

Solutions

2.1 Frequency 50 Hz; potential difference about 230 V.

2.2 Direct pd drives current in one direction only; alternating pd repeatedly reverses direction (the current repeatedly changes direction).

2.3 Live: brown – carries the alternating pd from the supply. Neutral: blue – completes the circuit, at or near 0 V. Earth: green and yellow stripes – safety wire at 0 V that carries current only in a fault, stopping the case becoming live.

3.1 (a) The fuse sits in the live wire: breaking the live side disconnects the appliance from the 230 V source, so no fault current can be supplied. (b) The earth wire gives the fault current a low-resistance path to earth; a very large current flows live $\rightarrow$ case $\rightarrow$ earth; the large current melts the fuse, breaking the live supply and making the case safe.

3.2 The switch is (usually) in the live wire only, so the lamp's live terminal and the supply-side wiring are still at about 230 V relative to earth; a person touching the live side completes a circuit to earth and receives a shock – the appliance must be unplugged to be safe.

3.3 (a) 0 V (at or close to earth potential). (b) With the neutral broken, the neutral-side wiring is connected to the live through the lamp's circuit, so it sits at about 230 V relative to earth even though no current flows (the circuit is incomplete, so the lamp cannot light); a person touching the neutral terminal now provides the missing path to earth; current flows through them and they receive a shock – the table's 230 V neutral-to-earth reading is the warning.