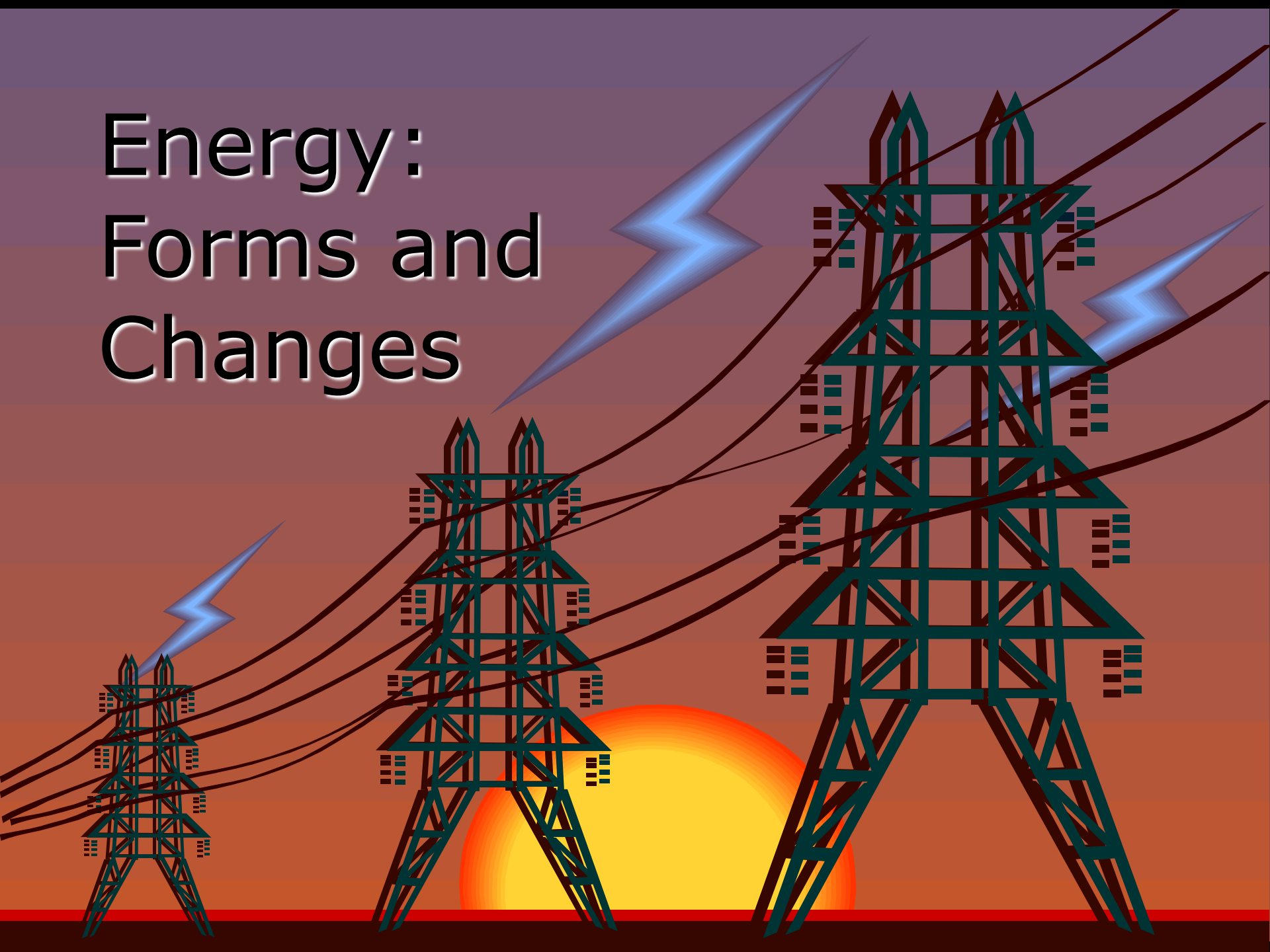


Energy: Forms and Changes



Nature of Energy



Living organisms need energy for growth and movement.



Nature of Energy

- What is energy that it can be involved in so many different activities?
 - Energy can be defined as the ability to do work.
 - If an object or organism does work (exerts a force over a distance to move an object) the object or organism uses energy.



Nature of Energy

- Energy and work is measured in joules (J).



