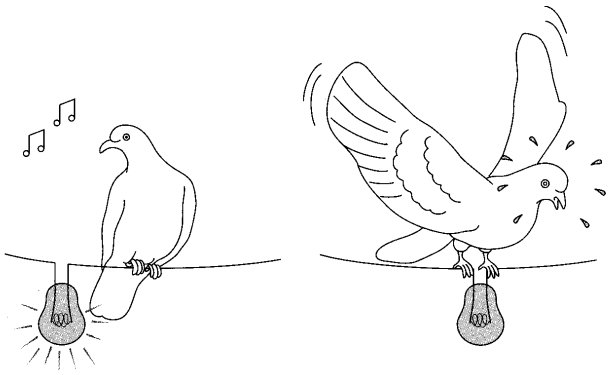
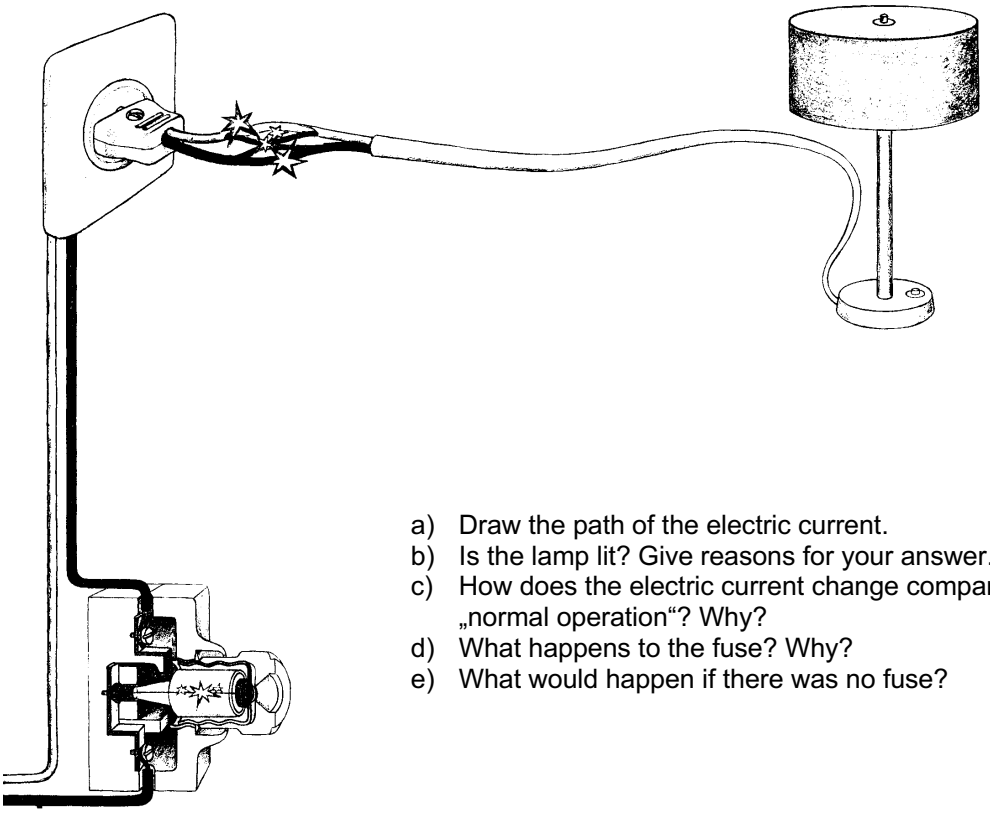
1. Why does the bird on the right feel less comfortable than the bird on the left?
   Hints:
   ☞ Compare the resistances of the wire, the bird and the lamp.
   ☞ Compare the voltages across the bird's feet in both pictures.
   ☞ Compare the currents through the birds in both cases.



