Energy

1.

Complete the following **energy transfer diagrams**. The first one has been done for you.

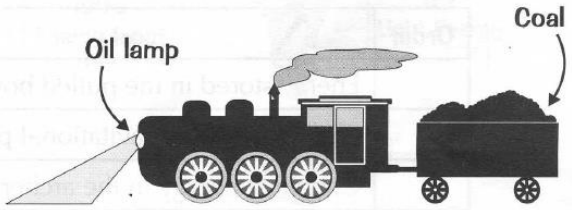
A solar water heating panel: light energy → heat energy

a) A gas cooker: ..... → heat and light energy

b) An electric buzzer: electrical energy → .....

2.

The diagram shows a **steam locomotive**.



a) What form(s) of energy are there in the:

i) coal .....

ii) hot steam (which powers the engine) .....

b) Describe two **energy transfers** which take place on the locomotive.

1.....

2.....

3.

Each of the following sentences is incorrect. Write a correct version of each one.

a) In a battery-powered torch, the battery transfers **electrical energy** into **light energy**.

.....

b) A **wind turbine** transfers **kinetic energy** into **electrical energy** only.

.....

c) A wind-up toy car transfers **chemical energy** into **kinetic energy** and **sound energy**.

.....

4.

Write down the name of an appliance which transfers:

a) electrical energy into **sound energy** .....

b) light energy into **electrical energy** .....

c) electrical energy into **heat** and **kinetic energy** .....

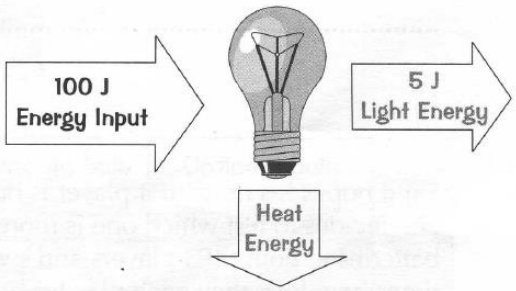
5.

Here is an **energy flow diagram** for an electric lamp. Complete the following sentences.

a) The **total energy input** is ..... J

b) The **useful energy output** is ..... J

c) The amount of energy **wasted** is ..... J



6.

Complete the table below.

Appliance	Total Energy Input (J)	Useful Energy Output (J)	Efficiency
1	2000	1500	
2		2000	0.50
3	4000		0.25

7.

A kettle has a power rating of 2000 W.
If it's 90% efficient, calculate its useful power output.

.....

.....

.....

8.

Clive is researching different kinds of electric light bulb.
He finds the following information.

	Low-energy bulb	Ordinary bulb
Electrical energy input per second (J)	15	60
Light energy output per second (J)	1.4	1.4
Cost	£3.50	50p
Typical expected lifetime	8 years	1 year
Estimated annual running cost	£1.00	£4.00

a) Write down two reasons for choosing a **low-energy** light bulb.

b) Write down two reasons why Clive might prefer to buy an ordinary bulb.

9.

A skateboarder has a mass of 65kg and moves down a ramp at a speed of 4m/s.

Calculate the kinetic energy store of the skateboarder.

10.

A garden snail has a mass of 0.04kg and travels at a speed of 0.03m/s.

Calculate the kinetic energy store of the snail.

11.

A ball has a kinetic energy store of 50J and moves at a speed of 5m/s.

Calculate the mass of the ball.

12.

An aeroplane has a kinetic energy store of 851kJ and travels at a speed of 80m/s.

Calculate the mass of the aeroplane.

Give your answer to three significant figures.

13.

A bungee jumper with a mass of 64kg has a kinetic energy store of 7600J.

Calculate the speed the jumper falls at.

Give your answer to three significant figures.

14.

A cheetah with a mass of 88kg has a kinetic energy store of 34 496J while chasing its prey.

Calculate the speed that the cheetah is running at.

15.

At an archery competition, a 300g arrow has struck the target and is suspended 0.9m above the ground. The gravitational field strength is 9.8N/kg.

Calculate the gravitational potential energy store of the arrow.

16.

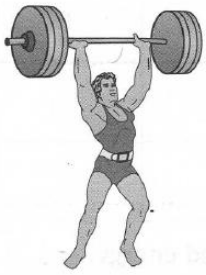
A rider with a mass of 70kg has a gravitational potential store of 1260J while sat on their horse. The gravitational field strength is 9.8N/kg.

Calculate the height the rider is sat at.

17.

A student drops a piece of apparatus with a mass of 5kg from a height of 2m to the floor. What is the change of potential energy?

18.



Bruce is practising weightlifting.

a) When Bruce holds the bar still, above his head, what kind of energy does the weight have?

.....

b)

When Bruce lets go of the weight, what happens to its energy?

.....

19.

When an archer shoots an arrow into the air several **energy transfers** take place.
The table below shows these transformations, but in the wrong order.
Number the energy transformations from 1 to 5 to show the correct order.

Order	Energy transfers
	Energy stored in the pulled bow and string is transferred into kinetic energy.
	The arrow loses gravitational potential energy and gains kinetic energy as it falls to earth.
	Chemical energy in the archer's muscles is transferred into elastic potential energy.
1	Chemical energy from the archer's food is stored in his muscles.
	As it goes upwards the arrow loses kinetic energy and gains gravitational potential energy.

20.

Tina was investigating a model **winch** —
a machine that uses an electric motor to lift objects.

Tina calculated that, in theory, **10 J** of electrical energy would be needed to lift a **boot** 50 cm off a table. She then tried lifting the boot with the winch, and found that, actually, **20 J** of electrical energy was used.

Why did the winch use so much more electrical energy in practice?
In your answer, include an explanation of what happened to the 'extra' 10 joules.