Effeciency and Reducing Unwanted Energy 4

Q:1 This question is about an electric kettle which is used to boil some water.

$$\text{efficiency} = \frac{\text{useful energy transferred by device}}{\text{total energy supplied to device}}$$
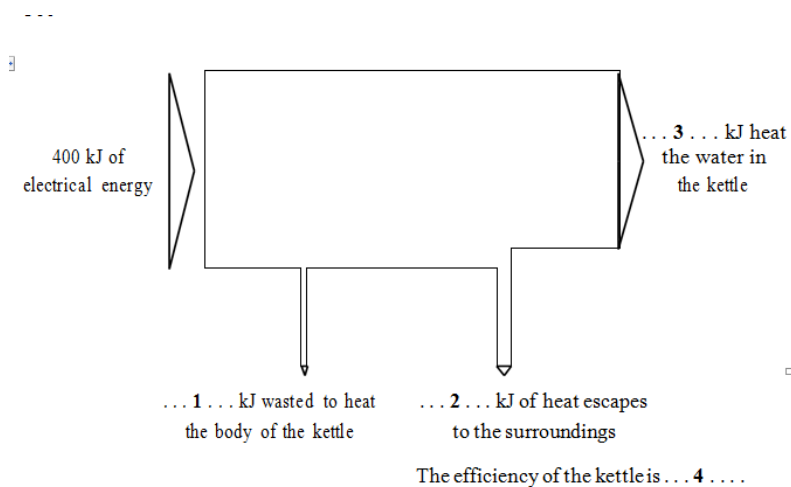
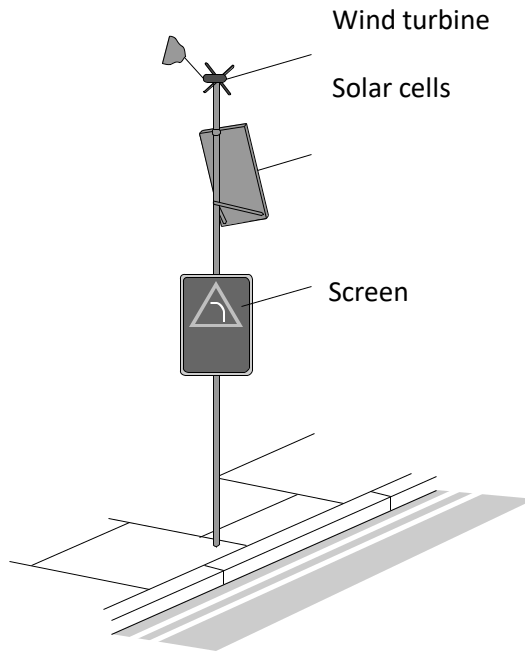Match numbers, **A**, **B**, **C** and **D**, with the spaces **1– 4**.

A   0.9

B   10

C   30

D   360

400 kJ of electrical energy

. . . 3 . . . kJ heat the water in the kettle

. . . 1 . . . kJ wasted to heat the body of the kettle

. . . 2 . . . kJ of heat escapes to the surroundings

The efficiency of the kettle is . . . 4 . . . .

Q:2 The diagram shows an electronic road sign.

Match types of energy, A, B, C and D, with the numbers 1–4 in the sentences.

A   electrical energy

B   thermal energy

C   light energy

D   kinetic energy

The useful energy output from the screen is . . . 1 . . . .

The energy input to the wind turbine is . . . 2 . . . .

The useful energy output from the solar cells is . . . 3 . . . .

The wasted energy output from the road sign is . . . 4 . . . .

Q:3   An electric motor is used to lift a weight.

The Sankey diagram shows the energy transformations that take place each second in the electric motor.

