10. A small magnet is dropped from rest above a stationary horizontal conducting ring. The south (S) pole of the magnet is upwards.

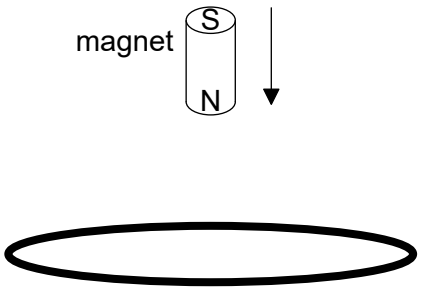

Diagram 1: side view

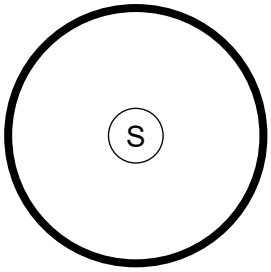

Diagram 2: view from above

While the magnet is moving towards the ring,

(a) state why the magnetic flux in the ring is increasing. [1]

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(b) sketch, using an arrow on **Diagram 2**, the direction of the induced current in the ring. [1]

(c) deduce the direction of the magnetic force on the magnet. [2]

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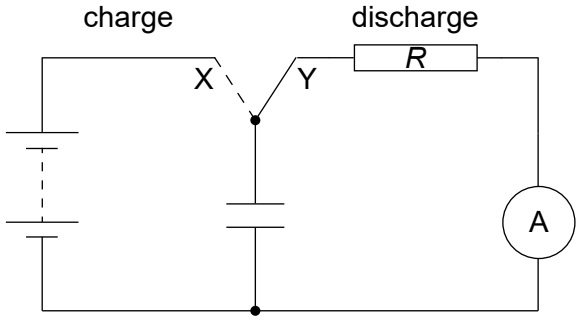
(Question 8 continued)

(b) The student uses a switch to charge and discharge the capacitor using the circuit shown. The ammeter is ideal.



The emf of the battery is 12 V.

(i) The resistor *R* in the circuit has a resistance of 1.2 kΩ. Calculate the time taken for the charge on the capacitor to fall to 50 % of its fully charged value. [3]

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(ii) The ammeter is replaced by a coil. Explain why there will be an induced emf in the coil while the capacitor is discharging. [2]

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(This question continues on the following page)

(Question 8 continued)

(iii) Suggest **one** change to the discharge circuit, apart from changes to the coil, that will increase the maximum induced emf in the coil. [2]

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