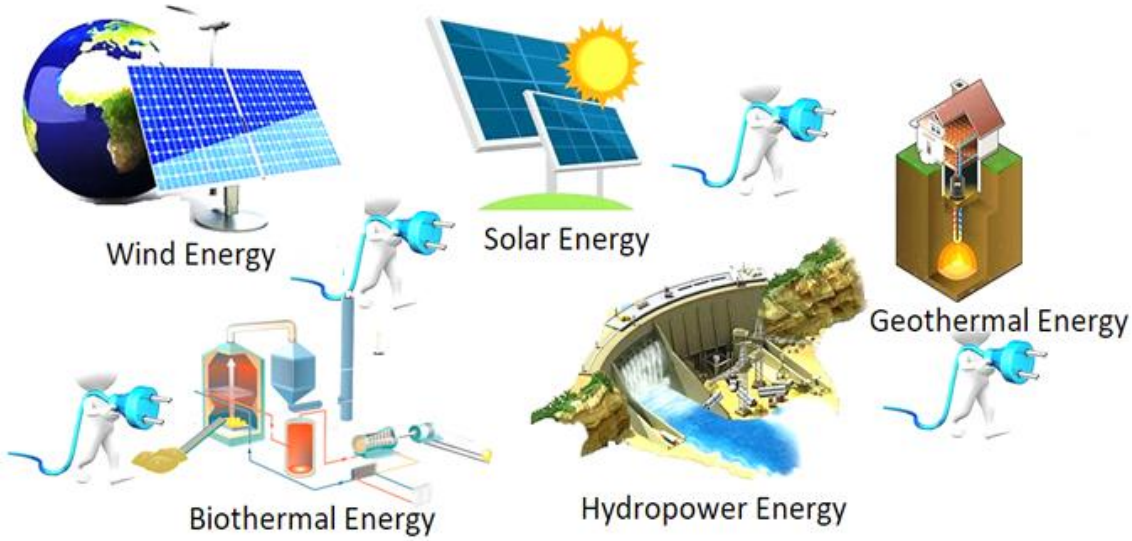
SOURCES OF ENERGY

(a) Energy is the ability to do work.

(b) Energy is needed by organisms and systems to do work.

(c) Something that stores or generates / produces energy is known as a source of energy.

(d) Energy is either renewable (can be used over and over again or never runs out, e.g.



wind) or non-renewable (cannot be used again, e.g. coal).

Renewable Energy

(a) Renewable energy is the energy that does not run out or cannot be depleted when used.

(b) Renewable energy comes from replenishable resources such as wind, solar, geothermal, water and biomass.

Examples of renewable energies:

A. Wind – uses wind which never runs out to generate electricity. Wind blows the blades of turbines which spins a generator to create electricity.

B. Solar – captures energy from the Sun using solar panels, the Sun never runs out.

C. Geothermal – uses the Earth's internal heat, which never runs out.

D. Hydropower – uses moving water to generate energy.

E. Biomass – is the energy produced by living or once living organisms. It uses fuel from organic materials such as wood, crops, organic waste, agricultural residues etc.

Answer the following questions

1. What is energy?

_____

2. Why is energy important?

_____

3. What is a source of energy?

_____

4. What is renewable energy?

_____

_____

_____

5. Explain what fossils fuels are.

_____

_____

6. List the four types of non-renewable energies.

_____

_____

7. Fully discuss the four types non-renewable energy.

_____

_____

8. Discuss why would non-renewable energies run out.

_____

_____

9. How is natural gas obtained?

_____

_____

Non-renewable Energy

(a) Non renewable energy is the energy that comes from sources that will run out or will be replenished over time.

(b) These energies do not form at the rate they are used.

(c) Society mainly depends on these sources for energy.

(d) Non-renewable energy is mainly produced by fossil fuels such as coal, natural gas and petroleum.

A. Fossil fuels – come from deposits of organic materials (dead plants and animals), e.g. coal.

B. Crude oil – is unrefined yellowish-black fossil fuel used to make petroleum products for our cars, seas and air transport. Crude oil is retrieved by drilling into the ocean floor.

