AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



MARK SCHEME

4.2.3 DOMESTIC USES AND SAFETY (PACK 2)

SCORE	PERCENTAGE
/249	%

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Q1.

(a) brown

1

(b) outside / case is plastic / an insulator

accept is double insulated
accept non-conductor for plastic
*do **not** accept it / hairdryer is plastic*

1

(c) (i) (1) S_1

and no other

1

(2) S_1 and S_3

both required, either order

1

(ii) S_1 must be ON (for either heater to work)

*do **not** accept reference to 'fan' switch*

1

S_1 switches the fan on

1

(d) 1495

*allow **1** mark for correct substitution*
ie, 6.5 × 230

2

watt(s) or W

*an answer of 1.495 kW gains **3** marks*
although the unit is an independent mark for full credit
the unit and numerical value must be consistent
accept joules per second or J/s

1

[9]

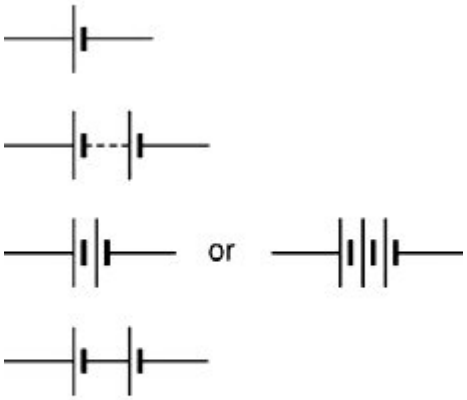
Q2.

(a) (i) ammeter and battery **in series** with the **gauge**

symbols must be correct
ignore a voltmeter drawn in series

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accept



not



or cells reversed to cancel out

1

voltmeter in parallel with the gauge

symbol must be correct

accept a freestanding circuit

diagram provided strain gauge is labelled or a resistor symbol used for the strain gauge

1

(ii) d.c. flows only in one direction

a.c. changes direction is insufficient

1

(b) (i) 75

this answer only

*allow **1** mark for correct substitution **and** transformation,*

ie resistance = $\frac{3.0}{0.040}$

2

(ii) increases

1

(iii) elastic / strain <u>potential</u>

*do **not** accept potential*

1

[7]

Q3.

(a) transferred to surroundings / surrounding molecules / atmosphere

'it escapes' is insufficient

or

becomes dissipated / spread out

accept warms the surroundings

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accept degraded / diluted

accept a correct description for surroundings eg to the washing machine

*do **not** accept transformed into heat on its own*

1

(b) a smaller proportion / percentage of the energy supplied is wasted

owtte

*accept a statement such as 'less energy is wasted' for **1** mark*

*do **not** accept costs less to run*

ignore references to uses less energy

2

(c) (i) 2.4 (p)

accept 2 p if it is clear from the working out this is rounded from 2.4 p

*allow **1** mark for correct substitution of correct values*

ie 0.2 × 12

*allow **1** mark for calculating cost at 40 °C (13.2 p)*

or

cost at 30 °C (10.8 p)

2

(ii) any **one** from:

- less electricity needed

  ignore answers in terms of the washing machine releasing less energy

  an answer in terms of the washing machine releasing CO_2 negates the mark

  *do **not** accept less energy is produced*

- fewer power stations needed

- less fuel is burned

  accept a correctly named fuel

  *do **not** accept less fuel is needed*

1

[6]

Q4.

(a) (i) connect the earth wire (to pin)

answers must be in terms of correcting the faults

1

screw cable grip (across cable)

accept tighten the cable grip

1

(ii) earth (wire)

accept the green and yellow (wire)

1

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(iii) any **two** from:

- fuse gets (very) hot
- fuse melts
  accept blows for melts
  *do **not** accept break / snap fuse / blow up*
- circuit breaks/ switches off
  accept stops current flowing

2

(b) any **two** from:
it refers to hairdryer

- hairdryer is plugged into mains (electricity socket)
  hairdryer works from the mains
  or
  hairdryer is using 230 V
  accept 240 for 230
- water conducts electricity
  *do **not** accept water and electricity don't mix*
- radio is low power / current / pd / voltage
  accept radio not connected to the mains
  *do **not** accept radio is waterproof*
- (the current in / p.d.across) hairdryer more likely to give a (fatal) electric shock
  accept the idea of electrocution if hairdryer is wet
  accept the idea of radio not causing electrocution if wet

2

[7]

Q5.

