ATOMIC ENERGY EDUCATION SOCIETY

Distant Learning Programme Class XI

Subject: Physics

Hand out Study Material

Chapter 1: Physical World (Module 1/1)

Contents :

- Meaning & various branches of physics.
- Physics in relation to society
- Fundamental forces of nature.
- Fundamental Conservation laws of nature i.e. Energy Conservation, Momentum Conservation,& Angular Momentum Conservation.

Physics:

A way of describing the **physical world.**

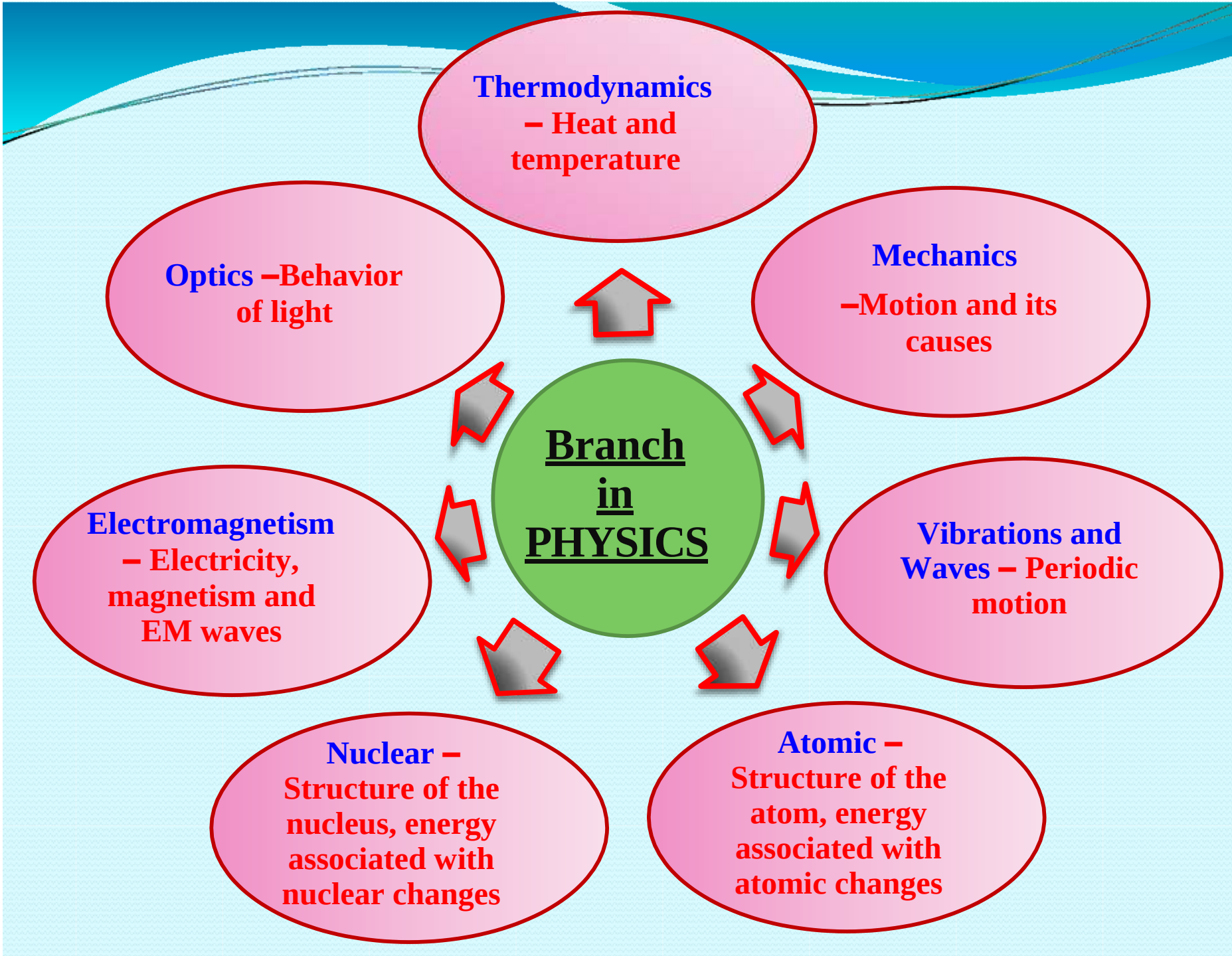
-Physics comes from the Greek “physis” meaning “nature” and the Latin “physica” meaning **natural things**

- Physics understands the behavior and structure of matter

-It deals with how and why **matter** and **energy**act as they do.

