

## Chapter 5- Reminder

- 1- First Newton's law formula:  $\vec{F}_{net} = \text{zero}$
- 2- Second Newton's law formula:  $\vec{F}_{net} = m \vec{a}$
- 3- Gravitational force:  $\vec{F}_g = m \vec{g}$
- 4- Weight force:  $\vec{W}_g = m \vec{g}$
- 5- Third Newton's law formula:  $\vec{F}_{AB} = -\vec{F}_{BA}$

### Module of Motions

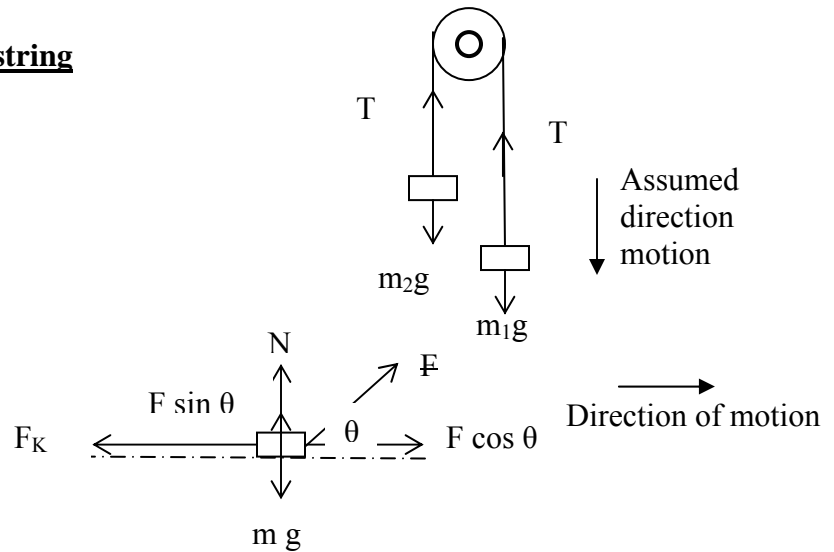
#### 1- Motion of two objects connected with string

**Motion of  $m_1$  mass:**

$$m_1 g - T = m_1 a$$

**Motion of  $m_2$  mass:**

$$T - m_2 g = m_2 a$$



#### 2- Motion of an object on surface

$$F \cos \theta - F_k = m a$$

$$N + F \sin \theta - m g = 0$$

#### 3- Motion of two objects one of them on plane and the second laying vertically

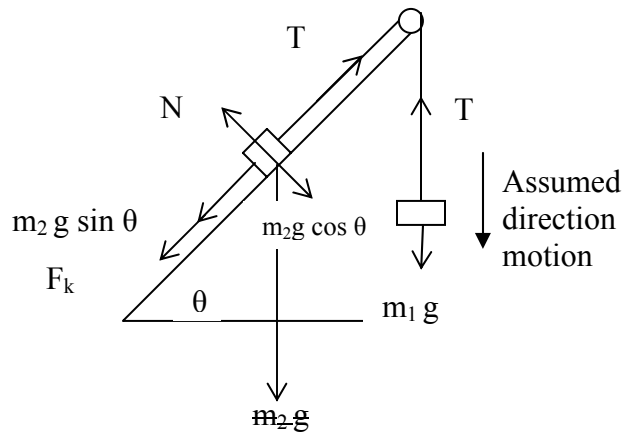
**Motion of  $m_1$  mass:**

$$m_1 g - T = m_1 a$$

**Motion of  $m_2$  mass:**

$$T - m_2 g \sin \theta - F_k = m_2 a$$

$$N - m_2 g \cos \theta = 0$$



#### 4- Motion of two objects connected with string moving on horizontal surface (frictionless)

**Motion of  $m_1$  mass:**

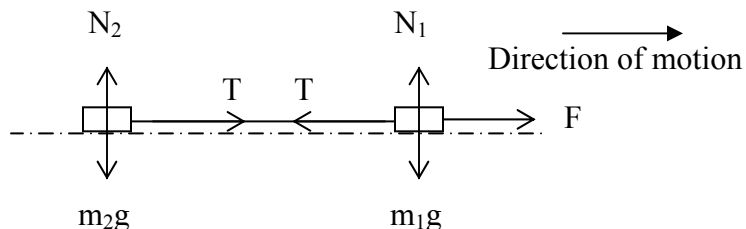
$$F - T = m_1 a$$

$$N_1 - m_1 g = 0$$

**Motion of  $m_2$  mass:**

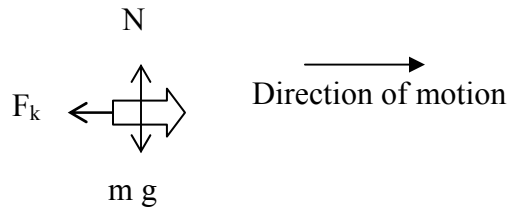
$$T = m_2 a$$

$$N - m_2 g = 0$$



## 5- Motion of a pullet

$$- F_k = m a$$
$$N - m g = 0$$



## 6- An elevator motion

**Notice:**  $\vec{F}_{EM} = -\vec{N}$

**Motion of an elevator only:**

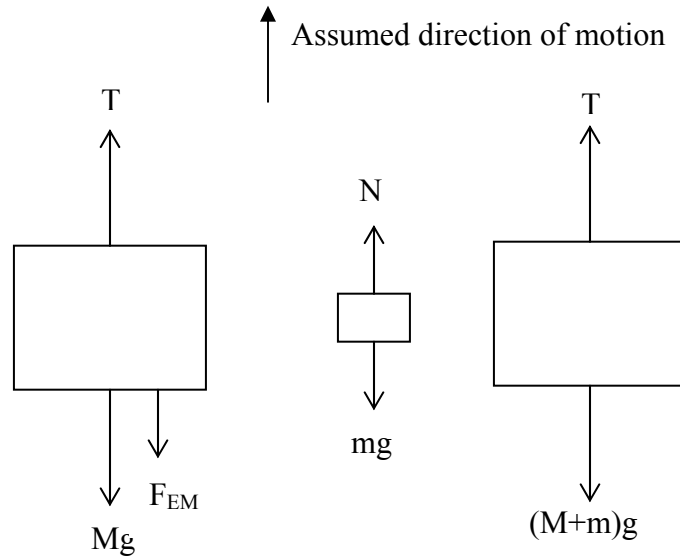
$$T - Mg - F_N = M a$$

**Motion of a man only:**

$$N - m g = m a$$

**Motion of the elevator and the man:**

$$T - (M+m)g = (M+m) a$$



**Notice:**

**Acceleration of system:** If **two objects or more** are moving as system, each object will have the **same acceleration** (they are moving with **uniform acceleration** and they have same **speed** and **distance** at any time).

**A slack of string:** If suddenly, the string (cord) becomes **not tight (not stretch)**, therefore put the **Tension Force** at that moment is equal to **zero** in the motion formula to get the **acceleration** of the system.