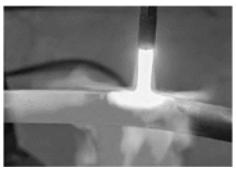
A. Energy changes and energy stores part 1 – Energy systems and energy changes

1. What sort of energy store do the following examples have?

a.  b.  c. 

a._____ b. _____ c. _____

2. 2. Write down the correct answer to complete the statement.

Energy can not…

be transferred from one source to another.

be created or destroyed.

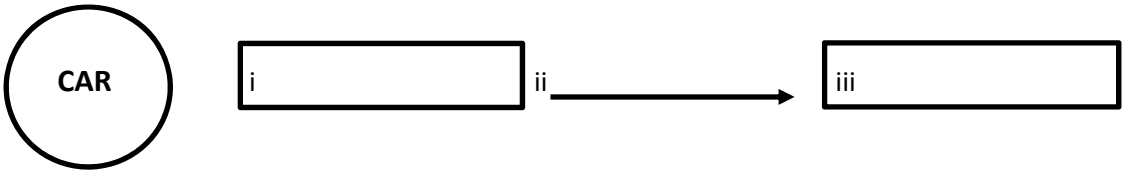
travel along a pathway to another store.

3. A basketball player throws the ball into the hoop. Describe the energy store change which has taken place.

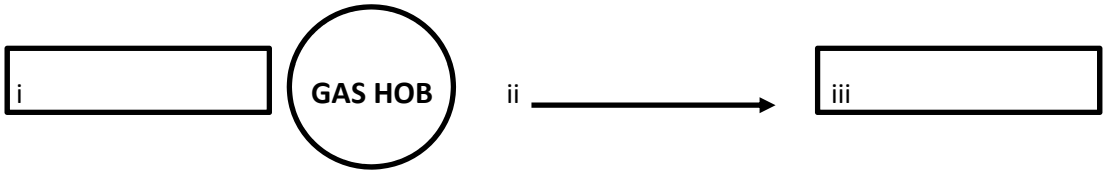
_____ → _____

4. Complete the energy store and pathway diagrams for the objects described.

a. A moving car braking to a stop.



b. Bringing water to the **boil** on a gas hob.



5. Describes the main change in energy stores for a coal fired power station.
   a. Name the energy sources for:
      i Input energy
      ii Useful output energy
      iii Wasted output energy.

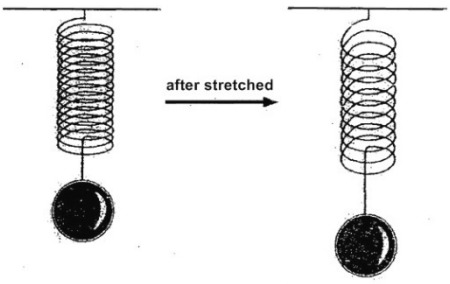
   b. In one hour, coal supplies 500 000 J of energy. The wasted energy amounts to 380 000 J.
   Calculate how much useful energy is produced in one hour.

6. When a football is kicked it gains kinetic energy.

   a. What is the formula used to calculate kinetic energy?

   b. The football has a mass of 0.4 kg. When the football is kicked, it has a velocity of 15 m/s.
   Calculate the kinetic energy of the moving football?

7. The un-stretched spring opposite has a length of 0.5 m but after a mass is added it is 0.6 m long.
   If the spring constant is 800 N/m.
   Calculate the stored elastic potential energy.



$$E_e = \frac{1}{2} k e^2$$

8. A pole vaulter just clears a bar which is 5.1 m high. His mass is 62 kg.

(g = 10 N/kg)

   a. Work out how much stored energy the pole vaulter has due to his position above the ground.

   b. Work out how much stored energy the pole vaulter has due to his position above the ground.

   c. As he falls back to the ground, this energy store will be transferred into a new energy store.
   Name this new energy store.

   d. When he lands, what happens to the energy stores described above?

B. Energy stores and Energy systems part 2 - Energy changes in systems Power

1.The specific heat capacity of a substance is…….

A. the ability of a 1 kg object to store transferred energy

B. the total amount of stored energy in an object

C. the energy needed to raise the temperature of 1 kg of a substance by 1 ºC.

2.When a bowl of water and a stone are left in hot sunshine, the stone feels much hotter than the water. Which one has the highest specific heat capacity? Explain your answer.

3. Give two alternative units of power?

4. A blowtorch burns butane gas to heat metal pipes.

a. Describe the energy transfers which occur as it is used.

_____energy is transferred into

_____energy usefully and

_____ energy is wasted.

b. Explain how some of the transferred energy is wasted.

c. The blowtorch transfers 2 kJ of energy in 4 mins. Work out the power of the blowtorch?

