

# Engineering Science

Energy  
Revision

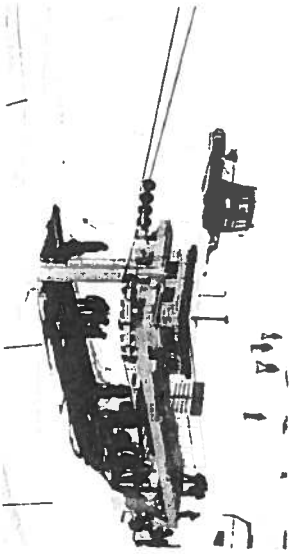
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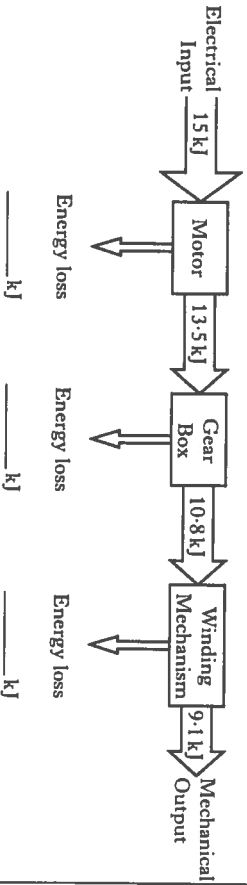
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# National 4 Questions

1 An electric motor is used to drive a ski tow.



(a) Complete the energy audit below.



(b) Calculate the **total energy loss** in the ski tow.

Total energy loss = \_\_\_\_\_ kJ

(c) Complete the following sentence using the list of phrases given.

*Input energy*      *Lost energy*      *Output energy*

"Because the \_\_\_\_\_ is always greater than the \_\_\_\_\_ the efficiency will always be less than 100%."

A local hydro electric power plant provides the energy for the ski tow. Hydro electricity is one example of renewable energy.

(d) State **three** other examples of **renewable** energy.

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_

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7 (continued)

(c) Explain why it is important to make systems as efficient as possible.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Electrical energy can be generated from a variety of different sources.

(d) (i) State **two** examples of **finite** energy sources.

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_

(ii) Explain the **advantages** (other than cost) of using **renewable** energy sources.

\_\_\_\_\_

\_\_\_\_\_

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3 2 1 0

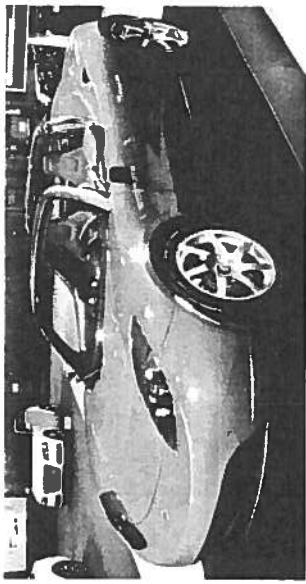
1 0

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7 A car manufacturer has produced an electric sports car.



The car's batteries are charged for 20 minutes from a 120 V supply providing 7 A.

(a) Calculate the electrical energy supplied.

The batteries provide 23 kW but the electric motor only produces 17.8 kW of useful output power.

(b) (i) Calculate the efficiency of the electric motor.

(ii) Explain why the electric motor is not 100% efficient.

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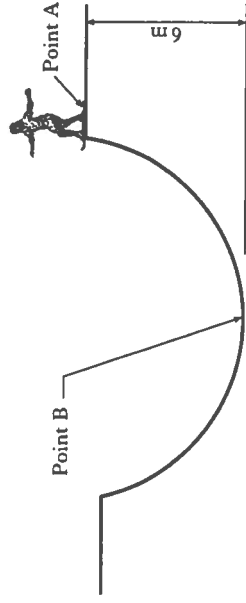
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3  
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2 A snowboarder of mass 65 kg is standing at point A on a half pipe.



(a) Calculate the potential energy of the snowboarder at point A.

The snowboarder is travelling at 10 m/s when he reaches point B.

(b) Calculate the kinetic energy of the snowboarder at point B.

(c) Complete the table below to indicate (✓) whether each listed energy source is renewable or non-renewable.

