School:	Centre No:
Name:	
Deadline Date:	
Assessor's Name:	

Assignment 2.1: Investigating energy transformations

In this assessment you will have opportunities to provide evidence for the following criteria:

Criteria reference	To achieve the criteria the evidence must show that the student is able to:	Task
P1	Carry out practical investigations that demonstrate how various types of energy can be transformed	**1a**
P2	Calculate the efficiency of energy transformations	**1b**
M1	Describe the energy transformations and the efficiency of the transformation process in these investigations	**2a, 2b**
D1	Explain how energy losses due to energy transformations in the home or workplace can be minimised to reduce the impact on the environment	**3**

Scenario

You are working for a company that designs buildings for large sporting events, and is involved in the design of venues for the 2012 London Olympics. You have been asked to produce information for new employees to explain energy transformations and energy efficiency.

Resources

You will need: large sheets of paper, coloured pens, Student Book pages 38−47, Help Sheets 1 and 2, calculator, ruler, Internet access, lab equipment for the investigations.

Portfolio of evidence

You will need to hand in the following:

For P1 and P2:
- Task sheet 1.1
- Task sheet 1.2

For M1:
- Your poster showing energy transformations as block diagrams
- Task sheet 2

For D1:
- Your leaflet explaining how to reduce energy losses

Assessor summary feedback

Internal verifier feedback

Student declaration

I certify that the work submitted for this assignment is my own.

Student signature:	Date:
Assessor signature:	Verifier signature:

Task 1a

This provides evidence for P1

You need to identify the energy transformations that occur in the items of equipment displayed in the lab.

Fill in the table on **Task Sheet 1.1.**

Task 1b

This provides evidence for P2

You are now finding out about the efficiency of energy transformations. You carry out an investigation into the efficiency of light bulbs.

Use **Task Sheet 1.2** to help with the method and to write up your results.

You need to advise your company on the use of energy-efficient equipment. To do this, answer the questions at the end of the Task Sheet. These ask you to calculate the efficiency of different types of equipment.

Task 2a

This provides evidence for M1

You are now asked to produce a poster that clearly explains the energy transformations in some common equipment.

You need to try out some items of equipment and decide what type of energy goes in and what type(s) of energy is/are output.

Use **Help Sheet 1**.

Now prepare a poster, showing the energy transformations as block diagrams.

Task 2b

This provides evidence for M1

You now need to investigate one energy transformation in detail. Since your company designs sporting venues, you are going to find out which type of flooring is best for ball sports. You need to investigate and report on how efficiently a ball bounces on different surfaces.

When a ball bounces from the floor, some energy is lost so it doesn't bounce back up to its original height. The height that it bounces up to is a measure of the efficiency of the energy transformation:

potential energy → kinetic energy → potential energy

Use **Task Sheet 2**.

Task 3

This provides evidence for D1

The Olympic Games in 2012 will be a major sporting event. Even before the Games start, there is an enormous impact on the environment. New sporting venues, travel links and Olympic villages for accommodation are being built. Your company is involved with this.

You need to work in a group to produce some leaflets. These need to inform staff of your company, so that they can make the best choices to reduce the impact of these developments on the environment. You need to consider energy use and energy wastage. Think about what you learnt earlier about efficiency and energy transfers. Suggest how energy losses can be reduced and explain how this will reduce the environmental impact.

A leaflet could look at, for example:

- methods of transporting large numbers of people to venues
- ways a building or stadium can be designed to reduce electricity use
- ways that quantities of waste from catering can be reduced.

If you are looking at reducing heating costs or air-conditioning costs (remember the Olympics will be in the summer), you will need to consider how to reduce/increase heat transfers. **Help Sheet 2** may help you.

You should suggest options and recommend which is the best.

Your group should produce at least two leaflets, each looking at a different way of reducing the environmental impact of the Olympics.

P1
(part)

Task Sheet 1.1

Demonstrating energy transformations

Try out the equipment displayed around the room.

Match each piece of equipment with the energy transformations in the table.

Energy transfer	**Equipment**
electricity → light	
chemical → electricity → sound	
potential (elastic) → sound	
potential (gravitational) → kinetic	
electrical → thermal	
chemical → light and thermal	
electrical → kinetic and sound	
electrical → light and sound	
light → electrical → kinetic	

Task Sheet 1.2

Calculating efficiency

P2 (part)

Some types of light bulb are more efficient than others. Investigate each bulb that your teacher has set out.

1 Write down the power of the bulb. This is the 'wattage', which you can find out from the spare bulb or its packaging.

Care: Do not touch the bulbs that are in the lamps – they get very hot.

2 Use the light meter to measure the amount of light given out by the bulb about 25 cm away from the bulb. The distance between the light meter and the bulb should be the same for each bulb you are testing. Write this down.