C. Natural gas – It is commonly methane and ethane drilled and pumped out of the Earth's crust.

D. Nuclear fuel – obtained from the breaking down (fission) of uranium to release massive / huge energy.

Answer the following questions

---

1. What is non-renewable energy?

   _____

2. What are the main sources of non-renewable energies?

   _____

3. Explain what fossils fuels are.

   _____

   _____

4. What would make energy from fossil fuels to run out?

   _____

5. Discuss the difference between renewable and non-renewable energies.

   _____

   _____

6. List the four types of non-renewable energies.

_____

_____

7. Fully discuss the four types non-renewable energy.

_____

_____

8. Discuss why would non-renewable energies run out.

_____

_____

9. How is natural gas obtained?

_____

_____

10. What is crude oil?

_____

11. How is nuclear fuel obtained?

_____

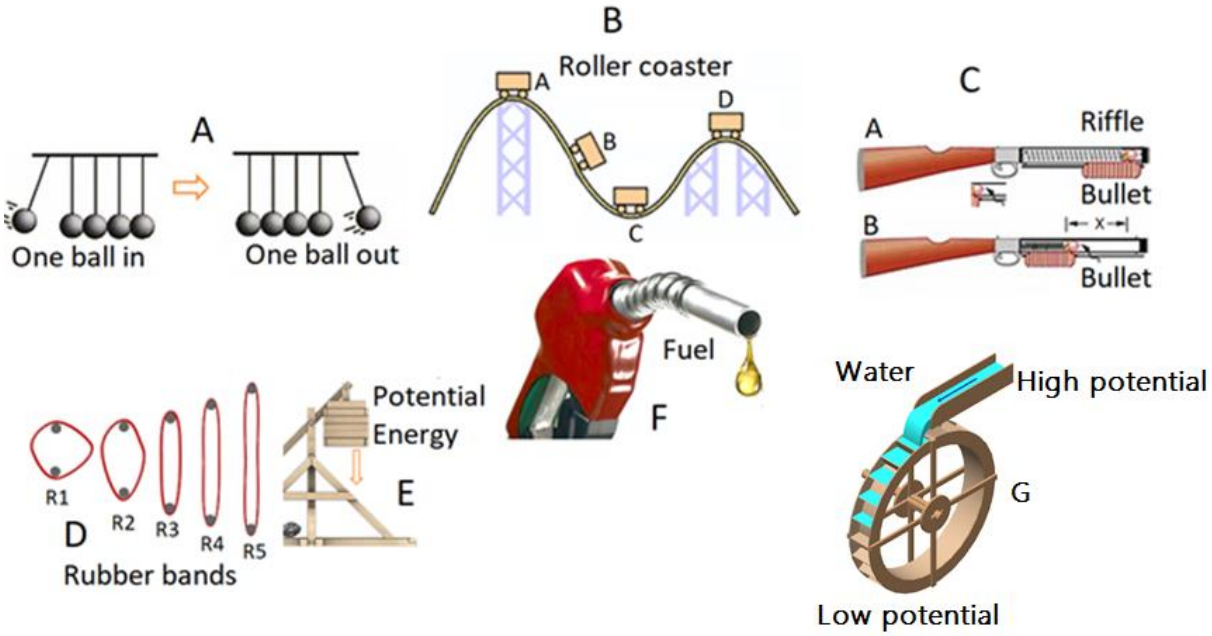
Potential energy

(a) Potential energy is stored energy.

(b) Energy can be stored in stretched bands, cells, fuels, food and springs.

(c) The unit used to measure energy is called the joule (J).

(d) The energy stored in food, fuels such as petrol and wood, is known as chemical potential energy.



Answer the following questions:

1. What is potential energy?

   _____

2. List three possible sources of potential energy.

   _____

3. What is the unit used to measure energy?

   _____

4. Where do we find chemical potential energy?

   _____

5. Looking at the diagram A above, explain why when the ball bounces against the other balls, one ball moves out.

   _____

6. In the roller coaster, B, at what point does the roller coaster have more potential energy and why?

_____

7. In diagram C, explain why the spring must be pushed back before the bullet is released.

_____

_____

8. In diagram D, how do R1 and R5 compare?

_____

_____

9. In diagram D, discuss which of the rubber bands will have more potential energy and which ones will have less.

_____

_____

10. In diagram B, at what position will the roller coaster be moving at its highest speed and why?

_____

_____

POTENTIAL AND KINETIC ENERGY

Kinetic energy

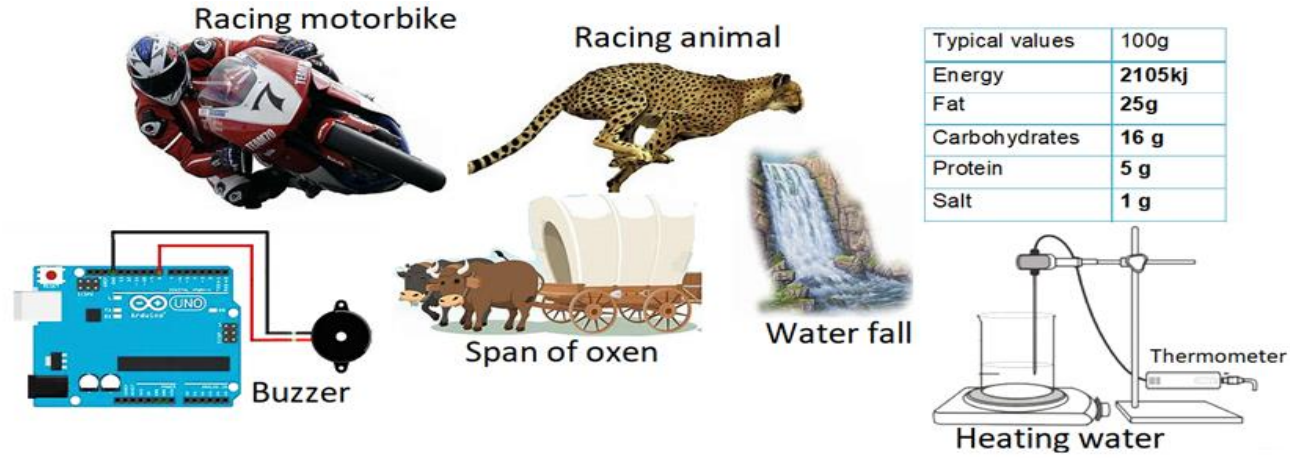
(a) Kinetic energy is energy possessed by a body that is in motion or moving.

