12 A device called a metal detector can be used to find metal buried underground.

(Source: © mArt88/Shutterstock)

The metal detector has two circuits, each containing a coil of copper wire.

Diagram 1 shows the circuit for the transmitter coil.

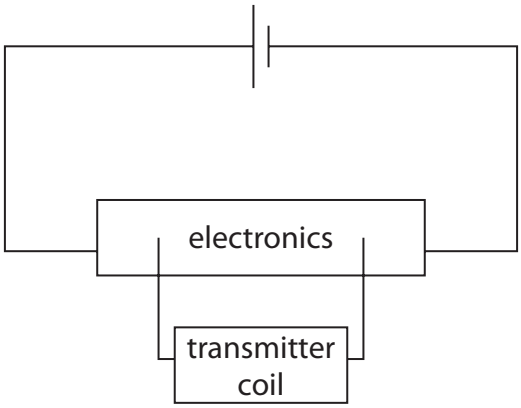

Diagram 1

(a) Suggest why there is a magnetic field around the transmitter coil.

(1)

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(b) The cell supplies direct current (d.c.). The electronics in diagram 1 change the direct current into alternating current (a.c.) in the coil.

(i) Describe the difference between direct current (d.c.) and alternating current (a.c.).

(2)

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(ii) Alternating current is supplied to the transmitter coil.

Diagram 2 shows a gold ring in the soil below the metal detector.

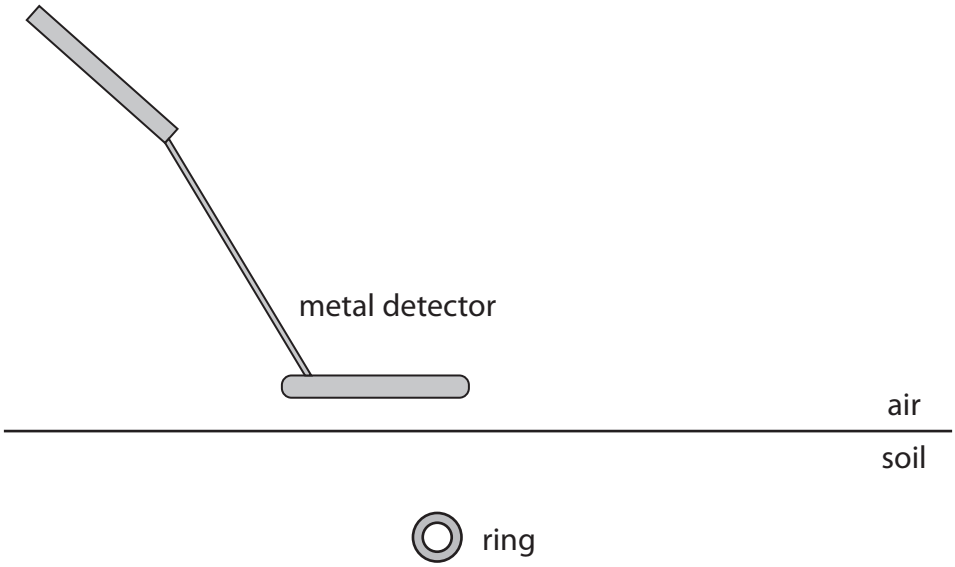

Diagram 2

Explain why there is an alternating current in the gold ring.

(3)

QUESTION 12 CONTINUES ON NEXT PAGE

(c) Diagram 3 shows the circuit for the receiver coil.

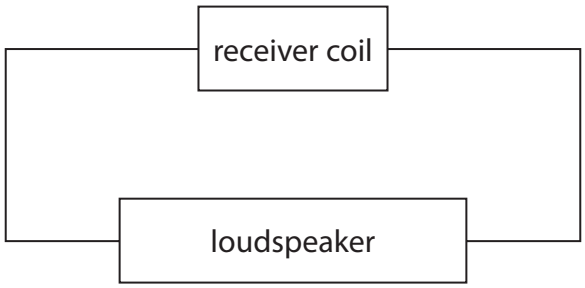

Diagram 3

As a result of the alternating current in the gold ring, there is an alternating current in the receiving coil.

Explain how an alternating current in the receiving coil causes a sound to be emitted from the loudspeaker.

(4)

(Total for Question 12 = 10 marks)

TOTAL FOR PAPER = 110 MARKS