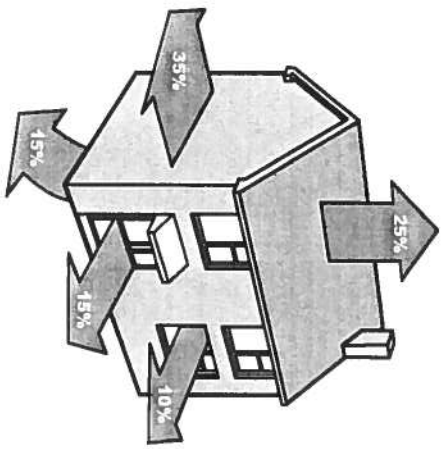
Energy source	Energy type	
	Renewable	Non-renewable
Wind		
Coal		
Gas		
Bio-mass		
Wave		

5  
4  
3  
2  
1  
0

2  
1  
0

2  
1  
0

3 The diagram below shows all the ways in which heat is lost from a house.



(a) State two methods of reducing energy loss within the house.

1 \_\_\_\_\_  
2 \_\_\_\_\_

(b) Complete the energy conversion statements for each of the given products to show the main input and output energy using the list below.

Potential    Kinetic    Heat    Chemical    Electrical  
Nuclear    Sound    Light    Magnetic

(i) Gas cooker

\_\_\_\_\_ energy is converted to \_\_\_\_\_ energy.

(ii) A wind-up radio

\_\_\_\_\_ energy is converted to \_\_\_\_\_ energy.

(iii) Washing machine

\_\_\_\_\_ energy is converted to \_\_\_\_\_ energy.

Wind is a renewable energy source used to generate electricity.

(c) State two other sources of renewable energy.

1 \_\_\_\_\_  
2 \_\_\_\_\_

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6 (continued)

(c) Geothermal is a source of renewable energy. State two other examples of a renewable energy source.

1 \_\_\_\_\_  
2 \_\_\_\_\_

(d) State two disadvantages of using fossil fuels, other than cost.

1 \_\_\_\_\_  
2 \_\_\_\_\_

(e) State two ways that energy can be conserved in the home.

1 \_\_\_\_\_  
2 \_\_\_\_\_

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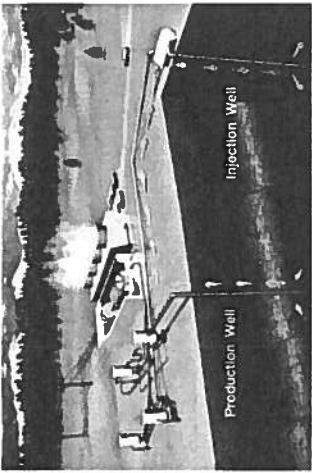
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# National 5 Questions

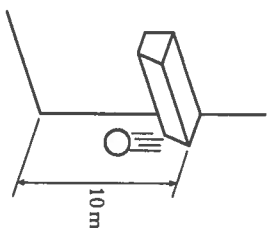
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4 Electricity can be generated from both finite and renewable sources. The Government is promoting the use of renewable sources such as <b>tidal, solar and wind</b> .		
(a) Explain <b>one</b> disadvantage which must be considered when using each of these sources. <b>Each disadvantage may be used only once.</b>		
Tidal _____	3	
Solar _____	2	
Wind _____	1	
(b) State <b>two other</b> examples of renewable energy sources.	0	
1 _____	2	
2 _____	1	
(c) State <b>two</b> examples of <b>finite</b> energy sources.	0	
1 _____	2	
2 _____	1	
	0	

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6 A geothermal power plant uses the heat in the earth to help produce electricity.		
		
(a) Calculate the heat energy absorbed by 100 litres of water which is pumped into the earth at 10 °C and comes out as steam at 240 °C. (1 litre of water has a mass of 1 kg.)		
(b) For every 15 MJ of heat energy that comes from the ground, the power plant produces 5.34 MJ of electricity.	3	
(i) Calculate the efficiency of the power plant.	2	
(ii) Explain why the power plant will not be 100% efficient.	1	
	0	

5 A 0.7 kg ball is dropped from a 10 m high balcony.



(a) Calculate, showing all working and units:

(i) the potential energy of the ball at the balcony;

(ii) the maximum velocity of the ball.  
(Assume that all  $E_p$  is converted into  $E_k$ .)

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1  
0

2  
1  
0

2  
1  
0

(b) When the ball bounces, it does not reach its original height.

State the two main forms of energy which are lost when the ball bounces.

(i) \_\_\_\_\_

(ii) \_\_\_\_\_

5 (continued)

Renewable energy can be generated from a number of different sources.

(c) State one disadvantage for each of the following renewable sources.  
(Give a different disadvantage for each source.)

Tidal

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Wave

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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2  
1  
0