2. Complete the table:

Safety feature	What does it protect?	How does it protect?
fuse		
ground		
FI circuit breaker (ground fault circuit interrupter)		

3. Here's an electric circuit with a fuse. Due to a defect in the cable there's a short circuit.

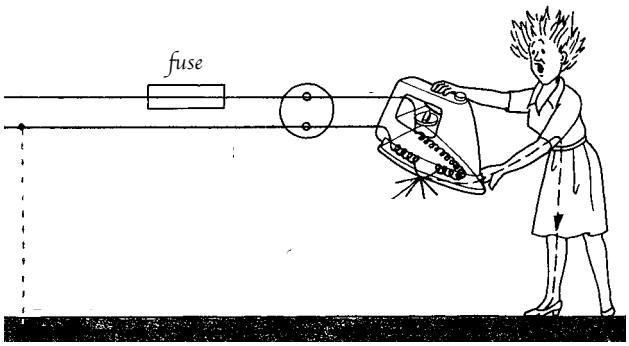


a) Draw the path of the electric current.
b) Is the lamp lit? Give reasons for your answer.
c) How does the electric current change compared to „normal operation"? Why?
d) What happens to the fuse? Why?
e) What would happen if there was no fuse?

4. Here's an ungrounded iron with a fuse. Due to a defect in the insulation the outside metal case gets in contact with a current-carrying wire on the inside.

a) What happens if the woman touches the metal case of the iron? Draw the path of the electric current in the picture.

b) *Assume*: U = 220 V, R_{iron} = 50 Ω, R_{woman} = 3.00 kΩ, parallel circuit. Calculate the current that passes through the woman (a current higher than 50 mA can be lethal). Calculate the total current (a current over 10 A causes the fuse to blow). Does the fuse blow? Does the woman receive a shock?

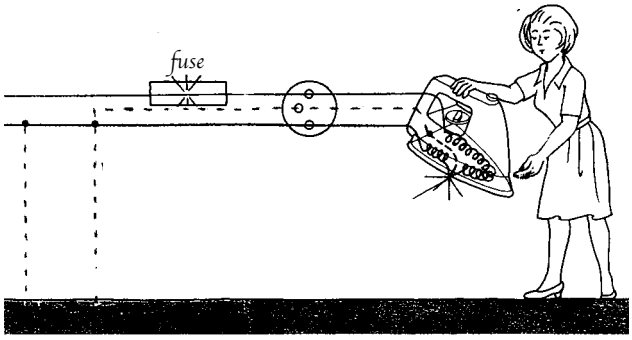


5. Here's a grounded iron with a fuse. Due to a defect in the insulation the outside metal case gets in contact with a current-carrying wire on the inside.

a) What happens if the woman touches the metal case of the iron? Draw the path of the electric current in the picture.

b) Why does the fuse blow?
Hint: Is the resistance of the ground wire large or small? How does this affect the current?

c) What would happen if there was no fuse in the circuit? Would the woman receive a shock without a fuse? What is the purpose of the fuse?

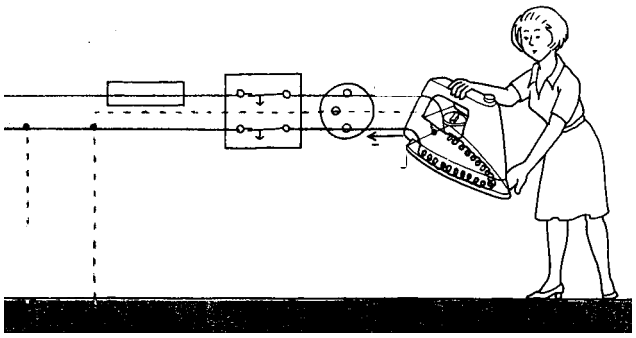


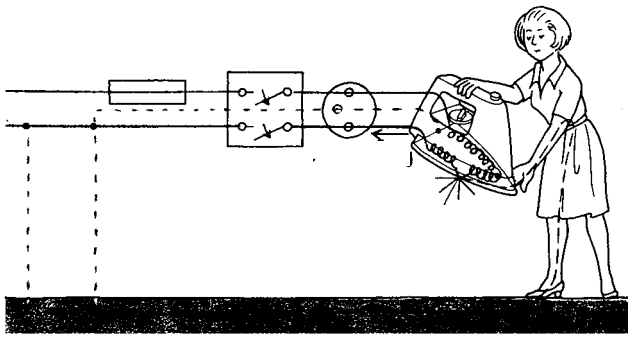
6. Here's an electric circuit protected by a ground fault circuit interrupter (FI circuit breaker).

a) Draw the path of the electric current in the picture.

b) Explain how a ground fault circuit interrupter (FI circuit breaker) works.

c) How long does it take for the ground fault circuit interrupter to break the circuit?





solutions: 4. b) I_{woman} = 73 mA, I_{iron} = 4.40 A, I_{total} = 4.47 A