(b) An object only has kinetic energy if it is moving.

(c) The faster an object / body moves, the more kinetic energy it will have.

(d) Water falls, running athletes, racing cars, electric current are some of the examples that represent kinetic energy.

(e) Potential and kinetic energy is also found in thermal (heating) systems, biological systems, e.g. oxen pulling a wagon. The oxen represent a biological system using stored energy from food to pull the wagon creating kinetic energy.



Answer the following questions

1. What is kinetic energy?

   _____

2. Specify the type of objects that have kinetic energy.

   _____

3. Give three different environments that demonstrate kinetic energy.

   _____

4. What type of system is represented by the span of oxen? Explain how the system works in this case.

   _____

5. What type of system is represented by the heating of water?

   _____

6. The table in the figure is a label from a food package. How much energy is in this food package?

   _____

7. Mechanical energy is the sum of potential and kinetic energy in an object. Discuss how the waterfall represents mechanical energy.

   _____

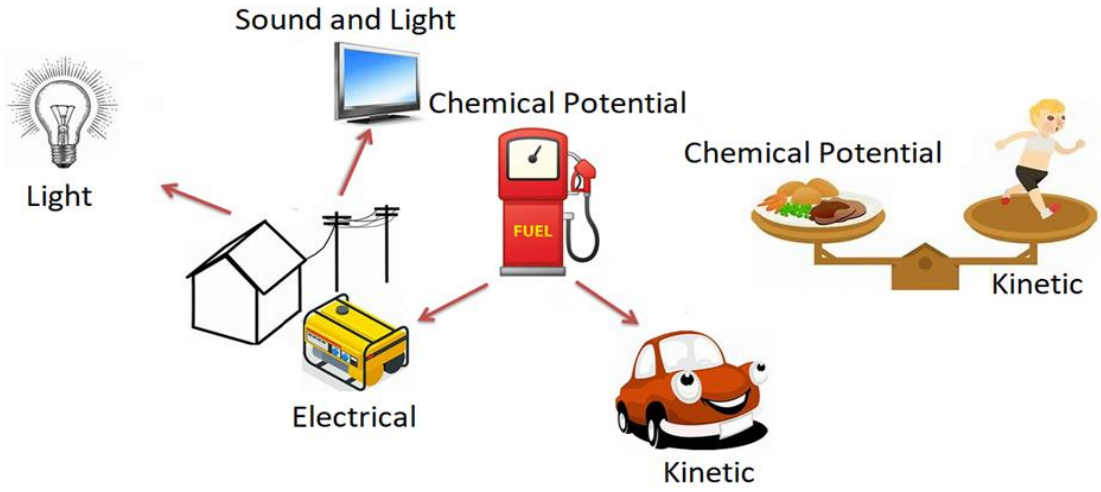
LAW OF CONSERVATION OF ENERGY

(a) The law of conservation energy states that energy can neither be created nor destroyed but can be changed from one form to another.

(b) There is a transfer of energy when systems come together.

(c) Energy transfer is when energy changes from one form to another.

(d) The energy transfer can be mechanically like in a moving car, electrically when electrical energy produces heat, light or sound and by heating as energy moves from a hotter object to a colder object.



Answer the following questions:

1. What does the law of conservation of energy say?

_____

_____

2. What is energy transfer?

_____

3. What are the two forms of energy conventions in a television?

_____

4. Discuss the energy conventions in a car.

_____

5. Discuss how a bulb is able to produce light.

_____

6. Discuss how an electric generator is able to produce electricity.

_____

HEATING AS A TRANSFER OF ENERGY

(a) During heating, energy moves from a hot to a cooler object.

(b) Energy transfer cannot happen if objects have the same temperature.

(c) Heat can be transferred by convection, radiation and conduction.

Conduction

(a) Heat conduction is the transfer of heat between objects that are in physical contact with each other.

(b) Conduction can only take place between objects that are solid.

(c) Heat conduction is slower in some materials.

(d) Materials such as metals are good conductors of heat.

(e) Materials that are good conductors of heat are suitable for use as cooking pots and heating devices.

(f) Materials that either slow down or prevent the conduction of heat are known as insulators, e.g. wood and plastic.