The Law of Conservation of Energy

- Energy can be neither created nor destroyed by ordinary means.
 - It can only be converted from one form to another.
 - If energy seems to disappear, then scientists look for it – leading to many important discoveries.



Law of Conservation of Energy

- In 1905, Albert Einstein said that mass and energy can be converted into each other.

-

- $E = MC^2$

E = Energy


M = Mass

C^2 = Speed of Light



States of Energy

- All forms of energy can be in either of two states:
 - Potential
 - Kinetic



States of Energy: Kinetic and Potential Energy

- Kinetic Energy is the energy of motion.
- Potential Energy is stored energy.



Kinetic Energy

- The faster an object moves, the more kinetic energy it has.
- The greater the mass of a moving object, the more kinetic energy it has.
- Kinetic energy depends on both mass and velocity.



Kinetic Energy

$$\text{K.E.} = \frac{\text{mass} \times \text{velocity}^2}{2}$$

What has a greater affect of kinetic energy, mass or velocity? Why?



Potential Energy

- Stored chemically in fuel, the nucleus of atom, and in foods.
- Or stored because of the work done on it:
 - Stretching a rubber band.
 - Winding a watch.
 - Pulling back on a bow's arrow.
 - Lifting a brick high in the air.

Gravitational Potential Energy

- Potential energy that is dependent on height is called gravitational potential energy.

