AQA GCSE Physics | 8463

SPECIFICATION POINT 4.2.5.1

# Static charge

## Mark schemes and examiner comments

| | |
|---|---|
| Tier | **Foundation** |
| Question groups | **19** |
| Available paper years | **2004–2024** |

## Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

**Name:** _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

### 4.2.5.1 Static charge

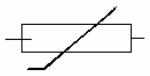
**Answer 01 · Mark scheme** June 2004 | 3451F | Original Q4 | Legacy

The full source mark scheme begins on page 38. Follow original question 4 in that document.

**Answer 02 · Mark scheme** June 2004 | 3462F3 | Original Q4 | Legacy

The full source mark scheme begins on page 59. Follow original question 4 in that document.

**Answer 03 · Mark scheme** June 2005 | 3451 | Original Q6 | Legacy

| | | | |
|---|---|---|---|
| (ii) | 6 | allow **1** mark for correct substitution | 2 |
| (iii) | 6 | accept their (b)(ii) | 1 |
| (c) | <u>thermistor</u> or  | accept correct circuit symbol<br>allow phonetic spelling | 1 |
| | <u>resistance</u> goes down (as temperature of thermistor goes up) | do **not** accept changes for goes down<br>do **not** accept an answer in terms of current only<br>answers in terms of other components are incorrect | 1 |
| total | | | 10 |

### 4.2.5.1 Static charge

**Answer 03 · Mark scheme**



**3451/F Q12**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | larger the distance, greater the time | accept 'they are proportional'<br>accept converse | 1 |
| (ii) | any value between 6 and 9 years inclusive | | 1 |
| (b)(i) | carbon dioxide | | 1 |
| (ii) | (Venus) has high**er** temperature (than Mercury) | accept has the high**est** temperature<br>accept Venus is hotter / hottest<br><br>do **not** accept has a high / very high temperature | 1 |
| | (Venus) further from the Sun than Mercury | accept 'Venus is not the closest planet to the Sun'<br><br>answer in terms of greenhouse effect only, scores **0** marks | 1 |
| total | | | 5 |

### 4.2.5.1 Static charge

**Answer 03 · Mark scheme** June 2005 | 3451 | Original Q6 | Legacy

**3451/F Q13**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | 20 | | 1 |
| (ii) | convection | | 1 |
| (iii) | fit draughtproof strips | accept lay carpet<br>accept fit curtains<br>accept close doors / windows / curtains<br>accept any reasonable suggestion for reducing a draught<br>'double glazing' alone is insufficient | 1 |
| (b) | air is (a good) insulator<br>**or**<br>air is a poor conductor | accept air cavity / 'it' for air | 1 |
| | reducing heat transfer by <u>conduction</u> | accept stops for reduces<br>ignore convection<br>do **not** accept radiation<br>do **not** accept answers in terms of heat being trapped | 1 |
| (c)(i) | most cost effective | accept it is cheaper or low<u>est</u> cost<br>accept shortest payback time<br>accept in terms of reducing heat loss by the largest amount<br>do **not** accept it is easier<br>ignore most heat is lost through the roof | 1 |
| (ii) | 4 | | 1 |
| total | | | 7 |

**4.2.5.1 Static charge**

**Answer 03 · Mark scheme** June 2005 | 3451 | Original Q6 | Legacy

**3451/F Q14**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | constant speed | do **not** accept normal speed<br>do **not** accept it is stopped / stationary | 1 |
| | in a straight line | accept any appropriate reference to a direction<br><br>constant velocity gains **2** marks<br>'not accelerating' gains **2** marks<br><br>terminal velocity alone gets **1** mark | 1 |
| (ii) | goes down owtte | accept motorbike (it) slows down | 1 |
| (b)(i) | 20 (m/s) | ignore incorrect units | 1 |
| (ii) | acceleration = change in velocity / time (taken) | do **not** accept velocity for change in velocity<br>accept change in speed<br>accept $a = \frac{v-u}{t}$ **or** $a = \frac{v_1 - v_2}{t}$<br>**or** a = $\frac{\Delta v}{t}$<br>do **not** accept $a = \frac{v}{t}$ | 1 |
| (iii) | 4<br>**or** their (b)(i) ÷ 5 | allow **1** mark for correct substitution | 2 |
| | $m/s^2$ | m/s/s **or** $ms^{-2}$ **or** metres per second squared **or** metres per second per second | 1 |
| (c) | vehicle may skid / slide | loss of control / brakes lock / wheels lock<br>accept greater stopping distance **or** difficult to stop | 1 |
| | due to reduced friction (between tyre(s) and road) | accept due to less grip<br>do **not** accept no friction | 1 |

**cont…**

**4.2.5.1 Static charge**



**3451/F Q14 cont**…

| | | | |
|---|---|---|---|
| (d) | any **three** from:<br>• increased speed<br>• reduced braking force<br>• slower (driver) reactions<br>• poor vehicle maintenance<br>• increased mass / weight of vehicle<br>• poor road surface<br>• more streamlined | do **not** accept night time / poor vision<br>N.B. specific answers may **each** gain credit eg tiredness (1), drinking alcohol (1), using drugs (1), driver distracted (1) etc<br>specific examples may **each** gain credit eg worn brakes or worn tyres etc<br>accept large mass / weight of vehicle<br>if candidates give three answers that affect stopping distance but not specific to increase award **1** mark only | 3 |
| total | | | 13 |

### 4.2.5.1 Static charge

**Answer 03 · Mark scheme**



**3451/F Q15**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | arrow from centre of the ball<br>**and** at right angles to the string<br>**and** in the correct direction | arrow should point to the student's belt<br>accept free-hand 'straight' line<br>do **not** accept curved line | 1 |
| (ii) | increase<br>increase<br>increase | accept 'be stronger / bigger'<br>accept 'be stronger / bigger'<br>accept 'be stronger / bigger' | 1<br>1<br>1 |
| (b) | speed<br>velocity<br>direction | all **three** correct<br><br>any two correct for **1** mark<br>otherwise **0** marks | 2 |
| (c)(i) | centripetal | accept 'centripedal' and other minor misspellings<br>do **not** accept anything which could be 'centrifugal' | 1 |
| (ii) | gravity | accept 'weight'<br>accept 'force of attraction due to mass(es) (of the Moon and the Earth)' | 1 |
| (iii) | electron(s) | | 1 |
| (iv) | electrostatic | accept 'electrical'<br>do **not** accept just 'centripetal' | 1 |
| total | | | 10 |

**4.2.5.1 Static charge**

**Answer 03 · Mark scheme** June 2005 | 3451 | Original Q6 | Legacy

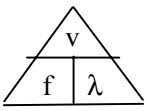
**3451/F Q16**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | **X** at the centre of the lifebelt | measuring from the centre of **X**, allow 2 mm tolerance in any direction | 1 |
| (ii) | any **two** from:<br><br>below the point of suspension<br><br>at the centre (of the lifebelt)<br><br>(because) the lifebelt / it is symmetrical | if X is on vertical line below the hanger (but not at centre) can gain the first point only<br><br>accept '(vertically) below **Y**'<br><br>accept 'in the middle'<br><br>**or** (because) the mass / weight is evenly distributed | 2 |
| (b) | Nm **or** newton metre(s)<br><br>750 | accept Newton metre(s)<br>do **not** accept any ambiguity in the symbol ie NM, nM or nm<br><br>(moment) = force × (perpendicular) distance (between line of action and pivot)<br>**or** (moment) = 500 × 1.5 gains **1** mark | 1<br><br>2 |
| (c) | **Quality of written communication**:<br><br>any **three** connected points from:<br><br>low(er) <u>centre of mass / gravity</u><br><br>(more) <u>stable</u><br><br>less likely to fall over<br><br>the <u>turning effect / moment</u> (of the weight of case) is less<br><br>so the pull on her arm is less | for **2** of the underlined terms used in the correct context<br><br><br>**or** <u>centre of mass / gravity</u> will be close(r) to the wheels / axle / ground<br><br>**or** less <u>unstable</u><br><br>accept 'less likely to overturn'<br>do **not** accept 'will not fall over'<br><br><br>**or** so less effort is needed to hold the case<br>ignore references to pulling the case | 1<br><br>3 |
| total | | | 10 |

**4.2.5.1 Static charge**



**3451/F Q17**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | any **two** from:<br>• **amplitude** decreasing<br>• **wavelength** increasing<br>• **frequency** decreasing<br><br>**Quality of written communication** | <br>accept siren / sound getting quieter<br>do **not** accept sound decreases<br><br>accept pitch decreasing<br>ignore reference to transverse wave<br>ignore reference to speed<br><br>contradictory statements within each point lose the mark<br><br>all emboldened terms in candidate's answer used correctly | 2<br><br>1 |
| (b)(i) | ultrasound **or** ultrasonic | | 1 |
| (ii) | wave speed = frequency × wavelength | accept speed / velocity for wave speed<br><br>accept $v = f \times \lambda$<br>do **not** accept w for λ<br>do **not** accept s for v<br><br>accept <br><br><br>provided subsequent calculation shows a correct method | 1 |
| (iii) | 339.2 **or** 340 **or** 339 | <br>allow **1** mark for using 212 000<br>allow **1** mark for correct substitution<br><br>an answer of 0.3392 **or** 0.34 **or** 0.339 gains **1** mark only<br>award full credit for a correct numerical answer with the unit changed to km/s | 3 |
| total | | | 8 |

### 4.2.5.1 Static charge

**Answer 04 · Mark scheme**

June 2005 | 3462 | Original Q6 | Legacy

The full source mark scheme begins on page 76. Follow original question 6 in that document.

