S.H.E: Electromagnetism

Problems Worksheet

1. Logan was preparing to hang a picture frame on a brick wall by using a cordless drill to bore a hole into the wall. While drilling the drill bit got stuck in the wall, stopping the motor from rotating. The drill motor started to get very hot.

   a. Explain why under normal operation the drill motor does not get as hot.

   b. Explain why the drill got hot after it got stuck.

2. Explain why an electric motor has a maximum rotation speed even in the case of a frictionless system.

3. A DC electric motor is made up of 250 coils with a total resistance of 24.0 Ω. It is powered by an 8.00 V emf source and has a 0.800 T magnetic flux. While under load the motor has a 5.00 V rms back emf.

    a. Based on the dimensions of the motor shown below, calculate the torque of the motor.

5.50 cm

12.0 cm
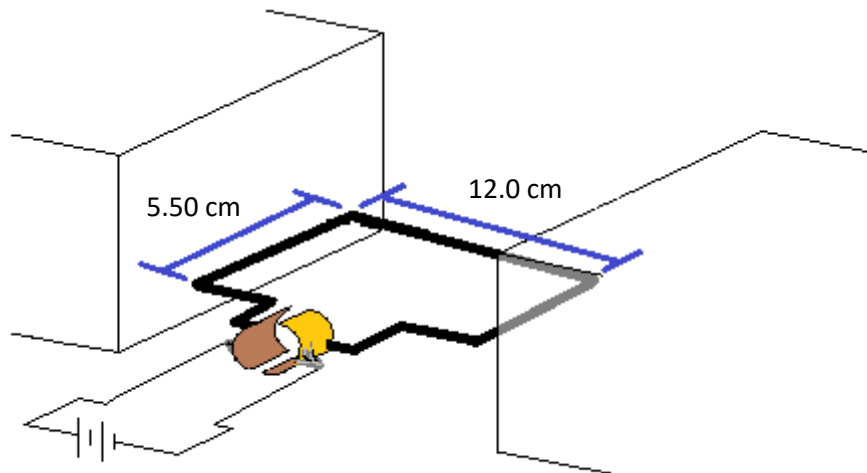
    b. When the load of the motor is suddenly removed, describe what happens to the value of the back emf.

4. An electric car was cruising while the motor was operating at 1200 rpm when supplied with a 25.0 A current that produced 84.4 Nm of torque. When the driver lightly tapped the brake pedal the car shifted into regenerative braking mode.

    a. Describe two benefits of regenerative braking.

    b. What is the rms voltage produced by the motor when it first enters regenerative braking mode?

5. Induction cook tops are an application of our understanding of the interaction between electricity and magnetism. For each of the **features** of the following parts of an induction cook top given below, describe how it is beneficial in induction cook tops.

    a. **High frequency** current in a solenoid

    b. **Iron** saucepan

    c. **Ceramic** surface of stove