5. Two cranes are lifting the same load of 120 kg to a height of 15 m.

Crane A

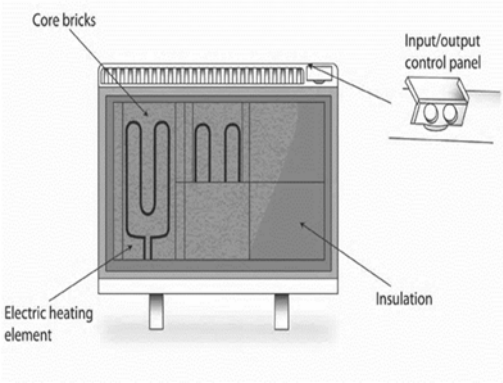
Crane B

Crane A takes 30 s to lift the load. Crane B lifts the same load in 9 s.
Calculate the difference in power of the two cranes.

C. Storage heaters contain bricks which warm up and store heat energy.

The bricks in the heater have a mass of 40 kg and are heated from 18 ^{0}C to 40 ^{0}C.

If the specific heat capacity of the brick material is 850 J/kg^{0}C, calculate the change in thermal energy during heating.



Change in thermal energy = Mass x Specific Heat Capacity x Temperature Change

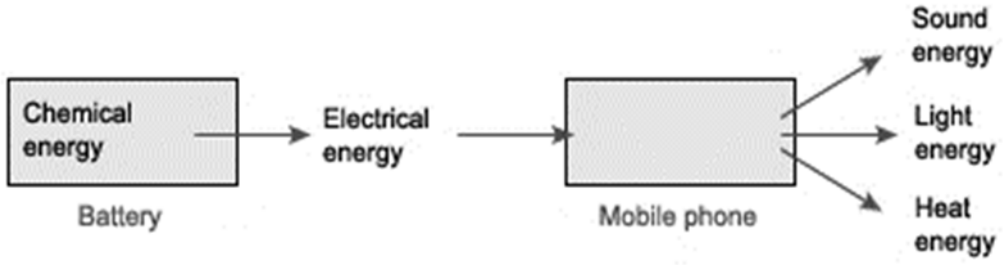
$$\Delta E = m \times c \times \Delta\theta$$

C. Conservation and dissipation of energy

1.In a "closed" system .....

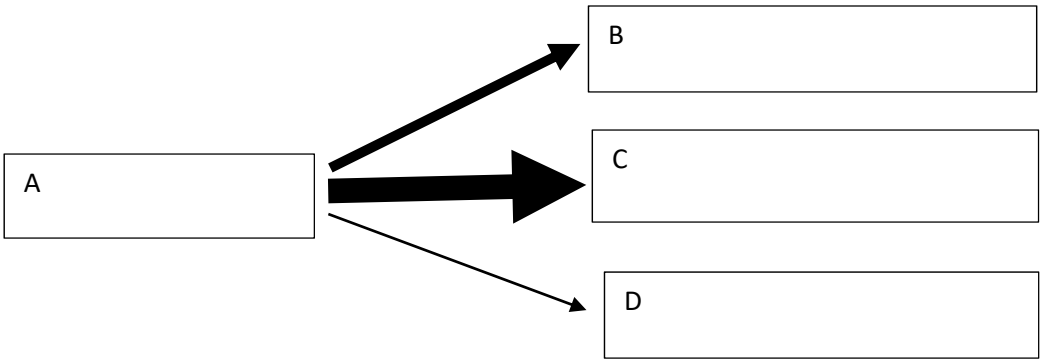
A. energy can be transferred but there is no net energy loss.
B. energy and mass are transferred in and out of the system.
C. energy cannot be transferred between different energy stores.

2. The energy transfer diagram for a mobile phone shows that 100 J of electrical energy produces 45 J of light energy and 36 J of sound energy.
How much thermal energy will be dissipated by the phone?



3. Explain how the thermal energy produced by a bus driving along a road is dissipated.

4. a. The diagram shows the main energy transfers for an electric fan. Complete boxes A to D showing the energy stores involved. Use the size of the arrows to help you.



b. State why the total energy supplied an electric fan must always equal the total energy transferred by the electric fan.

