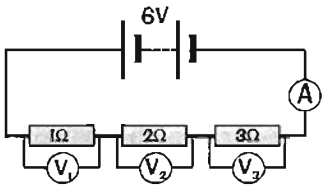
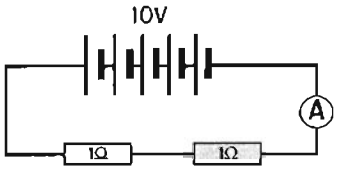
19.1 Circuits in Series and in Parallel

Q1 Look at the circuit on the right.



a) Calculate the total resistance in the circuit.
b) What current does the ammeter read?
c) Work out the voltmeter reading for meters 1, 2 and 3.

Q2 Look at the circuit below.



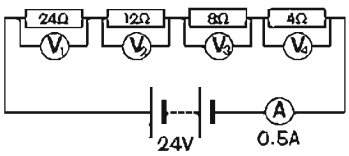
a) Find the total resistance.
b) The ammeter reading is 5A. If you wanted to reduce the current to 2A (using the same power supply and ammeter), how many extra 1ohm resistors would you have to connect in series?

Q3 Draw a circuit diagram of a power supply, an ammeter and two resistors in series. Voltmeters are connected in parallel with these resistors. If the voltmeters read 4V and 20V and the current is 0.5A:

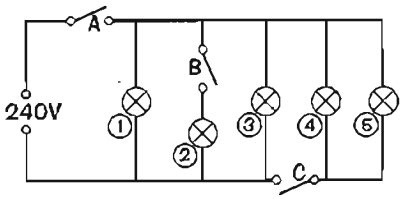
a) find the resistance of each resistor.
b) find the voltage supplied by the power supply.

Q4 Look at the circuit opposite.

Calculate what each voltmeter, V_1, V_2, V_3 and V_4 will read.



Q5 Study the circuit diagram below.
Which lamp(s) (1 – 5) are operated by switches A, B and C?



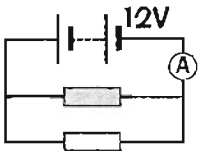
Taking all switches to be closed to start with:

switch A operates: _____,
switch B operates: _____,
switch C operates: _____.

Q6 Draw a circuit with a 2 ohm and a 4 ohm resistor in parallel, running off a 6V battery.

a) What is the current in the 2 ohm resistor?
b) What is the current in the 4 ohm resistor?
c) What is the current in the cell?
d) These two resistors are replaced with a single resistor.
What would this resistance be if the current in the cell stayed the same?

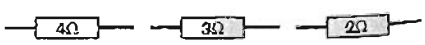
Q7 The resistances of the resistors in the circuit to the right are identical. The ammeter reads 1A.



What is the resistance of these resistors?

Q8 Draw a circuit diagram of a 12V power supply and two resistors, 6 ohm and 3 ohm, connected in parallel. Find the current in each resistor and in the power supply. Mark the currents on your diagram.

Q9 Draw these three resistors in parallel with a 24V power supply.



Write on the diagram the current in the cell and the current in each of the resistors.

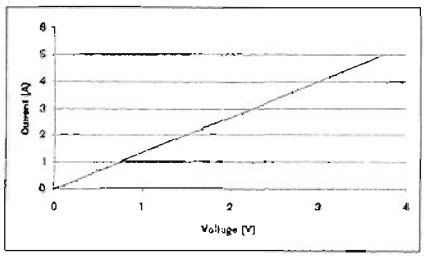
Module Ten — Electricity

Q2 From top: 12V; 10A; 2 Ohms; 0.1A; 3 Ohms ; 7.5V.

Q3 23 Ohms.

Q4 0.5A.

Q5 a)



b) 0.75 Ohms.
c) Resistor.
d) Voltage proportional to current (straight line graph through origin).

Q6 a) It decreases.
b) It increases.
c) With increasing light intensity, the slope of the curve becomes less steep → resistance decreases more slowly.
d) Automatic night light; LDR increases resistance in the dark, the circuit 'detects' the increase and turns the light on.
A detector could be placed on a fridgefreezer door to warn of a door left open.
Some new cars have sensors that automatically switch their headlights on when it gets dark.

Page 72 — Current in Circuits

Q1 a) 1 V.
b) 3 V.
c) 1.5 A.
d) 0.6 A.
e) 1.5 Ohms.
f) 3 Ohms.

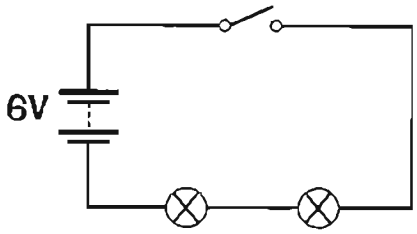
Q2 Shorter, lower; thick, lower; temperature, increases; one direction.

Q3 a) Flow of charged particles.
b) Reduces current.
c) Allows current in one direction only.
d) Unit of power.
e) Ions dissolved in water.
f) Unit of current.
g) Measures current.
h) Measures voltage.
i) Metal wire of low resistance.
j) Unit of voltage.

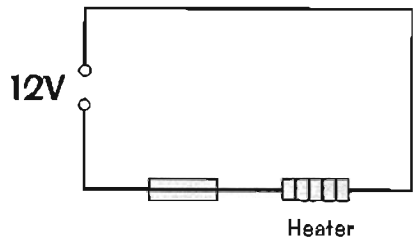
Page 73 — Current in Circuits

Q1 a) Resistance increases as temperature decreases.
b) 110 Ohms.
c) Car engine temperature sensors, electronic thermostats.
d) 30°C to 20°C, so temperature change is 10°C.