- Energy is the conceptual system for explaining how the universe works and accounting for changes in matter Although energy is not a “thing” three ideas about energy are important

1. It is changed from one form to another (transformed)by physical events
2. It cannot be created nor destroyed (conservation)
3. When it is transformed some of it usually goes into heat


Thermodynamics – Heat and temperature
Optics –Behavior of light
Mechanics –Motion and its causes
Branch in PHYSICS
Electromagnetism – Electricity, magnetism and EM waves
Vibrations and Waves – Periodic motion
Nuclear – Structure of the nucleus, energy associated with nuclear changes
Atomic – Structure of the atom, energy associated with atomic changes

- Physics - the study of matter, energy and their interactions - is an international enterprise, which plays a key role in the future progress ofhumankind. The support of physics education and research in all countries is important because:

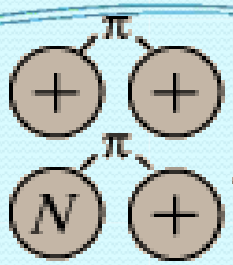
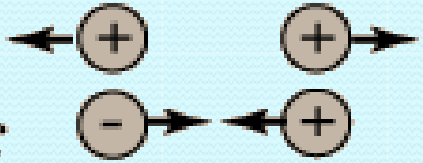
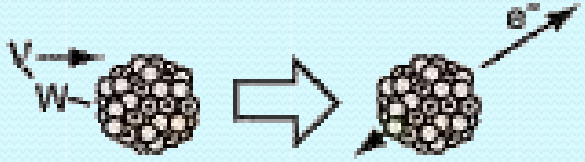
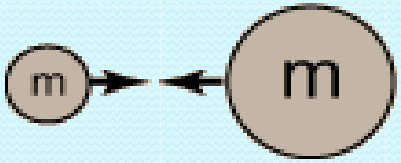
1) Physics is an exciting intellectual adventure that inspires young people and expands the frontiersof our knowledge about Nature.
2) Physics generates fundamental knowledge needed for the future technological advances that will continue to drive the economic engines of theworld.
3) Physics contributes to the technological infrastructure and provides trained personnel needed to take advantage of scientific advancesand discoveries.

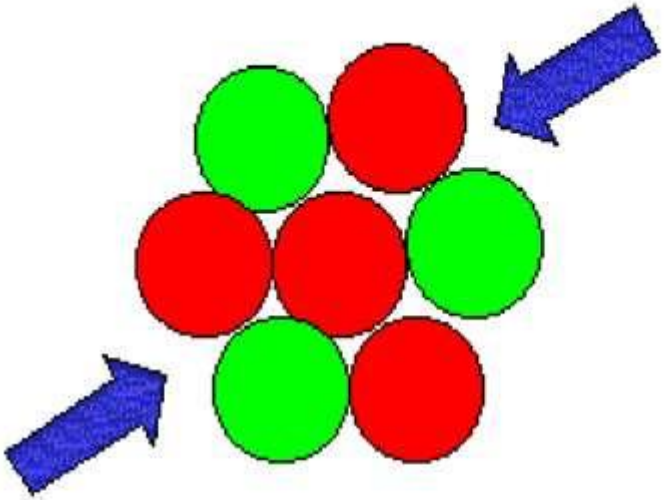
Physics is an important element in the education of chemists, engineers and computer scientists, as well as practitioners of the other physical andbiomedical sciences.

Physics extends and enhances our understanding of other disciplines, such as the earth, agricultural, chemical, biological, and environmental sciences, plus astrophysics and cosmology - subjects ofsubstantial importance to all peoples of the world.

