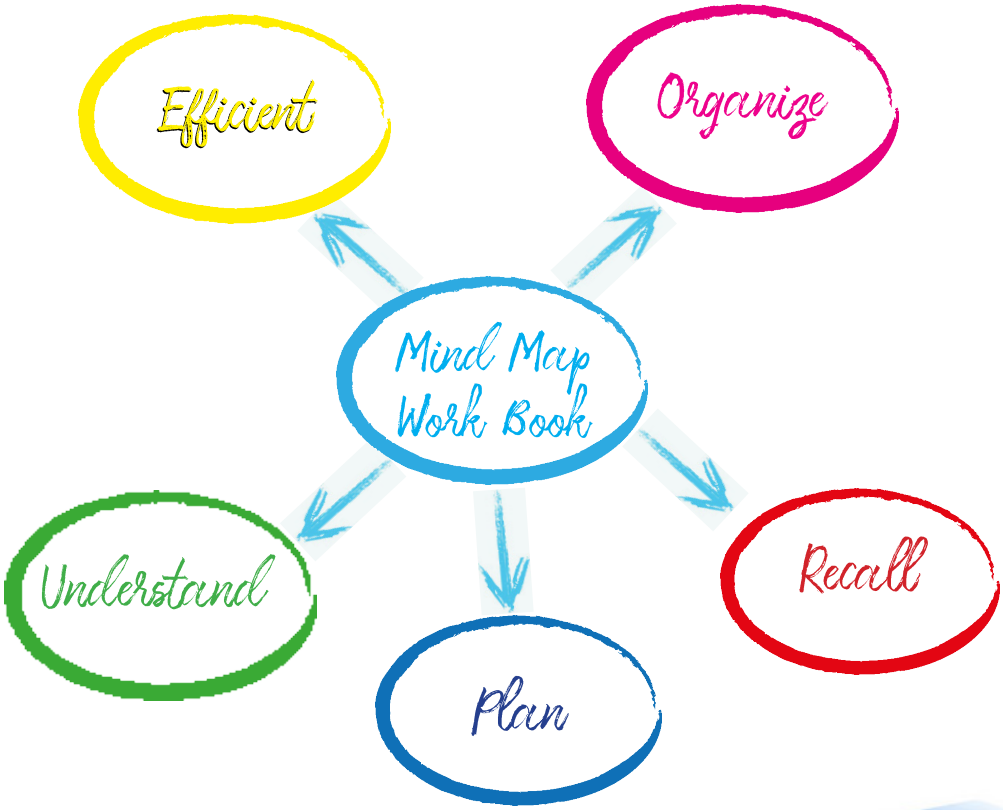
THE ULTIMATE MIND MAP WORK BOOK for Physics



DEVENNDRA CHAANDRAKAR

The Ultimate Mind Map Work Book for Physics

Preface

Mind mapping will bring you in the league of great genizuses like Leonardo da Vinci, Michelangelo, Charles Darwin, Sir Isaac Newton, Albert Einstein, Thomas Edison, Richard Feynman, Mary Curie, etc., who used the major elements of the Mind Map guidelines to make their thoughts visible, and thus to help them and mankind make great leaps in understanding the laws of nature.

GUIDED Mind Map is an important tool for building concept and last-minute revision for the competitive exam

- It is a graphical way to represent concepts.
- It helps in structuring information and improves the logical analysis
- It helps in cementing the concept and improves the visualization skill

This book is intended as work book for students in their high school and preparing for competitive exams like IITJEE, NEET (at national level) and other state level exams.
The work book contains 34 mind maps which are exhaustive and will help the students to recall the chapter. Mind Maps in the given book is designed while keeping in the view the conceptual aspect of learning. Key concept has been explained in simple flow chart. Topics and sub-topics were chosen based on their relative importance in IITJEE and NEET. Each Mind Map is having a video lesson explaining the key concepts.

How to Study Mind Map in the given work book?

1. Learn the concept from the text book
2. Recap the concept along with the Mind Maps of the relevant chapters
3. Watch the video lesson given for each Mind map along with the relevant mind map to strengthen your learning.

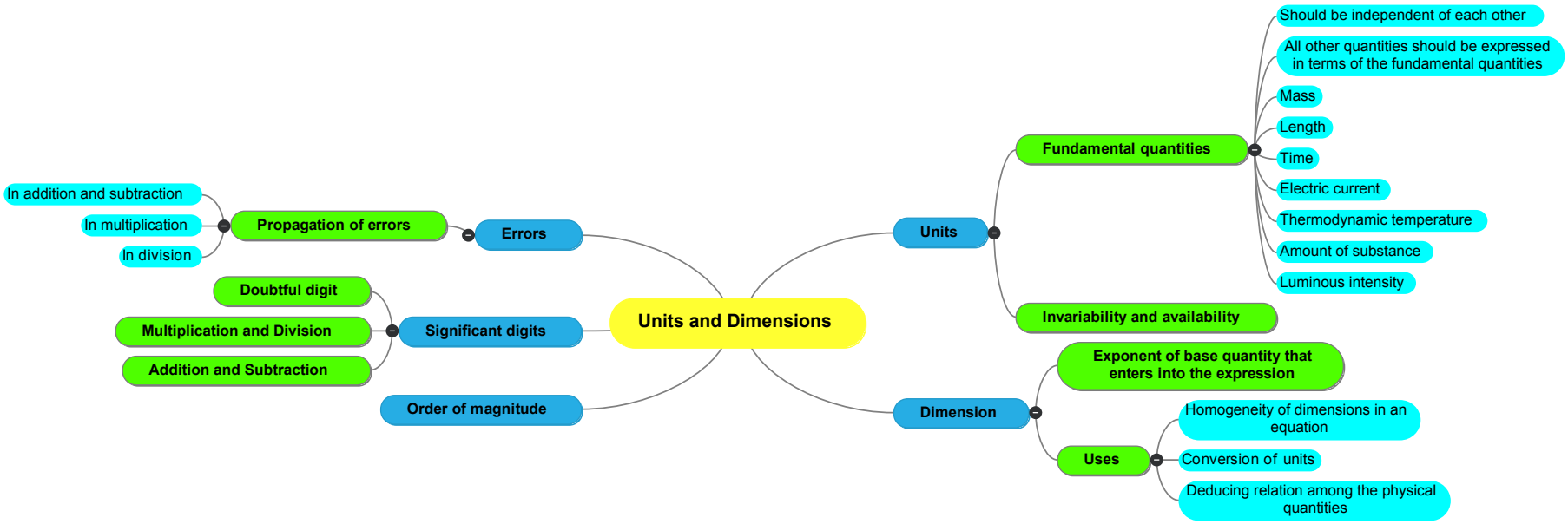
Share your Feedbacks and suggestions at devenndrachaandrakar@gmail.com. It will help me to bring the necessary changes for the benefit of the students.

