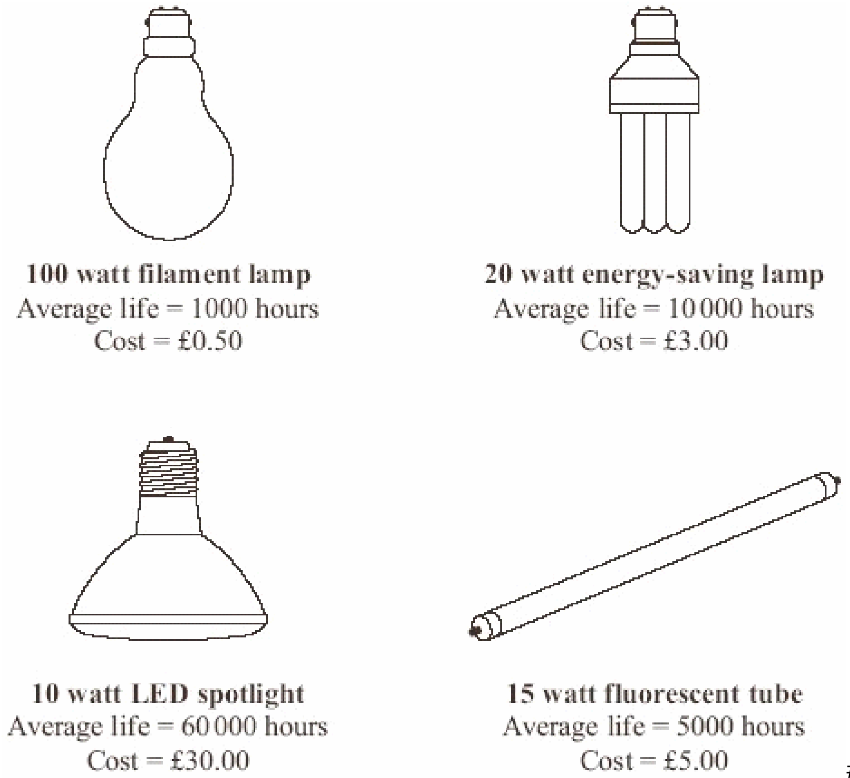
Energy transfers and efficiency

1. The diagram shows information about four types of electric lamp.

Each lamp produces the same amount of light energy in the same time.



###

(a) Which lamp is the most efficient?

1 100 watt filament lamp

2 20 watt energy-saving lamp

3 10 watt LED spotlight

4 15 watt fluorescent tube

(b) Which lamp would get the hottest when it is working?

1 100 watt filament lamp

2 20 watt energy-saving lamp

3 10 watt LED spotlight

4 15 watt fluorescent tube

(c) Which lamp would be the cheapest to run for 1000 hours?

1 100 watt filament lamp

2 20 watt energy-saving lamp

3 10 watt LED spotlight

4 15 watt fluorescent tube

Copyright © 2010 AQA and its licensors. All rights reserved.

(d) You want a lamp that will provide light for 60 000 hours. You realise that you may have to buy more than one lamp to last this long.

Which type of lamp would work out the cheapest to buy?

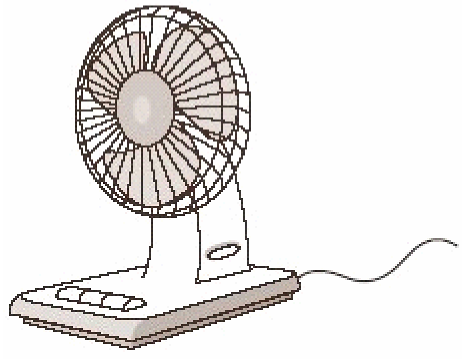
1 100 watt filament lamp

2 20 watt energy-saving lamp

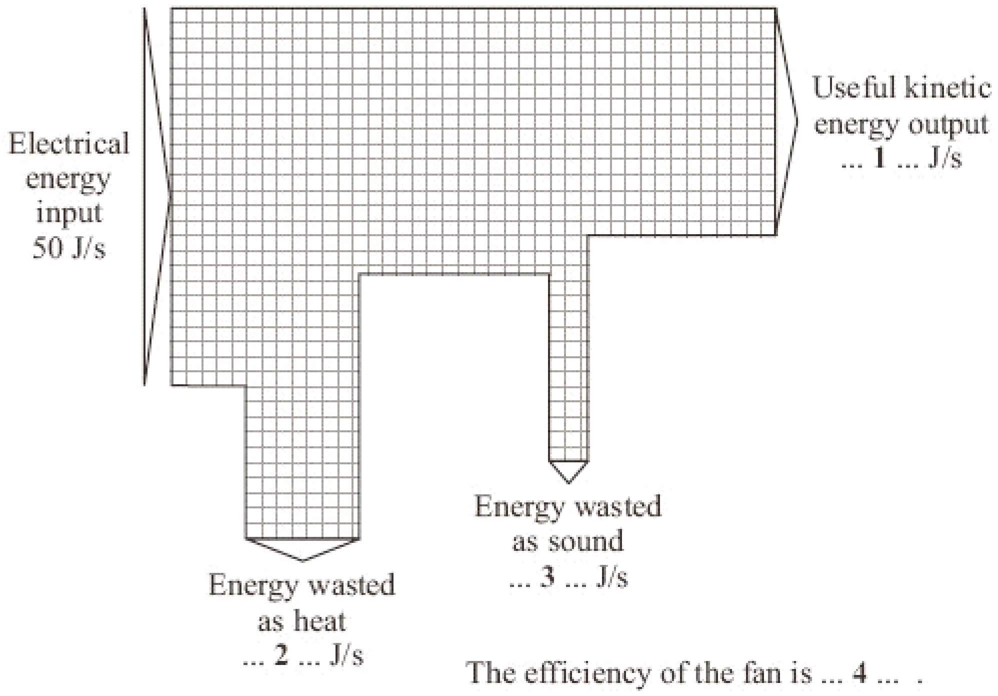
3 10 watt LED spotlight

4 15 watt fluorescent tube

2. The diagram shows an electric fan.



The Sankey diagram gives the energy transformations for the fan.