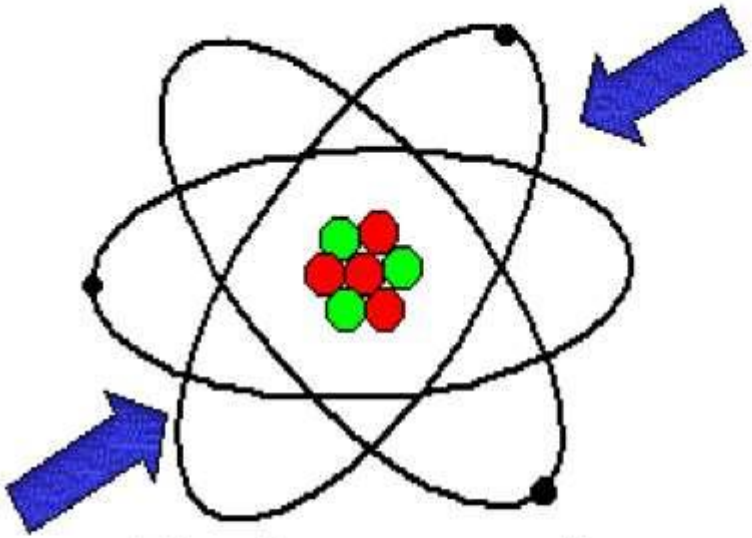
1) Physics improves our quality of life by providing the basic understanding necessary for developing new instrumentation and techniques for medical applications, such as computer tomography,magnetic resonance imaging, positron emission tomography, ultrasonic imaging, and laser surgery.

Funamental Forces of nature.

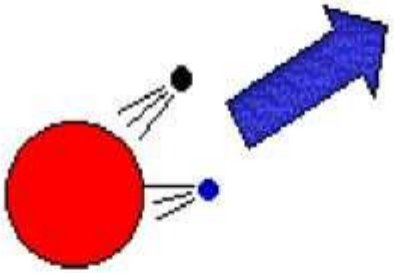
		Strength	Range (m)	Particle
Strong	 Force which holds nucleus togeher	1	10^{-15} (diameter of a medium sized nucleus)	gluons, π(nucleons)
Electro-magnetic		$\frac{1}{137}$	Infinite	photon mass = 0 spin = 1
Weak	 neutrino interaction induces beta decay	10^{-6}	10^{-18} (0.1% of the diameter of a proton)	Intermediate vector bosons W^+, W^-, Z_0, mass > 80 GeV spin =1
Gravity		6×10^{-39}	Infinite	graviton ? mass = 0 spin = 2



