# Year 9 Science – Term One KO

## 1. Tier 3 Vocab

- **Atom** Basic building blocks of all substances.
- **Chemical energy store** Energy stored because of the chemical composition of an object.
- **Conservation of energy** Energy cannot be created or destroyed, only transferred from one store to another.
- **Dissipation** The spreading out of energy so it is stored less usefully.
- **Efficiency** A measure of how much energy is usefully transferred.
- **Elastic potential energy store** Stored in a compressed or twisted elastic material.
- **Energy transfer** Energy moved from one store to another.
- **Gravitational energy store** Stored because of the position of the object above ground.
- **Joule** Unit of energy
- **Kinetic energy store** Stored in a moving object.
- **Mass** Amount of matter something contains, kilograms.
- **Temperature** A measure of how hot something is.
- **Work** Causes energy to be transferred from one store to another.

## 2. Energy stores and pathways

Objects can have **stored energy** either because of:

- Their chemical composition – **chemical energy**
- Their movement – **kinetic energy**
- Their temperature – **thermal energy**
- Their position in a field – **gravitational potential energy, magnetic energy, electrostatic energy**
- Compression or distortion of an elastic material – **elastic potential energy**

Energy can transfer from one store to another along one of four energy pathways:

- Mechanical - ***Force acts upon an object***
- Electrical - ***Electric current flow***
- Heat - ***Temperature difference between objects***
- Radiation - ***Electromagnetic waves or sound***

## 3. Energy transfers

- The unit for energy is the **joule.**
- The **law of conservation of energy** states**:**
  Energy **<u>cannot</u>** be created or destroyed, only transferred from one store to another.
- Energy can be **transferred** to other useful **energy stores** or **dissipated**.
- If energy is dissipated, it spreads out and gets transferred to less useful stores (e.g. heating due to friction).
- When an object falls through the air, its gravitational potential energy (GPE) store is transferred to its kinetic energy (KE) store.
- As it falls, the GPE store decreases and the KE store increases by the same amount.

## 4. Energy equations

$$E_k = \frac{1}{2}mv^2$$

$E_k$ is kinetic energy in joules (J); $m$ is mass in kilograms (kg); $v$ is speed in metres per second (m/s)

$$E_p = mgh$$

$E_p$ is gravitational potential energy in joules (J); m is mass in kilograms (kg); g is gravitational field strength in newtons per kilogram (N/kg); h is height in metres (m)

$$P = \frac{E}{t} \text{ or } P = \frac{W}{t}$$

$P$ is power in watts (W); $E$ is energy transferred in joules (J); $t$ is time in seconds (s); $W$ is work done in joules (J)

## 5. Efficiency

- **Efficiency** is a measure of how much energy is usefully transferred.
- Efficiency can be increased by using ways to reduce 'wasted' energy - **insulation, streamline design, lubrication of moving parts**, etc.
- It can be calculated using one of two equations:

$$efficiency = \frac{useful\ output\ energy}{total\ input\ energy}$$

$$efficiency = \frac{useful\ output\ power}{total\ input\ power}$$

- Efficiency will **always** be a decimal less than 1.
- It can be turned into a percentage by x100%.
- For example, an efficiency of 0.75 is 75% efficient, meaning the device wastes 25%.

## 6. Command Words

These are the key words in a question that tell you how the question should be answered.

**State** – requires you to recall a key fact without any further information needed.

Example:
State the law of conservation of energy.
Answer: Energy cannot be created or destroyed, only transferred from one store to another.

**Describe** – say what will happen, but <u>without</u> any reason why.

Example:
Describe what happens to the kinetic energy store of a car as its speed increases.
Answer: The kinetic energy store of the car will increase as speed increases.

**Explain** – give the reasons for something happening.

Example:
Explain what effect insulation has on the efficiency of a kettle.
Answer: Insulation will increase the efficiency *because* it reduces the amount of thermal energy transferred out of the kettle.