(g) Plastic and wood are poor conductors of heat and are suitable to use as insulators.

Answer the following questions:

1. What is heat conduction?

   _____

   _____

2. In what kind of objects does conduction take place?

   _____

3. Discuss how heat conduction takes place in different materials.

   _____

   _____

4. What are insulators?

   _____

5. Which materials can be used as insulators and why?

   _____

6. Discuss the kind of materials used as cooking pots.

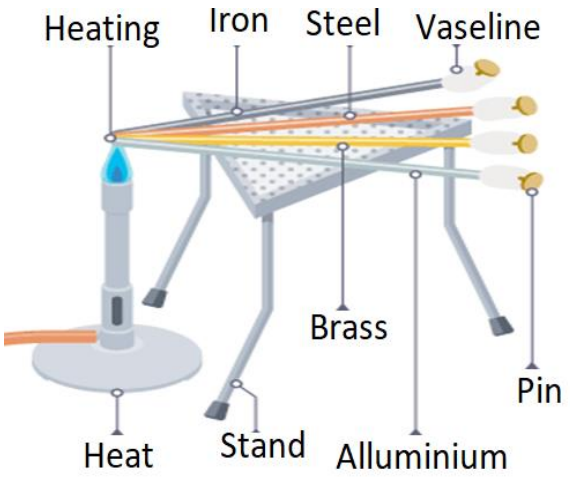
   _____

INVESTIGATION

AIM: To determine which metal is a good conductor of heat.

MATERIALS AND APPARATUS:

1. Bunsen burner / Spirit burner
2. matches
3. Vaseline / Wax
4. iron, steel, brass and aluminium rods
5. stopwatch
6. drawing pins
7. tripod



METHOD:

1. Stick the flat end of a drawing pin to the end of each of the metal rods using the Vaseline as shown in the diagram.
2. Carefully place the edges of the four metals towards the Bunsen burner.
3. Put a pin on the other end of each metal in the Vaseline.
4. Start heating the metals evenly.
5. Record the time it takes every pin to drop off.

RESULTS

Metal used	**Time taken to drop off**
Iron	
Steel	
Brass	
aluminium	

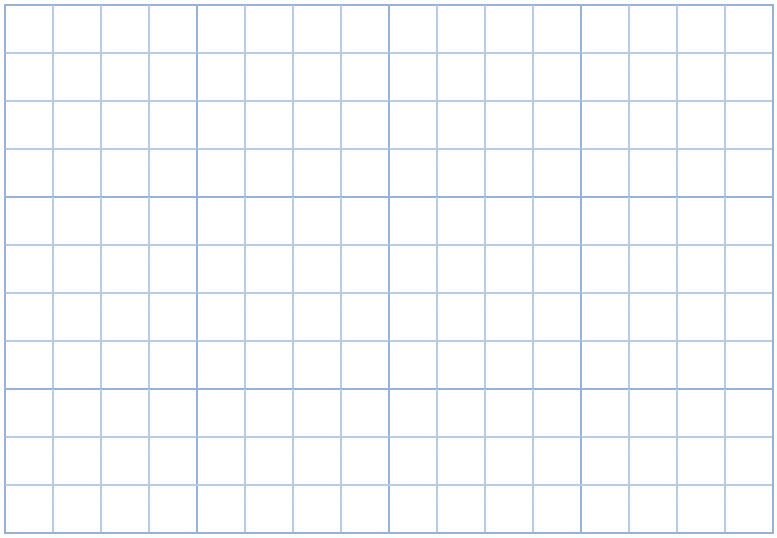
CONCLUSION

What is your conclusion regarding the heat conduction of the four metals?

_____

_____

Use the graph grid to draw a bar graph using the results in the table.



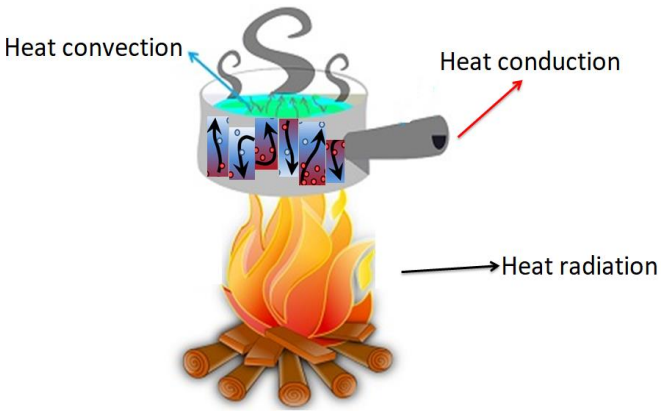
CONVECTION

(a) Heat convection is the movement of fluids (liquids and gases) when heated.

(b) Heat always travels from a hot to a cold object.

(c) Liquids and gas particles expand at high temperatures and move down at low temperatures.

(d) The up and down movement of liquids and gas particles due to heat transfer is known as convection current.



RADIATION

(a) Radiation is the transmission of energy in a form of waves.