(a) 125
*allow **1** mark for obtaining time period = 0.008 (s)*
or
frequency = 1 / time period (or their calculated time period)

2

hertz
or
Hz
*do **not** accept hz*

1

(b) 50 (hertz)

1

[4]

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Q6.

(a) (rate of) flow of charge / electrons / ions

accept movement for flow

*do **not** accept flow of electricity*

1

(b) 7(.0)

accept 6.96 / 6.95 or an answer that would approximate to 6.96 if rounded

*allow **1** mark for obtaining correct power and changing to watts ie 1600*

or

*allow **2** marks for correct substitution and transformation ie 1600 ÷ 230*

*an answer 0.00696 / 0.007 gains **2** marks*

*allow **1** mark for 1.6 / 230 or 1.7 / 230*

*an answer 7.39 or 7.4 gains **2** marks*

3

amp (ere)

accept A

1

[5]

Q7.

(a) 230

1

50

1

(b) (i) has a plastic case

accept outside is plastic

accept cover / handle/ hair dryer is plastic / non-conductor

or does not have a metal case **or** plastic is an insulator

accept is double insulated

1

(ii) copper

1

[4]

Q8.

(a) d.c. flows in (only) one direction

1

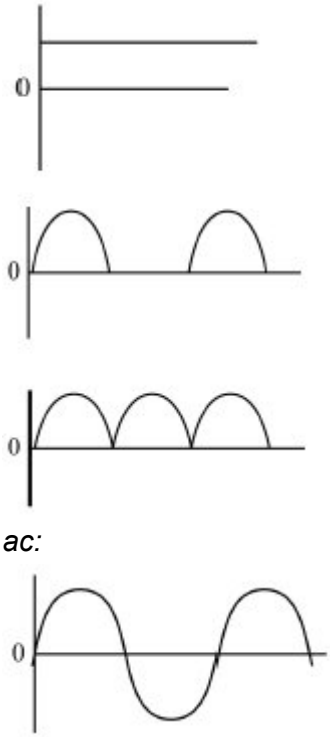
a.c. changes direction (twice every cycle)

accept a.c. constantly changing direction

ignore references to frequency

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accept answers presented as a clear diagram
e.g.



ac:

1

(b) (i) 10

*allow **1** mark for correct transformation and substitution i.e.*

$\frac{2.3}{230}$ *or* $\frac{2300}{230}$ *an answer 0.01 gains **1** mark*

2

(ii) 13 A

e.c.f.

accept the fuse size that is the next listed value greater than answer (b)(i)

1

[5]

Q9.

(a) (i) 0.0046

accept 4.6 mA

*allow **1** mark for correct substitution and transformation*

i.e. current = $\frac{230}{50000}$

*an answer of 4.6 gains **1** mark*

2

(ii) • increases overall resistance

1

• (in event of a shock) gives a smaller current

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accept gives smaller shock
*do **not** accept no shock/current*

1

(b) (i) 50 (hertz)

ignore units

1

(ii) NO has the lowest current at which people cannot let go

answer and reason needed
accept a sensible reason in terms of their answer to (b) (i)

or YES changing the frequency changes the current by only a small amount

1

(c) a current flows through from the live wire/metal case to the earth wire

accept a current flows from live to earth
*do **not** accept on its own if the current is too high*

this current causes the fuse to melt

accept blow for melt

2

[8]

Q10.

