

Eddy Currents 2 – Lesson Outline

Syllabus Reference

- 9.3.2.2.7 – explain the production of eddy currents in terms of Lenz's Law.
- 9.3.2.3.4 – gather secondary information to identify how eddy currents have been utilised in electromagnetic braking.

Resources

Video: Jumping Rings
<http://www.hscphysics.edu.au/resource/JumpingExplained.flv>

Video: Different Jumping Rings
<http://www.hscphysics.edu.au/resource/gzsod0ma0rjmczvi>

Video: Cold Jumping Rings
<http://www.hscphysics.edu.au/resource/sofrbwr4pkwr9ik7>

Video: Double Jumping Rings
<http://www.hscphysics.edu.au/resource/rwf4n51t9svml0y2>

Pre-video Activities

Pre-video Activity: Jumping Rings Activity Sheet. Students are to complete the activity sheet individually.

Because of the content of this topic, the Eddy Currents Lesson Outline would prove useful for the lead-up lesson.

View Video

Video: Jumping Rings
<http://www.hscphysics.edu.au/resource/JumpingExplained.flv>

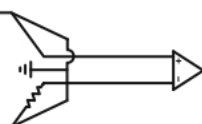
Activities

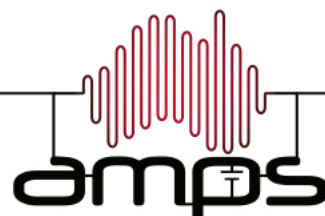
Split students into pairs. Hand out butcher's paper and markers. Students draw a diagram of the set-up of the Jumping rings. In different colours, add the magnetic field lines, the conventional current in the electromagnet, the induced eddy current, and the induced magnetic pole.

Students then label each diagram drawn with the physical law, i.e. the induced current is labelled with "Faraday's Law" and the direction of the current is labelled "Lenz's Law".

View Video

Video: Different Jumping Rings
<http://www.hscphysics.edu.au/resource/gzsod0ma0rjmczvi>





Activities

Student draw diagrams of the four different rings. This time they also draw the difference in the eddy currents that are induced. The thicker rings should have a greater eddy current travelling through it- the rings with slits should have very small eddy currents.

Lead a class discussion with the following questions:

How does the material of the rings affect the creation of eddy currents?

Are eddy current being produced in the slit-rings?

Why is the induced magnetic field so small when slit-rings are used?

View Video

Video: Cold Jumping Rings

<http://www.hscphysics.edu.au/resource/sofrbwr4pkwr9ik7>

Activities

Students discuss in small groups the physical reasons why reducing the temperature of the metal decreases its resistance and why this leads the rings to jump higher. In groups, student's answer the question: What happens to the rings if temperature is increased?

View Video

Video: Double Jumping Rings

<http://www.hscphysics.edu.au/resource/rwf4n51t9svml0y2>

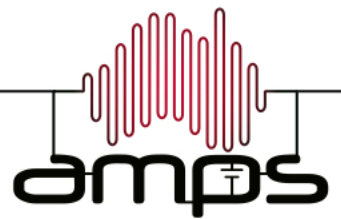
Activities

Students work in groups with butcher's paper and markers. Students can be given butchers paper to develop concept maps to explain what might be happening.

Each group should present their work to the rest of the class. Encourage class discussion and questioning. Teacher collates all groups' responses on board or screen. Ensure different group members are presenting findings to class.

Post-video Activities

As a summary or homework activity ask the students to write a hypothetical explanation of the jumping rings to a Year 11 student (keeping in mind the background knowledge such a student would possess).



Eddy Currents 2

Pre-Video Worksheet

Fill in the blanks with the words provided below:

electromotive change direction eddy opposes magnetic changing heat conductors circular

Electromagnetic induction is a phenomenon in which _____ fields 'create' electric currents in _____. It is based on two principles; Faraday's Law and Lenz's Law.

Faraday's law states that _____ magnetic fields induce an _____ force (which then creates a current in a conductor).

Lenz's law states the _____ that an induced current flows in a conductor – which is a direction such that it _____ the _____ that caused it.

_____ currents are a form of _____ induced currents, which often cause energy losses through _____ generation.

Match the change to its induced current and the induced magnetic field:

CHANGE	INDUCED CURRENT	INDUCED MAGNETIC FIELD