

13.3 Induced Currents and Magnetic Forces

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

KEY WORDS eddy currents 涡电流 • retarding force 阻碍力 • induced current 感应电流
• lenz's law 楞次定律

Objective

Build the skills to answer exam questions on **induced currents and magnetic forces**.**You must be able to:**

- determine the direction and size of a current **induced** by a changing flux
- explain why an induced current creates a **retarding force** 阻碍力
- analyse the energy transfer (mechanical → electrical → thermal)
- describe **eddy currents** 涡电流

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Induced current and retarding force

A changing flux drives an induced current whose direction (Lenz's law) **opposes** the change. In a moving conductor this makes a force that **resists** the motion.

■ Energy transfer

To keep the conductor moving you must do **work**; that mechanical energy becomes electrical energy, then thermal energy in the resistance.

■ Eddy currents

In a solid conductor, a changing flux drives swirling **eddy currents** — used in magnetic braking, and a cause of heating in transformer cores.

2 Practice

2.1 State the rule that gives the direction of an induced current. [1]

2.2 Explain why an induced current opposes the motion that produces it. [2]

2.3 Name the swirling induced currents in a solid conductor. [1]

3 Exam-style questions

3.1 An induced current always opposes the [1]

A	B
C	D

A applied voltage**B** change that produces it**C** resistance of the wire**D** shape of the wire

3.2 Eddy currents are used in [1]

A	B
C	D

A light bulbs**B** magnetic braking**C** batteries**D** fixed resistors

3.3 A metal loop is pulled out of a magnetic field region.

(a) State whether a current is induced in the loop. [1]

(b) State the direction of the magnetic force on the loop relative to its motion. [1]

(c) Describe the energy transfer as the loop is pulled out. [2]