(b) The energy (heat) is transferred from a source and travels through space as electromagnetic waves.

(c) Heat radiation does not require a medium and it happens in liquids, gases and solids.

(d) Radiation heats up dark surfaces because dark surfaces absorb more light energy while light coloured objects emit more light.

(e) The more light an object absorbs, the more it heats up.

(f) Shiny surfaces on the other hand reflect or cause light to bounce off.

Answer the following questions:

1. What is convection?

   _____

2. How does heat move?

   _____

3. How do liquids and gas particles behave when heated?

   _____

4. Explain what is meant by convection current?

   _____

5. What is radiation?

   _____

6. Discuss the difference between radiation and convection.

_____

_____

7. Explain how and where does radiation occur?

_____

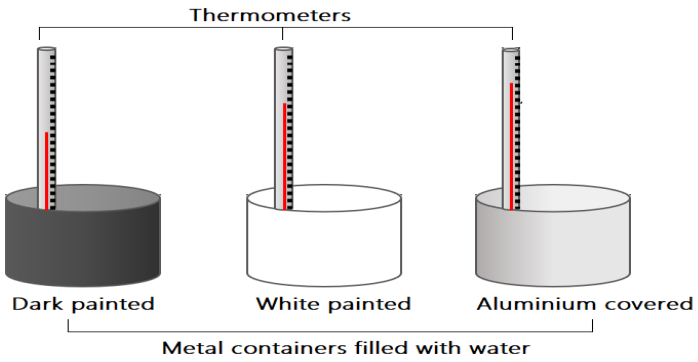
_____

8. Explain why radiation heats up dark surfaces than shiny surfaces.

_____

_____

INVESTIGATION: HEAT ABSORPTION



Introduction:

A colour that absorbs light changes the light into heat energy. The more light a material absorbs, the more heat energy it produces.

AIM: To compare the heat absorptions of different colours.

MATERIALS AND APPARATUS:

(a) 3 metal containers painted dark, white and silver

(b) 3 thermometers

(c) Water

(d) Stop watch or digital clock

Method:

1. Add the same amount of water in each container.
2. Take a temperature reading every 3 minutes
3. Record your readings in a table.
4. Compare the readings.

Results

Material	Temperature at 3 minutes intervals		
	3 minutes	6 minutes	9 minutes
Dark metal			
White metal			
Aluminium metal			

Conclusion

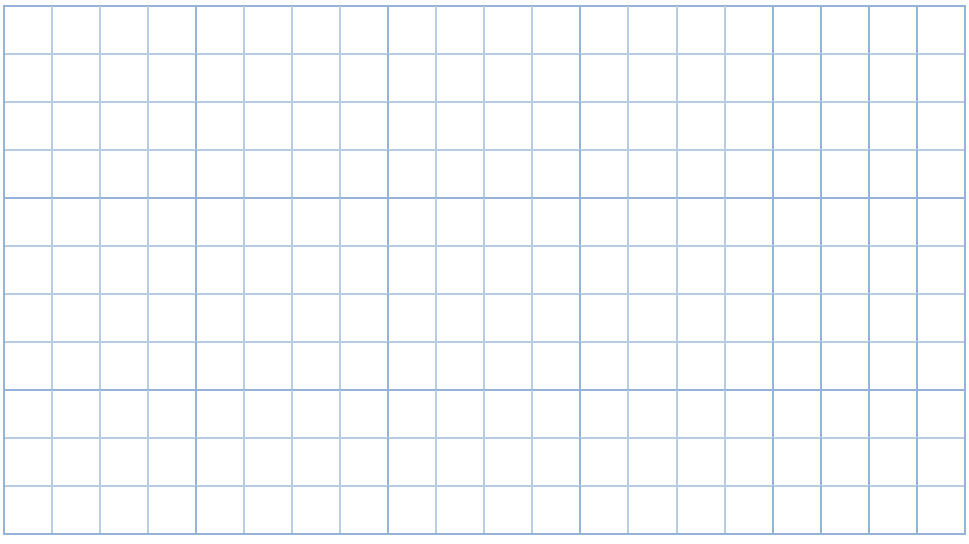
What is your conclusion regarding the heat absorption of the three colours?

_____

_____

Use the graph grid to draw a line graph using the results in the table.

Colour



0 2 4 6 8 10

Time (min)

Using insulating material

(a) Heat can be lost or gained through conduction, convection and radiation.

(b) Human bodies also lose energy in the same way (convection, radiation and conduction).

(c) Insulators are used to reduce heat loss (in cold conditions) or excessive heat coming in (hot conditions).

(d) Insulators are used in buildings, cars, clothes, blankets, cooler boxes and other designs that need temperature regulation.

(e) Insulators help in conserving energy

Answer the following questions:

1. List the three methods through which heat can be lost.

   _____

2. How do human bodies lose energy?

   _____

3. Discuss the importance of insulators.

   _____

4. Explain where and how do we use insulators.

   _____

   _____

INVESTIGATION

AIM: To compare the effectiveness of different materials as thermal insulators.

