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PHYSICS & CHEMISTRY

# Physics

## HSC Course

Module 2  
Motors and Generators

Module 2: Motors and Generators

Topic 1: The Motor Effect

————— **Foundation** —————

1. State the motor effect.

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2. (a) State the right hand grip rule.

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(b) What is this rule used for?

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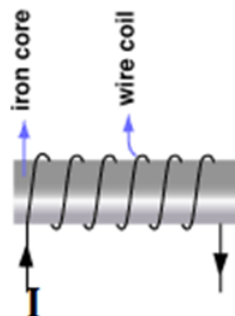
3. (a) State the right hand coil rule.

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(b) What is this rule used for?

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4. Determine the polarity (north and south poles) of the following electromagnet.



5. (a) State the right hand palm rule.

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(b) What is this rule used for?

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————— **Development** —————

1. Calculate the magnetic field strength at a distance of 3.0 m from a long straight wire carrying a current of 48 A. **1**

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★  $3.2 \times 10^{-6}$  T ★

2. The magnetic field strength at a distance of  $3.0 \times 10^{-2}$  m from a long straight conductor is  $6.0 \times 10^{-5}$  T. What is the current flowing in the conductor? **1**

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★ 9.0 A ★

3. (a) If a conductor of length 30 cm carries a current of 45 mA, calculate the magnitude of the force acting on it when it is placed at  $45^\circ$  to a magnetic field of strength 0.8 T. **2**

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★ 0.00764 N ★

- (b) A 10 cm length of wire experiences a force of 0.04 N when at right angles to a magnetic field of  $3.0 \times 10^{-2}$  T. Calculate the current flowing through this wire. 1

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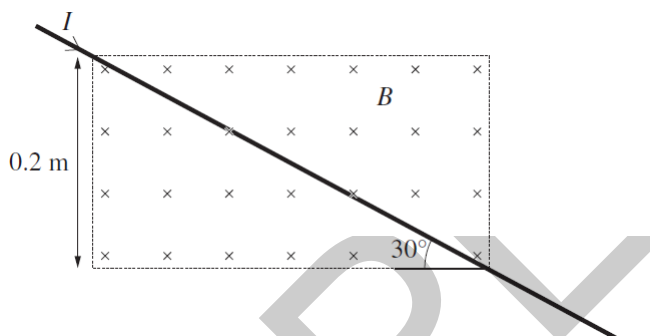
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★ 13.3 A ★

4. (a) A current-carrying wire passes through a region of uniform magnetic field with a magnitude 0.1 T, and as a result experiences a force of magnitude 0.05 N. Calculate the current. 1



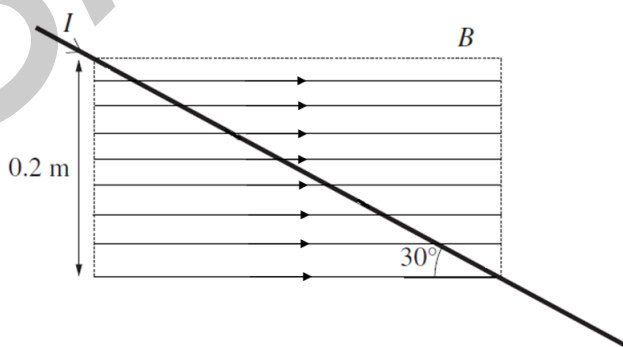
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★ 1.25 A ★

- (b) The same current-carrying wire is placed in a different uniform magnetic field with magnitude 0.1 T, and as a result experiences a force of 0.05 N. Calculate the current. 1

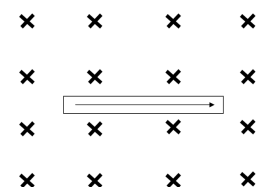
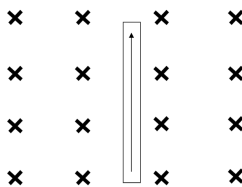
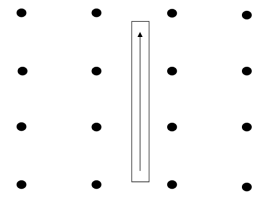
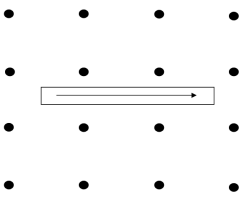