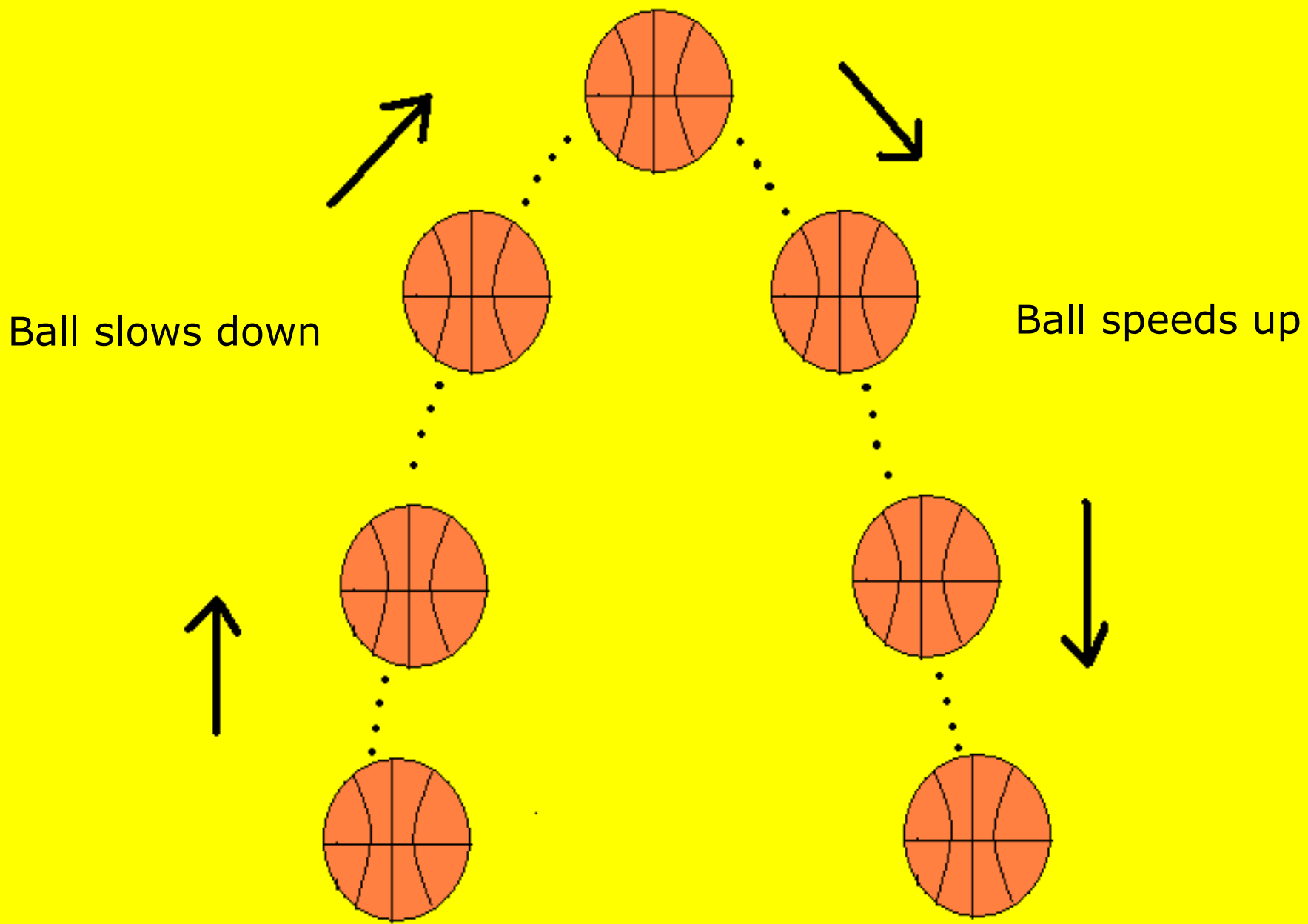




Gravitational Potential Energy

- “The bigger they are the harder they fall” is not just a saying. It’s true. Objects with more mass have greater G.P.E.
- The formula to find G.P.E. is
$$\text{G.P.E.} = \text{Weight} \times \text{Height.}$$

Maximum Potential Energy



Ball slows down

Ball speeds up

Maximum Kinetic Energy

Forms of Energy

- The five main forms of energy are:
 - Heat
 - Chemical
 - Electromagnetic
 - Nuclear
 - Mechanical





Heat Energy

- The internal motion of the atoms is called heat energy, because moving particles produce heat.
- Heat energy can be produced by friction.
- Heat energy causes changes in temperature and phase of any form of matter.



Chemical Energy

- Chemical Energy is required to bond atoms together.
- And when bonds are broken, energy is released.

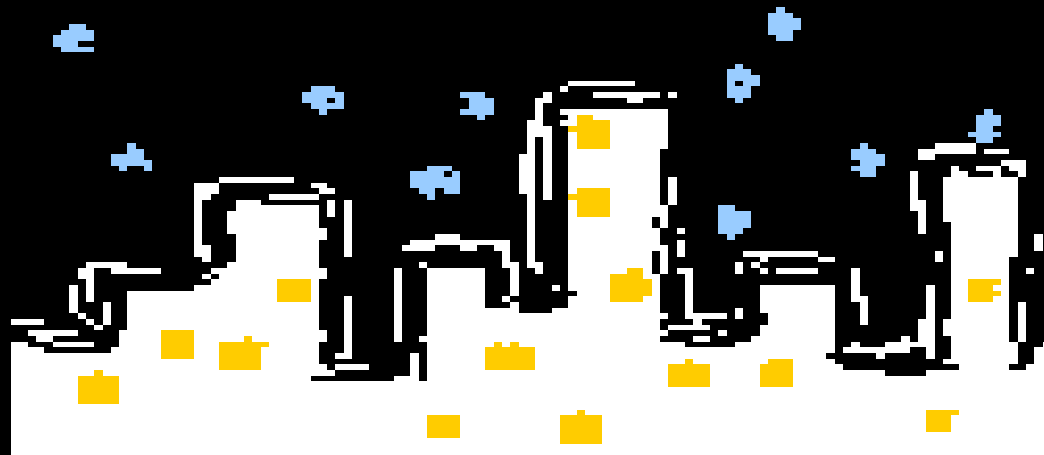
Chemical Energy

- Fuel and food are forms of stored chemical energy.



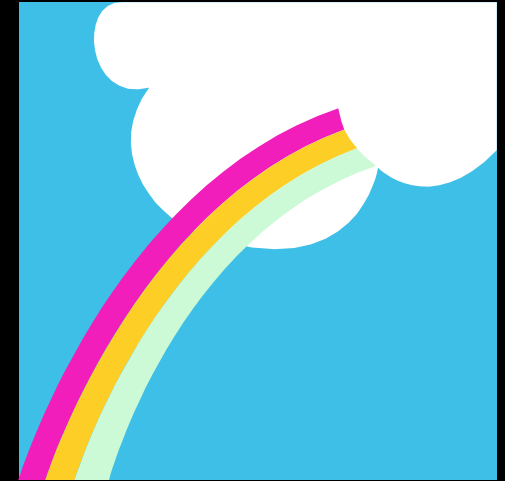
Electromagnetic Energy

- Power lines carry electromagnetic energy into your home in the form of electricity.



