

2001 HIGHER SCHOOL CERTIFICATE EXAMINATION
Physics

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Centre Number

Section I – Part B (continued)

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Student Number

Marks

Question 21 (3 marks)

A fan that ventilates an underground mine is run by a very large d.c. electric motor. This motor is connected in series with a variable resistor to protect the windings in the coil.

3

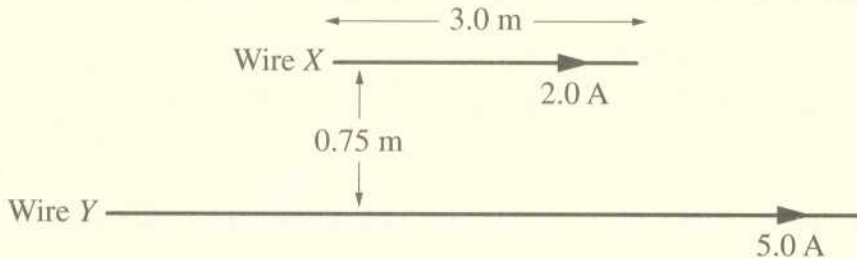
When the motor is starting up, the variable resistor is adjusted to have a large resistance. The resistance is then lowered slowly as the motor increases to its operating speed.

Explain why no resistance is required when the motor is running at high speed, but a substantial resistance is needed when the motor is starting up.

When the DC motor is starting up, the mechanical force of driving the fan provides an equally large BACK EMF (Electro-magnetic Force). ~~This~~ The resistance is required at start-up so the motor will not burn-out, and the ~~the~~ back EMF will be controlled. No resistance is required at high speed as the motor is now moving with constant velocity.

Question 22 (7 marks)

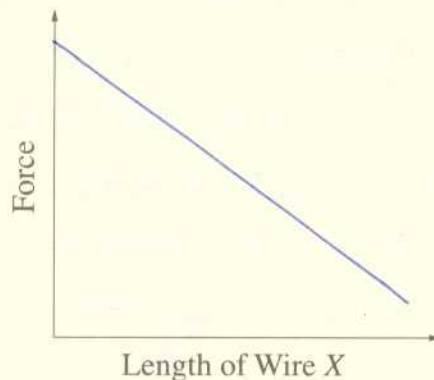
Two parallel wires are separated by a distance of 0.75 m. Wire X is 3.0 m long and carries a current of 2.0 A. Wire Y can be considered to be infinitely long and carries a current of 5.0 A. Both currents flow in the same direction along the wires.



- (a) What is the direction of the force that exists between the two wires? 1

Attracting each wire.

- (b) On the axes, sketch a graph that shows how the force between the two wires would vary if the length of Wire X was increased. 2



- (c) In your Physics course you have performed a first-hand investigation to demonstrate the motor effect. Explain how your results demonstrated that effect. 4

I adopted the use of a magnetic field structure and ^{coil and} electric current and ^{a handle} ~~rod~~. First the instruments were set up as a motor, the handle was attached to a plastic belt that is able to ^{turn} ~~make~~ the coil. Without current, the handle is still. Once a current is provided, the coil within the magnetic field turned and brought along with the turning of handle. Motor effect

states that a force is generated from an induced current with its electric fields ~~effecting~~ interact with magnetic field. In my case, ~~the~~ current was produced to flow in the coil, this generates ~~the~~ ^{an} electric field, which interacted with the magnetic field, cutting through magnetic flux, the coil turned and the handle followed.

Marks

Question 23 (6 marks)

Discuss the effects of the development of electrical generators on society and the environment.

6

The development of the electric generator has had a monumental impact on society. Throughout the Industrial Revolution generators had a negative impact on society as people moved out of towns & villages to work in cities. The poor working conditions and long hours, enabled by the generators, created slums and associated social problems. However, now electrical generators enable protection systems in laboratories & government buildings to protect computer-based information. Electrical generators have however had a negative impact on the environment as they release pollutants into the atmosphere & their development & electrical usage has also polluted the atmosphere.