Electrical energy (400J) — Useful gravitational potential energy |

Heat

Sound
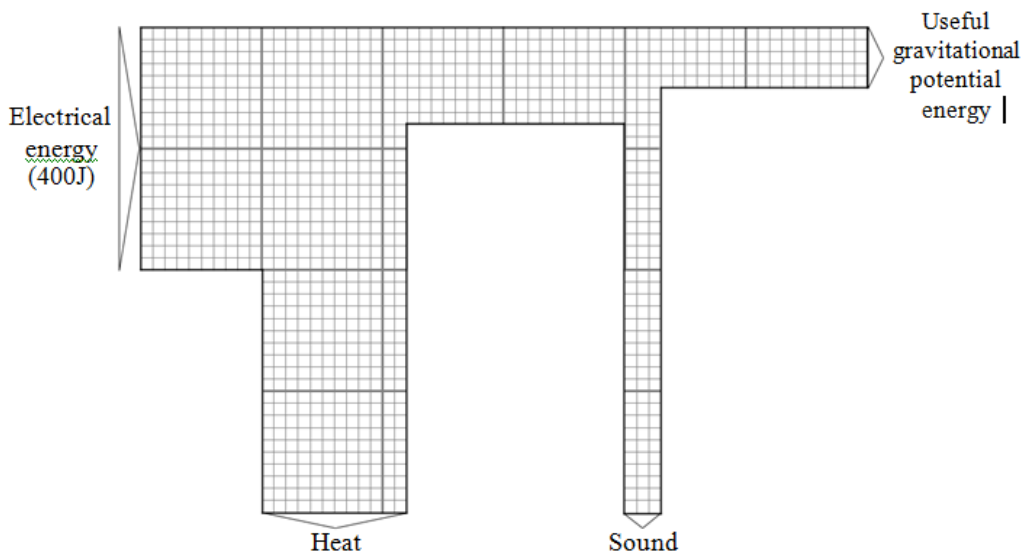
Match figures, A, B, C and D, with the numbers 1– 4 in the sentences.

A   0.25

B   60

C   100

D   240

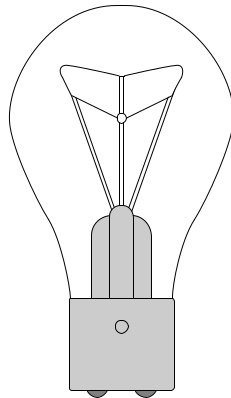|		useful energy transferred by the device
efficiency	=	total energy supplied to the device

Useful gravitational potential energy

The useful gravitational potential energy gained each second is . . . 1 . . . J.

The heat (thermal energy) produced each second is . . . 2 . . . J.

The sound energy produced each second is . . . 3 . . . J.

The total energy wasted each second is 300 J.   The efficiency of the electric motor is . . . 4 . . . .

Q:4   The diagram shows a lamp.

The lamp has a power of 100 watts (W).

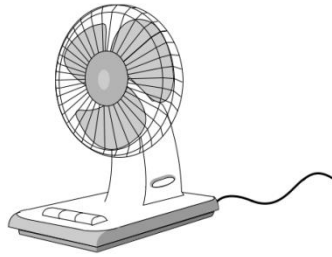It gives out light at a rate of 5 watts.

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

Match values, A, B, C and D, with the numbers 1–4 in the table.

