Learning Targets
1. I can explain how two objects can exert forces on each other without touching.
2. I can compare the electric, magnetic, and gravitational fields.
Vocabulary within this set of notes
1. Field Force:
2. Magnetism / Magnetic Fields:
3. Electric Fields:
4. Gravitational Fields:

Field Forces
Objects have a region of influence surrounding them, called “fields”.

This field can be electric, gravitational or magnetic.
Magnetic Potential Energy

Magnetism - The force generated by magnets

- Caused by a moving electric charge in the magnet or magnetic material
- The force is applied when the magnetic domains (think miniature magnets due to atoms) are aligned (pointed in the same direction!)

If the magnetic domains are aligned, the object is magnetic!
Magnetic Fields

- The field is the area around a magnet that can attract or repel objects in its field.
- Depends on:
  - Strength of the magnet
  - Distance between objects
- They always have two poles (N and S) where the magnetic field is the strongest
- Opposites attract N-S
- The field is strongest at its poles.
- Magnetic fields weaken rapidly with increasing distance!

Magnetic Fields

- They are **strongest when closer to the magnet because the field lines are closer together.**
- Always start on the north pole of the magnet and end at the south pole (see the direction of the arrows on the field model)
Earth is a magnet and has a magnetic field!

- The solid, metal inner core spins inside a liquid outer core of metal creating a magnetic field.
- Earth’s magnet field protects it from harmful charged particles (electromagnetic / radiant energy) sent by the Sun.
- These charged particles are deflected toward the magnetic poles and react with the Earth’s atmosphere causing aurora’s called the Northern and Southern Lights.

Electric Fields

- Electric fields can attract or repel, depending on the charge of the object that is involved.
- Electric fields get weaker at greater distances.
- The greater the charge, the stronger the field.
- Two opposing charges; positive and negative.

- Opposites charges attract, same charges repel!
Static electric force
- Creates positive (+) or negative (-) atoms called ions, by removing or adding electrons
- Electrons have a negative charge (so if you remove a - charge, what's left over becomes +)
- Electrons are easily moved by rubbing or by external force fields

Gravitational Fields
- Gravitational fields surround all objects that have mass
- If two objects are placed near one another, they will be attracted to one another!
- Gravitational fields weaken as mass decreases.
- Gravitational fields weaken as distance increases.
Gravitational Fields

- Gravity of Sun keeps planets revolving around it
- Gravity groups stars into galaxies
- Gravity of moon creates tides on Earth

- This force is hard to detect unless at least one of the objects is massive (like a star or planet)
- Therefore, gravity is a somewhat weak force. For instance, the magnetic force of a fridge magnet can overcome the force of gravity of the Earth