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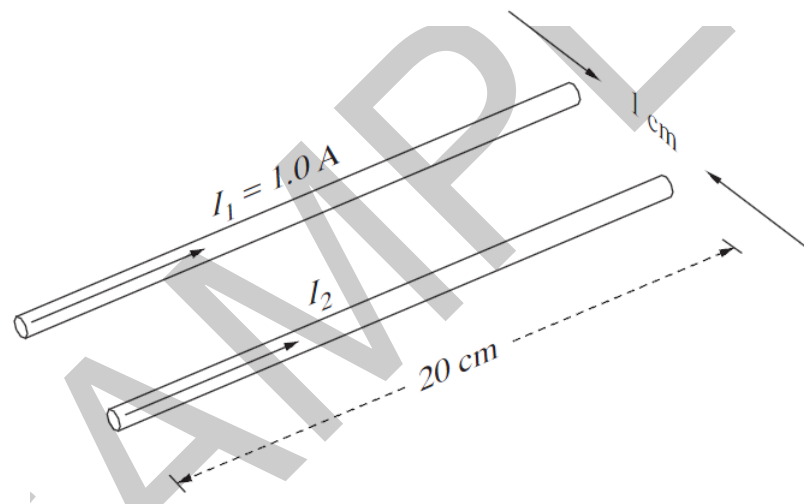
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★ 2.5 A ★

5. Using the right-hand palm rule, determine the direction of the force acting on the current-carrying wire placed in a magnetic field in each of the following diagrams. 4



6. (a) Calculate the force between the two parallel conductors below, given that  $I_1 = 1.0 \text{ A}$  and  $I_2 = 2 \text{ A}$ . 2



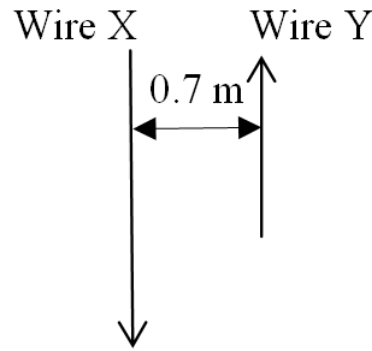
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★  $8 \times 10^{-6} \text{ N}$  attractive ★

- (b) Two parallel wires are separated by a distance of 0.7 m. Wire X carries a current of 2 A and is considered infinitely long. Wire Y carries a current of 10 A and is 3 m long. The direction of the current in each wire is shown below. 2



Calculate the magnitude and direction of the force that exists between the two wires.

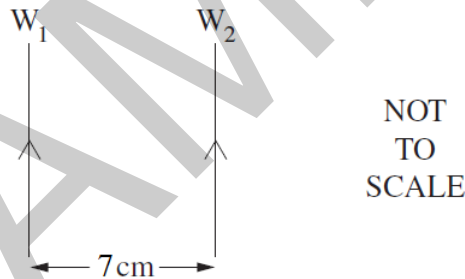
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★  $1.7 \times 10^{-5}$  N repulsive ★

7. Two identical wires,  $W_1$  and  $W_2$ , each 3 m in length, are orientated as shown. They carry identical currents in the direction indicated.



- (a) Identify the direction of the force  $W_2$  experiences as a result of the current in  $W_1$ . 1

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- (b) Calculate the current in each wire, given that the wires experience a force of  $5.0 \times 10^{-4}$  N. 2

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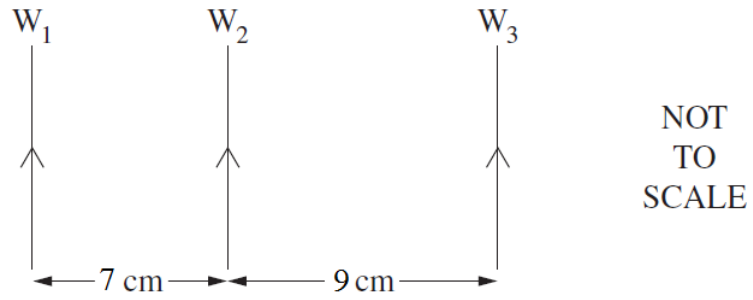
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★ 7.64 A ★

- (c) A third wire,  $W_3$ , carries a current of 3 A. Calculate the net force on  $W_2$  due to  $W_1$  and  $W_3$ . 3



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★  $3.47 \times 10^{-4}$  N left ★

SAMPLE