A   0.05

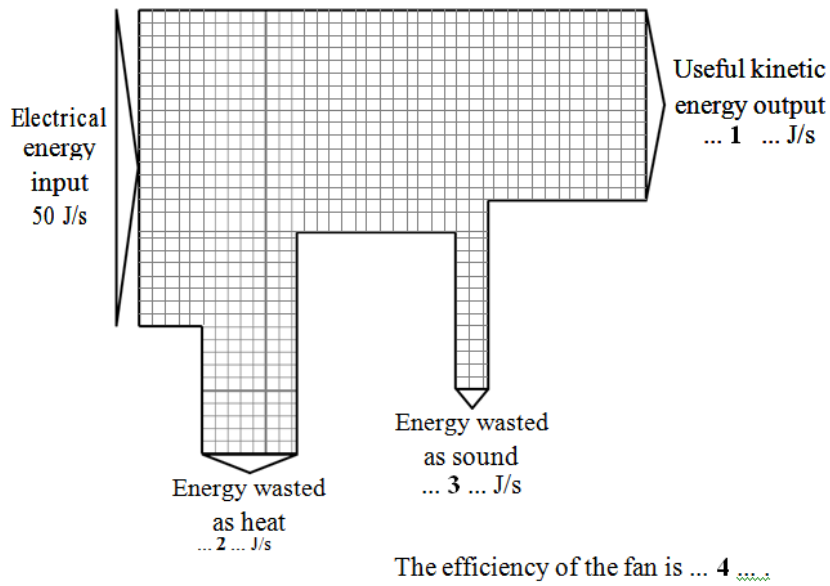B   5

C   95

D   100

1	amount of energy supplied to the lamp each second in joules
2	amount of energy transferred as light each second in joules
3	amount of energy wasted each second in joules
4	efficiency of the lamp

Q:5 The diagram shows an electric fan.

The Sankey diagram gives the energy transformations for the fan.

Useful kinetic
energy output
... **1** ... J/s

Electrical
energy
input
50 J/s

Energy wasted
as sound
... **3** ... J/s

Energy wasted
as heat
... **2** ... J/s

The efficiency of the fan is ... **4** ...
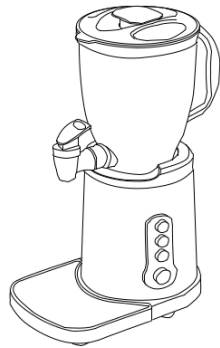
efficiency = $\dfrac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$
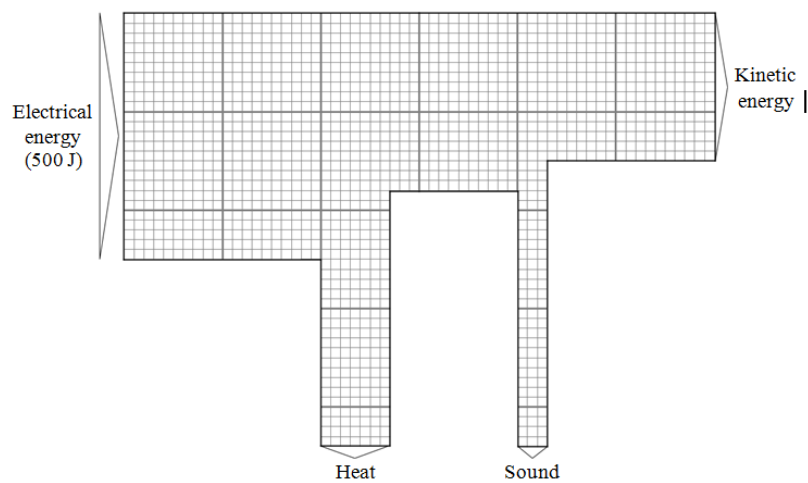
Match numbers, A, B, C and D, with the labels 1–4 on the Sankey diagram.

A   0.6

B   5

C   15

D   30

Q:6 The diagram shows a smoothie maker.

The Sankey diagram shows the energy transfers that take place each second in this smoothie maker.

Heat   Sound

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

Match figures, A, B, C and D, with the numbers 1– 4 in the sentences.

A   0.6

B   140

C   200

D   300

The kinetic energy produced each second is . . . 1 . . . J.
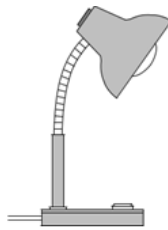
The heat produced each second is . . . 2 . . . J.

The total energy wasted each second is . . . 3 . . . J.

The efficiency of the smoothie maker is . . . 4 . . . .

