UNIT 8.2: PHYSICAL WORLD

Major Learning outcome for UNIT 8.2:

After this UNIT students should be able to:

Explain that energy is transferred / transformed and force act on all objects.

ENERGY

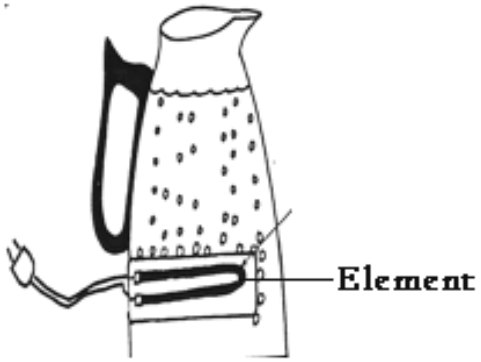
Energy: ability to do work
Work: be able to move something

Different kind of energy

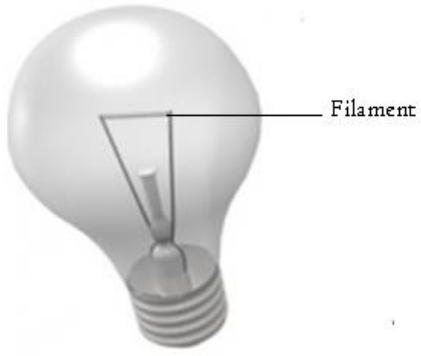
1. Heat
2. Sound
3. Electrical
4. Light
5. Movement/ kinetic
6. Atomic
7. Potential
   i. Stored chemical
   ii. Stored elastic
   iii. Stored gravitational

Energy at work

Element: a special wire for heating is called an electrical element.

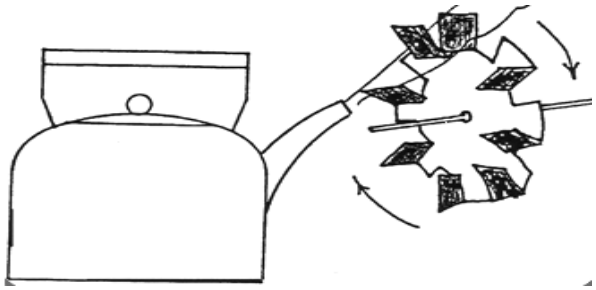


Filament: a special wire that change electricity into light is called an electric filament. Argon gas is often put in the bulb because it does not support burning.



Making heat to do work.

Paddlewheel: A paddlewheel is a very weak motor



The steam just blows the wheel around. But a real steam engine takes all the force of the expanding steam and uses it to push the wheels around.

Where energy goes

Energy cannot be created nor destroyed. It just changed from one form to another. Some is lost as heat to space.

Example of energy changes

Photosynthesis: $light \rightarrow stored\ chemical$
Electric kettle: $electrical \rightarrow heat$
Radio (battery): $stored\ chemical \rightarrow sound$

Conservation: looking after our energy supplies
Why: expensive, limited

Renewable Energy:

This is refers to the sources or energy that can be made easily or never run out. For example, air, wind, water, light from the sun.

Non-renewable energy

These are the sources or energy that cannot be replaced when they are used up. For example, the fossil fuel we burn for energy (natural gas, coal, oil). These resources take millions of years to form again.

Fossil fuels such as oil, coal, and gas will not last forever. They are non-renewable. People are trying hard to find new fuels that are clean and will provide the power we need. Wind and solar power are renewable resources that offer hope for the future.

FORCE

- A pull, push or twist acting on an object
- Unit is Newton (N)

Mass

- Amount of matter in an object.
- Unit is Kg.
- Mass does not change as on the moon and on earth

Weight

- a force acting on an object due to the pull of gravity.
- Weight is measured by a spring balance.
- Unit for weight is Newton (N)

Force of gravity

- A natural force pulling all object toward the centre of the earth.
- Force of gravity on earth = 10 m/s^2
- Force of gravity on the moon = $\frac{10}{6}$ m/s^2
- Force of gravity on earth is 6 times of the force of gravity on the moon.
- Gravity affects the weight but NOT the mass.

Calculating weight on the moon and on earth.

$W_{(e)} = m \times g_{(e)}$ where $g_{(e)} = 10\ m/s^2$

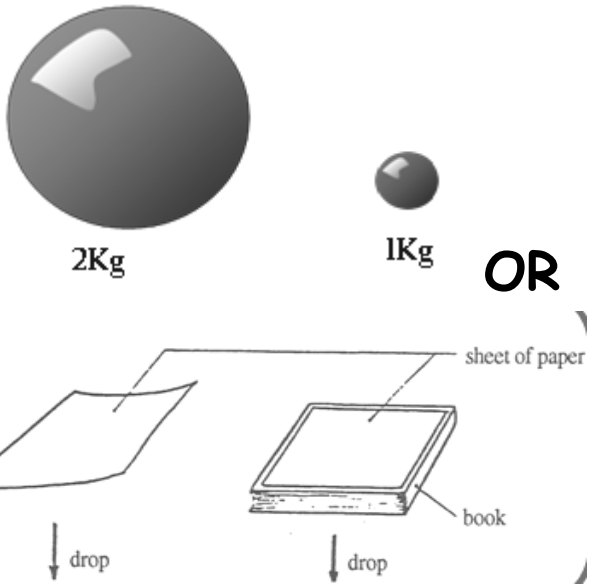
$W_{(m)} = m \times g_{(m)}$ where $g_{(m)} = \frac{10}{6}\ m/s^2$

*mass is the same everywhere.

Friction:

- Friction is a force that occurs when two surfaces opposes (pass against) each other.
- It is a force that opposes motion.
- Rough surfaces have high friction while smooth surface have low friction.
- Friction always acts on the opposite direction.

What happen when two objects is drop from above?



Theoretically, if any objects will drop from the same height, no matter what their masses are, they will reach the ground at the same time.
Practically, the two objects will NOT reach at the same time due to air resistance (friction).

Advantage of friction

- Rough wheels of tractor can be able to run on muddy ground
- Parachute can be able to fall down to the ground properly
- Without friction, cars and people will not be able to stop when they want to stop!
- Friction of brakes makes cars stop
- You walking properly is due to the friction between your feet and the ground

Disadvantage of friction

- Slow down motion
- More heat is lost

Types of Friction

1. **Sliding-** force resulting when pushing or pulling an object over a surface eg pushing a box across the floor.
2. **Rolling-** contact is reduced because of rollers, balls or wheels eg skate board
3. **Fluid** – type of friction that happens with liquid and gases eg Olympic bike riders, walking through water.

How to reduce friction

- Use lubricant such as oil, grease between surfaces
- Use ball bearing or rollers between surfaces
- Arrange objects on top of the other

UNBALANCE FORCE

- Newton 1st law: an object will remain at rest until a force is applied.
- When two forces are acting from opposite sides and are balanced, there will be no motion.
- When two forces are acting from opposite sides and are unbalanced, there will be motion (movements)
- Unbalance force cause the objects to slow down, speed up or change directions.