

# BGE Science Energy Summary

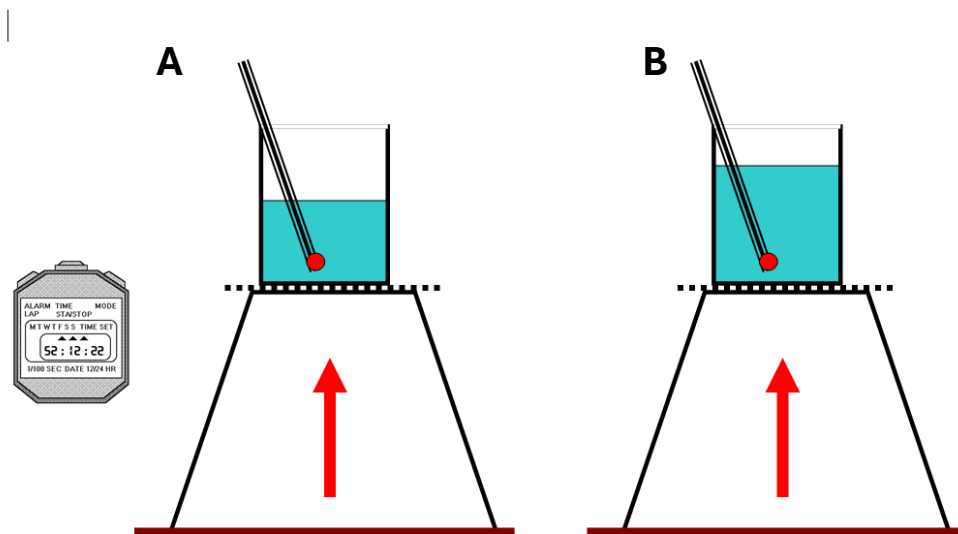
## Forms of energy

| Stores of Energy | Using Energy |
|------------------|--------------|
| E                | K            |
| G                | L            |
| C                | H            |
| N                | E            |
|                  | S            |

## Heat versus Temperature

Is there a difference between heat and temperature?

Heat is a form of \_\_\_\_\_. Temperature is a measure of how \_\_\_\_\_ or \_\_\_\_\_ something is.

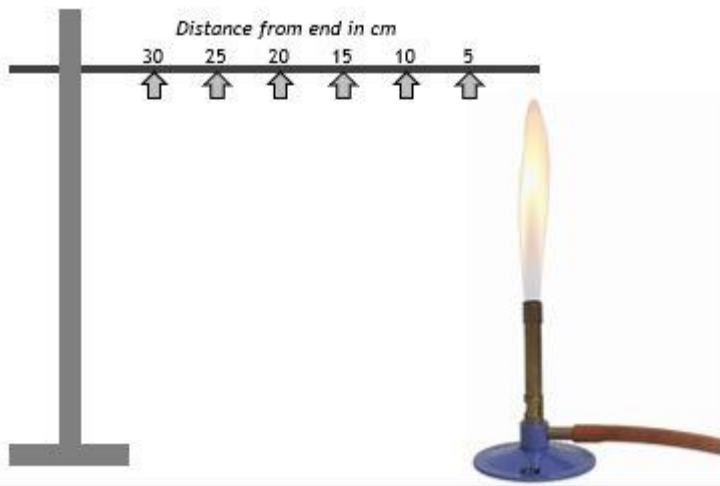


At the start of the experiment the temperature of the water in each beaker should be \_\_\_\_\_

After two minutes the temperature of the water in Beaker \_\_\_\_\_ is \_\_\_\_\_ because \_\_\_\_\_

After 10 minutes the temperature of the water in both beakers is \_\_\_\_\_°C, because \_\_\_\_\_

