | accept 'data in the table could be unreliable' | |
| **Total** | **6** | | | |

| Tier 5–7 | Q No 12 | 3/3c | how a reactivity series of metals can be determined by considering these reactions, and used to make predictions about other reactions | Tier 5–7 | Q No 12 |
|---|---|---|---|---|---|

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| (a) | 2 | * zinc<br>lead<br>copper<br>silver | | award two marks if all four metals are in the correct order<br>award one mark for zinc at the top and silver at the bottom of the list<br>award one mark for lead and copper in the correct order |
| (b) | 1 | * zinc | | |
| (c) | 1 | * no<br>because zinc is more reactive than silver **or** zinc is above silver in the reactivity series | accept the converse | **both** the answer and the reason are required for the mark |
| (d) | 1 | * below silver **or** at the bottom<br>because gold is the least reactive **or** gold does not react | | **both** the answer and the reason are required for the mark |
| **Total** | **5** | | | |

| Tier 5–7 | Q No 13 | 1/2j<br>4/2a<br>4/2c | use diagrams, tables, charts and graphs, including lines of best fit, to identify and describe patterns or relationships in data<br>how to determine the speed of a moving object and to use the quantitative relationship between speed, distance and time<br>that unbalanced forces change the speed or direction of movement of objects and that balanced forces produce no change in the movement of an object | Tier 5–7 | Q No 13 |
|---|---|---|---|---|---|

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| (a) (i) | 1 | * constant speed **or** steady speed | accept 'not accelerating' | |
| (ii) | 1 | * stationary **or** not moving **or** stopped | accept 'steady speed of zero' | *do **not** accept* 'it has a steady speed' |
| (b) | 1 | * 1.8 | accept '$\frac{18}{10}$' | |
| | 1 | * m/s | accept 'metres per second' **or** '$ms^{-1}$' | *do **not** accept* 'mps' |
| (c) (i) | 1 | * The forward force was zero and friction was greater than zero. ✓ | | if more than one box is ticked, award no mark |
| (ii) | 1 | * 6 | accept answers from 5.8 to 6.2 | |
| **Total** | **6** | | | |

| Tier 5–7 | Q No 14 | 4/2e<br>4/2f | that forces can cause objects to turn about a pivot<br>the principle of moments and its application to situations involving one pivot | Tier 5–7 | Q No 14 |
|---|---|---|---|---|---|

| Part | Mark | Answer | Accept | Additional guidance |
|---|---|---|---|---|
| (a) | 1<br>1 | * 0.96<br>* Ncm | accept '0.06 × 16'<br>accept 'cmN'<br>accept for both marks '0.0096 Nm' | *do **not** accept* lower case n for N<br>the mark for the unit may be given in (b) (i) provided it is not contradicted in part (a) |
| (b) (i) | 1 | any **one** from<br>* 0.96 Ncm<br>* the same as the carbon dioxide balloon | accept the same numerical answer given in (a) (the unit is not required)<br>accept 'the same' | consequential marking applies |
| (ii) | 1 | * 0.02 | | accept numerical answer to (b) (i) ÷ 48 |
| **Total** | **4** | | | |