QUESTIONSHEET 1

(a) 3 A / 2 1
= 1.5 A 1

(b) 6 V 1

(c) resistance = V / I 1
= 6 / 1.5 1
= 4 Ω 1

TOTAL / 6

QUESTIONSHEET 2

(a) 5 Ω + 10 Ω 1
= 15 Ω 1

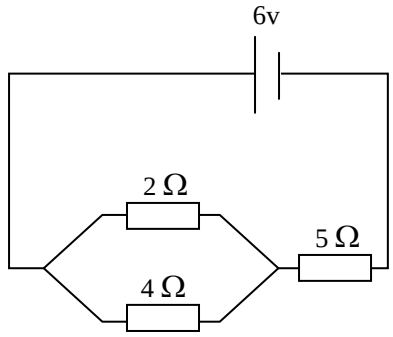
(b) I = V / R 1
= 3 / 15 1
= 0.2 A 1

Units are essential in calculations. Sometimes examination questions give a blank space for the answer followed by the unit. Sometimes no unit is given and you are expected to supply it. It is a common mistake to leave the units out altogether – don't get into this bad habit.

TOTAL / 5

QUESTIONSHEET 3

(a)



symbols correct 1
2 Ω and 4 Ω resistors in parallel 1
5 Ω resistor in series 1

(b) resistance of parallel resistors given by

$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2}$ 1

$= \frac{1}{2} + \frac{1}{4}$ 1

$R_t = \frac{4}{3}\Omega$ 1

so total resistance = $\frac{4}{3}\Omega + 5 = 6\frac{1}{3}\Omega$ 1

(c) $\frac{6}{6\frac{1}{3}}$ 1

= 0.95 A 1

For parallel resistors, it is sometimes easier to use the expression Product / Sum for the total resistance.
i.e. here we get 2 × 4 / (2 + 4) = 8 / 6 = 4/3 Ω

TOTAL / 9

QUESTIONSHEET 4

(a) (i) Power of lamp is 6 W 1
when used on 12 V 1

(ii) 6 W = 6 J/s 1
5 minutes = 300 s 1
energy transferred = 300 × 6 1
= 1800 J 1

(b) (i) I = P / V = 6 / 12 1
= 0.5 A 1

(ii) R = V / I = 12 / 0.5 1
= 24 Ω 1

(c) No difference 1
24 V shared between 2 lamps / pd across each lamp is 12 V 1

Power is the rate of transferring electrical energy into other forms – in this case, heat and light. A 6 W lamp transfers 6 Joules of electrical energy into heat & light each second, since 1 W = 1 J/s.
The formula P = I / V is one you need to know.

TOTAL / 12

QUESTIONSHEET 5

(a) (i) 0.6 × 10/20 1
= 0.3 A 1

(ii) 0.6 + 0.3 1
= 0.9 A 1

(b) V = I R 1
0.6 × 10 or 0.3 × 20 1
= 6 V 1

Current is inversely proportional to the resistance as long as the pd is constant. So half the current flows through the resistor that is twice as big.

TOTAL / 7

QUESTIONSHEET 6

(a) $\frac{1}{R} = \frac{1}{10} + \frac{1}{10} = \frac{1}{5}$ 1
R = 5 Ω 1

(b) 10 + 5 1
= 15 Ω 1

(c) current through single resistor = V / R = 6 / 15 1
= 0.4 A 1
current through parallel resistors = 0.2 A 1

In many questions, the value of the parallel resistors is the same. In this case, the total resistance is half the value of one.

TOTAL / 7

QUESTIONSHEET 7

(a) (i) 2 + 5 + 10 1
= 17 Ω 1

(ii) 1/R = 1/2 + 1/5 + 1/10 1
= 8 / 10 Ω 1
R = 10 / 8 = 1.25 Ω 1

(b) Current larger in (ii) 1
current inversely proportional to resistance 1
smaller resistance means larger current 1

TOTAL / 8

QUESTIONSHEET 8

(a) $\frac{1}{R_1} = \frac{1}{6} + \frac{1}{12} = \frac{1}{4} \Rightarrow R_1 = 4\Omega$ 1

$\frac{1}{R_2} = \frac{1}{3} + \frac{1}{6} = \frac{1}{2} \Rightarrow R_2 = 2$ 1

Total resistance = 2 + 4 = 6Ω 1

(b) I = V / R 1
= 12 / 6 1
= 2 A 1

(c) R = 4 + 3 1
= 7 1
I = 12 / 7 or 1.7 A 1

(d) R = 3 + 6 = 9 Ω 1
I = V / R = 12 / 9 1
= 1.33 A 1

TOTAL / 11

QUESTIONSHEET 9

(a) C 1

(b) (i) a complete path 1
for electricity to flow 1
when connected to a voltage supply 1

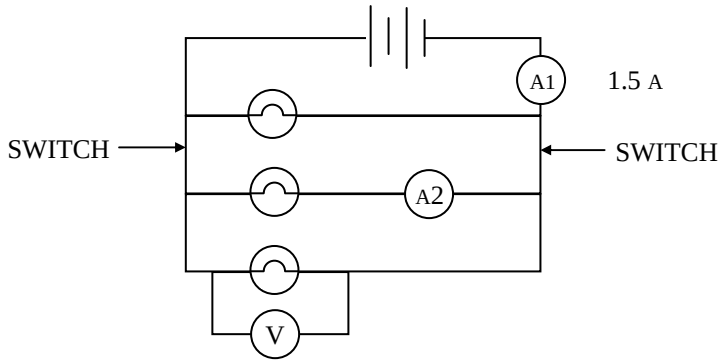
(ii) A & D (both) 1

No electricity flows in the last circuit, because the cells are the opposite way round from each other, so they cancel out.