Hypothesis: Formulate a hypothesis

MATERIALS AND APPARATUS

(a) 1 Large beaker / bottle

(b) 1 Small beaker / bottle

(c) Bunsen burner / Spirit burner

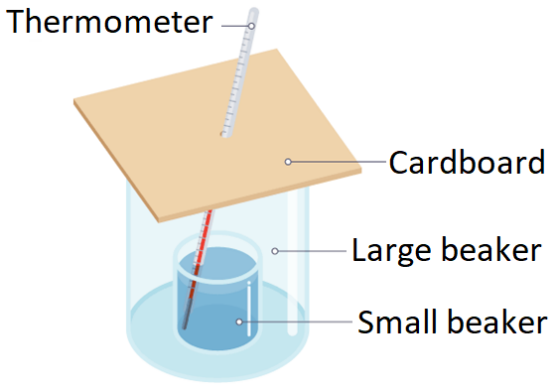
(d) Thermometer

(e) Styrofoam

(f) Plastic

(g) Newspaper

(h) Stop watch / Watch



Method:

1. Place a small beaker into a larger beaker or use bottles.
2. Heat water to a boil and use it to fill the small beaker.
3. Make a lid out of cardboard and drill a hole big enough to insert a thermometer.
4. Put the cardboard lid over the large beaker.
5. Insert a thermometer through the lid into the smaller beaker.
6. Take a reading of the water temperature over 5 minutes on one minute intervals.
7. Repeat steps 1- 6 now putting the following materials between the two beakers as insulators:

    (a) Styrofoam

    (b) Plastic

    (c) Newspaper

RESULTS

Insulator	Temperature in °C at 1 minute intervals				
	1 min	2 min	3 min	4 min	5 min
None					
Styrofoam					
Plastic					
Newspaper					

Conclusion:

What is your conclusion about the materials used as insulators?

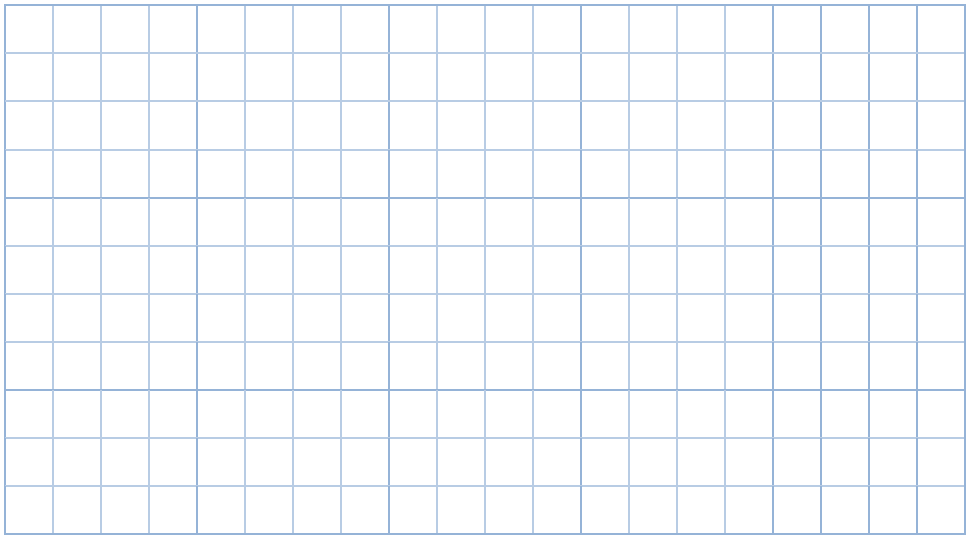
_____

_____

_____

Use the graph grid to draw a line graph using the results in the table.

Temperature



0 1 2 3 4 5

Time (min)

ENERGY TRANSFER TO SURROUNDINGS

(a) Systems have energy input and output.

(b) Energy input is the energy that goes in and output is the useful energy.

(c) Appliances produce useful energy outputs

(d) Not all energy in systems is useful energy since some energy is being wasted.

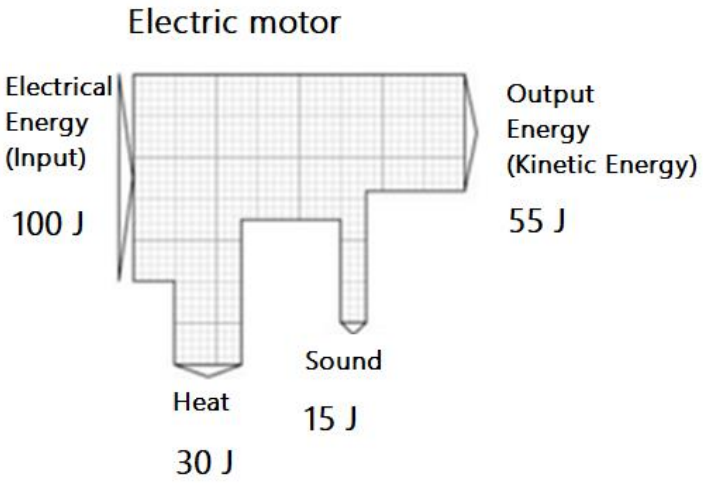
(e) Energy is wasted in the form of heat, sound and light or even transferred to surroundings.

