



Mains Electricity

Workbook pages 90-92

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Q1 Choose from the words below to fill in the gaps.

changing	AC	ohms	hertz	DC	volts	direct
alternating			frequency	amps	direction	

In the United Kingdom the mains electrical supply is about 230 **volts**.
 The supply is **alternating** current (**AC**) which means that the **direction** of the current is constantly **changing**.
 The supply has a **frequency** of 50 **Hertz (Hz)**.

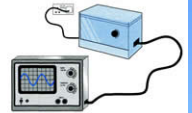
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Q2 Answer the following:

- a) What does "CRO" stand for?
Cathode ray oscilloscope
- b) What does the trace on a CRO screen show?
Voltage against time
- c) Give the names of the two main dials on the front of a CRO.
Voltage gain - controls the scale of the y-axis and timebase - controls the scale of the x-axis

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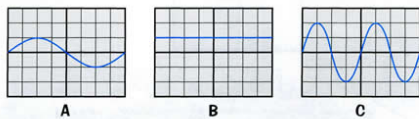
Q3 James connects a CRO to a power pack. By adjusting the power pack, he can alter the amount of voltage going across the CRO.



- a) Explain why the trace on the CRO screen is 'stretched' or 'squashed' vertically when James changes the voltage.
The amplitude of the trace indicates the voltage applied to the oscilloscope. If he reduces the voltage the trace will be flatter and if he increases it it will be taller. The frequency will be unchanged
- b) Why is the trace 'stretched' or 'squashed' vertically when James moves the gain dial on the CRO?
The voltage gain dial changes the scale of the y-axis of the trace. If each cm is made to represent more volts the trace will get flatter - if it is made to represent fewer volts it will get taller.
- c) What happens to the trace when he moves the timebase control?
The time base will change the number of oscillations he can see on the screen. If he alters it so that each cm represents a bigger time he will see less full periods of the oscillation and vice versa

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Q4 The diagram shows three traces on the same CRO. The settings are the same in each case.



Write down the letter of the trace that shows:

- a) the highest frequency AC **C**
- b) direct current **B**
- c) the lowest AC voltage **A**

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Q5 The diagram shows a trace on a CRO screen. The timebase is set to 10 ms per division, and the gain to 1 volt per division.

- a) What is the peak voltage? **2V**
- b) What is the time period?
40 ms
- c) Calculate the frequency of the supply.
 $F = 1/T = 1/(40 \times 10^{-3} \text{ or } 1/0.04) = 25 \text{ Hz}$



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Q6 Jim is comparing two computers — one is designed for use in Britain, and the other in America. He looks at the manufacturers' badges, which give important information about the electrical supplies each computer needs.

BRITCOM — 884	
Power supply	230 volts, 50 Hz
Fuse	3 A
Power consumption	20 W
This appliance must be earthed British Computer Company, London	

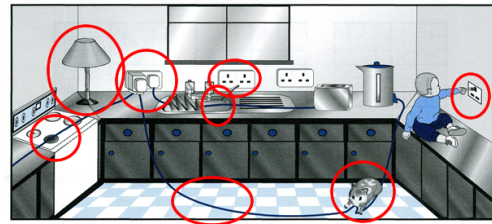
USCOM — 2800	
Power supply	110 volts, 60 Hz
Fuse	3 A
Power consumption	25 W
Double Insulated US Computers Inc., New York	

Write down **two reasons** why the American computer would **not** be suitable for use in Britain.

- It is designed to run at 110V - the 230V voltage in the UK would cause its circuits to overheat!
- It is designed to have a supply with a frequency of 60Hz in the UK it is 50Hz

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Q7 Look at this picture of a kitchen. Put a ring round everything that is unsafe.



Lamp could easily be knocked over - Overloaded socket (pulls too much current - could cause an electrical fire in the wall) - Sockets should not be placed so near the sink - electrocution water hazard

Child putting a fork in the socket and anyway he could fall from there!

Hamster gnawing cable from kettle

Cable on the floor - trip hazard - over sink - could get wet - over cooker - could get melted

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Q8 Answer the following questions about **plugs**:

a) Why is the body of a plug made of rubber or plastic?

Rubber or plastic are electrical insulators.

b) Explain why some parts of a plug are made from copper or brass.

They need to be good conductors - metals conduct electricity well

c) What material is the cable insulation made from, and why?

Rubber or plastic because they are insulators, strong, waterproof and flexible.

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Q9 Use the words below to complete these rules for wiring a plug.

outer bare live earth neutral insulation firmly green and yellow

- Strip the **insulation** off the end of each wire.
- Connect the brown wire to the **live** terminal.
- Connect the blue wire to the **neutral** terminal.
- Connect the **green and yellow** wire to the **earth** terminal.
- Check all the wires are **firmly** screwed in with no **bare** bits showing
- The cable grip must be securely fastened over the **outer** covering of the cable.

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Q10 This plug is **incorrectly** wired. Write down the **three** mistakes.

- Earth is not connected to the earth pin
- Bare wires are showing
- Neutral and live are the wrong way round



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