TOTAL / 5

QUESTIONSHEET 10

(a) switch shown in either of the positions indicated 1



(b) Parallel 1

(c) 1.5 / 3 1
= 0.5 A 1

(d) 12 V 1

TOTAL / 5

QUESTIONSHEET 11

(a) Resistance in circuit alters current 1
ammeter resistance must be low so it doesn't affect current flow 1

(b) (i) In parallel across component 1

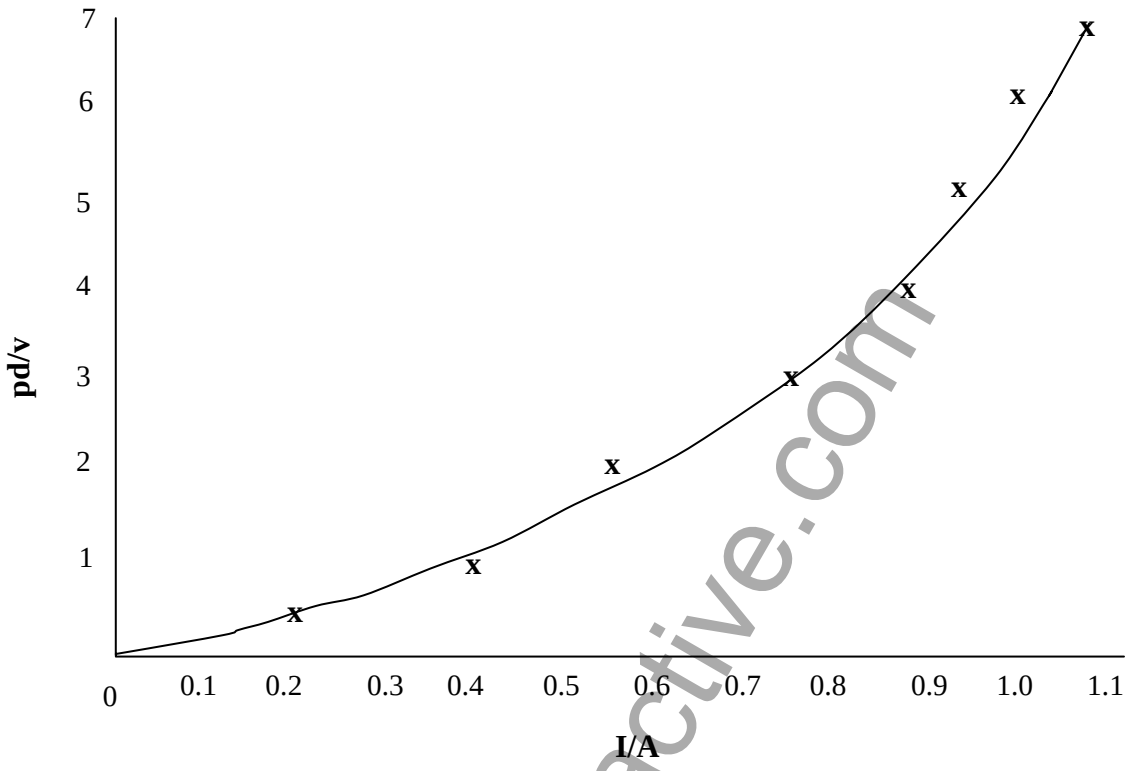
(ii) voltmeter must have high resistance 1
little current flows through voltmeter 1
most current flows through component 1

For two parallel resistors, $1/R = 1/R_1 + 1/R_2$. So if one resistor (the voltmeter) R_2 has a high resistance, $1/R_2$ is very small and the total resistance is almost the same as without the voltmeter.