4.2.5.1 Static charge

Answer 05 · Mark scheme



**Question 7**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | clothing and seat rub together | accept friction between clothing and seat | 1 |
| | electrons transfer from seat to driver<br>**or**<br>electrons transfer from driver to seat | accept electrons transfer on its own if first mark scores<br><br>an answer in terms of *rubbing,* between clothing and seat **and** *charge* transfer without mention of electrons gains **1** mark<br>an answer in terms of *friction* / *rubbing* **and** *electron transfer* without mention of clothing and seat gains **1** mark | 1 |
| (b)(i) | how wet the air is affects charge (build up)<br>**or**<br>damp air is a better conductor<br>**or**<br>damp air has a lower resistance | accept humidity affects charge<br><br>do **not** accept fair test or as a control unless explained | 1 |
| (ii) | No – it was only the lowest under these conditions<br>**or**<br>No – there are lots of other materials that were not tested<br>**or**<br>Yes – the highest value for cotton is smaller than the lowest value for the other materials | accept answer in terms of changing the conditions may change the results<br><br>do **not** accept results show that it is always less / smallest | 1 |
| total | | | 4 |

4.2.5.1 Static charge

Answer 06 · Mark scheme

June 2008 | PHY2F | Original Q2 | Legacy

**Question 2**

| | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | electrons | | 1 |
| | jumper | | 1 |
| (ii) | positive | accept protons<br>accept + | 1 |
| (iii) | positively charged | accept any clear way of indicating the answer | 1 |
| (b)(i) | copper | | 1 |
| | it is an (electrical) conductor | only accept if copper is identified<br>do **not** accept it conducts heat<br>accept it conducts heat and electricity<br>accept copper is the best conductor<br>accept correct description of conduction | 1 |
| (ii) | current | | 1 |
| total | | | 7 |

### 4.2.5.1 Static charge

**Answer 06 · Mark scheme**

June 2008 | PHY2F | Original Q2 | Legacy

**PHY2F**

**June 08**

### 4.2.5.1 Static charge

**Answer 07 · Mark scheme**



**Question 3**

| question | answers | extra information | mark |
|---|---|---|---|
| **3**(a)(i) | **Y** and **Z** | both required, in either order | 1 |
| **3**(a)(ii) | **X** | and no other | 1 |
| **3**(b)(i) | cause a <u>spark</u><br><br>cause a fire / explosion | <br><br>accept blow up for explosion<br>do **not** accept this mark if the reason given makes no sense e.g. if fuel reacts with the pipe it causes an explosion | 1<br><br>1 |
| **3**(b)(ii) | The charge will flow to earth | | 1 |
| **Total** | | | **5** |

### 4.2.5.1 Static charge

**Answer 07 · Mark scheme**

January 2009 | PHY2F | Original Q3 | Legacy

**PHY2F**

**Answer 08 · Mark scheme**

January 2009 | PHY3F | Original Q3 | Legacy

No matching mark scheme was available in the supplied archive for this question.

4.2.5.1 Static charge

Answer 09 · Mark scheme



## Question 8

| question | answers | extra information | mark |
|---|---|---|---|
| **8**(a)(i) | gained electrons | | 1 |
| **8**(a)(ii) | see if it exerts a force on another (charged) object<br><br>**or**<br><br>see if it will pick up (small) pieces of paper | accept repels another negative(ly charged)object<br>accept attracts a positive(ly charged) object<br>accept attracts or repels a charged object<br><br>accept any correct way of showing an electrostatic effect i.e. bend a (slow moving) stream of water (from a tap)<br><br>do **not** accept see if you get an electric shock on its own | 1 |
| **8**(b)(i) | plastic is an insulator<br><br>stop them discharging<br>**or**<br>stop them being earthed | accept plastic is a poor conductor<br>any mention of heat negates this mark<br><br>accept keeps the charge on the person<br>accept stop them being grounded<br>accept electricity cannot go to earth<br>do **not** accept so don't get an electric shock | 1<br><br>1 |
| **8**(b)(ii) | type of clothing could affect (build up of) charge/data | accept it is a variable/ factor (that needs to be controlled)<br>do **not** accept fair test on its own | 1 |
| **8**(b)(iii) | there is a clear pattern<br>**or**<br>enough precision to tell difference (between the materials)<br>**or**<br>accept none of the results are within 0.1kV of the shock line or each other | accept there is a wide range of results | 1 |

**Question 8 continues on the next page . . .**

4.2.5.1 Static charge

Answer 09 · Mark scheme



**PHY2F**

**Question 8 continued . . .**

| question | answers | extra information | mark |
|---|---|---|---|
| **8**(b)(iv) | any **two** from:<br>• the material normally used has a value above the p.d likely to cause a shock<br>• use a material that reduces pd (below 3.6 kV)<br>• so people are less likely to be shocked<br>• can put 'non-shock' seating in adverts<br>• may sell more seats/ cars | accept use a material that reduces charge (on the person)<br>accept so people will not feel a shock<br>owtte | 2 |
| **Total** | | | **8** |

### 4.2.5.1 Static charge

**Answer 10 · Mark scheme**



**Question 2**

| question | answers | extra information | mark |
|---|---|---|---|
| **2**(a) | repel | correct order only | 1 |
| | opposite | | 1 |
| | attract | | 1 |
| **2**(b) | refuelling an aircraft | reason cannot score if refuelling aircraft is not chosen | 1 |
| | a spark may cause an explosion / fire / ignite the fuel | accept the static for a spark<br>accept named fuel<br><br>there must be a consequence of having a spark<br><br>do **not** accept answers in terms of people getting a shock or electrocuted | 1 |
| **Total** | | | **5** |

### 4.2.5.1 Static charge

**Answer 10 · Mark scheme**

January 2010 | PHY2F | Original Q2 | Legacy

**PHY2F**

4.2.5.1 Static charge

Answer 11 · Mark scheme

June 2010 | PHY2F | Original Q4 | Legacy

## Question 4

| question | answers | extra information | mark |
|---|---|---|---|
| **4**(a)(i) | negative | accept minus<br>**or** – (ve)<br>do **not** accept electron/s | 1 |
| **4**(a)(ii) | positive | accept plus<br>**or** + (ve)<br><br>allow this mark if (a)(i) and (a)(ii) are given the wrong way around | 1 |
| **4**(b) | Objects carrying the same type of charge **repel**.<br>**or**<br>Objects carrying the **opposite** type of charge attract. | do **not** accept unattract for repel<br><br>accept **different** for opposite<br><br>allow credit if candidates change more than one word but final statement is equivalent to one of these two. | 1 |
| **4**(c) | 1 photoconducting<br><br>3 charge<br><br>4 attracts | | 1<br><br>1<br><br>1 |
| **4**(d) | accept anything feasible eg paint spraying / crop spraying / (electrostatic) precipitator / making sandpaper / a printer | accept a reasonable description of a process<br><br>do **not** accept scanner on its own<br><br>do **not** accept paint car / paint bicycle on its own<br><br>must be use, **not** demonstration of charge ie rubbing a balloon and sticking to a wall is incorrect | 1 |
| **Total** | | | **7** |

### 4.2.5.1 Static charge

**Answer 11 · Mark scheme** June 2010 | PHY2F | Original Q4 | Legacy

**PHY2F**

4.2.5.1 Static charge

Answer 12 · Mark scheme



## Question 8

| question | answers | extra information | mark |
|---|---|---|---|
| **8**(a) | 3rd box<br><br>The negative charge in the water is repelled by the rod and the positive charge is attracted. | | 1 |
| **8**(b)(i) | friction between bottles and conveyor belt / (plastic) guides<br><br>charge transfers between bottles and conveyor belt / (plastic) guides | accept bottles rub against conveyor belt / (plastic) guides<br><br>accept specific reference<br>eg electrons move onto / off the bottles<br><br>reference to positive electrons / protons negates this mark | 1<br><br>1 |
| **8**(b)(ii) | an atom that has lost / gained electron(s) | do **not** accept a charged particle | 1 |
| **8**(b)(iii) | charge will not (easily) flow off the conveyor belt | accept the conveyor belt / bottle is an insulator / not a conductor<br><br>accept conveyor belt is rubber | 1 |
| **Total** | | | **5** |

4.2.5.1 Static charge

Answer 13 · Mark scheme

June 2011 | PHY2F | Original Q4 | Legacy

## Question 4

| question | answers | extra information | mark |
|---|---|---|---|
| 4(a) | fleece rubs against shirt<br>**or**<br>friction (between fleece and shirt) | it refers to the fleece | 1 |
| | (causing) <u>electrons</u> to transfer from one to the other | accept a specific direction of transfer<br><br>do **not** accept charge for electrons<br>positive electrons negates this mark<br>movement of protons negates this mark | 1 |
| 4(b) | Electrical charges move easily through metals.<br><br>An electric current is a flow of electrical charge. | | 1<br><br>1 |
| 4(c)(i) | copper<br><br>(good electrical) conductor | reason only scores if copper chosen<br><br>accept it is a metal<br><br>any mention of heat conduction negates this mark | 1<br><br>1 |
| 4(c)(ii) | lower than | | 1 |

**Question 4 continues on the next page**

4.2.5.1 Static charge



**PHY2F**

**Question 4 continued**

| question | answers | extra information | mark |
|---|---|---|---|
| **4(c)(iii)** | accept any sensible suggestion, eg:<br>• too many variables (to control)<br>• lightning strikes / storms are random / unpredictable<br>• do not know which building will be struck<br>• do not know when a building will be struck<br>• do not know when lightning will happen<br>• (very) difficult to create same conditions in a laboratory<br>• lightning storms are not the same | it is not safe is insufficient<br>do **not** accept lightning does not strike the same place twice | 1 |
| **Total** | | | **8** |

### 4.2.5.1 Static charge

**Answer 13 · Mark scheme** June 2011 | PHY2F | Original Q4 | Legacy

**PHY2F**

4.2.5.1 Static charge

Answer 14 · Mark scheme

January 2013 | PH2FP | Original Q5 | Legacy

## Question 5

| question | answers | extra information | mark |
|---|---|---|---|
| 5(a)(i) | electrons<br><br>a positive | | 1<br><br>1 |
| 5(a)(ii) | (forces are) equal<br><br>(forces act in) opposite directions | accept (forces are)the same<br><br>forces are balanced is insufficient<br><br>accept (forces) repel<br><br>both sides have the same charge is insufficient | 1<br><br>1 |
| 5(b) | aluminium | | 1 |
| Total | | | 5 |

