Using Energy

Total Marks : 21

Q1.

A different cyclist uses a motorised bicycle.

The motorised bicycle is powered by an electric motor.

Figure 3 is an energy diagram for the motor.

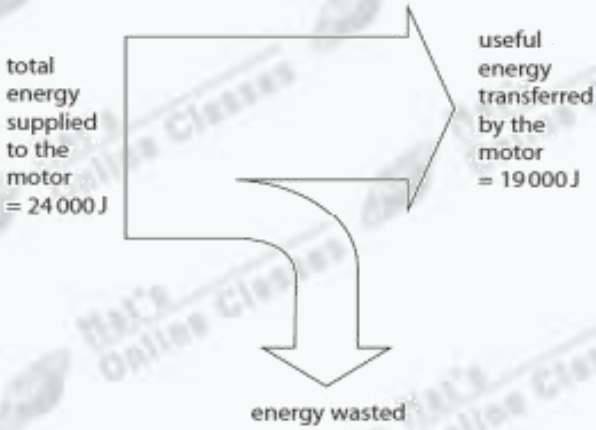

Figure 3

(i) Calculate how much energy is wasted.

(1)

energy wasted = ... J

(ii) Calculate the efficiency of the electric motor.

(2)

Use the equation:

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

efficiency of electric motor = ...

Q2.

Figure 2 shows an energy transfer diagram for a steam engine.

The diagram shows the amounts of energy transferred each second by the steam engine.

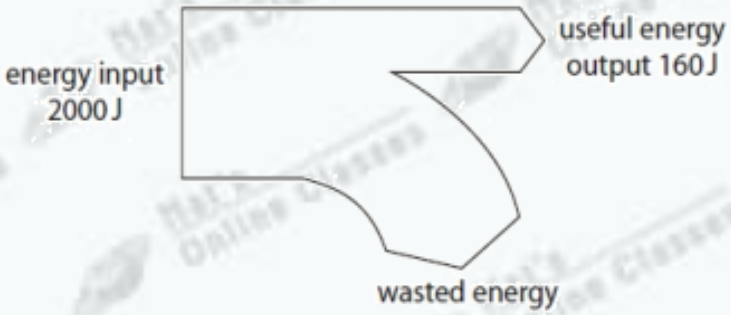

Figure 2

(i) Calculate the amount of wasted energy.

(1)

wasted energy = ... J

(ii) Calculate the efficiency of the steam engine.

Use the equation

$$\text{efficiency} = \frac{\text{(useful energy transferred by the steam engine)}}{\text{(total energy supplied to the steam engine)}}$$

(2)

efficiency = ...

(iii) State what happens to the wasted energy.

(1)

.....

(iv) Coal is a fossil fuel that is burnt in some steam engines.

State **two** ways that the use of coal might be harmful to the environment.

(2)

1 .....

.....

2 .....

.....

Q3.

A kettle is used to heat water.

Figure 11 shows a graph of temperature against time for the water in the kettle.

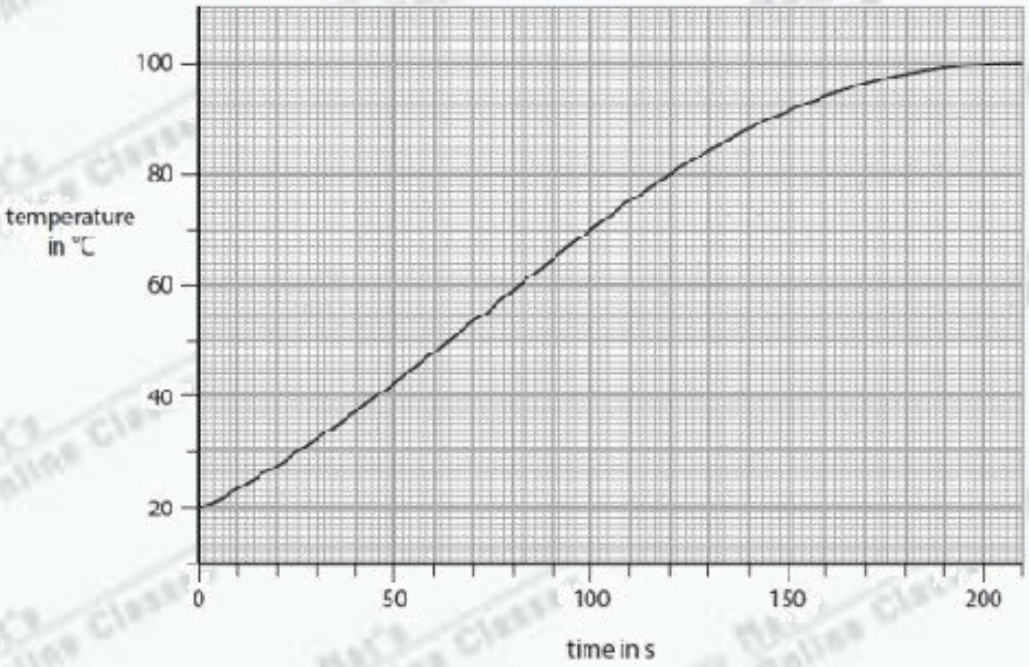

Figure 11

Calculate the rate of increase in temperature at a time of 150 s, by drawing a tangent to the curve in Figure 11 at a time of 150 s.

(3)

..... °C / s

Q4.

A kettle is used to heat water.

The kettle has an efficiency of 91% in supplying energy to the water.
The thermal energy of the water increases by 3.3×10^5 J in 200 s.

Calculate the total amount of energy supplied to the kettle in the 200 s.

Use the equation

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

(2)

total amount of energy supplied = ... J

Q5.

Figure 13 shows wind turbines, used to generate electricity for the National Grid.

(Source: © MarcelClemens/Shutterstock)

Figure 13

The wind turns the turbine blades.

The wind is a renewable source of energy.

(i) State **two** other renewable sources of energy.

(2)

1 .....

2 .....

(ii) For one turbine

- the energy input per second from the wind is 6.2 kJ
- the energy output per second to the National Grid is 2.2 kJ.

Calculate the efficiency of this turbine.

(2)

efficiency = ...

(iii) Suggest a reason why it is impossible for the turbine to use all the kinetic energy of the wind.

(1)

.....

.....

Q6.

State **two** non-renewable energy sources.

(2)

1 .....

2 .....