TOTAL / 6

QUESTIONSHEET 12

(a)



axes labelled + units	1
correct plotting	2
smooth curve drawn	1

(b) (i) no 1

(ii) the graph is not a straight line 1
or V / A ≠ R 1

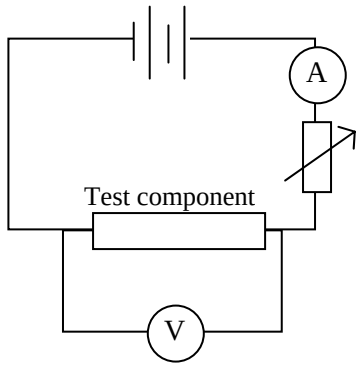
(iii) filament lamp 1

TOTAL / 8

QUESTIONSHEET 13

(a) Voltage is proportional to current 1
for a metal conductor at constant temperature 1

(b)



circuit symbols correct 1
ammeter in series 1
voltmeter in parallel 1
variable resistor in series 1

TOTAL / 6

QUESTIONSHEET 14

(a) A = metal wire 1
B = diode 1
C = lamp filament 1

(b) A 1

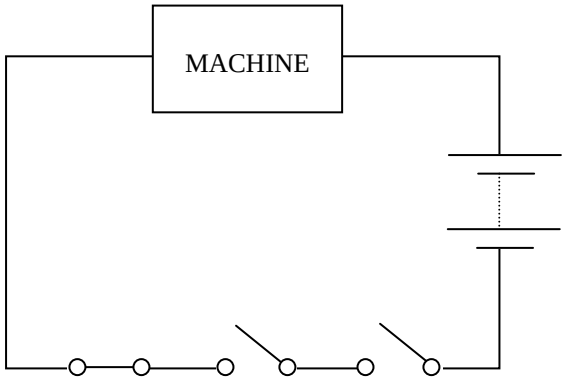
(c) C 1

An ohmic conductor obeys Ohm's law, so a graph of I against V must be a straight line through the origin.
The gradient of graph C decreases so the resistance must be increasing.

TOTAL / 5

QUESTIONSHEET 15

(a) (i)



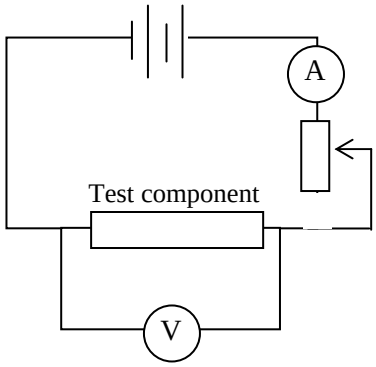
two switches	1
in series	1
with machine	1

(ii) each switch must be able to turn off machine 1

(b) switches not in series 1
each must be able to switch light on or off 1
needs two parallel parts of circuit 1

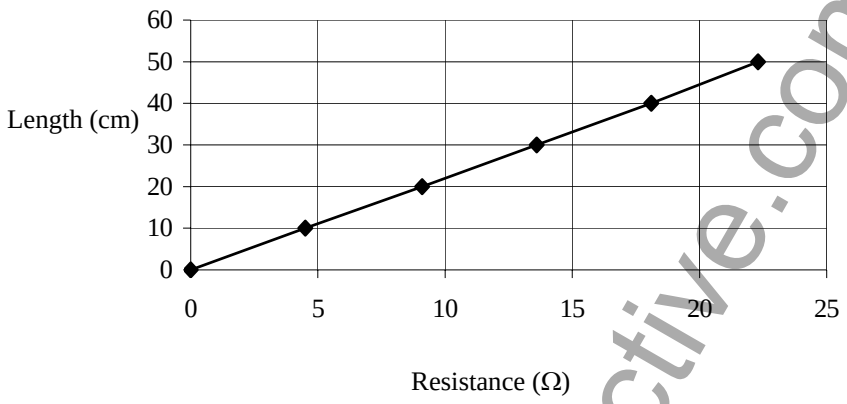
TOTAL / 7

QUESTIONSHEET 16



(a) Set up Ohm's law circuit 1
measure pd across wire and current through it 1
measure length of wire 1
change length of wire and repeat experiment 1

(b) (i)



(ii) as length increases 1
resistance increases
directly proportional 1

(iii) as length varies, resistance varies 1
current varies 1
and light dims or brightens 1

The first two or three marks of this question could be obtained by drawing a labelled diagram.

TOTAL / 12

QUESTIONSHEET 17

(a) A = battery 1
B = lamp/light bulb 1
C = switch 1
D = variable resistor 1

(b) varies current in a circuit / acts as dimmer switch 1

You must be able to recognise circuit components. Look at the syllabus or ask your teacher which ones you must know. Note that a battery is made up of two or more cells joined in series

TOTAL / 5

QUESTIONSHEET 18

(a) (i) 1.5 V 1
(ii) 0 V 1
(iii) 3.0 V 1
(iv) 1.5 V 1
(v) 1.5 V 1

(b) car bulb needs 12 v 1

(c) increases 1

TOTAL / 7

QUESTIONSHEET 19

(a) silver too expensive 1

(b) copper is too heavy 1

(c) rubber and PVC 2

(d) water will conduct electricity 1
would get shock with wet hands 1

TOTAL / 7

QUESTIONSHEET 20

(a) One connected after another in line 2

(b) 240 / 20 1
= 12 V 1

(c) bulb from 40-bulb set uses 6 v 1
higher voltage would cause it to blow 1

(d) (i) fuse would blow repeatedly 1

(ii) fault would not blow fuse 1
could be dangerous to operator 1

TOTAL / 9
