Module 6 Electromagnetism
HSC Style questions
16 marks

2010

8 While drilling into a tough material, the DC motor in an electric drill is slowed significantly. This causes its coils to overheat.

Why do the coils overheat?

(A) The resistance of the coils increases significantly.

(B) The increased friction on the drill is converted to heat.

(C) The back emf decreases and so the current in the coils increases.

(D) The induced eddy currents increase and so more heat is produced.

9 Why is high voltage used to transmit electrical energy from power stations to users?

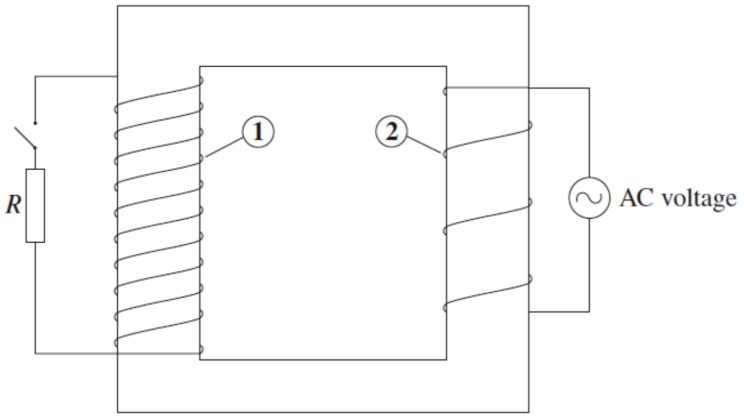
(A) It helps to protect the system from lightning strikes.

(B) It allows the supporting structures to have smaller insulators.

(C) It minimises the effects of the electrical resistance of the wires.

(D) It ensures that, even with voltage losses, 240 V will still reach the user.

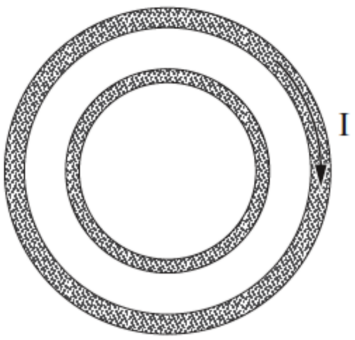
10 The diagram shows a model of a transformer in a circuit.



Which of the following correctly identifies Part 1 and Part 2 and the function of this transformer?

	Part 1	*Part 2*	*Function of transformer*
(A)	Primary coil	Secondary coil	Step-up
(B)	Secondary coil	Primary coil	Step-down
(C)	Primary coil	Secondary coil	Step-down
(D)	Secondary coil	Primary coil	Step-up

11 Two copper rings lie in the same plane as shown.



An increasing current flows clockwise around the outer ring.

What happens in the inner ring?

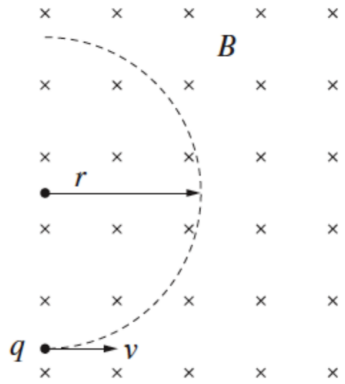
(A) A decreasing clockwise current flows.

(B) A decreasing anticlockwise current flows.

(C) An increasing clockwise current flows.

(D) An increasing anticlockwise current flows.

15 A charged particle, q, enters a uniform magnetic field B at velocity v. The particle follows a circular path of radius r as shown.



If the magnitude of the magnetic field were doubled and the other variables were kept constant, what would the new radius be?

