Motors and loudspeakers: two applications

Student activity • observation and reasoning

YEAR 11 / LESSON 83 / PHYSICS + SCIENCE (DOUBLE AWARD)

The question

Why does one device rotate while another vibrates?

Inspect an unpowered educational motor and loudspeaker, then use diagrams to explain their different motion.

Equipment

- Unpowered educational motor model and loudspeaker model
- Original coil diagrams, booklet and ruler

Keep both models disconnected throughout. Do not dismantle speakers or touch sharp frames or exposed moving parts. Staff position the models. Keep magnets away from sensitive devices; offer diagrams. No loud sound or exposed powered rotor is used.

Course coverage: Shared Physics / Double Award: 6.12–6.14. Motor and loudspeaker applications of magnetic force.

Plan, model or apparatus sketch

Draw labelled magnetic-field, current and force arrows where relevant.

Method and reasoning

Read the whole sequence before starting

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1. Inspect a disconnected educational motor model and a disconnected loudspeaker model. Staff identify the coil, permanent magnet, supports and electrical connections without dismantling equipment.

2. Draw a rectangular motor coil in a field. Mark current in the two sides and use the left-hand rule to predict opposite forces and a turning effect.

3. Use a paper sequence of half-turns to explain how a split-ring commutator reverses current in the coil every half-turn so the turning effect continues in the same rotational sense.

4. Draw the loudspeaker coil in its magnetic gap attached to the cone. Show how alternating current gives alternating force and cone motion rather than continuous rotation.

5. Compare the effect of changing a loudspeaker signal’s frequency with changing its amplitude within normal operating limits. Link frequency to pitch and cone vibration amplitude to sound level qualitatively.

6. Complete a comparison of input, force, moving part and output. Distinguish the motor’s split-ring contacts from the loudspeaker’s fixed lead connections.

Cleanup

- Return diagrams and store disconnected models.

Record your evidence

Blank spaces are for your own work

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Reference and task data

This is an unpowered observation and model lesson. A motor converts electrical energy to mechanical motion with losses; a loudspeaker transfers electrical energy into cone motion and sound with losses. No efficiency measurements are implied.

Feature	Motor	Loudspeaker
Coil motion		
Current change		
Force action		
Useful output		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Why do opposite sides of a motor coil experience opposite forces?

2. What does the split ring change every half-turn?

3. Why is a split ring useful?

4. What reverses loudspeaker force?

5. Which signal property principally changes pitch?

6. Why is a loudspeaker not simply a rotating motor?