(a) electric drill **C**

1

MP3 player **E**

1

toaster **B**

1

(b) (i) 2100

no unit required / ignore units
accept 2.1 kW must have units for this

1

(ii) **Y**

1

(iii) bar drawn with any height greater than **Y**

ignore width of bar

1

(c) (i) any **one** from:

answers must be a comparison

- holds more water

*do **not** accept 1 litre of water on its own*

- works in other countries

accept a named country
accept works at 2 voltages

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- boils faster
- has a more powerful element
  *do **not** accept 1 kW element on its own*
- can filter water

1

ignore can wash filter

(ii) any **one** from:

- it weighs less
- smaller to pack
- cheaper to use
  answers must be a comparison
  ***or** state why the chosen feature is an advantage*
  accept boils enough for one drink

1

[8]

Q11.

(a) (i) hairdryer 13

all correct

saw 3

*allow **1** mark for 2 correct*

1

mixer 13

1

(ii) fuse melts

accept blows/ breaks/ snaps for melts
*do **not** accept blows up*
*do **not** accept fuse gets hot on its own*
*do **not** accept does not work on its own*

1

(b) (i) 920

*allow **1** mark for correct substitution*

2

(ii) no earth (wire)

1

outside / case may become live

cause a fire insufficient

or danger of electric shock

1

(c) (i) L and N

both required

1

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(ii) 9 (volts)

correct answer only

1

[9]

Q12.

(a) (i) blue

1

(ii) earth

1

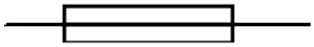
(iii) rubber / plastic

*accept any suitable **named** non conductor eg polypropylene*

*do **not** accept bakelite*

*do **not** accept an insulator*

1

(iv) 

1

(b) any **two** from:

- draws too high a current

  accept power for current
  *do **not** accept electricity/ electric for current*
  accept too much current goes through the socket
  *do **not** accept too many currents go through the socket*

- socket overloaded

  *it = socket do **not** accept circuit for socket*

- wiring gets too hot / melts

  accept socket for wiring
  *do **not** accept fuse melts or blows*
  *do **not** accept plug/ appliances overheating*

- (may) cause a fire

- (may) cause sparking

- (possible) physical damage to the socket

  a physical reason, such as stick out from the wall is insufficient

  ignore reference to electric shocks

2

[6]

Q13.

(a) earth yellow and green

accept green and yellow

1

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live brown

1

neutral blue

1

(b) (i) path shows electricity flowing from washing machine through to the person (and on to earth)

ignore direction of arrows

1

(ii) electricity flows through earth wire (to earth) **or** goes to ground

***not** escaping electricity*

***not** fuse wire blowing*

1

not through the person **or** miss the person **or** not electrocuting

***not** electric shock*

1

(c) hairdrier

*hairdrier needed for second mark **except** allow double insulated if iron or fridge **but not** plastic case*

1

double insulated **or** plastic case

accept 'It's made of plastic'
accept 'it does not conduct'

1

[8]

Q14.

(a) alternates

accept switches
accept (constantly) changes
accept goes up and down

1

between positive and negative

1

(b) potential difference between the neutral and earth (terminal)

accept voltage for p.d

or potential of the neutral terminal with respect to earth

1

(c) (i) 0.025 (s)

1

(ii) 40 (Hz)

accept 1 ÷ their (a)(i)

1

[5]

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Q15.

(a) 800 (W)

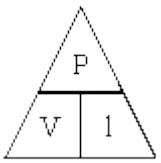
accept 0.8kW but this answer must have the unit

1

(b) (i) power = voltage × current

accept the equation rearranged

accept P = VI
do not accept C for current
do not accept P = VA
do not accept power = VA
do not accept



unless subsequent calculation shows understanding

1

(ii) 3.5 (A)

accept a larger number of d.p. but you must be able to round to 3.5

allow 1 mark for

current = $\frac{power}{voltage}$

or *(I =)* $\frac{800}{230}$

2

(iii) 5 (A)

independent of (ii) unless e.c.f from part (b)(ii)

1

(c) 0.95 **or** 95 (%)

allow I mark if useful energy output is given as 760 ignore any incorrect unit

2

[7]

Q16.