The 3 ways heat travels \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

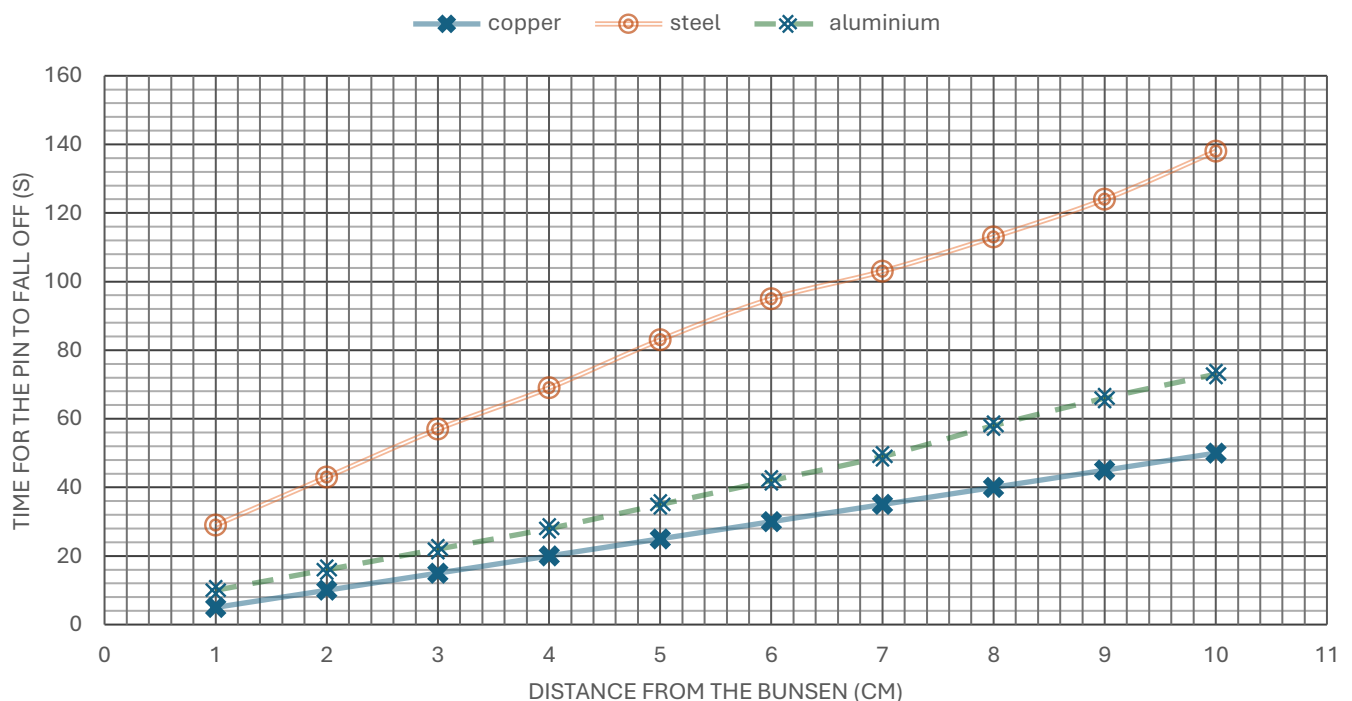


State the method that by which heat travels along the rod.

From the graph

1. Which rod allows the heat along it best?
2. Which rod is worst at allowing the heat to travel along it?
3. Explain your answer to Q2 and 3

## Time for the pins to fall off for different metals



- Heat can be transferred in \_\_\_\_\_ (a number) distinct ways.
- Heat travels from **hot/cold** places to **hot/cold** places.
- Heat can be transferred by c\_\_\_\_\_, c\_\_\_\_\_ and r\_\_\_\_\_
- Heat can travel through solid because the energy is passed along from particle to particle. This process is called \_\_\_\_\_.
- M\_\_\_\_\_ are good conductors of heat.
- C\_\_\_\_\_ and A\_\_\_\_\_ are good conductors of heat.
- Materials which do not conduct heat are called \_\_\_\_\_.
- Gases are the poorest conductors of heat, in other words they are the best i\_\_\_\_\_