### 4.2.5.1 Static charge

**Answer 14 · Mark scheme**

January 2013 | PH2FP | Original Q5 | Legacy

**PH2FP**

### 4.2.5.1 Static charge

**Answer 15 · Mark scheme**

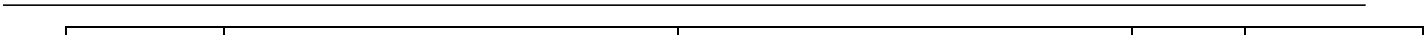
June 2017 | PH2FP | Original Q1 | Legacy

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **1(a)(i)** | electrons | | 1 | AO1 2.3.1b |
| **1(a)(ii)** | positive | | 1 | AO1 2.3.1b |
| **1(b)(i)** | repel | accept a correct description eg push away from | 1 | AO1 2.3.1d |
| **1(b)(ii)** | (the forces are) equal (in magnitude) | accept in equilibrium<br>accept balanced<br>accept the same | 1 | AO3 2.3.1c |
| **1(c)(i)** | copper | | 1 | AO1 2.3.1e |
| **1(c)(ii)** | the temperature increases | | 1 | AO2 2.4.2a |
| **1(c)(iii)** | 2000 | allow **1** mark for correct substitution ie<br>$I = \frac{4}{0.002}$<br>provided no subsequent step | 2 | AO2 2.3.2a |
| **Total** | | | **8** | |

### 4.2.5.1 Static charge

**Answer 15 · Mark scheme**

June 2017 | PH2FP | Original Q1 | Legacy



4.2.5.1 Static charge

Answer 16 · Mark scheme

November 2020 | 8463/2F | Original Q8

## Question 8

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **08.1** | Move the wooden block to the left. | | 1 | AO3<br>4.5.6.2.2<br>RPA7 |
| **08.2** | use a pulley (on the edge of the bench) | allow any feasible method to stop the string from rubbing | 1 | AO3<br>4.5.6.2.2<br>RPA7 |
| **08.3** | suitable scale<br><br>points plotted correctly<br><br>line of best fit | <br><br>allow 5 correctly plotted for **2** marks **OR** 3–4 correctly plotted for **1** mark | 1<br><br>2<br><br>1 | AO2<br>4.5.6.2.2<br>RPA7 |
| **08.4** | (directly) proportional | allow a correct description of direct proportionality<br><br>ignore positive correlation<br><br>allow weight (added to mass holder) for force<br><br>allow f = ma for **1** mark | 1 | AO3<br>4.5.6.2.2<br>RPA7 |
| **08.5** | repeat the measurements/investigation<br><br>ignore anomalies **and** calculate the mean / average | | 1<br><br>1 | AO3<br>4.5.6.2.2<br>RPA7 |
| **08.6** | resultant force = mass × acceleration<br><br>**or**<br><br>F = m a | | 1 | AO1<br>4.5.6.2.2<br>RPA7 |

### 4.2.5.1 Static charge

**Answer 16 · Mark scheme**

November 2020 | 8463/2F | Original Q8

| | | | | |
|---|---|---|---|---|
| **08.7** | $0.375 = 0.60 \times a$<br><br>$a = \frac{0.375}{0.60}$<br><br>$a = 0.625$ (m/s$^2$)<br><br>$a = 0.63$ (m/s$^2$) | | 1<br><br>1<br><br>1<br><br>1 | AO2<br>4.5.6.2.2<br>RPA7 |
| **Total** | | | **14** | |

4.2.5.1 Static charge

Answer 17 · Mark scheme

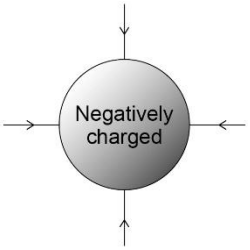
June 2022 | 8463/1F | Original Q3

## Question 3

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 03.1 | electrons<br><br>electrons | | 1<br><br>1 | AO1<br>4.2.5.1 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 03.2 | a positive charge | | 1 | AO1<br>4.2.5.1 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 03.3 | a force of repulsion<br><br>the rods have the same charge **or** the rods are both negatively charged | dependent on scoring first marking point | 1<br><br>1 | AO1<br>4.2.5.1 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 03.4 |  | | 1 | AO1<br>4.2.5.2 |

### 4.2.5.1 Static charge

**Answer 17 · Mark scheme**



| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.5** |   **A** | | 1 | AO1 4.2.5.2 |

| | | |
|---|---|---|
| **Total Question 3** | | **7** |

4.2.5.1 Static charge

Answer 18 · Mark scheme

June 2023 | 8463/2F | Original Q2

## Question 2

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.1** | kinetic<br><br>thermal | this order only | 1<br><br>1 | AO1<br>4.5.6.3.4 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.2** | (minimum braking) distance increases with increasing speed | allow positive correlation | 1 | AO2<br>4.5.6.3.1 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.3** | increases | | 1 | AO1<br>4.5.6.3.3 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.4** | 12.5 – 5.0 = 7.5 (m/s)<br><br>$t = \frac{7.5}{0.25}$<br><br>$t$ = 30 (s) | <br><br>this mark may be awarded if the change in velocity is incorrectly calculated<br><br>allow a correctly calculated answer using a change in velocity incorrectly calculated | 1<br><br>1<br><br>1 | AO2<br>4.5.6.1.5 |

4.2.5.1 Static charge

Answer 18 · Mark scheme



| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.5** | *F* = 1600 × 0.25<br><br>*F* = 400 (N) | | 1<br><br>1 | AO2<br>4.5.6.2.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.6** | initial height of the ruler above the person's hand | | 1 | AO3<br>4.5.6.3.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.7** | there will be more variation in distances | allow reaction times for distances<br><br>allow the three students tested are not typical | 1 | AO3<br>4.5.6.3.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.8** | carry out the experiment listening to music<br><br>then not listening to music (and compare the results) | <br><br>allow compare with original results | 1<br><br>1 | AO3<br>4.5.6.3.2 |

| | |
|---|---|
| **Total Question 2** | **13** |

4.2.5.1 Static charge

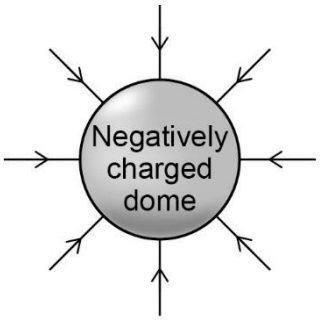
Answer 19 · Mark scheme

June 2024 | 8463/1F | Original Q1

## Question 1

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 01.1 | negative | | 1 | AO1 4.2.5.1 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 01.2 | repulsion | | 1 | AO1 4.2.5.1 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 01.3 |   | | 1 | AO1 4.2.5.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 01.4 | resistance | | 1 | AO1 4.2.5.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 01.5 | ionised | | 1 | AO1 4.2.5.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 01.6 | electrons | | 1 | AO1 4.2.5.2 |

### 4.2.5.1 Static charge

**Answer 19 · Mark scheme**



| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **01.7** | energy transferred = 0.000 002 × 300 000<br><br>energy transferred = 0.6 (J) | | 1<br><br>1 | AO2<br>4.2.4.2 |

| | |
|---|---|
| **Total Question 1** | **8** |

GCSE 2004
*June Series*

ASSESSMENT and QUALIFICATIONS ALLIANCE

# Mark Scheme

## Physics Specification B
*3451/F*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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### 4.2.5.1 Static charge



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### 4.2.5.1 Static charge





# GCSE PHYSICS

# INFORMATION FOR EXAMINERS

## 1. General

The mark scheme for each question shows:

- the marks available for each part of the question;
- the total marks available for the question;
- the typical answer or answers which are expected;
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example:
where consequential marking needs to be considered in a calculation;
or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

## 2. Emboldening

**2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

**2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.

**2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; e.g. allow smooth / free movement.)

## 3. Marking points

### 3.1 Marking of Quality of Written Communication

Where *Quality of written communication* appears in the mark scheme, one mark is to be awarded for either of the following points:

- Using correct scientific terms
- Correct sequencing or linking of ideas or points

The mark scheme will specify which of the points is to be awarded in a particular question. A QoWC mark can be awarded for a scientific answer, even if it is not accurate. It cannot be awarded for a nonsensical or non-scientific answer.
On the script, the QoWC tick should be identified by a 'q' written next to it.

### 3.2 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

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Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

| Candidate | Response | Marks awarded |
|---|---|---|
| 1 | 4,8 | 0 |
| 2 | green, 5 | 0 |
| 3 | red*, 5 | 1 |
| 4 | red*, 8 | 0 |

Example 2: Name two planets in the solar system. (2 marks)

| Candidate | Response | Marks awarded |
|---|---|---|
| 1 | Pluto, Mars, Moon | 1 |
| 2 | Pluto, Sun, Mars, Moon | 0 |

**3.3 Use of chemical symbols/formulae**

If a candidate writes a chemical symbol/formula instead of a required chemical name, full credit can be given if the symbol/formula is correct and if, in the context of the question, such action is appropriate.

**3.4 The marking of quantitative relationships**

Full credit can be given for a correct quantitative relationship expressed in:

- named units;
- physical quantities;
- standard symbols;
- a combination of physical quantities and units.

No credit can be given for any quantitative relationship expressed in terms of:

- a combination of physical quantities, units and symbols;
- a diagram, e.g. the ohm's law triangle, unless the rest of the answer shows clearly that the candidate understands the relationships involved.

**3.5 Marking procedure for calculations**

**3.5.1** Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.
However:

- if the answer is incorrect, mark(s) can be gained by correct substitution/working and this is shown in the 'extra information' column;
- if the answer is correct, but an incorrect relationship is written in the working, then no marks can be awarded (see 3.5.2).

**3.5.2** Where calculations are based on incorrectly recalled relationships, neither the incorrectly recalled relationship, nor the resulting calculation based on the incorrect relationship, will be credited.

**3.6 Interpretation of 'it'**

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.


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### 4.2.5.1 Static charge





**3.7 Errors carried forward**

There should be no error carried forward from a previous answer which has been based on wrong science. Any error in the answers to a structured question should be penalised once only.

Examples

(a) A candidate who calculates average speed using speed = time/distance **and** then proceeds to use this incorrect answer to calculate an acceleration based on the correct quantitative relationship should be given credit for the use of the correct acceleration relationship but none for either numerical answer.