(a) (i) live and neutral wrong way around

accept blue and brown wrong way round or in the wrong place
for credit both wires must be given
*do **not** accept the wires are in the wrong holes*

1

(ii) to protect the appliance

*accept melt or blow **or** burns out if too much current **or** power or energy or electricity flows*

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*accept to stop too much current **or** power **or** energy **or** electricity flowing*
*accept stop overheating **or** a fire*
*do **not** accept 'safety' unless qualified by above*

1

(b) (metal) cover

accept (heating) element
*do **not** accept the mains cable*

1

[3]

Q17.

(a) horse completes circuit between wire and earth **or** horse earths the wire

1

charge **or** electrons **or** current **or** electricity flows through the horse

1

(b) (i) **two** from:

- RCB breaks circuit when it detects a difference between currents in live and neutral wires
- fuse breaks circuit only when fuse rating exceeded or when it melts
- RCB is resettable

2

(ii) 500 (ms)

*leakage current = 0.02A **1** mark only*

1

[6]

Q18.

(a) (i) 7

1

(ii) (electrical) power = voltage x current

accept P = V × I (correct standard symbol)
accept watts = volts x amps
accept a correct rearrangement

accept 

if subsequent use of  *is correct*

1

(iii) 1610
or their (a)(i) × 230

*1.61 kW = **2** marks*
*do **not** accept 7 × 240*

2

watts

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accept watt
accept W
accept .J/s

(iv) melts

accept burns out
accept blows
accept breaks
*do **not** accept stops working*
*do **not** accept burns*

2

current greater than 13(A)
or current exceeds fuse rating **or** current 15(A)

*do **not** accept too much current*
unless qualified

(b) (i) if live wire touches case

accept if case becomes live
accept metal for case

2

current flows to earth **or** ground
or fuse melts **or** stops iron becoming live

accept electricity flows to earth
*do **not** accept - you will get a shock*
*accept with <u>no earth</u> (wire) you would or could get a shock for **1**mark*

(ii) (outer) case is made of insulator

accept outside is plastic
*accept outside is not made of metal **or** conductor*

cable is (also) insulated

accept wires for cable
*do **not** accept it has two layers of insulation without explanation*
*do **not** credit answers in terms of heat*

2

[10]

Q19.

(a) A – fuse
B – (cable) grip

for 1 mark each

2

(b) X – brown/red
Y – green + yellow/green
Z – blue/black

for 1 mark each

3

(c) any plastic/rubber

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for 1 mark

1

(d) (i) earth

for 1 mark

1

(ii) metal appliance needs earthing/safety qualified

for 1 mark

1

(e) cut less insulation on earth; neutral wire needs connecting;
fit fuse properly; cable grip needs to be an outer cable **or** allow identifying faults

for 1 mark each

4

[12]

Q20.

(a) in range $6 < I \geq 13$ A

for 1 mark
(no unit no mark)

1

(b) 4

gains 2 marks

(else working

gains 1 mark

(resistance of circuit correctly worked (2Ω))

2

(c) 72 (I^2 R) ecf

gains 2 marks

else working

gains 1 mark

an answer of 36W (ie for one lamp) – (1)

2

(d) 1000 or 16.7 min (ecf from (c))

gains 2 marks

else working

gains 1 mark
(formula with incorrect substitution – no mark (12V)

2

[7]

Q21.

(a) Mains socket – once only
Shower cable can get wet
Trailing cable to fire (not heater unless fire clearly identified)

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Use of fire
Free running cable from ceiling
Appliance on side of bath
Use of ordinary light switch
Free cable to sink light

any 3 each for1 mark

3

(b) (i) 7, 4, 1, 80.5

Four right – 2
Three right – 1
All right in W – 1

2

(ii) Toaster

1

(iii) 32p

gets 3 marks

Else 8 × 4

gets 2 marks

Else unit cost = 8p

gets 1 mark

3

[9]

Q22.

(a) Earth
return/neutral
live

for 1 mark each

3

(b) (i) rubber/plastic

for 1 mark

1

(ii) cable/wire/grip
cable/wires
fuse

for 1 mark each

3

(iii) case

for 1 mark

1

[8]

Q23.