Q:7 The diagrams show four electrical devices. The Sankey diagrams show the energy transformations involved in the four electrical devices.
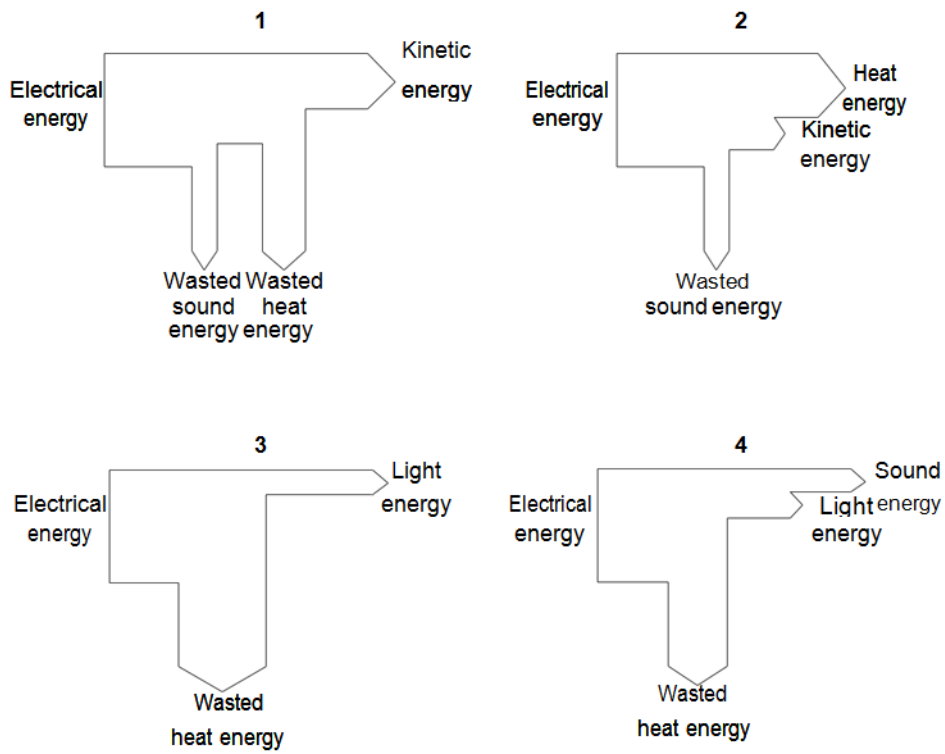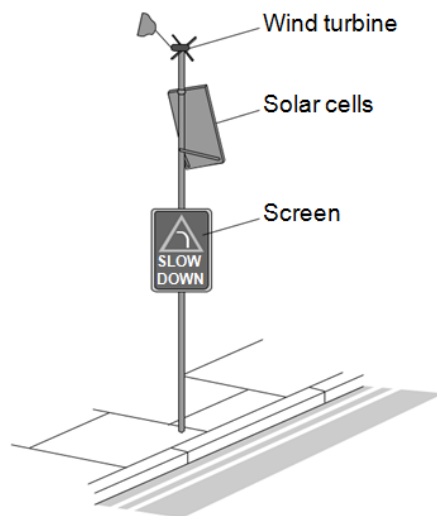

A
Electric drill

B
Desk lamp

C
Hair dryer

D
Television

Match devices, A, B, C and D, with the Sankey diagrams 1– 4.

1

Electrical energy → Kinetic energy

Wasted sound energy   Wasted heat energy

2

Electrical energy → Heat energy / Kinetic energy

Wasted sound energy

3

Electrical energy → Light energy

Wasted heat energy

4

Electrical energy → Sound energy / Light energy

Wasted heat energy

Q:8 The diagram shows an electronic road sign.

Wind turbine

Solar cells

Screen

SLOW DOWN

Match types of energy, A, B, C and D, with the numbers 1–4 in the sentences.

A   electrical

B   thermal

C   light

D   kinetic

The useful energy output from the screen is . . . 1 . . . energy.

The energy input to the wind turbine is . . . 2 . . . energy.

The useful energy output from the solar cells is . . . 3 . . . energy.

The wasted energy output from the road sign is . . . 4 . . . energy.

TOTAL MARKS=32