

DYNAMICS

Unit 2 AP Physics

UNIT 2: DYNAMICS

Systems

Gravitational field

Contact forces

Newtons 1st law

Newtons 3rd law and FBD

Newtons 2nd law

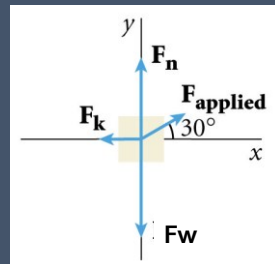
Application of Newtons 2nd law

DYNAMICS

Dynamics investigates the cause of an object's motion.

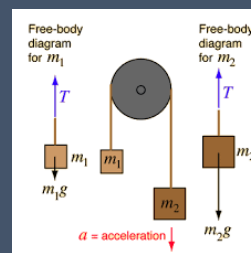
A **Force** is an action exerted on an object which may change the object's state of rest or motion. (Example pushing or pulling)

- Causes object to start or stop moving or change direction
- **Forces** can cause **accelerations**
- Unit – **Newtons (N)**
- 1 N Force causes a 1 Kg object to accelerate to 1 m/s^2



SYSTEM

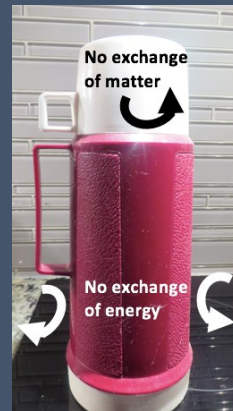
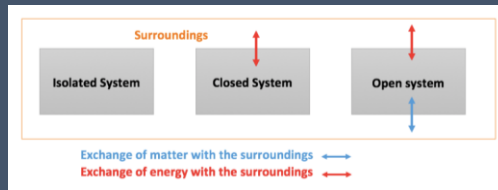
- A **System** is the **object** or **collection of objects** that we are choosing to study
- Treated as having no internal structure
 - **Internal interactions** change little or not at all, or which changes in these interactions are irrelevant to the question addressed
- Example: Ball – don't care about air molecules inside or their interactions



SYSTEM

Everything else that is outside of the object, we call the **environment/Surrounding**

- This consists of objects that might interact with the system, thus effect its motion
- These interactions are called **external forces**
 - Touch the object
 - Push the object
 - Pull the object



GRAVITATIONAL FIELD

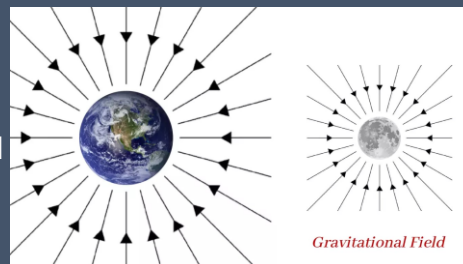
A **gravitational field - g** at the location of an object, with a mass m , causing a gravitational force of magnitude mg to be exerted on the object in the direction of the field

- On Earth this gravitational force is called **weight**

$$F_g = mg$$

If g is the only force exerted on the object, the observed freefall acceleration of the object is equal to the gravitational field at that location

$$a = g$$



2 TYPES OF FORCES

Field Force: A non-contact force that acts on an object over some distance. For example:

- Gravity (force of attraction between two objects due to their mass) F_g
- Electromagnetism

Contact Forces: A force that acts on an object due to direct contact with another object. For example:

- Friction F_f
- Normal Force F_n
- Tension F_T
- Spring Force F_{spring}

On a microscopic level, contact forces are generally caused by electromagnetism between atoms/molecules.