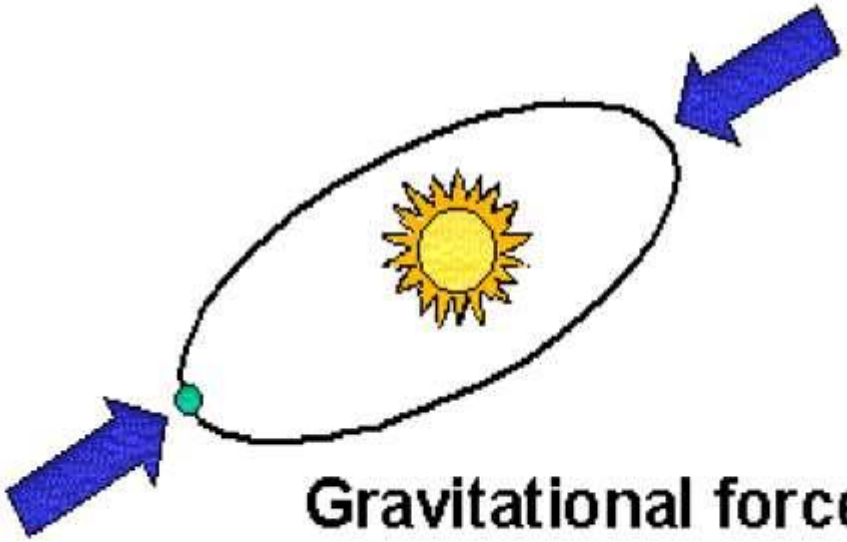
Strong force
binds the nucleus



Electromagnetic
force binds atoms

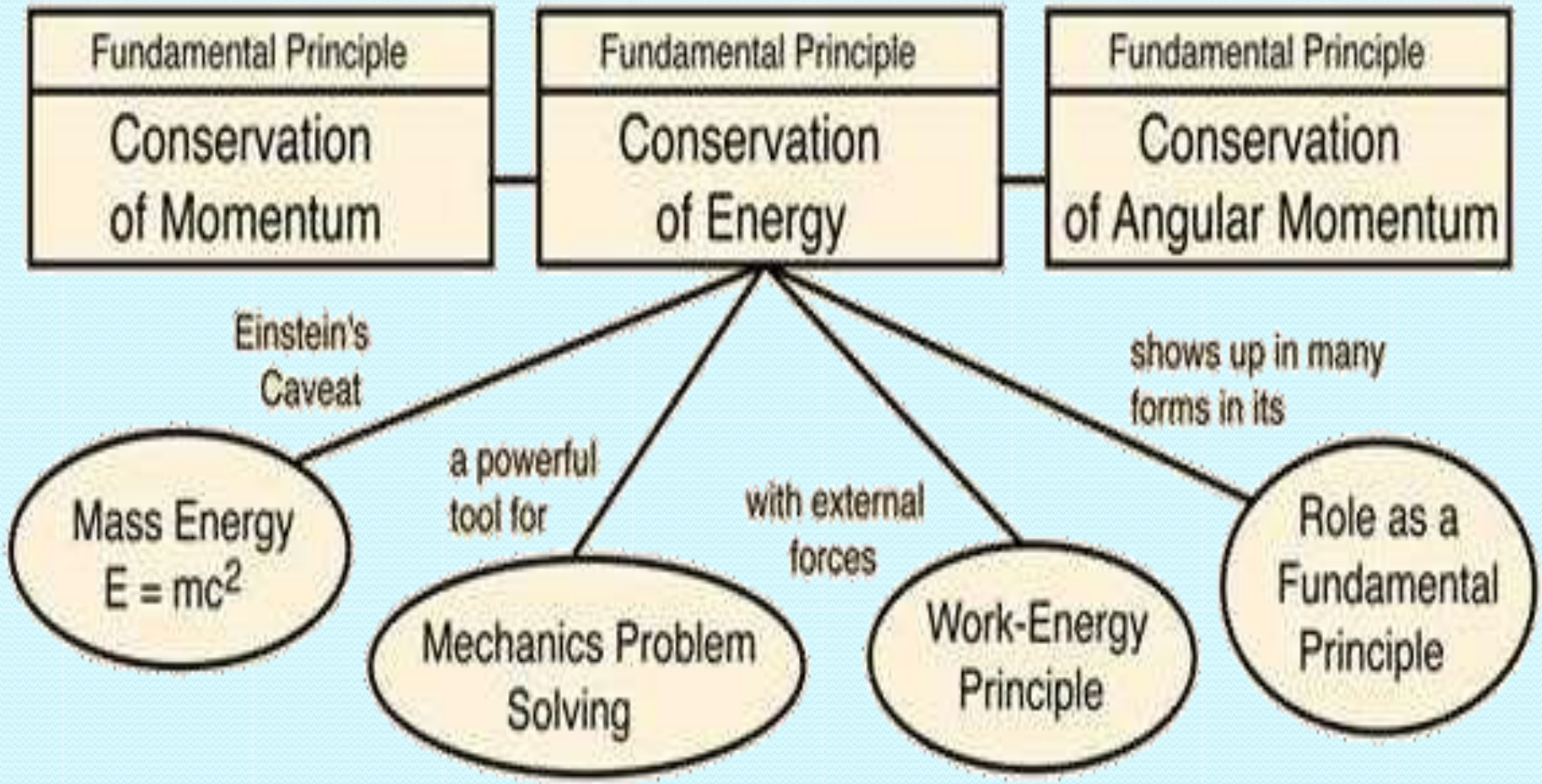


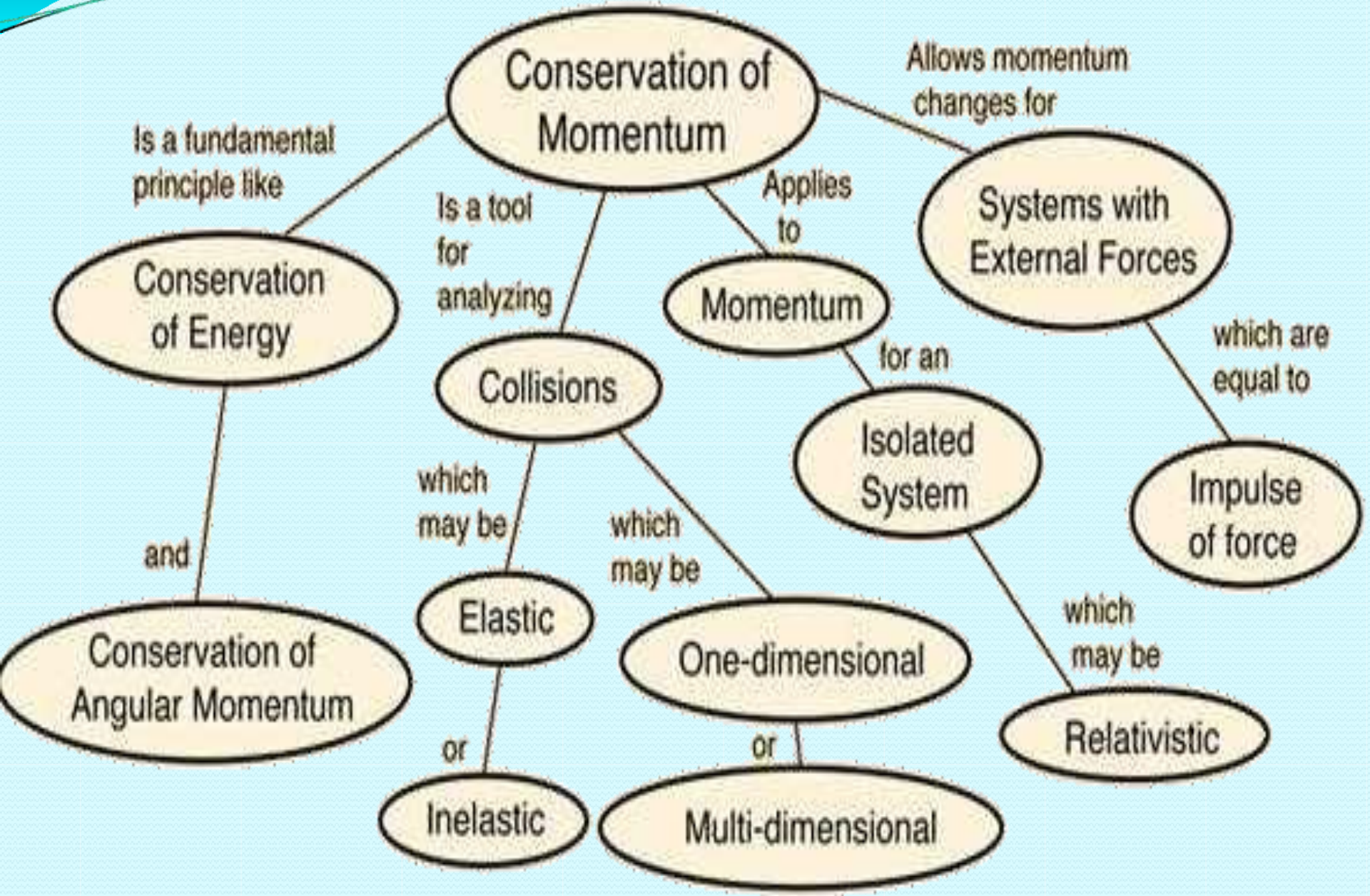
Weak force in
radioactive decay

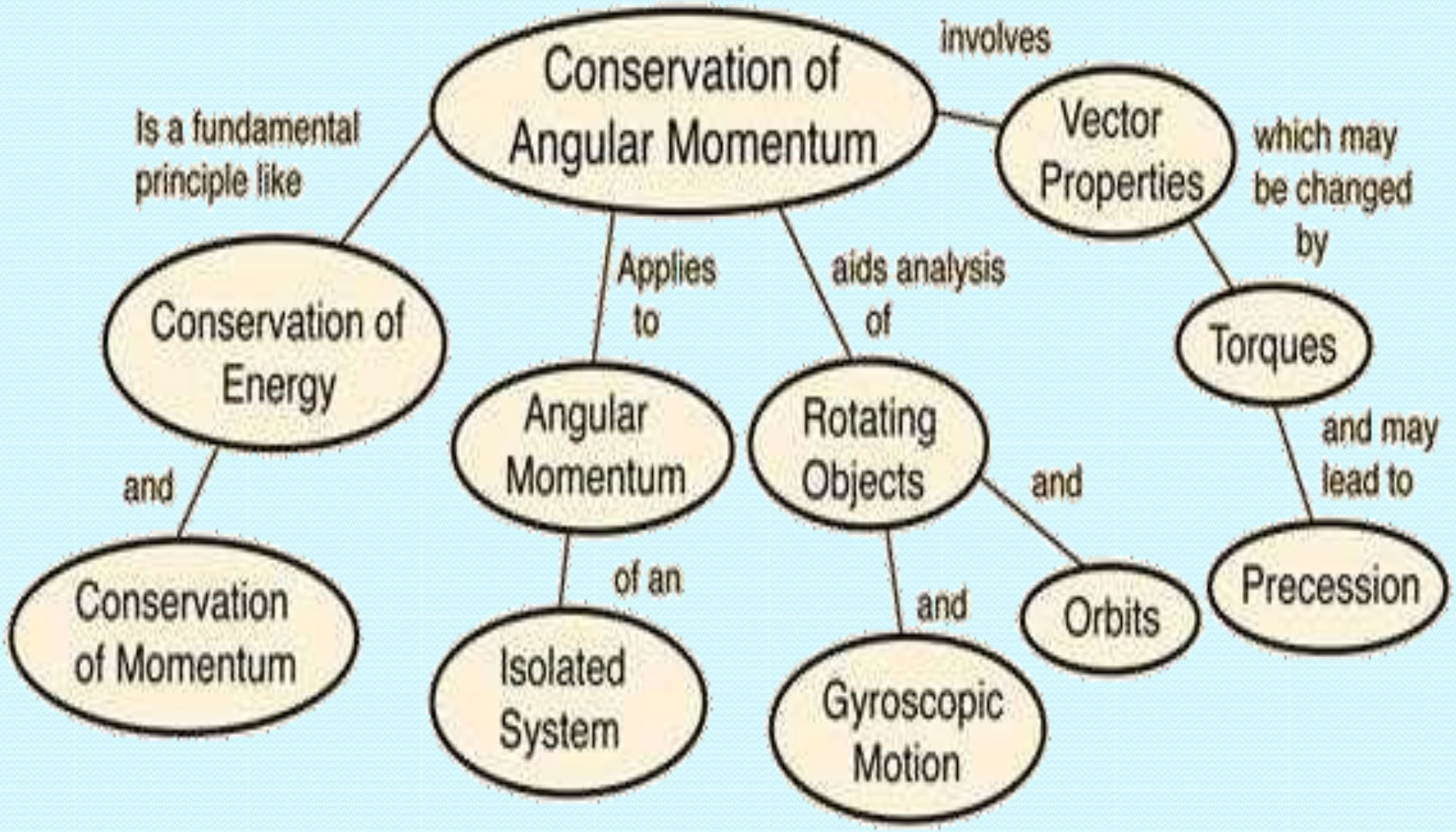


Gravitational force
binds the solar system

CONSERVATION LAWS


Fundamental Principle
Conservation of Momentum
Fundamental Principle
Conservation of Energy
Fundamental Principle
Conservation of Angular Momentum
Einstein's Caveat
Mass Energy $E = mc^2$
a powerful tool for
Mechanics Problem Solving
with external forces
Work-Energy Principle
shows up in many forms in its
Role as a Fundamental Principle


Conservation of Momentum
Is a fundamental principle like
Conservation of Energy
and
Conservation of Angular Momentum
Is a tool for analyzing
Collisions
which may be
Elastic
or
Inelastic
which may be
One-dimensional
or
Multi-dimensional
Applies to
Momentum
for an
Isolated System
which may be
Relativistic
Allows momentum changes for
Systems with External Forces
which are equal to
Impulse of force


Conservation of Angular Momentum
involves
Vector Properties
which may be changed by
Torques
and may lead to
Precession
Is a fundamental principle like
Conservation of Energy
and
Conservation of Momentum
Applies to
Angular Momentum
of an
Isolated System
aids analysis of
Rotating Objects
and
Orbits
and
Gyroscopic Motion

REFERENCES :
NCERT XI CLASS
WIKIPEDIA
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