$$\text{efficiency} = \frac{\text{useful energy transferred by device}}{\text{total energy supplied to device}}$$

Copyright © 2010 AQA and its licensors. All rights reserved.

Match numbers, **A**, **B**, **C** and **D**, with the labels **1 – 4** on the Sankey diagram.

A 0.6

B 5

C 15

D 30

3. Some students investigated how effective three different devices were at drying things. They added water to a paper towel until the mass of the paper towel was 45.6 g. They then hung the paper towel in front of one of the devices. After five minutes, they measured the mass of the paper towel again.

The test was carried out three times and the mean mass calculated. The whole procedure was repeated with the other devices, using identical paper towels.

Their results are shown below.

		Mass after 5 minutes in grams			
Device used	**Mass at start in grams**	**1st test**	**2nd test**	**3rd test**	**Mean**
No device	45.6	45.5	45.4	45.6	45.5
Hand held mini fan	45.6	45.4	45.2	45.3	45.3
Hair dryer	45.6	41.2	41.0	41.1	41.1
Desk fan	45.6	43.7	43.6	43.8	43.7

(a) The size of the paper towels, their mass at the start and the distance of the dryer from the towels are . . .

1 independent variables.

2 dependent variables.

3 control variables.

4 discrete variables.

(b) The tests are repeated to . . .

1 check for systematic errors.

2 improve the reliability of the experiment.

3 see if the devices have an effect.

4 improve the precision of the tests.

(c) The students calculated the mean mass of water lost at the end of five minutes for each device.

To show which device was best at drying the towels, the students should plot . . .

1 a line graph of the mean mass of water lost against the device used.

2 a bar chart of the mean mass of water lost against the time.

3 a bar chart of the mean mass of water lost against the device used.

4 a line graph of the mean mass of water lost against the time.

Copyright © 2010 AQA and its licensors. All rights reserved.
exampro EXTRA ONLINE AQA

(d) The results show that the device that dried the paper towels best was . . .

1 the hair dryer because the mean mass of water lost after five minutes was highest.

2 the hair dryer because it produces hot air.

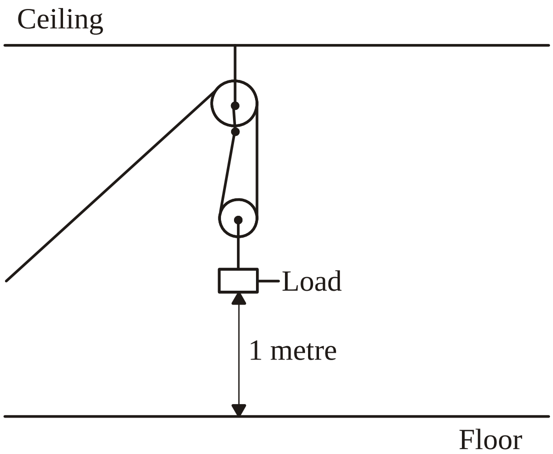
3 the desk fan because it had the largest fan blades.

4 the hand held mini fan because the mean mass of water lost after five minutes was lowest.

4. In each part choose only **one** answer.

A student investigated a pulley system used to lift different loads. The student calculated the useful energy transferred by the pulley system for each load as it was lifted one metre. She then calculated the efficiency of the pulley system using the following equation.

$$\text{efficiency} = \frac{\text{useful energy transferred by the pulley system}}{\text{total energy supplied to the pulley system}}$$



The table shows the student's results.

Useful energy transferred by the pulley system (in J)	Total energy supplied to the pulley system (in J)	Calculated efficiency
1.00	3.33	0.30
2.00	4.16	0.48
3.00	5.00	
4.00	5.05	0.79
5.00	6.25	0.80

A What was the efficiency when the useful energy transferred by the pulley system was 3 J?

1 0.15

2 0.167

3 0.60

4 1.67

Copyright © 2010 AQA and its licensors. All rights reserved.
exampro EXTRA ONLINE AQA

B Which value of total energy supplied to the pulley system is probably anomalous?

1 3.33 J

2 4.16 J

3 5.05 J

4 6.25 J

C Using both your knowledge and the data in the table, suggest what would happen to the efficiency of the pulley system if the energy supplied continued to increase.

The efficiency would eventually . . .

1 exceed 1.00.

2 reach a maximum.

3 begin to decrease.

4 increase, then begin to decrease.

D The difference between the useful energy transferred by the pulley system and the total energy supplied to the pulley system is called the . . .

1 effective energy.

2 transferred energy.

3 transformed energy.

4 wasted energy.

Copyright © 2010 AQA and its licensors. All rights reserved.
exampro EXTRA ONLINE AQA