(b) A candidate who incorrectly calculates average speed using speed = distance/time and then proceeds to use this incorrect value to calculate an acceleration based on the correct quantitative relationship, should be given credit for the use of both correct quantitative relationships **and** for the correct substitution and use of the incorrect value in the calculation of the rate of acceleration.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

**3.8 Phonetic spelling**

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

**3.9 Brackets**

(…..) is used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

**3.10 Interpretation of marginal points**

There will be times when the answer is almost, but not quite, correct. Some examiners would award a mark while others would not. In any one script, an attempt should be made to balance these nearly correct answers by giving the mark on some occasions but not on others. If this is not done, the marking would end up being too lenient or too harsh.

**3.11 Unexpected Correct Answers not in the Mark Scheme**

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

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### 4.2.5.1 Static charge





**GCSE Physics**
**Foundation Tier 3451/F**

**3451F Q1**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | comet | correct order only | 1 |
| | elliptical | | 1 |
| | Milky Way | | 1 |
| | Universe | | 1 |
| (b)(i) | D A C B | allow **2** marks for two letters in the correct place<br>allow **1** mark for one letter in the correct place | 3 |
| (ii) | A | | 1 |
| total | | | 8 |



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### 4.2.5.1 Static charge





**3451F Q2**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | 95 | | 1 |
| (b) | alpha | accept correct symbol | 1 |
| (c) | any **two** from:<br>• radiation is outside the body<br>• radiation will not reach (living) cells<br>• radiation absorbed by the air | <br>accept detector is on ceiling or high up the wall<br>accept radiation cannot pass through the body / skin<br>accept cannot pass through the plastic casing<br>do **not** accept because it is alpha radiation – unless qualified<br>do **not** accept does not give off harmful substance<br>do **not** accept cannot pass through building materials etc. | 2 |
| (d) | less (than) | | 1 |
| total | | | 5 |

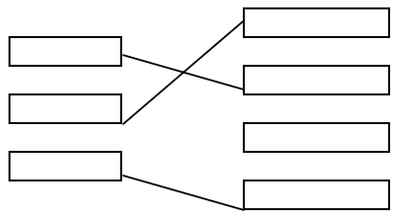
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### 4.2.5.1 Static charge





**3451F Q3**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | generator | accept dynamo<br>accept alternator | 1 |
| (b)(i) | 1400 | ignore units | 1 |
| (ii) | 0.3 or 30% | any incorrect unit penalise **1** mark<br>allow **1** mark for the correct use of 600 **or** 0.3% **or** 30 | 2 |
| (c) | **1** mark for each correct link<br> | if more than 3 lines are drawn, mark only 3 lines starting with those that are incorrect | 3 |
| (d)(i) | 110 | no tolerance | 1 |
| (ii) | 12 | no tolerance | 1 |
| (iii) | wind speed may be too low to operate the generator | accept wind may not always blow<br>accept power depends on wind speed<br>accept does not generate if wind speed is too high<br>accept does not generate if wind speed is above 12 (m/s)<br>accept does not generate if wind speed is below 1.6 (m/s)<br>accept it is unreliable<br>do **not** accept answers referring to cost only | 1 |
| total | | | 10 |



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### 4.2.5.1 Static charge





**3451F Q4**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | B E A D | allow **1** mark for each letter in the correct place, to a maximum of **3** marks | 3 |
| (b) | (a spark) may cause the (petrol vapour) to explode / ignite<br><br>connect tanker to earth with a (conducting) wire / chain **or** earth the tanker | accept petrol for (petrol vapour)<br>accept catch fire for explode<br><br>accept ground for earth | 1<br><br>1 |
| (c) | **Quality of written communication**<br><br>any **two** from:<br><br>• when current greater than fuse rating / value<br><br>• fuse (becomes hot and) melts / burns out<br><br>• circuit is broken | for a logical sequence<br><br><br><br>accept when current too great for appliance<br>do **not** accept 'if there is too much current'<br>do **not** accept voltage or electricity<br><br>accept fuse blows / breaks<br><br>accept circuit switched off<br>this cannot score credit on its own | 1<br><br>2 |
| total | | | 8 |

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### 4.2.5.1 Static charge





**3451F Q5**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | crust | | 1 |
| (ii) | inner core is <u>solid</u><br><br>outer core is liquid | do **not** accept just rock<br><br>inner core is denser / hotter than outer core gets **2** marks<br>accept one is solid and one is liquid for **1** mark<br>accept they are different densities for **1** mark<br>wrong way round = **0** marks | 1<br><br>1 |
| (b) | seismograph | | 1 |
| (c) | difficult to measure (slow) movement (1)<br>of plates (1) dependent mark<br>**or**<br>difficult to measure friction / forces (1)<br>between plates (1) dependent mark | | 1<br><br>1 |
| (d) | geothermal | | 1 |
| (e)(i) | 5000 | | 1 |
| (ii) | 2500 | | 1 |
| total | | | 9 |



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### 4.2.5.1 Static charge





**3451F Q6**

| | answers | extra information | mark |
|---|---|---|---|
| (a) | converging<br>image<br>object<br>image<br>object<br>shorter | | 1<br>1<br>1<br>1<br>1<br>1 |
| (b)(i) | (Earth's) gravity | accept centripetal<br>accept minor misspellings, however, do **not** credit any response which could be 'centrifugal' | 1 |
| (ii) | to(wards) (the centre of the) Earth | allow inwards<br>do **not** accept downwards | 1 |
| (c)(i) | **either**<br><br>friction (force)<br>**or** centripetal force<br><br>between the tyres / wheels and (the surface of) the road | <br><br>allow grip<br><br>allow on the tyres / wheels<br>**or** towards the centre of the bend / arc / circle | <br><br>1<br><br>1 |
| (ii) | mass<br>**or** speed<br>**or** momentum<br><br>radius / diameter | allow weight<br>allow velocity<br><br>do **not** credit 'curvature' or 'circumference' | 1<br><br>1 |
| (d) | centripetal | accept minor misspellings (see above) | 1 |
| total | | | 13 |

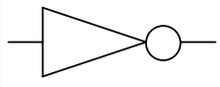
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## 4.2.5.1 Static charge





**3451F Q7**

| | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | two switches in series **and** circuit complete | ignore small imperfections | 1 |
| (ii) | two switches in parallel **and** circuit complete | ignore small imperfections | 1 |
| (iii) | one switch in parallel with the cell / lamp (but **not** both) | ignore small imperfections | 1 |
| (iv) | (i) AND<br>(ii) OR<br>(iii) NOT | accept 'and'<br>accept 'or'<br>accept 'not' | 1<br>1<br>1 |
| (b)(i) | when it is light the sensor sends on / high / 1 signal to the gate<br>off / low / 0 sent to the lamp<br>**or**<br>when it is dark the sensor sends off / low / 0 signal to the gate (1)<br>on / high / 1 sent to the lamp (1) | | 1<br>1 |
| (ii) | any suitable application | e.g. to switch a security light on (and off)<br>e.g. to switch a light on when it is dark<br>do **not** credit just '… to switch a light on / off' | 1 |
| (c)(i) |  | accept shading-in of either or both parts<br>end connections are not required<br>accept any orientation | 1 |
| (ii) | 1 0 **or** 0 1<br>0 1 1 0 | all correct | 1 |
| (iii) | truth (table) | | 1 |
| total | | | 12 |



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### 4.2.5.1 Static charge





**3451F Q8**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | 60 | | 1 |
| (b) | $5\frac{1}{2}$ hours | must include unit | 1 |
| (c) | 30 | | 1 |
| (d) | 30 minutes<br>or $\frac{1}{2}$ hour | must include unit | 1 |
| (e) | D **and** E<br><br>least steep part of the graph | accept finish for E<br>accept correct numbers from axes with units<br><br>accept covers smallest distance in a set time<br>accept only moves 5 km in<br>$1\frac{1}{2}$ hours (accept anything between 5 and 6)<br><br>ignore horse is tired | 1<br><br>1 |
| total | | | 6 |

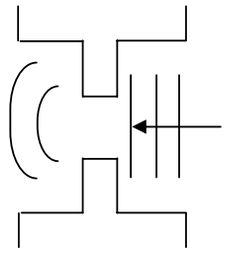
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## 4.2.5.1 Static charge





**3451F Q9**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | any **one** from:<br>• (doctors) to see inside a patients body **or** endoscope<br>• telephone cables<br>• optical fibre / fibre optic lamps **or** (artificial) Christmas trees<br>• data transfer **or** internet connection | <br>accept keyhole surgery<br>do **not** accept flex **or** wires for cable<br>accept decorative / ornamental lighting<br>accept any feasible practical suggestion for taking light to a difficult to access place<br>do **not** accept lighting unqualified<br>do **not** accept lamp unqualified<br>do **not** accept communications unless clarified | 1 |
| (ii) | (incident) ray angle greater than critical angle<br>total internal reflection occurs | either order<br>accept (incident) ray greater than 42°<br>accept TIR<br>do **not** accept just description of TIR | 1<br>1 |
| (b)(i) | waves shown diffracting in the correct direction<br> | ignore wavelength | 1 |
| (ii) | diffraction | accept diffract / diffracted | 1 |
| total | | | 5 |



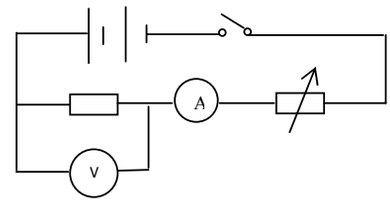
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### 4.2.5.1 Static charge