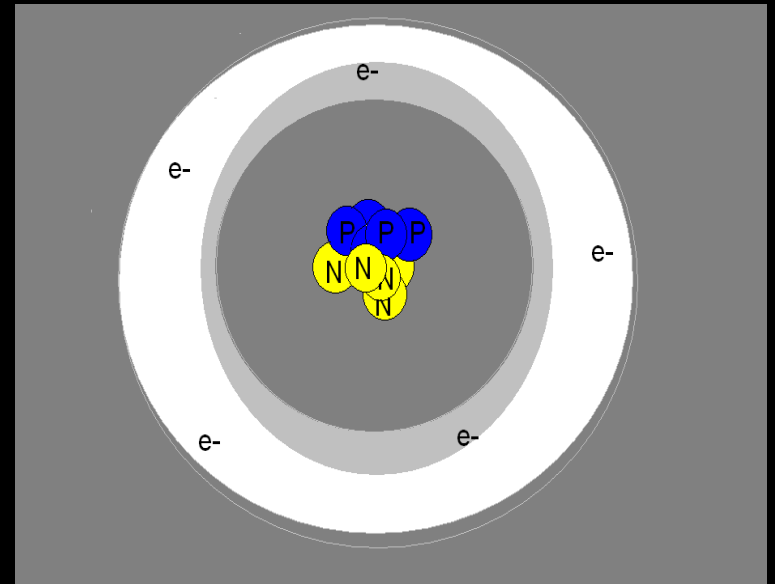
Electromagnetic Energy

- Light is a form of electromagnetic energy.
- Each color of light (Roy G Bv) represents a different amount of electromagnetic energy.
- Electromagnetic Energy is also carried by X-rays, radio waves, and laser light.



Nuclear Energy

- The nucleus of an atom is the source of nuclear energy.



Nuclear Energy

- Nuclear energy is the most concentrated form of energy.





Nuclear Energy

- When the nucleus splits (fission), nuclear energy is released in the form of heat energy and light energy.
- Nuclear energy is also released when nuclei collide at high speeds and join (fuse).



Mechanical Energy

- When work is done to an object, it acquires energy. The energy it acquires is known as mechanical energy.



Energy Conversion

- Energy can be changed from one form to another. Changes in the form of energy are called energy conversions.

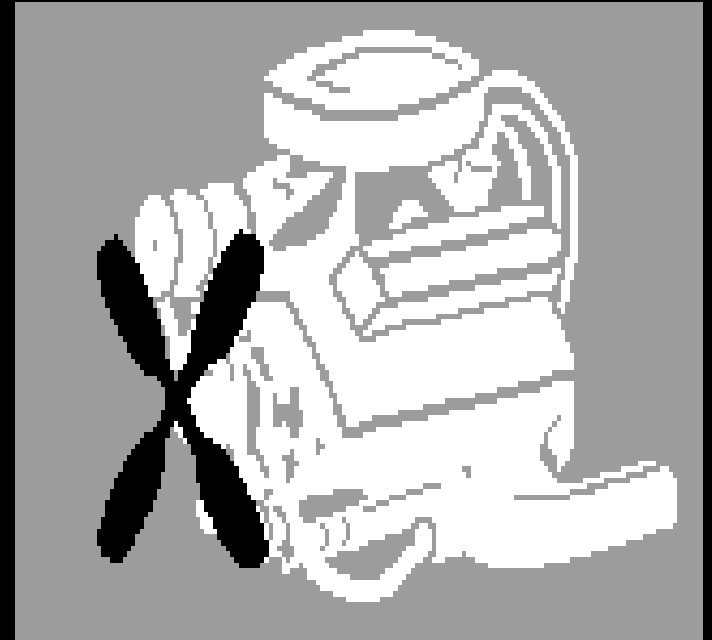


Energy conversions

- All forms of energy can be converted into other forms.
 - The sun's energy through solar cells can be converted directly into electricity.
 - Green plants convert the sun's energy (electromagnetic) into starches and sugars (chemical energy).

Energy Conversions

- In an automobile engine, fuel is burned to convert chemical energy into heat energy. The heat energy is then changed into mechanical energy.





Chemical \rightarrow Heat \rightarrow Mechanical