S4 Technological Studies: Homework 26: Energy.

Mark:	/25
Grade:	

Name:_____ Class:_____ Date:_____

1. Energy is a very important resource, it helps provide us with heat, light and the ability to do work.

   (a) Where do all of the earths energy sources originally come from? **1 0**

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   (b) (i) Explain what is meant by the term fossil fuels. **2 1 0**

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   (ii) List three examples of non-renewable sources of energy found in the UK. **3 2 1 0**

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   (iii) Describe the effects that burning of fossil fuels can have upon the environment. **2 1 0**

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2. Instead of burning fossil fuels, alternatives to non-renewable energy sources are currently being developed and improved.

   (a) Describe the difference between a non-renewable and a renewable energy source. **2 1 0**

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   (b) (I) Give some examples of renewable energy sources that can provide us with usable energy. **2 1 0**

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(ii) Choose two of you examples of renewable energy and describe some of the advantages and disadvantages associated with each.

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4 3 2 1 0

3. Recent government campaigns have urged us to become more energy efficient and conserve energy in the home.

(a) Why has it become important for us to conserve energy?

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(b) (ii) Describe some of the ways that energy can be wasted or lost in your home.

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2 1 0

(ii) Suggest some possible solutions to this problems.

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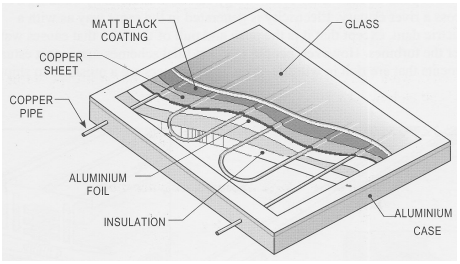
2 1 0

4. The diagram shows a cutaway view of a solar panel.



Describe how it can be used to help provide heat in a modern building.

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4 3 2 1 0

S4 Technological Studies: Homework 27: Energy.

Mark:	/ 23
Grade:	

Name:_____ Class:_____ Date:_____

1. (a) A motorist breaks down and has to push his car for 2 km to the nearest garage.
If he applies an average force of 50 N to the car, how much work will he do pushing his car to the garage? **3 2 1 0**

(b) Once the car has been repaired the driver continues on his journey, driving at an average speed of 70 km/h.
If the weight of the car is 500 kg and the driver weighs 75 kg, calculate the kinetic energy of the vehicle during the journey. **4 3 2 1 0**

(hint: convert km/h into m/s)

(c) After the car has been travelling for 45 minutes, the temperature of the water coolant in the engine rises from 20 ºC to 35 ºC.
How much heat energy is transferred to the coolant if there is 4 litres of coolant in the engine? **4 3 2 1 0**

(hint: specific heat capacity of water is 4200 kJ/kgK and 1 litre of water has a mass of 1 kg)

2. Once a schoolgirl has completed her homework she decides to play on her game console for 30 minutes. The system plugs into the mains and uses a voltage of 230 V, drawing a current of 3 A.

(a) Calculate the electrical energy used by the games console.

3 2 1 0

(b) Determine the power consumed by the system during use.

3 2 1 0

3. A passenger is flying to South Africa on a jumbo jet. When the plane is fully loaded at take off it has a mass of 100,000 kg, but when it lands it has used most of its fuel and has a mass of only 80,000 kg.

(a) If the aircraft has an average speed of 750 km/h, what is the difference in kinetic energy at take off and landing.

3 2 1 0

(b) During the mid point of the flight the plane cruises at a height of 10,000 m. Calculate the potential energy of the aircraft.

(hint: Assume the plane has used half its fuel load)

3 2 1 0

S4 Technological Studies: Homework 28: Energy.

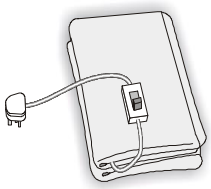
Mark:	/21
Grade:	

Name:_____ Class:_____ Date:_____

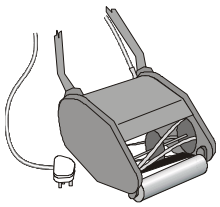
1. Three devices that convert energy from one from to another are shown below.

   For each draw a simple systems diagram illustrating the energy changes taking place, you should show both useful energy and other energies that may not be required but are also present at the output.

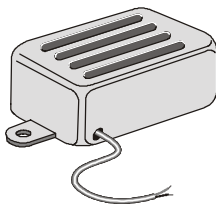
   (a) An electric blanket.



   (b) An electric lawnmower.



   (c) A buzzer.



2. Everyday usage of the term "*conservation of energy*" means using less energy to do the same amount of work, however the "*law of conservation of energy*" has an older and different meaning in technology and science.

   In terms of energy transformation and conversion, explain the **law of conservation of energy**.