**3451F Q10**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | all symbols correct | <br>accept push switch symbol<br>switch may be open or closed<br>any lines through symbols = **0** marks | 1 |
| | correct circuit drawn<br><br>voltmeter must be across resistor only | polarity of cells not relevant provided they are joined correctly<br>two cells are required in the diagram<br>ignore the order of the components<br>allow small gaps in circuit<br><br>omission of any component = **0** marks | 1 |
| (b)(i) | potential difference<br>= current × resistance | accept voltage or p.d. for potential difference<br><br>accept $V = I \times R$<br><br>accept  provided<br>subsequent use correct<br><br>do **not** accept C for current | 1 |
| (ii) | 2 | allow **1** mark for correct substitution<br>wrong working loses both marks | 2 |
| (iii) | straight line drawn <u>through the origin</u><br><br>straight line passes through<br>$I = 0.4, V =$ their (b)(ii) / 2 **and** 0.0 | judge by eye<br><br>this mark may be awarded if all points shown including these points are correct even if no line is drawn<br>N.B. a curve scores **0** marks | 1<br><br>1 dep |
| (c) | temperature <u>increases</u> | accept filament lamp / it gets <u>hotter</u><br>allow heat for temperature | 1 |
| total | | | 8 |

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## 4.2.5.1 Static charge





**3451F Q11**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | gamma rays | accept gamma<br>accept correct symbol | 1 |
| (ii) | infra red | accept IR | 1 |
| (b) | ultraviolet <u>absorbed</u> by ink<br><br>(energy) given out as light | <br><br>accept glows / luminous<br>accept for **both** marks the ink is fluorescent<br>do **not** accept answers in terms of uv being reflected | 1<br><br>1 |
| (c) | any **two** from:<br><br>• UV can damage / kill / ionise / alter (normal) cells<br><br>• change DNA structure **or** mutate<br><br>• (normal) cells may become cancerous | <br><br>do **not** accept attacks cells **or** burns skin<br><br><br><br>accept may cause (skin) cancer<br>accept abnormal cell multiplication | 2 |
| (d)(i) | microwaves **and** infra red | both answers needed in either order<br><br>do **not** accept heat for IR | 1 |
| (ii) | 0.9 | <br><br>allow **1** mark for the <u>correct</u> use of<br>1.8 (kW) ($1.8 \times \frac{1}{2}$ or $1.8 \times 30$)<br>i.e. adding the correct 2 power values | 2 |
| total | | | 9 |



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## 4.2.5.1 Static charge





**3451F Q12**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | accelerating | accept getting faster<br>accept speed / velocity increasing | 1 |
| (ii) | acceleration increases | accept velocity / speed increases more rapidly<br>do **not** accept velocity / speed increases | 1 |
| (b)(i) | $\text{acceleration} = \frac{\text{change in velocity}}{\text{time (taken)}}$ | accept $a = \frac{v - u}{t}$ **or** $a = \frac{v_1 - v_2}{t}$<br>do **not** accept velocity for change in velocity<br>do **not** accept change in speed<br>do **not** accept $a = \frac{v}{t}$ | 1 |
| (ii) | 15 | allow **1** mark for an answer of 900 **or** for correct use of 540 seconds | 2 |
| (iii) | velocity includes direction | accept velocity is a vector (quantity)<br>accept converse answer | 1 |
| (c) | force of gravity (between shuttle and Earth)<br><br>plus correct orbital speed (makes shuttle move in a curve) | accept gravitational pull if used correctly<br><br>accept forward motion **or** constant speed for orbital speed<br>accept it is travelling fast enough<br>accept for **2** marks the force of gravity provides the centripetal force | 1<br><br>1 |
| (d) | black is a good emitter of radiation<br>**or** to limit the temperature rise inside the shuttle | accept heat for radiation<br>accept the tiles are good insulation<br>do **not** accept black absorbs heat on its own<br>do **not** accept tiles are heat proof | 1 |
| total | | | 9 |

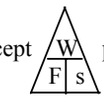
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### 4.2.5.1 Static charge





**3451F Q13**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | work (done)<br>= force (applied) × distance (moved) | accept W = F × s or W = F × d<br><br>accept  provided<br><br>subsequent method is correct | 1 |
| (ii) | 240 000<br><br>joules | allow **1** mark for correct substitution **or** correct use of 1200 (N)<br><br>accept J<br>do **not** accept j / Nm | 2<br><br>1 |
| (b) | 800 (watts) | accept 0.8 kW<br>accept their (a)(ii) ÷ 300 correctly evaluated for **2** marks<br><br>allow **1** mark for correct substitution (a)(ii) ÷ 5 correctly evaluated for **1** mark | 2 |
| (c)(i) | any **one** from:<br>• needs to raise the chair / lift<br>• lifting more than one chair<br>• energy transfer to the surroundings correctly qualified | <br><br>allow lifting more than 2 people<br>implication of a heavier weight<br><br>accept loss for transfer<br>do **not** accept motor inefficient<br>do **not** accept motor gets hot<br>do **not** accept friction unless the location is specified as external to the motor | 1 |
| (ii) | electrical<br><br>potential | accept electric<br><br>**both** answers required for the mark | 1 |
| total | | | 8 |



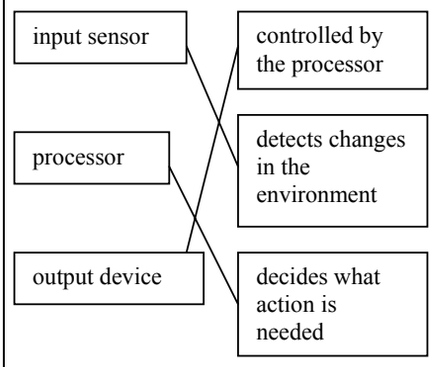
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### 4.2.5.1 Static charge





**3451F Q14**

| | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | current | | 1 |
| (ii) | resistance<br><br>decreases | <br><br>accept 'the flow of electrons / current (through it) increases' for **1** mark<br><br>do **not** credit just '… it will get warmer' | 1<br><br>1 |
| (b) |  | all pairs correct<br><br>one pair correct for **1** mark | 2 |
| (c)(i) | potential divider | accept voltage divider | 1 |
| (ii) | 4 (volts) | $6 \times \frac{30}{45}$ for **1** mark | 2 |
| (iii) | across the new resistor…(will) increase<br><br>across $R_2$ … (will) decrease | <br><br>N.B. independent marks | 1<br><br>1 |
| total | | | 10 |

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### 4.2.5.1 Static charge





**3451F Q15**

| | answers | extra information | mark |
|---|---|---|---|
| (a) | relay (normally open) (switch) | each mark is independent | 1 |
| | … switch on a (larger) current (in another circuit) **or** switch on a higher voltage circuit | do **not** accept switch on another circuit **or** smaller / equal current | 1 |
| | light emitting diode / LED | do **not** credit LDR | 1 |
| | … in one / direct / certain direction **or** from left to right | **or** when the cathode is connected to the negative terminal / side<br>**or** when the left-hand side is connected to the positive terminal / side<br>do **not** credit just '… is big enough'<br>do **not** accept 'positive direction' | 1 |
| | AND gate | accept 'and' gate | 1 |
| | … (both) inputs are on / high / 1 **or** current flows in both inputs | do **not** accept numerical values unless expanded | 1 |
| (b) | **Quality of written communication** | If in a sensible order which clearly indicates advantages or disadvantages, including answers in the form of a table **or** as bullet points<br>Q ✓ Q X | 1 |
| | any **three** from:<br>• advantage of mobile phones<br>• drawback of mobile phones<br>• benefit of the Internet<br>• drawback of the Internet | <br>e.g. more convenient for service engineers<br>e.g. calls can be received away from base<br>e.g. privacy can be more easily invaded<br>e.g. drivers can be distracted<br>e.g. microwaves / radio waves can / may cause damage to the brain<br>e.g. access to educational material<br>e.g. some material is salacious<br>e.g. spam (on external e-mail)<br>these are examples<br>candidates may be credited for a variety of responses | 3 |
| total | | | 10 |



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## 4.2.5.1 Static charge





**3451F Q16**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | **Y** and **Z** | | 1 |
| | they have the same number of protons **or** same atomic number | accept they have the same number of electrons **or** same number of protons **and** electrons<br>allow only different in number of neutrons<br>N.B. independent marks | 1 |
| (b) | **Quality of written communication** | for correct use of terms underlined in B **or** C<br><br>Q ✓ Q X | 1 |
| | A – alpha particle passes straight through the empty space of the atom **or** it is a long way from the nucleus<br><br>B – alpha particle <u>deflected</u> / <u>repelled</u> / <u>repulsed</u> by the (positive) <u>nucleus</u><br><br>C – alpha particle heading straight for the <u>nucleus</u> is <u>deflected</u> / <u>repelled</u> / <u>repulsed</u> backwards | describes 3 tracks correctly for **2** marks<br>describes 2 or 1 track correctly for **1** mark<br><br>do **not** accept hits the nucleus<br>do **not** accept answers referring to refraction<br>do **not** accept answers in terms of reflected backwards unless qualified in terms of repulsion<br><br>mention of difference in charge on nucleus negates that track | max 2 |
| total | | | 5 |

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GCSE 2004
*June Series*

ASSESSMENT and QUALIFICATIONS ALLIANCE

# Mark Scheme

## Science: Double Award

## Specification B (Co-ordinated)

*3462/3F*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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### 4.2.5.1 Static charge



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### 4.2.5.1 Static charge





## SCIENCE: DOUBLE AWARD CO-ORDINATED

## INFORMATION FOR EXAMINERS

**1. General**

The mark scheme for each question shows:

- the marks available for each part of the question;
- the total marks available for the question;
- the typical answer or answers which are expected;
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example:
where consequential marking needs to be considered in a calculation;
or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

**2. Emboldening**

**2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

**2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.

**2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; e.g. allow smooth / free movement.)

**3. Marking points**

**3.1 Marking of Quality of Written Communication**

Where *Quality of written communication* appears in the mark scheme, one mark is to be awarded for either of the following points:

- Using correct scientific terms
- Correct sequencing or linking of ideas or points

The mark scheme will specify which of the points is to be awarded in a particular question. A QoWC mark can be awarded for a scientific answer, even if it is not accurate. It cannot be awarded for a nonsensical or non-scientific answer.
On the script, the QoWC tick should be identified by a 'q' written next to it.