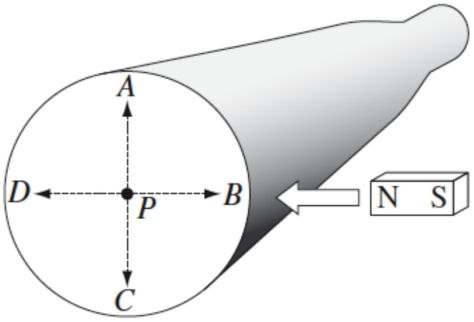
(A) $\frac{r}{4}$

(B) $\frac{r}{2}$

(C) $2r$

(D) $4r$

16 A cathode ray beam strikes the screen at point *P*, producing a bright spot. The north end of a magnet is brought towards the beam as shown.



Towards which point does the bright spot move?

(A) *A*

(B) *B*

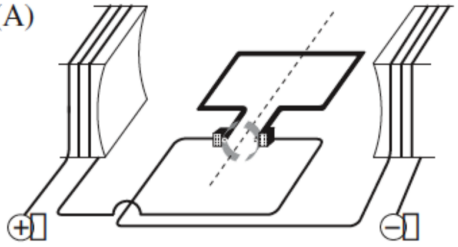
(C) *C*

(D) *D*

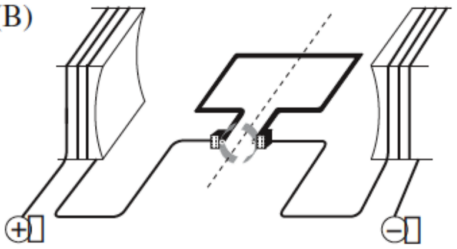
20 The diagrams show possible ways to connect the coils and rotor of a DC motor to a DC power supply.

In which circuit will the rotor turn in a clockwise direction?

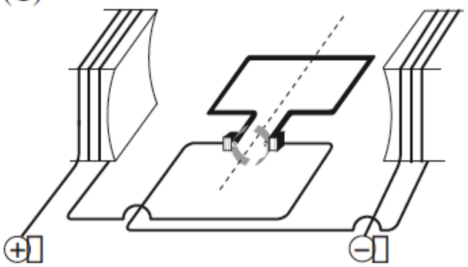
(A)



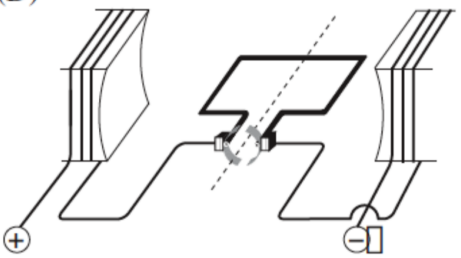
(B)



(C)

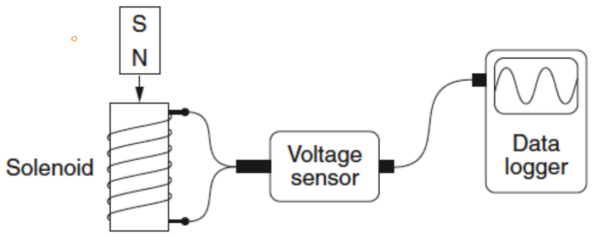


(D)

