Physics S1 Summary Don't forget the Ppt PS questions, and MCQ will be the hardest section

- FBD will come

Free Fall

Free Fall :

- is the motion of an object where gravity is the only force acting upon it.
- The value of g(upward direction) = -9.8 m/s^2

Formulas :

$$\Delta x = v_i t + \frac{1}{2} a t^2$$

$$v_f = v_i + at$$

$$v_f^2 = v_i^2 + 2a\Delta x$$

- This lesson will mostly be in the MCQ

Friction

Friction : *it's dependent on the normal force acting on the object

- It is a force that opposes that relative motion or tendency of such motion of 2 surfaces in-contact.

3 Types of Friction :

1. Static Friction
2. Kinetic Friction
3. Rolling Friction

Factors that affect Friction :

1. **Surface roughness** :-

- rougher surfaces tend to have higher friction due to more interlocking features.

2. **Normal Force** :-

- the force pressing 2 surfaces together; greater normal force typically results in higher friction.

- Equal in magnitude (to the weight.

3. **Material Properties** :-

- different materials exhibit different coefficients of friction, which quantifies the frictional force relative to the normal.

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Static Force/Friction :

- Opposes the initiation of motion
- Magnitude : Varies up to a maximum value, where if exceeded kinetic force will take turn and the object starts moving.

Kinetic Force/Friction :

- Opposes the motion of an object already in motion.
- Magnitude : generally constant for a given situation.

Similarities :-

- Nature of Force : Both types of forces oppose relative motion.
- Dependent on Surface : Both types of friction depend on the surface.

Formula :

F_n is the normal force.

- $F_f = \mu_s \cdot F_n$

F_f is the maximum static frictional force,

$F_f = \mu_k \cdot F_n$

F_f is the kinetic frictional force,

Unbalanced Friction Forces

- No problem solving questions for this lesson.

- In short, it's when the forces acting on the object are unbalanced(not equal in magnitude to one another.)

Unbalanced friction forces :

- They occur when forces are not equal in magnitude, leading to an acceleration or deceleration of an object.

Formulas :

$$F_{net} = \mu_k . F_N$$

$$F_{net} = F_A - F_f$$

$$F_{net} = ma$$

$$F_f = \mu_k mg$$

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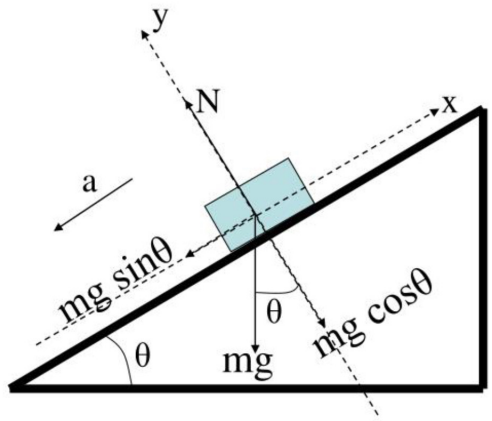
Friction on Inclined Planes

- No problem solving for this lesson, only theoretical questions will be coming

Inclined Plane :

- It is a flat surface that is tilted at an angle to the horizontal.



Component Formulas : * not given

$F_{g_x} = F_g \cdot \sin\theta$ → Horizontal

$F_{g_y} = F_g \cdot \cos\theta$ → Vertical

+

$F_N = mg$

Tips/To take note of :

- F_N is perpendicular(straight) to the object -> straight to the (y-component)
- Angles should/must be the sum of 90* ⇒ because of course it's a right angle

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Projectile Motion

Projectile Motion : *The object is called a projectile.

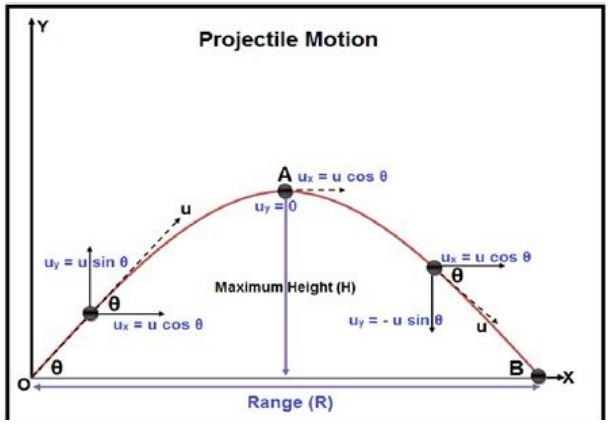
- It is a form of motion in which an object is thrown near the earth's surface, and it moves along a curved path under the action of gravity only.

Projectile Motion determining factors :

- Mass, angle of projection, maximum height, initial velocity, and range.
- Horizontal and vertical components ⇒ V_x & V_y

The projectile motion drawing/diagram :

FORMULAS : To complete



To take note of :

- Horizontal Component does not change (during projectile).
- Vertical component increases until it reaches 0m/s(max velocity), and then it starts decreasing(it's actually increasing in negative values)
- The path of the projectile is called a **trajectory**.
- Gravity is the only force that affects it.
- The projectile makes a parabola when in motion, and follows a parabolic path
  ⇒ **Parabolic projectile**

Analysis :

- 45°, always gives the maximum range(no matter what).
- Range does not depend on the angle of projection, only the max height depends on the angle of projection.
- Angles can have the same range but not max height. -> it's because each angle will have a different angle which results in different heights.

* When two angles are complementary (= 90)
60°+ 30° = 90
^^^^^^^^^^ ⇒ Both will have the same range.

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Periodic Motion

Periodic Motion :

- a motion that repeats itself after a certain equal interval of time.
- Ex: a water wave, rocking chair, a tuning farh, a bouncing hall, a swing in motion, a rolling ball, and etc.

Simple Harmonic Motion (SHM) :

- Equilibrium position → x = 0, it's when the block/object is at rest.
- if the force is always directed towards the equilibrium position, the motion is called **SHM**.
- Ex: Clock, Musical instruments, Spring, and etc.

- If the block was to be displaced to the left(from the right) → negative position.

Hooke's Law :-

- The force "F" exerted by a spring is directly proportional to the displacement "x" from its equilibrium position provided the elastic limit is not exceeded.

- If it exceeds the limit, then this will not obey *Hooke's Law*(from this moment).

Formula : $F = -kx$

Where,
F : Spring force
x : Displacement
k : Spring constant

Pendulum

Pendulum :

- is a body suspended from a fixed point so that it can swing back and forth under the influence of gravity.

Time Period of a Pendulum :

- the time a pendulum takes to complete 1 cyde.

- In a pendulum, the value of g = 9.8 m/s^2

Formula :

$$T = 2\pi\sqrt{\frac{L}{g}}$$

T = period of simple pendulum (s)
L = length of pendulum (m)
g = gravitational acceleration (m/s^2)