**3.2 Marking of lists**

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

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Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

| Candidate | Response | Marks awarded |
|---|---|---|
| 1 | 4,8 | 0 |
| 2 | green, 5 | 0 |
| 3 | red*, 5 | 1 |
| 4 | red*, 8 | 0 |

Example 2: Name two planets in the solar system. (2 marks)

| Candidate | Response | Marks awarded |
|---|---|---|
| 1 | Pluto, Mars, Moon | 1 |
| 2 | Pluto, Sun, Mars, Moon | 0 |

**3.3 Use of chemical symbols/formulae**

If a candidate writes a chemical symbol/formula instead of a required chemical name, full credit can be given if the symbol/formula is correct and if, in the context of the question, such action is appropriate.

**3.4 The marking of quantitative relationships**

Full credit can be given for a correct quantitative relationship expressed in:

- named units;
- physical quantities;
- standard symbols;
- a combination of physical quantities and units.

No credit can be given for any quantitative relationship expressed in terms of:

- a combination of physical quantities, units and symbols;
- a diagram, e.g. the ohm's law triangle, unless the rest of the answer shows clearly that the candidate understands the relationships involved.

**3.5 Marking procedure for calculations**

**3.5.1** Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.
However:

- if the answer is incorrect, mark(s) can be gained by correct substitution/working and this is shown in the 'extra information' column;
- if the answer is correct, but an incorrect relationship is written in the working, then no marks can be awarded (see 3.5.2).

**3.5.2** Where calculations are based on incorrectly recalled relationships, neither the incorrectly recalled relationship, nor the resulting calculation based on the incorrect relationship, will be credited.

**3.6 Interpretation of 'it'**

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.


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### 4.2.5.1 Static charge





**3.7 Errors carried forward**

There should be no error carried forward from a previous answer which has been based on wrong science. Any error in the answers to a structured question should be penalised once only.

Examples

(a) A candidate who calculates average speed using speed = time/distance **and** then proceeds to use this incorrect answer to calculate an acceleration based on the correct quantitative relationship should be given credit for the use of the correct acceleration relationship but none for either numerical answer.

(b) A candidate who incorrectly calculates average speed using speed = distance/time and then proceeds to use this incorrect value to calculate an acceleration based on the correct quantitative relationship, should be given credit for the use of both correct quantitative relationships **and** for the correct substitution and use of the incorrect value in the calculation of the rate of acceleration.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

**3.8 Phonetic spelling**

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

**3.9 Brackets**

(…..) is used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

**3.10 Interpretation of marginal points**

There will be times when the answer is almost, but not quite, correct. Some examiners would award a mark while others would not. In any one script, an attempt should be made to balance these nearly correct answers by giving the mark on some occasions but not on others. If this is not done, the marking would end up being too lenient or too harsh.

**3.11 Unexpected Correct Answers not in the Mark Scheme**

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

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### 4.2.5.1 Static charge





**Double Award**
**Foundation Tier 3462/3F**

**3462/3F Q1**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | comet | correct order only | 1 |
| | elliptical | | 1 |
| | Milky Way | | 1 |
| | Universe | | 1 |
| (b)(i) | D A C B | allow **2** marks for two letters in the correct place<br>allow **1** mark for one letter in the correct place | 3 |
| (ii) | A | | 1 |
| total | | | 8 |


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### 4.2.5.1 Static charge





**3462/3F Q2**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | 95 | | 1 |
| (b) | alpha | accept correct symbol | 1 |
| (c) | any **two** from:<br>• radiation is outside the body<br>• radiation will not reach (living) cells<br>• radiation absorbed by the air | <br>accept detector is on ceiling or high up the wall<br>accept radiation cannot pass through the body / skin<br>accept cannot pass through the plastic casing<br>do **not** accept because it is alpha radiation – unless qualified<br>do **not** accept does not give off harmful substance<br>do **not** accept cannot pass through building materials etc. | 2 |
| (d) | less (than) | | 1 |
| total | | | 5 |

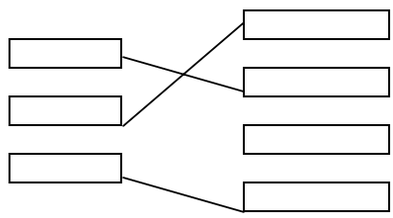
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### 4.2.5.1 Static charge





**3462/3F Q3**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | generator | accept dynamo<br>accept alternator | 1 |
| (b)(i) | 1400 | ignore units | 1 |
| (ii) | 0.3 or 30% | any incorrect unit penalise **1** mark<br>allow **1** mark for the correct use of 600 **or** 0.3% **or** 30 | 2 |
| (c) | **1** mark for each correct link<br> | if more than 3 lines are drawn, mark only 3 lines starting with those that are incorrect | 3 |
| (d)(i) | 110 | no tolerance | 1 |
| (ii) | 12 | no tolerance | 1 |
| (iii) | wind speed may be too low to operate the generator | accept wind may not always blow<br>accept power depends on wind speed<br>accept does not generate if wind speed is too high<br>accept does not generate if wind speed is above 12 (m/s)<br>accept does not generate if wind speed is below 1.6 (m/s)<br>accept it is unreliable<br>do **not** accept answers referring to cost only | 1 |
| total | | | 10 |


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### 4.2.5.1 Static charge





**3462/3F Q4**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | B E A D | allow **1** mark for each letter in the correct place, to a maximum of **3** marks | 3 |
| (b) | (a spark) may cause the (petrol vapour) to explode / ignite | accept petrol for (petrol vapour)<br>accept catch fire for explode | 1 |
| | connect tanker to earth with a (conducting) wire / chain **or** earth the tanker | accept ground for earth | 1 |
| (c) | **Quality of written communication** | for a logical sequence | 1 |
| | any **two** from: | | 2 |
| | • when current greater than fuse rating / value | accept when current too great for appliance<br>do **not** accept 'if there is too much current'<br>do **not** accept voltage or electricity | |
| | • fuse (becomes hot and) melts / burns out | accept fuse blows / breaks | |
| | • circuit is broken | accept circuit switched off<br>this cannot score credit on its own | |
| total | | | 8 |

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### 4.2.5.1 Static charge





**3462/3F Q5**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | crust | | 1 |
| (ii) | inner core is <u>solid</u><br><br>outer core is liquid | do **not** accept just rock<br><br>inner core is denser / hotter than outer core gets **2** marks<br>accept one is solid and one is liquid for **1** mark<br>accept they are different densities for **1** mark<br>wrong way round = **0** marks | 1<br><br>1 |
| (b) | seismograph | | 1 |
| (c) | difficult to measure (slow) movement (1)<br>of plates (1) dependent mark<br>**or**<br>difficult to measure friction / forces (1)<br>between plates (1) dependent mark | | 1<br><br>1 |
| (d) | geothermal | | 1 |
| (e)(i) | 5000 | | 1 |
| (ii) | 2500 | | 1 |
| total | | | 9 |


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## 4.2.5.1 Static charge





**3462/3F Q6**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | 60 | | 1 |
| (b) | $5\frac{1}{2}$ hours | must include unit | 1 |
| (c) | 30 | | 1 |
| (d) | 30 minutes<br>or $\frac{1}{2}$ hour | must include unit | 1 |
| (e) | D **and** E<br><br>least steep part of the graph | accept finish for E<br>accept correct numbers from axes with units<br><br>accept covers smallest distance in a set time<br>accept only moves 5 km in<br>$1\frac{1}{2}$ hours (accept anything between 5 and 6)<br><br>ignore horse is tired | 1<br><br>1 |
| total | | | 6 |

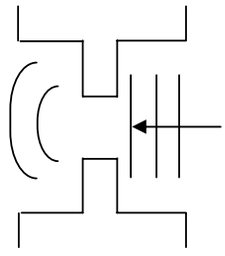
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### 4.2.5.1 Static charge





**3462/3F Q7**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | any **one** from:<br><br>• (doctors) to see inside a patients body **or** endoscope<br><br>• telephone cables<br><br>• optical fibre / fibre optic lamps **or** (artificial) Christmas trees<br><br>• data transfer **or** internet connection | <br><br>accept keyhole surgery<br><br>do **not** accept flex **or** wires for cable<br><br>accept decorative / ornamental lighting<br>accept any feasible practical suggestion for taking light to a difficult to access place<br>do **not** accept lighting unqualified<br>do **not** accept lamp unqualified<br><br>do **not** accept communications unless clarified | 1 |
| (ii) | (incident) ray angle greater than critical angle<br><br>total internal reflection occurs | either order<br>accept (incident) ray greater than 42°<br><br>accept TIR<br>do **not** accept just description of TIR | 1<br><br>1 |
| (b)(i) | waves shown diffracting in the correct direction<br><br> | ignore wavelength | 1 |
| (ii) | diffraction | accept diffract / diffracted | 1 |
| total | | | 5 |

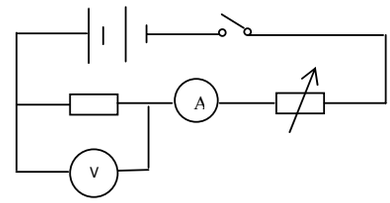
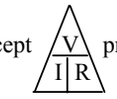

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### 4.2.5.1 Static charge





**3462/3F Q8**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | all symbols correct | <br>accept push switch symbol<br>switch may be open or closed<br>any lines through symbols = **0** marks | 1 |
| | correct circuit drawn<br><br>voltmeter must be across resistor only | polarity of cells not relevant provided they are joined correctly<br>two cells are required in the diagram<br>ignore the order of the components<br>allow small gaps in circuit<br><br>omission of any component = **0** marks | 1 |
| (b)(i) | potential difference<br>= current × resistance | accept voltage or p.d. for potential difference<br><br>accept $V = I \times R$<br><br>accept  provided<br>subsequent use correct<br><br>do **not** accept C for current | 1 |
| (ii) | 2 | <br>allow **1** mark for correct substitution<br>wrong working loses both marks | 2 |
| (iii) | straight line drawn <u>through the origin</u><br><br>straight line passes through<br>$I = 0.4, V =$ their (b)(ii) / 2 **and** 0.0 | judge by eye<br><br>this mark may be awarded if all points shown including these points are correct even if no line is drawn<br>N.B. a curve scores **0** marks | 1<br><br>1 dep |
| (c) | temperature <u>increases</u> | accept filament lamp / it gets <u>hotter</u><br>allow heat for temperature | 1 |
| total | | | 8 |