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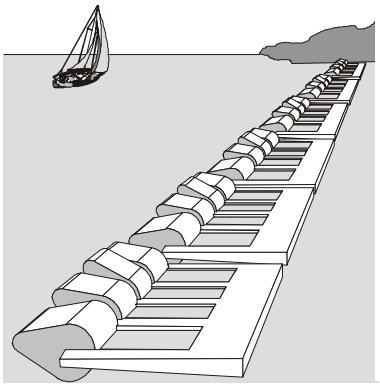
3 2 1 0

3 2 1 0

3 2 1 0

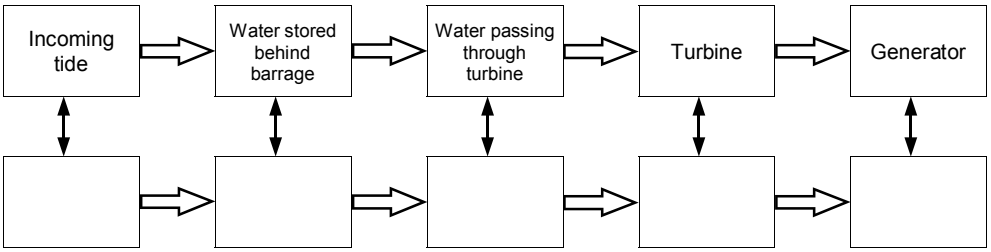
2 1 0

3. Renewable energy sources are continually being developed.



One such example is a wave barrage like the one shown that can be used with a turbine to produce a clean source of electrical energy.

(a) Complete the block diagram below showing the changes in energy throughout the power generating system.



5 4 3 2 1 0

(b) An energy audit is carried out in the turbine house of the wave barrage electrical generation system.

It is found that from 100 units of kinetic energy from the waves only 36 units of electrical energy are generated.

Suggest reasons why the turbine and generator combination are not 100% efficient.

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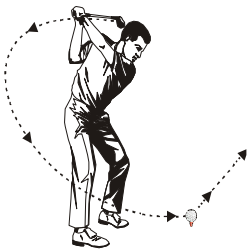
2 1 0

4. A golfer swings a club at a ball and hits down the centre of the fairway.



If the ball has a mass of 0.1 kg and achieves a maximum kinetic energy of 125 joules, calculate the balls highest velocity.

3 2 1 0

S4 Technological Studies: Homework 29: Energy.

Mark:	/23
Grade:	

Name:_____ Class:_____ Date:_____

1. A electric kettle is used to boil some water. The kettle holds 1.5 litres of water when full and operates from a 230 V mains supply, drawing a current of 13 A.

   (a) Calculate the heat energy supplied to boil the water in the kettle from an initial temperature of 15ºC.
   (hint: specific heat capacity of water is 4200 kJ/kgK and 1 litre of water has a mass of 1 kg)

   3 2 1 0

   (b) Assuming all the electrical energy supplied is converted to heat energy, how long will it take to boil the water in the kettle?

   3 2 1 0

2. During a football match a goalkeeper kicks the ball out of his hands into the air. The ball reaches a maximum height of 30 m.

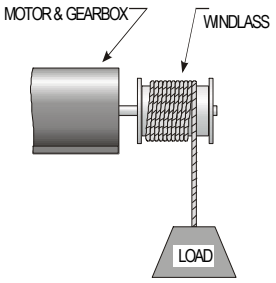
   (a) Calculate how much kinetic energy the goalkeeper gives to the ball if it has a mass of 2 kg.

   3 2 1 0

(b) Determine the speed at which the ball leaves the keepers foot.

3 2 1 0

3. On a building site a hoist containing a motor and gearbox system is used to raise a load from the floor to the top of the scaffolding 25 meters from the ground.



The load weighs 100 kg and the motor runs from a 110 V generator, drawing a current of 15 A.

(a) Determine the potential energy of the load when it has been raised.

3 2 1 0

(b) Assuming that hoist system is 100% efficient, calculate the time taken to raise the load from the ground.

2 1 0

(c) (i) Calculate the average speed at which the load is raised.

3 2 1 0

(ii) Find the average kinetic energy of the load as it is being raised.

3 2 1 0

S4 Technological Studies: Homework 30: Energy.

Mark:	/ 22
Grade:	

Name:_____ Class:_____ Date:_____

1. A household immersion heater holds 150 litres of water. The initial temperature of the water in the tank is 20 ºC.

   The immersion heater operates from a mains supply of 230 V, drawing a current of 8 A and has an efficiency of 65%.

   (a) Calculate the amount of heat energy required to heat a full tank of water to 90 ºC. **3 2 1 0**

   (b) (i) Find the amount of electrical energy supplied to the heating element. **2 1 0**

   (ii) Determine how long it would take to heat a full tank of water to 90 ºC. **4 3 2 1 0**

2. A service elevator is used to raise goods in a hotel.

The elevator is driven by a 230 V electric motor, drawing a current of 15 A. The average speed of the elevator over its 25m lift is 0.5 m/s.

(a) (i) Determine how long it takes the fully laden elevator to reach the top.

3 2 1 0

(ii) Calculate the amount of electrical energy consumed to raise the load.

3 2 1 0

(b) What is the potential energy gained by the elevator after it has been raised?

3 2 1 0

(c) (i) Determine the efficiency of the service elevator.

2 1 0

(ii) How long would it take to raise the load if the elevator was 100% efficient?

2 1 0