(a) Current = 0.4A (1)
R = V/I or 240/0.4 (1)
R = 600 ohm (1)

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3

(b) Doubles

gets 2 marks

OR gets bigger

gets 1 mark

2

(c) P = V.I or 240 × 0.4
P = 96W

for 1 mark each

2

(d) 1 = 0.2A
P = 48W

for 1 mark each

BUT may get equation mark here if not in (c)

2

(e) P = V.I.t (1)
P = 240 × 0.2 × 6 × 3600
OR P = 48 × 6 × 3600

gets 1 mark

P = 1036800 W

gets 1 mark

3

[12]

Q24.

(a) (i) S_3

for 1 mark

1

(ii) S_1, S_2 and S_3

for 1 mark

1

(b) (i) increases/current passes through heaters/current unaffected in fan

for 1 mark

1

(ii) (fan) blows/air moving prevents dryer overheating

for 1 mark each

2

(c) (i) brown
blue

any order

for 1 mark each

2

(ii) earth/green and yellow

for 1 mark

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1

(iii) (case is) plastic
plastic does not conduct (electricity)
for 1 mark each

2

(d) (i) 1300/power
for 1 mark

1

(ii) time/units of time
for 1 mark

1

[12]

Q25.

(a) (i) 13A
for 1 mark

1

(ii) fuse heated melts owtte / blows / burns out **Not** explodes / burns
circuit breaks
any 2 for 1 mark each

2

(b) (i) 2750 × 6 or 2.75 × 6
gains 1 mark

but
16.5
gains 2 marks

2

(ii) 2750 × 6 × 7 or 2.75 × 6 ×7 or (b)(i) × 7 or kW h × cost / kW h
gains 1 mark

but
115p or 116p or 115.5p or £1.16 or £1.15
gains 2 marks

2

[7]

Q26.

(a) heat / thermal
kinetic / movement
each for 1 mark

2

(b) (i) its a good (electrical) conductor
for 1 mark

1

(ii) its a good (electrical) <u>insulator</u> / very <u>poor conductor</u>

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for 1 mark

1

(c) (i) 2.75 × 6

gains 1 marks

but
16.5

gains 2 marks

2

(ii) (c)(i) × 7 or no. of kW h × cost/kW h

gains 1 marks

but
115.5 or e.c.f if correct

gains 2 marks

2

(d) it would heat and melts / blows / burns out / breaks circuit

any two for 1 mark each (fuse wire just breaks – gains 1) (blows up – gets 0)

(fuse causing wire to melt gets 1)

2

[10]

Q27.

(a) E – green and yellow
N – blue (*not* black **but** black / blue OK)
L – brown (*not* red **but** red / brown OK)

for 1 mark each

3

(b) fuse
screws to secure wires
cable grip (maybe described)
reference to an earth
(plastic case *wrong*)

any two for 1 mark each

2

[5]

Q28.

(i) power = current × voltage
or any correctly transposed version

accept watts = amps × volts

accept P = IV

do not credit P = CV

accept p.d. for voltage triangle acceptable only if used correctly in (ii)

1

(ii) 2 000 000 (1)

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2000 kilowatts/kW (2)

accept KW

watts/W (1)

2 megawatts/MW (2)

*do not credit mW (1) if correct method is clearly shown but answer is numerically incorrect **or** unit is absent **or** incorrect*

do not credit any working from an incorrect equation in (d)(i) but an appropriate unit should be credited

2

[3]

Q29.