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### 4.2.5.1 Static charge





**3462/3F Q9**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | gamma rays | accept gamma<br>accept correct symbol | 1 |
| (ii) | infra red | accept IR | 1 |
| (b) | ultraviolet <u>absorbed</u> by ink<br><br>(energy) given out as light | <br><br>accept glows / luminous<br>accept for **both** marks the ink is fluorescent<br>do **not** accept answers in terms of uv being reflected | 1<br><br>1 |
| (c) | any **two** from:<br><br>• UV can damage / kill / ionise / alter (normal) cells<br><br>• change DNA structure **or** mutate<br><br>• (normal) cells may become cancerous | <br><br>do **not** accept attacks cells **or** burns skin<br><br><br><br>accept may cause (skin) cancer<br>accept abnormal cell multiplication | 2 |
| (d)(i) | microwaves **and** infra red | both answers needed in either order<br><br>do **not** accept heat for IR | 1 |
| (ii) | 0.9 | allow **1** mark for the <u>correct</u> use of<br>1.8 (kW) $(1.8 \times \frac{1}{2}$ or $1.8 \times 30)$<br>i.e. adding the correct 2 power values | 2 |
| total | | | 9 |


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### 4.2.5.1 Static charge





**3462/3F Q10**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | accelerating | accept getting faster<br>accept speed / velocity increasing | 1 |
| (ii) | acceleration <u>increases</u> | accept velocity / speed increases <u>more</u> rapidly<br>do **not** accept velocity / speed increases | 1 |
| (b)(i) | $\text{acceleration} = \frac{\text{change in velocity}}{\text{time (taken)}}$ | accept $a = \frac{v - u}{t}$ **or** $a = \frac{v_1 - v_2}{t}$<br>do **not** accept velocity for change in velocity<br>do **not** accept change in speed<br>do **not** accept $a = \frac{v}{t}$ | 1 |
| (ii) | 15 | allow **1** mark for an answer of 900 **or** for <u>correct</u> use of 540 seconds | 2 |
| (iii) | velocity includes direction | accept velocity is a vector (quantity)<br>accept converse answer | 1 |
| (c) | force of gravity (between <u>shuttle</u> and Earth)<br><br>plus correct orbital speed (makes <u>shuttle</u> move in a curve) | accept gravitational pull if used correctly<br><br>accept forward motion **or** constant speed for orbital speed<br>accept it is travelling fast enough<br>accept for **2** marks the force of gravity provides the <u>centripetal</u> force | 1<br><br>1 |
| (d) | black is a good emitter of radiation<br>**or** to limit the temperature rise inside the shuttle | accept heat for radiation<br>accept the tiles are good insulation<br>do **not** accept black absorbs heat on its own<br>do **not** accept tiles are heat proof | 1 |
| total | | | 9 |

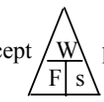
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### 4.2.5.1 Static charge





**3462/3F Q11**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | work (done)<br>= force (applied) × distance (moved) | accept W = F × s or W = F × d<br><br>accept  provided<br><br>subsequent method is correct | 1 |
| (ii) | 240 000<br><br>joules | allow **1** mark for correct substitution **or** correct use of 1200 (N)<br><br>accept J<br>do **not** accept j / Nm | 2<br><br>1 |
| (b) | 800 (watts) | accept 0.8 kW<br>accept their (a)(ii) ÷ 300 correctly evaluated for **2** marks<br><br>allow **1** mark for correct substitution (a)(ii) ÷ 5 correctly evaluated for **1** mark | 2 |
| (c)(i) | any **one** from:<br>• needs to raise the chair / lift<br>• lifting more than one chair<br>• energy transfer to the surroundings correctly qualified | <br><br>allow lifting more than 2 people<br>implication of a heavier weight<br><br>accept loss for transfer<br>do **not** accept motor inefficient<br>do **not** accept motor gets hot<br>do **not** accept friction unless the location is specified as external to the motor | 1 |
| (ii) | electrical<br><br>potential | accept electric<br><br>**both** answers required for the mark | 1 |
| total | | | 8 |


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## 4.2.5.1 Static charge





**3462/3F Q12**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | **Y** and **Z** | | 1 |
| | they have the same number of protons **or** same atomic number | accept they have the same number of electrons **or** same number of protons **and** electrons<br>allow only different in number of neutrons<br>N.B. independent marks | 1 |
| (b) | **Quality of written communication** | for correct use of terms underlined in B **or** C<br><br>Q ✓ Q X | 1 |
| | A – alpha particle passes straight through the empty space of the atom **or** it is a long way from the nucleus<br><br>B – alpha particle deflected / repelled / repulsed by the (positive) nucleus<br><br>C – alpha particle heading straight for the nucleus is deflected / repelled / repulsed backwards | describes 3 tracks correctly for **2** marks<br>describes 2 or 1 track correctly for **1** mark<br><br>do **not** accept hits the nucleus<br>do **not** accept answers referring to refraction<br>do **not** accept answers in terms of reflected backwards unless qualified in terms of repulsion<br><br>mention of difference in charge on nucleus negates that track | max 2 |
| total | | | 5 |

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ASSESSMENT and QUALIFICATIONS ALLIANCE

## General Certificate of Secondary Education

# Science: Double Award 3462/3F
*Specification B (Co-ordinated)*

# Mark Scheme

## *2005 examination - June series*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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4.2.5.1 Static charge





# Double Award
# Foundation Tier 3462/3F

**3462/3F Q1**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | less than | accept any correct indication | 1 |
| (ii) | more than | accept any correct indication | 1 |
| (b) | any **two** from:<br><br>stays above the same place<br><br>above the equator<br><br>one orbit takes 24 hours | <br><br>do **not** accept stays in the same place<br><br>do **not** accept goes around equator unless qualified<br>do **not** accept orbit at same speed as Earth<br>do **not** accept orbit at a constant speed<br>accept has same angular speed / velocity as Earth | 2 |
| total | | | 4 |

**3462/ 3F Q2**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | comet | | 1 |
| (b) | large group / number / collection of stars | ignore reference to planets<br>accept millions of stars<br>do **not** accept thousands of stars<br>do **not** accept loads of stars | 1 |
| (c) | giant<br><br>supernova<br><br>neutron | | 1<br><br>1<br><br>1 |
| total | | | 5 |

### 4.2.5.1 Static charge





**3462/3F Q3**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | radio | | 1 |
| (ii) | gamma | accept microwave<br>accept infrared | 1 |
| (iii) | ultra violet | | 1 |
| (iv) | microwaves | | 1 |
| (b) | the same as | | 1 |
| (c) | **Quality of written communication** | award for a sensible sequence of **two** points | 1 |
| | X-rays do not go through lead | accept lead protects them from the X-rays<br>accept not exposed to X-rays | 1 |
| | lead stops / reduces risk of X-rays harming / damaging / killing (persons) <u>cells</u> | accept X-rays (may) cause cancer<br><br>accept organs for cell<br>do **not** accept references to electric shock<br>do **not** accept stops bones of people showing on X-ray<br>answers involving the horse wearing an apron are incorrect<br><br>references to gamma rays are incorrect | 1 |
| total | | | 8 |

### 4.2.5.1 Static charge



*Science: Double Award (Co-ordinated)* – AQA GCSE Mark Scheme, 2005 June series

**3462/3F Q4**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | light<br><br>electrical | | 1<br><br>1 |
| (b) | 15% **or** 0.15 | correct substitution gains **1** mark only<br>an answer of 15 with no unit **or** an incorrect unit gains **1** mark<br>an answer of 0.15 given with a unit gains **1** mark | 2 |
| (c) | the ticket machine is a long way from other electricity supplies | | 1 |
| (d) | any figure between 5 and 10 inclusive | unit not required but if given must match numerical answer | 1 |
| total | | | 6 |

### 4.2.5.1 Static charge





**3462/3F Q5**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | radon (gas) | do **not** accept gas | 1 |
| (ii) | background | | 1 |
| (b) | bigger | accept any word which means bigger | 1 |
| (c) | **Z**<br><br>alpha will not pass through aluminium or lead | if Z is not given, the reason does not score<br>accept alpha cannot go through metals / dense material<br>accept there is nothing to stop the radiation<br>accept alpha will not pass through aluminium<br>do **not** accept alpha will not pass through lead<br>do **not** accept alpha stopped by air | 1<br><br>1 |
| total | | | 5 |

### 4.2.5.1 Static charge



*Science: Double Award (Co-ordinated)* – AQA GCSE Mark Scheme, 2005 June series

**3462/3F Q6**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | loses negative charge / electrons | do **not** accept positive charge<br>transfers to the comb<br>do **not** accept friction | 1 |
| (b) | **A** attract | | 1 |
| | **B** repel | | 1 |
| | **C** attract | | 1 |
| (c) | **F A D E** | allow **2** marks for 2 letters in the correct place<br>allow **1** mark for 1 letter in the correct place | 3 |
| total | | | 7 |

### 4.2.5.1 Static charge





**3462/3F Q7**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | all points correctly plotted | tolerance ± $\frac{1}{2}$ square on y axis only<br>allow **1** mark for 3 correctly plotted points | 2 |
| | attempt made to draw a smooth curve | do **not** accept dot-to-dot line | 1 |
| (b)(i) | 3 days ± 0.2<br>**or**<br>any value correctly obtained using their graph line | if no line drawn in (a), answer must be exactly 3 | 1 |
| (ii) | 3 days or their (b)(i) | | 1 |
| (c) | radon-222 | accept radon **or** 222<br>accept alpha or 3.8<br>correct isotope required for reason to score | 1 |
| | has the shortest <u>half-life</u> | accept the others have longer <u>half-lives</u> | 1 |
| total | | | 7 |

### 4.2.5.1 Static charge



*Science: Double Award (Co-ordinated)* – AQA GCSE Mark Scheme, 2005 June series

**3462/3F Q8**

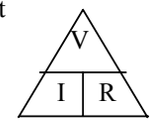
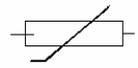
| question | answers | extra information | mark |
|---|---|---|---|
| (a) | fossils of Cynognathus are found in Africa and South America | | 1 |
| | the shapes ……. almost fit together | only two boxes should be ticked<br>deduct **1** mark for each additional box to a minimum mark of **0** | 1 |
| (b) | continental | | 1 |
| | crust | | 1 |
| | tectonic | | 1 |
| total | | | 5 |

