

Unit 2: Force and their Effects



Unit 2: Forces Conclusion

1. Formulae:

1. $W = mg$
2. $\rho = \frac{m}{v}$
3. $\Sigma F = ma$
4. $F = kx$
5. Momentum (P) = mv
6. Momentum before = momentum after
7. Impulse = $mv - mu$
8. Impulse = Ft

2. Force:

1. For force in straight line

- Resolve find resultant force
- $\Sigma F = ma$

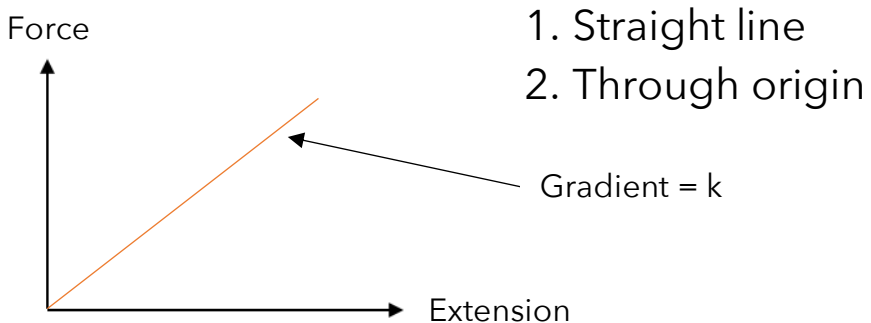
2. For force in 2 planes

- Head to tail
- Find resultant
- $\Sigma F = ma$

3. Centripetal force

- Towards centre
- Circular motion

3. Hooke's law:



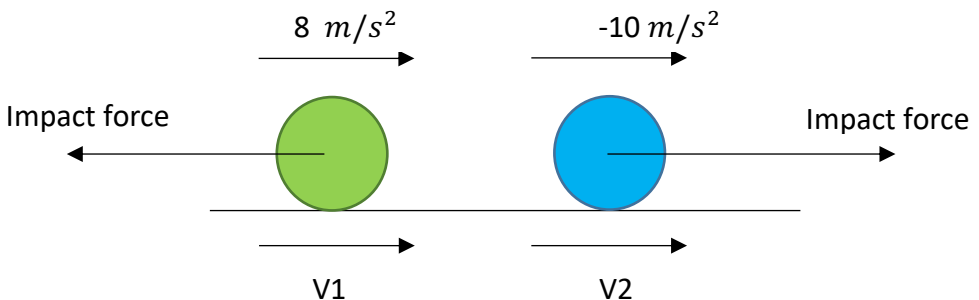
4. Momentum:

Step 1. Set direction

- Set velocity to the right to be positive
- Set every unknown velocity (u_1 , u_2 , v_1 , v_2) to the right, if you know it is to the left put arrow to the right and write down negative number
- Use formula

Step 2. Use formula

You know that this ball moves to the left, so put it negative



Defining confusing terms:

1. Impact time = contact time during collision
2. Impact force = force of collision given by another ball

Definitions:

Force and their Effects (Unit 2):

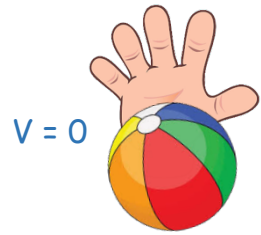
1. **Density** = mass divided by volume
2. **Weight of (table)** = force of gravity between (table) and Earth
3. **Force** = rate of change of momentum
4. **Newton law 1** = object has same speed and direction unless you act force on it
5. **Newton law 2** =
[Force = mass x acceleration]
6. **Newton law 3** = Every action has equal and opposite reaction

7. **Hooke's law** =
[Force = constant(k) x extension]
8. **Limit of proportionality** = the point where proportionality between force and extension stops
9. **Principle of conservation of momentum**
= Total momentum of a system remains constant if system is isolated
10. **Elastic collision** = Total kinetic energy is conserved when collides
11. **Inelastic collision** = Loss kinetic energy when collides
12. **Impulse** = change in momentum



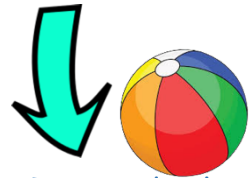
Free Fall:

When drop from stationary



1. Weight acts down and air resistance acts up
2. Start at a (acceleration) = 10 m/s^2
3. Air resistance increases as speed increases
4. Net force reduces
5. Less force, less acceleration
6. Reach terminal velocity

At Terminal velocity



1. No resultant force
2. Air resistance = weight
(Upwards force = downwards force)
3. No acceleration/ constant speed

When open parachute:

1. Larger surface area
2. Larger air resistance



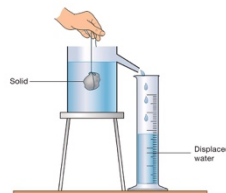
Density:

Measure density of **regular** object:

1. Using balance to measure mass
2. Using rule to measure volume
3. Density is mass/volume

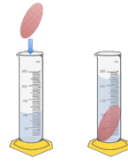
Measure density of **irregular** object:

1. Using balance to measure mass
2. Measure volume by
 - Displacement can
 - Filled to overflowing with liquid
 - Submerge (rock)
 - Measure volume displaced with measuring cylinder
3. Density is mass/volume



Measure volume of irregular object:

1. Displacement can
2. Filled to overflowing with liquid
3. Submerge (rock)
4. Measure volume displaced with measuring cylinder



Measure volume of wood:

- 1) By using measuring cylinder
- 2) Measure volume of liquid (V_1)
- 3) Submerge wood attached with sinker (given e.g. brass) into water
- 4) Measure new volume of liquid (V_2)
- 5) $V_2 - V_1$
- 6) Subtract volume of sinker (given e.g. brass) from the result to give wood volume

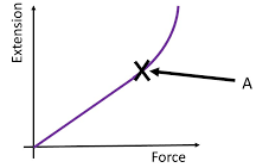
Why (wood) not sink:

Density of wood less than density of water

Spring:

How graph obey Hooke's law:

- 1) Straight line
- 2) through the origin



Beyond limit of proportionality:

graph becomes non-linear

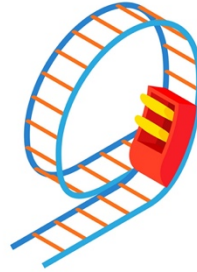
How mass creates force to stretch spring:

Force of gravity acts on mass

Measure mass using spring balance:

- 1) hang object from spring balance
- 2) reading in Newton taken, divide reading by 10

Circular motion:



Why circular motion with constant speed does not have constant velocity?

1. Velocity is vector
2. Vector has magnitude and direction
3. Circular motion changes direction, hence velocity is changing

Is there resultant force on car if it moves at constant speed around circular track:

1. There is change in velocity, hence there is acceleration
2. $\Sigma F = ma$, hence there is resultant force
3. Resultant force acts towards centre (centripetal force)