(f) We say it is wasted because it is not used for the intended purpose.

(g) Cars waste about 65% energy in the form of heat.

(h) Coal power stations waste about 50% of energy as heat.

(i) We can use a Sankey diagram to show how energy can be transferred in a system.



Answer the following questions:

1. What is energy input and output?

   _____

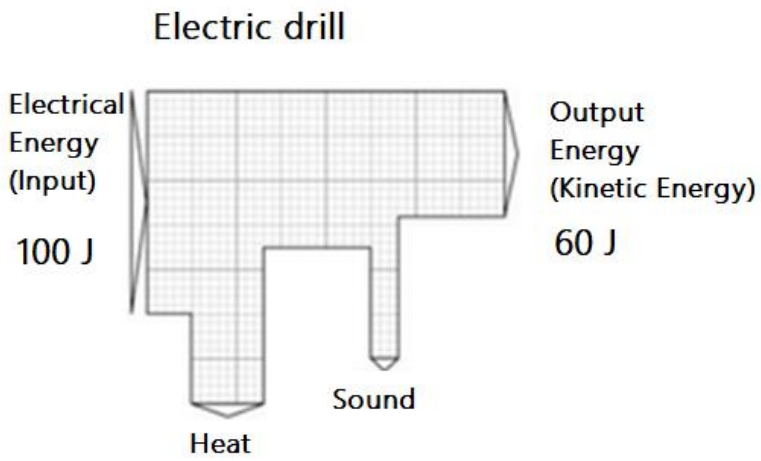
2. Explain the ways in which energy is wasted.

   _____

3. How much energy do cars and coal power station waste?

   _____

4. Use the diagram to answer the questions that follow.



4.1 What is the energy input in this diagram?

_____

4.2 How much is the energy input as shown in the diagram?

_____

4.3 If 25 % of the energy is wasted as heat, what is the amount of energy wasted?

_____

4.4 How much energy is wasted as sound?

_____

4.5 What is the useful energy of the drill?

_____

4.6 The efficiency of an electric drill also depends on the number of turns per minute. How can you improve the efficiency of the electric drill shown?

_____

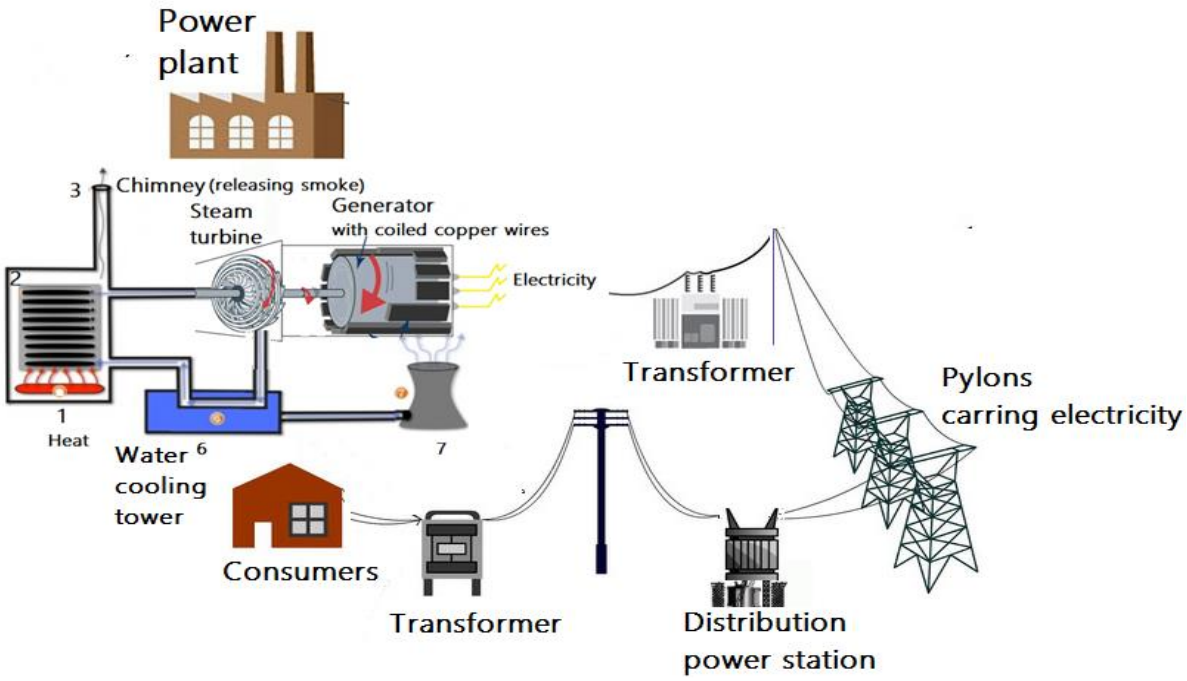
(a) National electricity grid is the production of electricity in a huge scale.