### 4.2.5.1 Static charge





**3462/3F Q9**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | $A_1 = 0.5$<br><br>$A_4 = 0.5$ | ignore any units<br><br>allow **1** mark for $A_1 = A_4 \neq 0.5$ | 1<br><br>1 |
| (ii) | the resistance of **P** is more than 20 Ω<br><br>a smaller current goes through P / $A_2$ (than 20 Ω) | <br><br>dependent on getting 1st mark correct<br>accept converse | 1<br><br>1 |
| (b)(i) | potential difference = current × resistance | accept pd / voltage for potential difference<br>accept V = I × R, correct symbols and correct case only<br>accept volts = amps × ohms<br>accept <br><br>provided subsequent method is correct<br>allow combination of physical quantities and named units<br>allow voltage = I × R | 1 |
| (ii) | 6 | allow **1** mark for correct substitution | 2 |
| (iii) | 6 | accept their (b)(ii) | 1 |
| (c) | thermistor or <br><br>resistance goes down (as temperature of thermistor goes up) | accept correct circuit symbol<br>allow phonetic spelling<br><br>do **not** accept changes for goes down<br>do **not** accept an answer in terms of current only<br>answers in terms of other components are incorrect | 1<br><br>1 |
| total | | | 10 |

### 4.2.5.1 Static charge



*Science: Double Award (Co-ordinated)* – AQA GCSE Mark Scheme, 2005 June series

**3462/3F Q10**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | larger the distance, greater the time | accept 'they are proportional'<br>accept converse | 1 |
| (ii) | any value between 6 and 9 years inclusive | | 1 |
| (b)(i) | carbon dioxide | | 1 |
| (ii) | (Venus) has high**er** temperature (than Mercury) | accept has the high**est** temperature<br>accept Venus is hotter / hottest<br><br>do **not** accept has a high / very high temperature | 1 |
| | (Venus) further from the Sun than Mercury | accept 'Venus is not the closest planet to the Sun'<br><br>answer in terms of greenhouse effect only, scores **0** marks | 1 |
| total | | | 5 |

### 4.2.5.1 Static charge





**3462/3F Q11**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | 20 | | 1 |
| (ii) | convection | | 1 |
| (iii) | fit draughtproof strips | accept lay carpet<br>accept fit curtains<br>accept close doors / windows / curtains<br>accept any reasonable suggestion for reducing a draught<br>'double glazing' alone is insufficient | 1 |
| (b) | air is (a good) insulator<br>**or**<br>air is a poor conductor | accept air cavity / 'it' for air | 1 |
| | reducing heat transfer by <u>conduction</u> | accept stops for reduces<br>ignore convection<br>do **not** accept radiation<br>do **not** accept answers in terms of heat being trapped | 1 |
| (c)(i) | most cost effective | accept it is cheaper or low<u>est</u> cost<br>accept shortest payback time<br>accept in terms of reducing heat loss by the largest amount<br>do **not** accept it is easier<br>ignore most heat is lost through the roof | 1 |
| (ii) | 4 | | 1 |
| total | | | 7 |

### 4.2.5.1 Static charge



*Science: Double Award (Co-ordinated)* – AQA GCSE Mark Scheme, 2005 June series

**3462/3F Q12**

| question | answers | extra information | mark |
|---|---|---|---|
| (a)(i) | constant speed | do **not** accept normal speed<br>do **not** accept it is stopped / stationary | 1 |
| | in a straight line | accept any appropriate reference to a direction<br><br>constant velocity gains **2** marks<br>'not accelerating' gains **2** marks<br><br>terminal velocity alone gets **1** mark | 1 |
| (ii) | goes down owtte | accept motorbike (it) slows down | 1 |
| (b)(i) | 20 (m/s) | ignore incorrect units | 1 |
| (ii) | acceleration = change in velocity / time (taken) | do **not** accept velocity for change in velocity<br>accept change in speed<br>accept $a = \frac{v-u}{t}$ **or** $a = \frac{v_1 - v_2}{t}$<br>**or** a = $\frac{\Delta v}{t}$<br>do **not** accept $a = \frac{v}{t}$ | 1 |
| (iii) | 4<br>**or** their (b)(i) ÷ 5 | allow **1** mark for correct substitution | 2 |
| | $m/s^2$ | m/s/s **or** $ms^{-2}$ **or** metres per second squared **or** metres per second per second | 1 |
| (c) | vehicle may skid / slide | loss of control / brakes lock / wheels lock<br>accept greater stopping distance **or** difficult to stop | 1 |
| | due to reduced friction (between tyre(s) and road) | accept due to less grip<br>do **not** accept no friction | 1 |

**cont…**

### 4.2.5.1 Static charge





**3462/3F Q12 cont**…

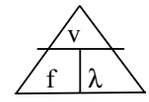
| | | | |
|---|---|---|---|
| (d) | any **three** from:<br>• <u>increased</u> speed<br>• <u>reduced</u> braking force<br>• <u>slower</u> (driver) reactions<br>• <u>poor</u> vehicle maintenance<br>• <u>increased</u> mass / weight of vehicle<br>• <u>poor</u> road surface<br>• <u>more</u> streamlined | do **not** accept night time / poor vision<br>NB specific answers may **each** gain credit eg tiredness (1), drinking alcohol (1), using drugs (1), driver distracted (1) etc<br>specific examples may **each** gain credit eg worn brakes or worn tyres etc<br>accept large mass / weight of vehicle<br>if candidates give three answers that affect stopping distance but not specific to <u>increase</u> award **1** mark only | 3 |
| total | | | 13 |

### 4.2.5.1 Static charge



*Science: Double Award (Co-ordinated)* – AQA GCSE Mark Scheme, 2005 June series

**3462/3F Q13**

| question | answers | extra information | mark |
|---|---|---|---|
| (a) | **Quality of written communication** | all emboldened terms in candidate's answer used correctly | 1 |
| | any **two** from:<br>• **amplitude** decreasing<br>• **wavelength** increasing<br>• **frequency** decreasing | accept siren / sound getting quieter<br>do **not** accept sound decreases<br><br>accept pitch decreasing<br>ignore reference to transverse wave<br>ignore reference to speed<br><br>contradictory statements within each point lose the mark | 2 |
| (b)(i) | ultrasound **or** ultrasonic | | 1 |
| (ii) | wave speed = frequency × wavelength | accept speed / velocity for wave speed<br><br>accept $v = f \times \lambda$<br>do **not** accept w for $\lambda$<br>do **not** accept s for v<br><br>accept <br><br><br>provided subsequent calculation shows a correct method | 1 |
| (iii) | 339.2 **or** 340 **or** 339 | allow **1** mark for using 212 000<br>allow **1** mark for correct substitution<br><br>an answer of 0.3392 **or** 0.34 **or** 0.339 gains **1** mark only<br>award full credit for a correct numerical answer with the unit changed to km/s | 3 |
| total | | | 8 |

4.2.5.1 Static charge

**Answer 17 · Examiner comments** June 2022 | 8463/1F | Original Q3

**Question 3 (Low demand)**

**03.1** Approximately 30% of students scored 2 marks, with about 60% of students scoring 1 mark.

**03.2** 55% of students identified the charge correctly.

**03.3** About 75% of students chose the correct box (repulsion), but many students couldn't give an appropriate reason. Students often just said 'opposite charges attract' which was insufficient, or discussed magnetic poles which was not creditworthy. Approximately 30% of students scored 2 marks on this question.

**03.4** About 35% of students chose the correct electric field pattern.

**03.5** Approximately 65% of students chose the correct position of the charged spheres.

**Answer 18 · Examiner comments** June 2023 | 8463/2F | Original Q2

**02.1**

22 % of students scored 1 mark and 61 % of students scored both marks for identifying the energies

**02.2**

The majority of the students identified the correct relationship between the speed and the braking distance. Those that didn't described the graph rather than mentioning braking distance or speed, or used incorrect phrases eg 'directly proportional'.

**02.3**

84% of students knew that braking distance increases when a road becomes icy.

**02.4**

This 3-mark question required students to calculate the change in velocity then use this correctly to determine the time taken. Many students failed to show how they calculated the change in velocity and could not be awarded any marks.

4.2.5.1 Static charge

Answer 18 · Examiner comments

June 2023 | 8463/2F | Original Q2

**02.5**

86 % scored 2 marks for calculating the resultant force. Common mistakes involved dividing instead of multiplying, or calculating 1600 x $0.25^2$, the squared apparently being inferred from the unit of deceleration ($m/s^2$).

**02.6**

77% of students were able to identify the control variable for the investigation.

**02.7**

Many students correctly stated that there would be a greater number of results, which could lead to a change in the mean. But some simply stated that different people have different reaction times. Credit was also given for those that stated the reaction times of 3 children tested may not be representative of the whole class. However, some only answered by saying ‘only 3 children were tested’ which was insufficient to get the mark.

**02.8**

30 % scored 1 mark and only 33 % scored 2 marks. Rather than describing a change to the experiment students would state how they thought music would affect the reaction time, or why music would affect the reaction time.
Many who got 1 mark suggested they did the experiment with music on but did not say to compare with previous results or do it with music off.

4.2.5.1 Static charge

Answer 19 · Examiner comments



**Question 1 (Low Demand)**

**01.1** Only 38% of students scored a mark for knowing that when a person touches a negatively charged metal dome they also become negatively charged.

**01.2** 55% of students scored a mark for this question about the force of repulsion between like charges.

**01.3** Only 29% of students scored a mark for this question. The majority of wrong answers chose the diagram for the electric field around a positively charged dome.

**01.4** 62% of students chose the correct answer, knowing that an insulator has a high resistance. The most common incorrect answer was temperature.

**01.5** 67% of students answered this question correctly, knowing that a spark jumps when the air is ionised.

**01.6** 78% of students answered this question correctly, identifying electrons as the particle transferred when a spark jumps between two objects.

**01.7** 93% of students calculated the energy transferred correctly.

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