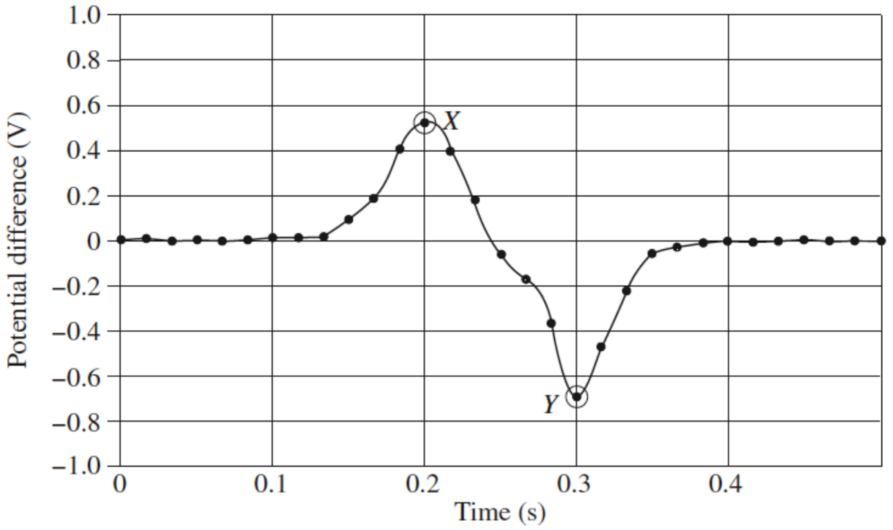


Question 26 (5 marks)

A bar magnet is dropped through the centre of a solenoid connected to a data logger as shown.



The data are recorded in the graph as shown.

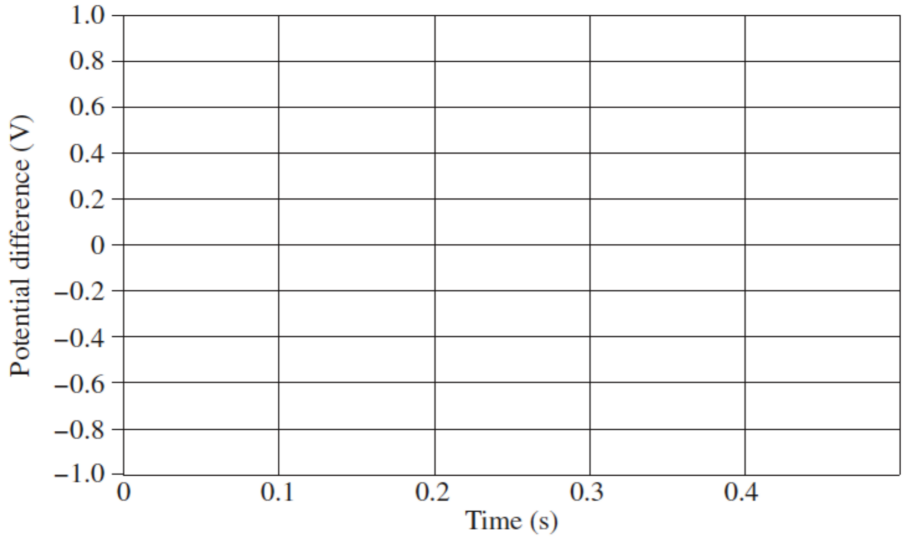


(a) Why is the magnitude of the potential difference at *Y* greater than at *X*? **2**

(b) The magnet is dropped again with two changes being made. **3**

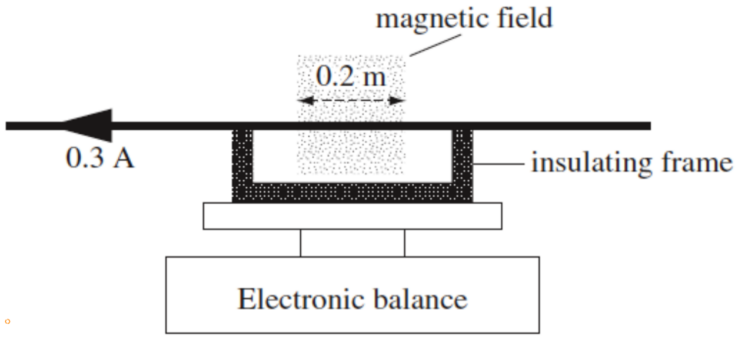
1. It is dropped from a greater height.
2. The south pole of the magnet is pointing down.

Sketch a graph that represents the most likely outcome of this new experiment.



Question 28 (4 marks)

A copper rod is placed on a wooden frame, which is placed on an electronic balance. A length of 0.2 m of the rod passes at right angles to a horizontal magnetic field. **4**



When a current of 0.3 A is passed through the rod, the reading on the balance increases by 7.5×10^{-4} kg.

What is the strength and direction of the magnetic field?