- Heat travels through fluids, (liquids and gases) by \_\_\_\_\_ (and also radiation).
- Convection occurs as the warmed material has greater spacing between the particles so the density of the warmer material is less than the density of the c\_\_\_\_\_ material.
- The heated fluid r\_\_\_\_\_, the colder fluid sinks down to take its place. This sets up a **convection current**. Hot air balloons use this to change height.
- Stirring a hot fluid ensures the temperature is the same throughout the fluid.
- Radiation is the way heat travels from the S\_\_\_\_\_ to E\_\_\_\_\_.
- Radiation is heat travelling in waves.
- Radiation does not need particles to travel.
- Radiation is also called infra-red radiation.
- B\_\_\_\_\_ D\_\_\_\_\_ surfaces absorb and emit more radiation, s\_\_\_\_\_ surfaces reflect more radiation

## 1. What are non-renewable and renewable energy resources?



### Non-renewable resources

- A. Cannot be replenished
- B. Will run out (finite)  
e.g. fossil fuels (oil, coal, gas), nuclear fuels

#### Advantages

- A. Reliable
- B. Provide large amounts of energy
- C. Low extraction costs

#### Disadvantages

- A. Fossil fuels could run out one day
- B. Burning fossil fuels releases carbon dioxide and other greenhouse gases into the atmosphere. The global scientific community has reached consensus that this contributes to global warming causing what is commonly referred to as climate change
- C. Nuclear power stations are expensive to build and produce dangerous waste

### Renewable resources

- A. Can be replenished
- B. Will not run out (infinite)  
e.g. wind, solar, hydroelectric, wave, tidal, geothermic, biomass

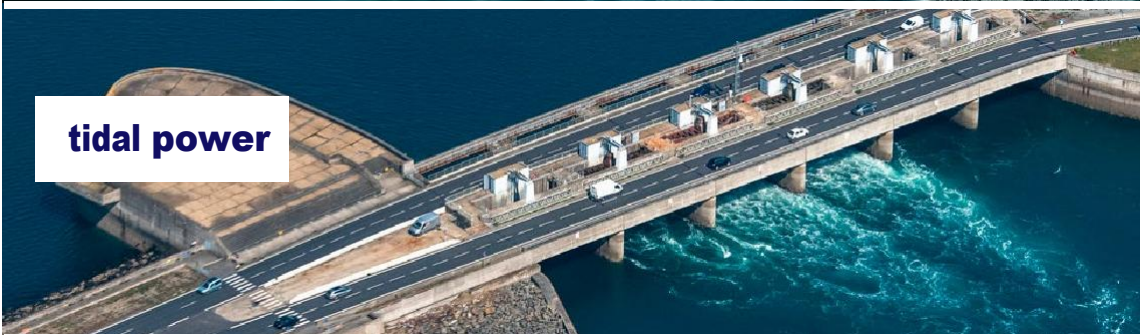
#### Advantages

- A. Will never run out
- B. Once in place, renewables operations don't add carbon dioxide or other greenhouse gases to the atmosphere

#### Disadvantages

- A. Don't produce power on the same large scale as traditional fossil fuel power stations, so more will need to be built
- B. Can disrupt habitats and migrating birds
- C. Wind and solar power can be intermittent as both depend on ever-changing weather

