

## Grade 8 Natural Science Worksheet

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### Energy transfers

#### Part One: The transfer of kinetic energy

This is a simple demonstration to illustrate how mechanical or kinetic energy can be transferred from one object to another.

*You will need:*

A smooth surface such as a table top

A ruler

2 one rand coins

1 ten cent coin

1 two rand coin

*What to do:*

1. Place the two one rand coins side by side on the table.
2. Place one end of the ruler in line with, but about 3 cm away from one of the coins, with one end resting on the table. Hold the other end of the ruler in your hand so that it is at an angle of about  $45^\circ$ .
3. Place the two rand coin on the ruler, about half way up.
4. Let the two rand coin go.
5. What happens? [2]
6. Repeat the procedure, this time letting the ten cent coin strike the other one rand coin.
7. What happens? [2]
8. Explain the differences in the resulting action of the two coins.  
[6]
9. Explain the action of the coins in terms of kinetic and potential energy and energy transfer.  
[10]

[20 marks]

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### **Part Two: Make a paddle boat**

This activity demonstrates how potential energy can be stored and transferred to kinetic energy, resulting in the movement of an object.

How about making this paddle boat?

*You will need:*

2 clean, empty 1 litre milk cartons

An elastic band

2 long pencils

A pair of scissors

A ruler

*What to do:*

1. Use the scissors to make a small hole on one side of one of the milk cartons, about 3 cm from the bottom. Make a similar hole on the opposite side of the carton. The holes should be large enough to slip the pencils into.
2. Poke a pencil, point first, into each hole. About 5 cm of the pencil should go into the hole.
3. Hold the pencil ends to point towards the bottom of the carton. Wrap an elastic band across the ends of the pencils as they protrude out of the bottom of the carton – like legs for the carton.
4. Cut a rectangle from the other milk carton, big enough to fit between the pencils.
5. Place the cardboard in the middle of the elastic band and wind it away from the milk carton.
6. Hold the twisted band and place the milk carton boat in a bath of water or in a river/pond. Let the elastic band go.

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Explain how it is that the carton-boat moves forward. Make sure you talk about how the energy is transferred.

[8]

Your teacher will examine your boat to see how it has been constructed and will award marks for how well you have followed the instructions and how well your boat works.

[7]

[15 marks]

### Part Three: Write a paragraph

Look at the list of words below:

Radio	Radio signal/radio waves
Batteries	Wires
Tuner	Amplifier
Speaker	Vibrate
Air	Sound
Eardrums	Brain

Use the words listed above to write a short paragraph explaining the energy transfers which take place from the time you switch on your battery-operated radio, listen to a song, to the time you turn the radio off.

[20 marks]

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### Suggested Solutions

Question number	Possible marks	Solution
1	20	<p>5. The two rand coin slides down the ruler and strikes the one rand coin. ✓            ✓ The one rand coin moves forward. ✓ [2]</p> <p>7. The ten cent coin slides down the ruler and strikes the one rand coin. ✓            ✓ The one rand coin moves forward. ✓ [2]</p> <p>8. The two rand coin caused the one rand coin to move forward much further than did the ten cent coin. ✓✓ The lighter coin (ten cent coin) has a lower mass ✓ and is able to impart less energy ✓ (hence movement) ✓ than the heavier two rand coin. ✓ [6]</p> <p>9. The non-moving one rand coins each possess potential energy. ✓✓ The moving two rand and ten cent coins have kinetic energy as they slide down the ruler. ✓✓ As they hit the one rand coins, they transfer their energy to the one rand coins, ✓✓ and these coins now have kinetic energy. ✓✓ The coin which was hit by the ten cent coin has less kinetic energy than the coin hit by the two rand coin. ✓✓ [10]</p>
2	15	<p>As the piece of cardboard was turned around and around, the elastic band was wound up. ✓ The elastic band was moved – kinetic energy. ✓ Because the elastic band was kept motionless ✓ (you held it still while you placed the boat into the water), the energy was in the form of potential energy. ✓ As you released the elastic band, it unwound. ✓ This caused the cardboard to flip round and round quickly. ✓ As the cardboard turns, it creates a wheel-like motion which pushes the water backwards and propels the boat forward ✓ – the potential energy has been transferred to kinetic energy. ✓✓ [8]</p> <p>Award marks for construction of boat according to instructions. [7]</p>
3	20	<p>In your radio, there are wires ✓ which connect the batteries ✓ to the tuner. ✓ When you turn your radio on, ✓ the energy from the batteries ✓ (chemical energy) ✓ is transferred into electrical energy ✓ which uses the electrical wires to allow the tuner to receive radio signals from the air (radiant energy) ✓. Other wires are connected from the tuner to the amplifier. ✓ The amplifier amplifies the signal (or makes it stronger). ✓ More electrical wires connect the amplifier to the speaker. ✓ These wires transfer energy from the amplifier to the speaker. ✓ The connection is along electrical wires. This electrical energy causes the speakers to vibrate (kinetic energy). ✓ This vibration is transferred to the air. ✓ The air also starts to vibrate. ✓ It vibrates according to a certain pattern set up by the vibrating speaker. This is sound (radiant energy). ✓ Our ear</p>

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		<p>drums also vibrate and the kinetic energy of the vibration (movement) is ✓ converted once again into electrical energy, ✓ as the nerve impulse travels to our brain. ✓ Our brains interpret the nerve impulse as music. ✓ We hear a song! When we turn off the radio, we push a switch which breaks the electrical circuit. ✓ Energy can no longer be transferred by the electric current in the wires from the battery to the tuner. No energy is transferred – we hear no more sound. ✓</p>
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