(b) The grid works as a circuit.

(c) Coal, oil, gas, nuclear power, solar, wind, geothermal and water all contribute to the national electricity grid.

(d) Heat energy is used to heat water and generate steam.

(e) The steam is used to turn the blades of turbines



(f) Turbines are connected to the generator.

(g) The turbines then turn the generators that produce electricity.

(h) The electricity is then transferred into the national electricity supply grid through wires.

(i) Pylons carry the electrical energy in cables to consumers to use it.

(j) Dynamos are small electric generators used in some bicycles, mining helmets, windup torches and radios to produce small amounts of useful energy from mechanical movement.

Answer the following questions:

1. What is National electricity grid?

   _____

2. List the contributing energy producers to the national electricity grid.

   _____

   _____

3. Discuss how different systems contribute to the electricity grid.

   _____

   _____

4. What is the role of turbines in energy generation?

   _____

5. What turns the turbines?

   _____

6. Discuss how electricity is produced and how it is finally transported to consumers.

   _____

   _____

CONSERVING ELECTRICITY IN THE HOME

(a) Producing electricity comes at a cost hence electricity must be conserved.

(b) The electricity system in South Africa has been under strain.

(c) The strain has led to rotating power disruptions.

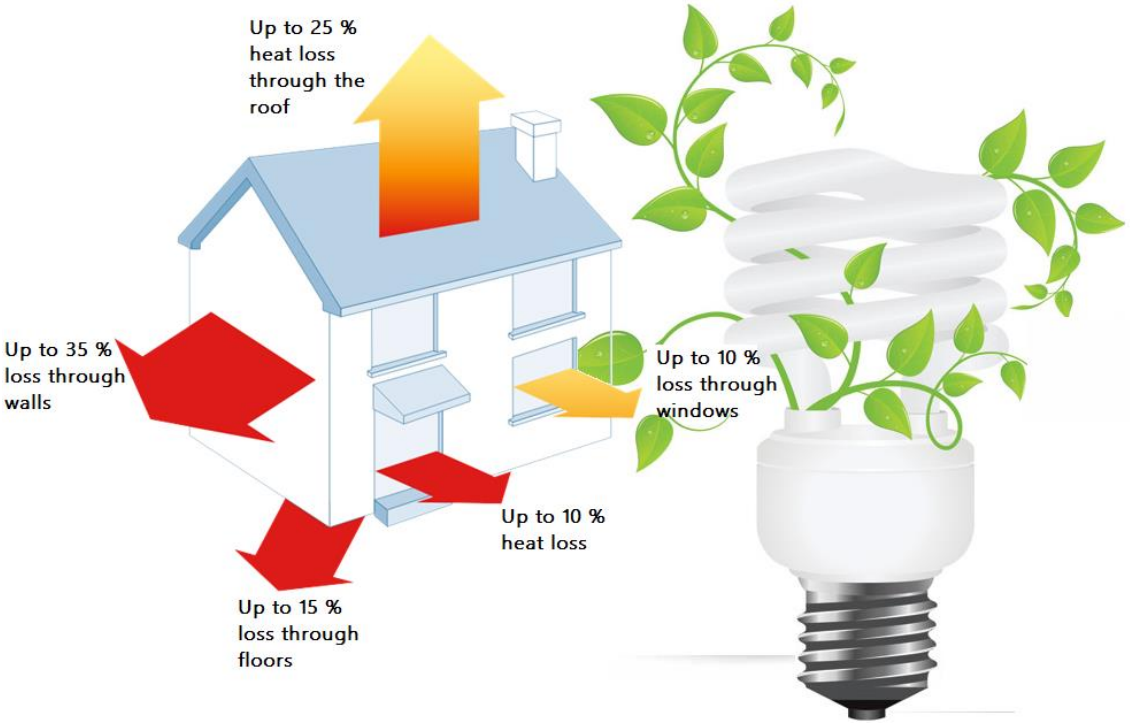
(d) Saving electricity is a responsibility for all.

(e) We can save electricity by turning off the lights when not in the room or building.

(f) Saving electricity includes dressing warm instead of using heaters.

(g) Do not boil or heat more water than you need.

(h) Match pot size to stove plate and use energy efficient appliances and light bulbs.



Answer the following questions:

1. Explain why producing electricity is expensive.

   _____

2. Explain what happens if the energy demand is greater than the supply?

   _____

   _____

3. Is it important to save energy? Explain.

_____

_____

4. Looking at diagram, discuss how heat is lost.

_____

5. Explain how energy can be conserved.

_____

_____