3 One way to compare the efficiency of the bulbs is to calculate the amount of light produced per watt of electrical power. Divide the amount of light by the bulb's wattage. The most efficient bulbs produce most light per watt.

4 Write your results in the table on the next sheet. Add any other comments, e.g. whether the bulbs seems to be giving out a lot of heat, whether the light is directional like a spotlight or spread out, any difference in the colour of the light.

5 You need to advise your company on the use of energy-efficient equipment. To do this, you need to calculate the efficiency of different types of equipment. Answer the questions on the next sheet. Write your answers on a separate sheet of paper and attach it.

P2
(part)

Task Sheet 1.2

continued

Results

Type of bulb	Wattage	Amount of light	Amount of light per watt	Other comments

The light meter was _____ cm from the bulb each time.

Questions

1 A filament bulb uses 100 J of electrical energy per second. It produces 4 J per second of light energy. A fluorescent bulb uses 50 J of electrical energy per second. It produces 10 J per second of light energy.

Calculate the efficiency of each of these light bulbs. Explain which type should be used.

2 A fan heater uses 1000 J of electrical energy per second. It produces 950 J per second of thermal energy. A bar heater uses 850 J of electrical energy per second. It produces 820 J per second of thermal energy.

Calculate the efficiency of each of these heaters. Explain which type should be used.

M1
(part)

Task Sheet 2

Investigating the efficiency of energy transformations

When a ball is dropped from a height, bounces off the floor and rebounds, the energy transformation is:

gravitational potential energy → kinetic energy → gravitational potential energy

But the ball does not reach its original height. This is because some energy is lost when the ball hits the floor. Gravitational potential energy (GPE) is proportional to height. So you can compare GPE after the bounce with GPE before the bounce by comparing the heights:

Efficiency = GPE after the bounce ÷ GPE before the bounce

= height after bounce ÷ height before bounce

Investigate the best surface for ball sports. Try out three different surfaces.

One of you holds a metre rule vertically and drops the ball from a height of 1 metre. The other person kneels down and estimates the height of the rebound.

	Height before bounce	**Height after bounce**	**Efficiency**			
Surface 1						
Surface 2						
Surface 3						

What can you do to improve the reliability of your data?

Write a short report of your conclusions on a separate piece of paper and attach it.

Help Sheet 1

Describing energy transformations

M1 (part)

You need to prepare a poster suitable for employee training. The poster should describe three different energy transformations, using block diagrams.

First look at the equipment in the room and use this table to write down the input energy form and output energy form(s) for three items.

Equipment	Input energy form	Output energy form(s)

Now draw each energy transformation as a block diagram on your poster.
For example:

Energy transformation for a lamp

Artwork <A2.1_HS1_AW1>

Artwork <A2.

Help Sheet 2

Controlling heat transfer

D1 (part)

Type of heat transfer	How it takes place	How you can alter the amount of heat transfer	How to reduce heat transfer	How to increase heat transfer
Conduction	When part of a solid is heated, particles vibrate, passing on heat to their neighbours	The choice of materials	Use insulators such as wood, plastic, and those with trapped air pockets	Use good heat conductors such as metals
Convection	Warm regions of a gas or liquid become less dense and move upwards to cooler regions	Whether you heat or cool the fluid from the top or from the bottom	Stop the movement of gases or liquids, e.g. by blocking draughts	Set up convection currents, e.g. by heating gas or liquid from the bottom, or by providing a draught
Thermal radiation	Energy waves travel through space from the surface of hot objects, e.g. the Sun	The choice of colour	Make surfaces light coloured or shiny	Make surfaces dark coloured and dull

Assignment 2.1 Investigating energy transformations

Task Checklist

Scenario

You are working for a company that designs buildings for large sporting events, and is involved in the design of venues for the 2012 London Olympics. You have been asked to produce information for new employees to explain energy transformations and energy efficiency.

Task and Portfolio of Evidence	**Student Tick when completed**	**Teacher Tick when marked**	**Teacher Feedback**
Task 1a: Identify energy transformations Provides evidence for P1			
Task sheet TS1.1: Demonstrating energy transformations			
Task 1b: Carry out an investigation into the efficiency of light bulbs Provides evidence for P2			
Task sheet TS1.2: Calculating efficiency			

Checklist Assignment 2.1 (continued)

Task and Portfolio of Evidence	**Student Tick when completed**	**Teacher Tick when marked**	**Teacher Feedback**
Task 2a: Produce a poster that explains energy transformations in some common equipment Provides evidence for M1			
Poster showing energy transformations			
Task 2b: Investigate one energy transformation in detail Provides evidence for M1			
Task sheet TS2: Investigating the efficiency of energy transformations			
Task 3: Produce at least two leaflets each looking at a different way of reducing the environmental impact of the Olympics Provides evidence for D1			
Leaflet prepared in groups			

Student feedback

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