5. The diagrams show two different types of loft insulation.

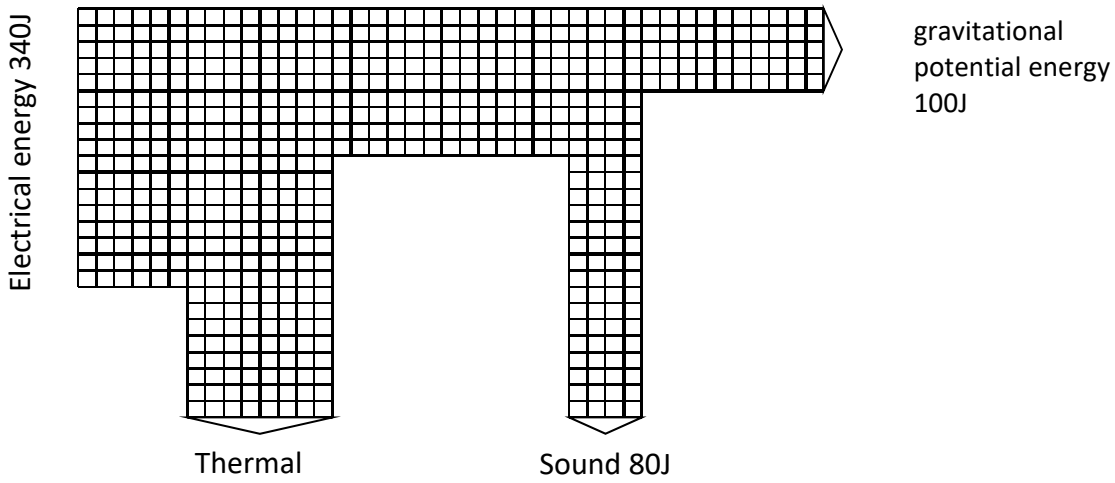
Fiberglass insulation

Wool insulation

a. The wool needs to be thicker to have the same insulating properties. Explain which material has the highest thermal conductivity?

b. Explain how trapped air reduces the rate of heat loss, in terms of thermal conductivity.

6. The diagram represents the energy store transfers when a motor is lifting a weight.



a. How much electrical energy is transferred to a thermal energy store?
b. What is the total amount of dissipated energy?
c. Calculate the efficiency fraction of the useful energy transfer.

7. The motor for a lift in a tall building uses 12 000 W of power. The lift and its passengers have a mass of 500 kg.

The lift motor takes 10 s to raise the lift and its passengers through a height of 20 m. Work out the percentage efficiency of the lift motor.

8. The low energy bulb below uses 18 000 J of energy in one hour. If the efficiency of the low energy bulb is 78 % work out the amount of light energy given off by the bulb in one hour.

Energy transferred = _____

D. National and Global Energy resources

1. What is a fossil fuel?

2. Copy and complete the table below by ticking the correct box for each energy source.

Energy source	Renewable	Non-renewable
Bio-fuels		
Oil		
Nuclear		
Hydro-electricity		
Wind turbines		
Coal		
Solar power		
Wave energy		
Natural gas		

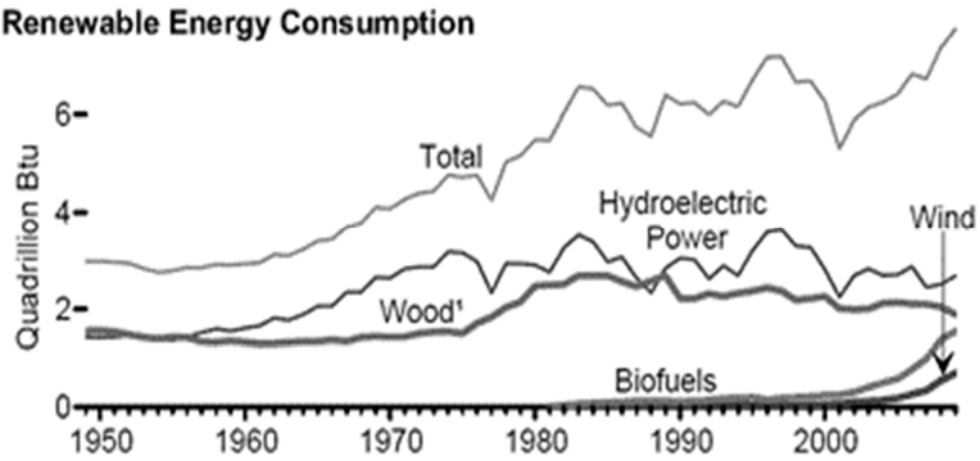
2. What is a renewable energy source?

3. Why are fossil fuels considered to be a more reliable energy resource than renewable energy resources?

4. Despite a large investment by the UK government in wind power, the amount of fossil fuel used has not seen a decline. Give a possible explanation for this.

6. The UK government is committed to investing in a "blend" of energy supply types to provide the UK's energy needs for the next 100 years.
Give an advantage of this rather than using just coal.

7. The graph shows the world use of renewable energies over the past sixty years.



a. Why has the use of wood increased very little over this time?

b. A lot of money has been invested in wind turbines. Why does this energy source not produce as much as any other renewable resource?

8. Copy and complete the table to give **energy sources** that could be used in each situation.

Energy use	Energy source 1	Energy source 2
Running a car		
Producing electricity		
Heating the home		
Powering a train		

1. Describe how human activities have contributed to the greenhouse effect?
2. Explain how burning coal in power stations contributes to global warming.
3. Describe **two** problems associated with the storage of waste from nuclear power stations.
4. State **two** reasons why people might object to having a wind farm built close to their homes.