(a) series circuit

all four components must be included

if a battery included the neatness mark may still be awarded

1

circuit fully functional **or** properly connected

this is the neatness mark

do not credit a parallel circuit with one switch controlling both components

1

(b) case **or** outer parts are made of plastic **or** insulator **or** non-metallic

1

there is no electrical pathway between inner and outer insulation

accept no connection between inner and outer part

do not credit two layers of insulation

1

(c) (i) [A] power = voltage × current

*accept $P = V\ I$ **or***

$W = V \times A$

***or** any transformation*

1

[B] 1600 ÷ 230 =current

1

6.96 **or** 7

accept with no working for two marks

accept 6.95

in [A] award a mark for a triangle if calculation correctly performed

1

(ii) [A] voltage = current × resistance

*accept $V = I\ R$ **or** any transformation*

1

[B] 230 ÷ 7 = overall R = 33

accept 230 ÷ 6.96 = overall R = 33

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1

resistance of motor = 33 – 20 = 13

accept with no working for two marks

do not credit negative answer

accept consequential errors from c(i)

in [A] award a mark for a triangle if calculation correctly performed

1

[10]

Q30.

(a) (i) P = V × 1

or equivalent

credit a triangle if part (ii) correctly uses the relationship

*credit power = volts × amps **or** watts V × A*

do not accept C for current

1

(ii) (P = 230 × 10 =) 2300

credit 2.3

1

W **or** J/s

kW

1

(b) (i) 15 A

*credit 13 A **or** amps*

1

(ii) any **three** from

earth

any short (to the metal tank) causes fuse to blow

fuse is in the live wire

to prevent damage to the heater

credit to stop the current

3

(c) (i) V = I × R

or equivalent

credit a triangle if part (ii) correctly uses the relationship

1

(ii) (230 = 10 × R =) 23

ohms **or** Ω

2

[10]

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Q31.

(a) earth at top

1

neutral on left

1

live on right

1

(b) (i) (when a short occurs to the metal case) electricity flows to earth

a logical sequence of events is required which address each of the key aspects

1

electricity **or** current flows to earth

*accept flows to ground **or** down the earth wire*

1

(a surge of current) blows the fuse

this breaks the (live) circuit

do not accept a short circuit

1

stops electricity flowing (through person **or** appliance)

do not accept it stops an electric shock

1

(ii) 3 A

accept 5A

1

[8]

Q32.

(a) *Formula mark*
P = V × I

*accept P = VI **or** W = V 5 A **or** any transformation*

1

Substitution mark I = 900 ÷ 230

1

Calculation mark 3.9

*accept 3.9 **or** 3.91 **or** 4 for three marks with no working*

1

(b) 900 + 1300 = 2200 ÷ 230 = 9.6

*accept 9.57 to 9.6 **or** 10 for both marks with no working*

2

(c) 1.2 + 0.45 = 1.65

1

× 0.5 = 0.825

*accept 0.8 **or** 0.83 for both marks with no working*

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1

(d) any **one** from

use less energy (to cook something)

*accept fewer energy losses **or** use less electricity*

cook faster

do not credit a cost argument about buying two different ovens

1

[8]

Q33.

(i) **EITHER**

30000 (2) joules/J (1)

or 30 kilojoules/kj

3

OR

power × time = energy

1

time = 120 (seconds)

1

(ii) vibration (of the food processor / some part of the food processor / the food)

1

[4]

Q34.

(a) any **two** from

(risk of) cutting (through the) cable

accept cutting the wire

grass may be wet

***or** it may rain*

wires may be loose (because cable experiences a lot of movement)

accept cable may be loose

(risk of) touching exposed part(s)

2

(b) some current will go through (the rest of) the lawnmower / the user / to earth

do not credit any reference to the electromagnet

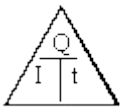
1

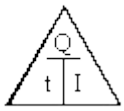
(c) (i) charge = current × time

***or** any transposed version*
accept Q = I × t
***or** any transposed version*
accept C = A × s
***or** coulombs = amperes × seconds*

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or *any transposed version*

or 

or


but only if subsequently used correctly

1

(ii) **EITHER**

1200 microcoulombs / μC

or *1.2 millicoulombs / mC*
or *0.0012 coulombs /C*

3

OR

correct arithmetic

either
converting milliamps to amps
and milliseconds to seconds
or correct multiplication

unit given as coulombs /C
or millicoulombs / mC
or microcoulombs / μC

example : charge = 30 × 40 = 1200 millicoulombs should be credited with 2 marks

1

[7]

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