

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

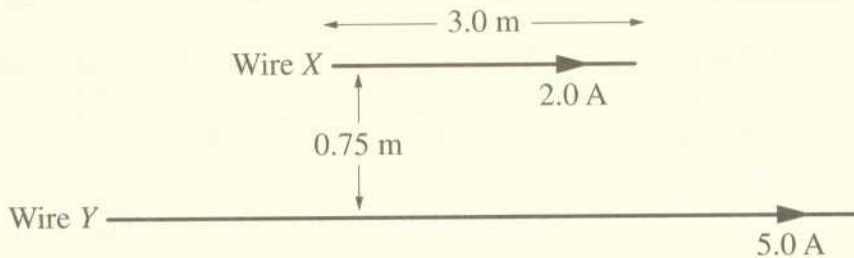
When the motor is starting up, the variable resistor is adjusted to have a large resistance. The resistance is then lowered slowly as the motor increases to its operating speed.

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 motor starts up, the motor is running at a low speed. This means that back emf is small and thus current is large. A large resistance is applied ~~to~~ ^{to prevent a} ~~current surge~~ ^{current surge} that the motor doesn't burn out. As the motor increases its speed, back emf increases, resisting the current, thus the applied resistance needed is less. At high speeds no resistance is required because back emf is sufficient to prevent burning out of the motor.

Question 22 (7 marks)

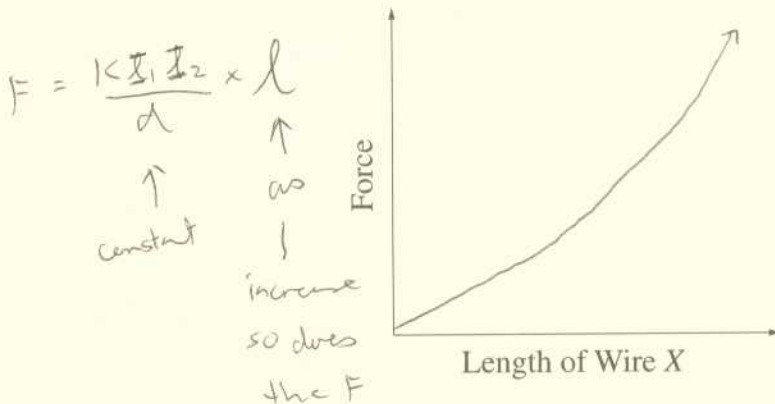
Two parallel wires are separated by a distance of 0.75 m. Wire X is 3.0 m long and carries a current of 2.0 A. Wire Y can be considered to be infinitely long and carries a current of 5.0 A. Both currents flow in the same direction along the wires.



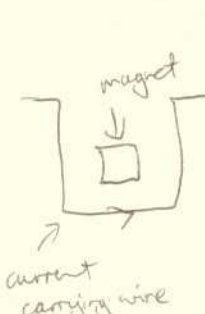
- (a) What is the direction of the force that exists between the two wires? 1

..... attraction..... they will be moving
 towards each other

- (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



..... Motor effect is the force experienced by a force carrying current
 carrying wire in a magnetic field. Basic diagram of
 investigation
 The result was a magnetic field with north
 (current being direction in diagram)
 towards the wire, would cause a force on the wire
 to experience a force is carrying wire to move. The
 force in the wire can be determined by the right hand
 palm rule. General result was depending on the
 direction of magnetic field and current, the moment
 of the wire was different. This indicates
 the fact that a ^{wire} carrying wire experiences
 a force in a magnetic field

Marks

Question 23 (6 marks)

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

? physics?
6

The development of electrical generators have mostly improve society in that the quality of life has been subjected to major beneficial changes. Generators provide a source of electricity that is used to power electrical appliances, lighting, heating, computers that have been integrated into our lifestyle and is part of our leisure as demonstrated by the television and the computer. It has improved the quality of life but yet at what cost? Since coal is often burnt to produce steam that drives our generators, it emits greenhouse pollution that is leading to global warming. The isolation of these generators or power plants merely removes the pollution to another part of the state and isn't a real solution to the overall problem. Electrical generators is increasingly ~~polluting~~ moving toward nuclear powered energy and the product (radioactive) and the disposal of them is a major environmental concern. Thus the development of electrical generators have contributed greatly to our way of living, providing light, heat and leisure but we have become too reliant on it and the environmental pollution is a cause of concern.