| Renewable energy resource                                                                                      | How it works                                                                                                                                                                                                         | Advantages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Disadvantages                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>wind power</p>          | <p>Wind turbines in exposed places on land and at sea use generators to turn wind into electricity.</p>                                                                                                              | <ul style="list-style-type: none"> <li>• Operation of wind turbines does not release emissions that can pollute the air or water</li> <li>• No fuel costs and low running costs</li> </ul>                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• High manufacturing and implementation costs</li> <li>• Visual and noise pollution</li> <li>• Weather dependent - needs wind</li> </ul>                                                                                                                                        |
|  <p>solar power</p>         | <p>Solar cells use energy from sunlight to generate electricity. Cells are grouped on panels and many panels make a solar farm.</p>                                                                                  | <ul style="list-style-type: none"> <li>• Operation does not release emissions that can pollute the air or water</li> <li>• No fuel costs and low running costs</li> <li>• Reliable in sunny countries, in daytime</li> <li>• Can give a single house its own electricity supply</li> <li>• Cost of manufacturing solar panels has fallen, making this the cheapest form of electricity</li> </ul>                                                                                              | <ul style="list-style-type: none"> <li>• Solar panels have a life span of around 30 years</li> <li>• Solar cells produce a relatively small amount of electricity; solar farms can require a lot of space</li> <li>• Weather/season dependent - solar panels are more effective in areas with more sunlight</li> </ul> |
|  <p>hydroelectric power</p> | <p>Uses falling water; rainwater that collects behind a dam passes through turbines to generate electricity.</p>                                                                                                     | <ul style="list-style-type: none"> <li>• Operation does not release emissions that can pollute the air or water</li> <li>• Reliable in areas with high rainfall</li> <li>• No fuel costs and low running costs</li> <li>• Can immediately respond to high energy demand</li> <li>• Operation does not release emissions that can pollute the air or water</li> <li>• No fuel costs and low running costs</li> <li>• Useful for island countries, to provide energy on a small scale</li> </ul> | <ul style="list-style-type: none"> <li>• High manufacture and implementation costs</li> <li>• High environmental impact due to flooding of the valley and habitat loss</li> <li>• Only works in hilly areas with high rainfall</li> </ul>                                                                              |
|  <p>wave power</p>          | <p>As waves come to shore, they force air into lots of small turbines to generate electricity.</p>                                                                                                                   | <ul style="list-style-type: none"> <li>• Operation does not release emissions that can pollute the air or water</li> <li>• No fuel costs and low running costs</li> <li>• Useful for island countries, to provide energy on a small scale</li> </ul>                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• High manufacture and implementation costs</li> <li>• Can be unpopular with local communities because of environmental impact</li> <li>• Weather dependent - wave size decreases with less wind</li> </ul>                                                                     |
|  <p>tidal power</p>        | <p>A tidal barrage (a dam with turbines in it) is built across a river estuary. As the tide comes in, the water flows through the turbines and generates electricity.</p>                                            | <ul style="list-style-type: none"> <li>• Operation does not release emissions that can pollute the air or water</li> <li>• No fuel costs and low running costs</li> <li>• Useful for island countries with the potential to provide electricity on a large scale</li> </ul>                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• High manufacture and implementation costs</li> <li>• Only certain estuaries are suitable</li> <li>• Building a barrage can affect local habitats and boat access</li> </ul>                                                                                                   |
|  <p>geothermal</p>        | <p>Cold water is pumped underground, heated by hot rocks and changed to steam. The steam generates electricity or can be used directly for heating. Simpler and cheaper to use in volcanic regions.</p>              | <ul style="list-style-type: none"> <li>• Operation does not release emissions that can pollute the air or water</li> <li>• No fuel costs and low running costs</li> <li>• Reliable, simple and cost effective in volcanic regions such as Iceland and New Zealand, as hot rocks are nearer to the surface</li> </ul>                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• High implementation costs</li> <li>• Less viable in non-volcanic regions as you have to dig deeper to reach hot rocks</li> </ul>                                                                                                                                              |
|  <p>biomass</p>           | <p>Biomass is material that comes from plants and animals. When burnt, it heats water to produce steam. The steam drives turbines to generate electricity. It can also be converted to liquid and gaseous fuels.</p> | <ul style="list-style-type: none"> <li>• Readily available</li> <li>• Can potentially be net zero as although biomass produces CO2 when burnt, plants absorb CO2 when photosynthesising</li> </ul>                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Produces CO2 when burnt</li> <li>• Can take up large areas of farmland and can have a negative impact on habitats and biodiversity</li> </ul>                                                                                                                                 |

| Renewable energy resource                                                                                   | How it works                                                                                                                                                                                                  | Advantages                                                                                                                                                                                                                                                                                                                                                                                                             | Disdvantages                                                                                                                                                                                                                                                                                                           |
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**Net zero\*** means reducing greenhouse gas emissions and balancing the impact of any remaining emissions by removing them from the atmosphere

• \*please see: <https://www.un.org/en/climatechange/net-zero-coalition-for-the-un's-definition-of-net-zero>High manufacture and implementation costs