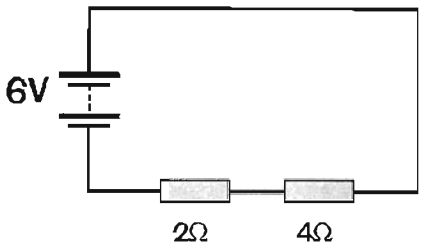
Q2



Q3



Q4



a) 6 Ohms.
b) 1A.

Q5 6 Ohms each.

Q6 All lamps go out; 480 Ohms; 48 Ohms each lamp.

Q7 a and 4; b and 3; c and 1; d and 2.

Q8 a) 4 Ohms. b) 3A. c) Meter 1: 3V Meter 2: 9V.

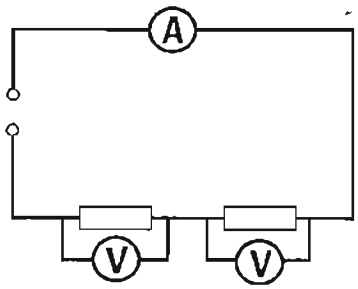
Q9 dimmer; decreases; smaller; increased; up.

Page 74 — Currents in Series and Parallel

Q1 a) 6 Ohms.
b) 1A.
c) $V_1 = 1V$; $V_2 = 2V$; $V_3 = 3V$.

Q2 a) 2 Ohms.
b) 3 more (5 in all).

Q3



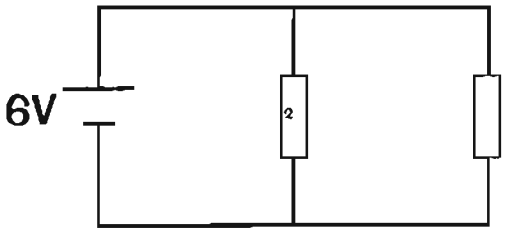
a) 8 Ohms; 40 Ohms.
b) 24V.

Module Ten — Electricity

Q4 V_1 = 12V; V_2 = 6V; V_3 = 4V; V_4 = 2V.

Q5 **A:** 1, 2, 3, 4 & 5.
B: 2.
C: 4 & 5.

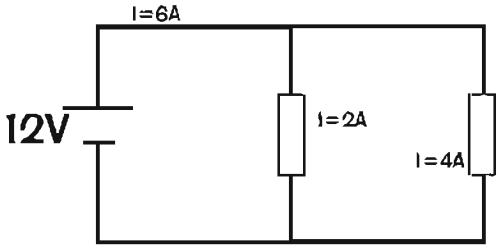
Q6



a) 3A.
b) 1.5A.
c) 4.5A.
d) 4/3 Ohms.

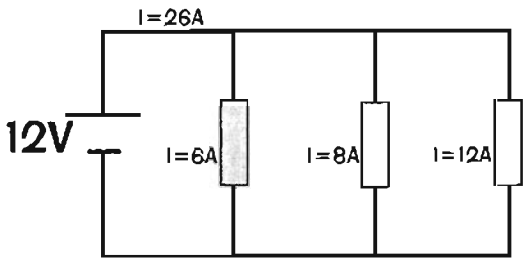
Q7 24 Ohms each.

Q8



2A in 6 Ohms; 4A in 3 Ohms; 6A

Q9



12A in 2 Ohms; 8A in 3 Ohms;
6A in 4 Ohms; 26A in cell.

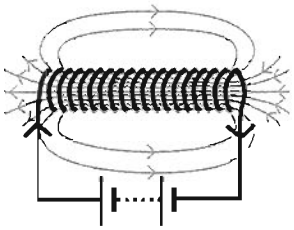
19.2 — Electricity Moving Things

Page 75 — Magnetic Fields

Q1 Magnetic: iron, nickel, steel. All the others are not magnetic.

Q2 A magnetic field / is a region where / magnetic materials / like iron and steel / and also wires carrying currents / experience a force / acting on them.

Q3 a)



b) Strong, uniform.
c) Increase the current. Increase the number of turns on the solenoid.

Q4 a) **i)** Jude's.
ii) Jeremy's.
iii) John's.
b) Yes. To avoid a short circuit

Q5 a) A – cell, B – magnet, C – "core", D – axle, E – split pin, F – base, G – magnet, H – yoke, J – coils of wire.
b) Insulators: C and F.
c) Turns; increase; iron core.

Q6 Ammeter in series; voltmeter in parallel to motor.

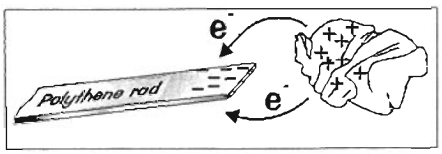
Q7 Food-mixer, fan heater, food blender, washing machine, dryer etc.

19.3 — Static Electricity

Page 76 — Static Electricity

Q1 **a)** Are attracted to each other.
b) Is caused by friction.
c) Move, never the positive charges
d) Builds up if charge builds up.
e) Is lost if a charged rod is moved away.
f) The greater the voltage.
g) By connecting it to Earth.
h) Repel each other.
i) If electrons are rubbed on
j) Repel each other.
k) If electrons are rubbed off.

Q2 a&b)



Q3 If you rub an acetate rod with a cloth / electrons are transferred from / the rod to the cloth. / So the cloth becomes / negatively charged / and the rod becomes / positively charged.

Q4 Increases, voltage, high, earthed, spark.

Q5 Metals contain a 'sea' of free electrons which are able to flow freely throughout the metal. These electrons are able to carry the current easily through the metal.