Devenndra Chaandrakar

Index

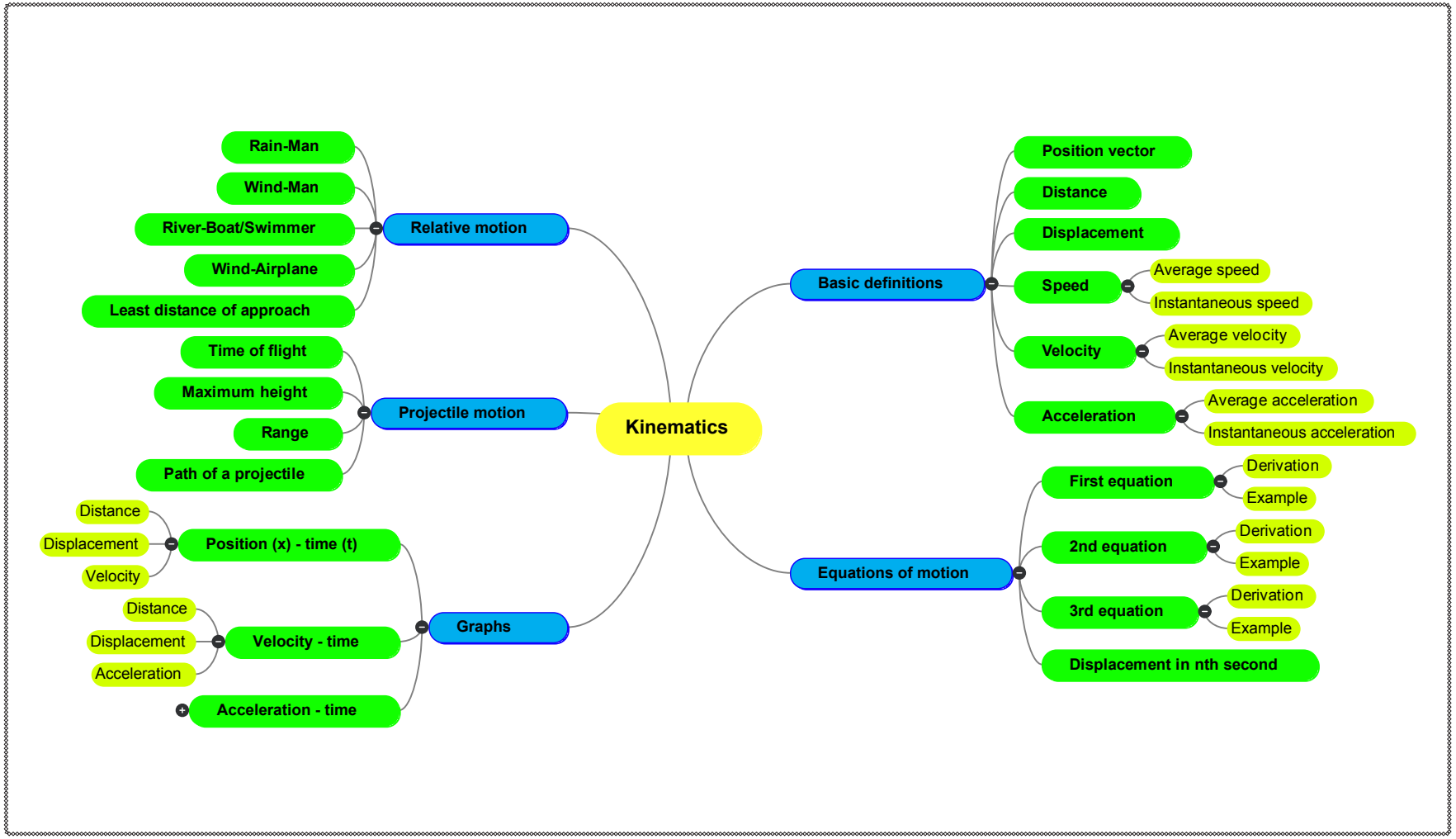
1. Units and Dimension 1-2
2. Kinematics 3-4
3. Laws of Motion 5-6
4. Friction 7-8
5. Circular Motion 9-10
6. Work, Energy and Power 11-12
7. Center of Mass 13-14
8. Conservation of Momentum & Collisions 15-16
9. Rotational Motion 17-18
10. Gravitation 19-20
11. Simple Harmonic Motion 21-22
12. Fluids 23-24
13. Properties of Matter 25-26
14. Waves 27-28
15. Heat and Temperature 29-30
16. Calorimetry 31-32
17. Kinetic Theory of Gases 33-34
18. Laws of Thermodynamics 35-36
19. Heat Transfer 37-38
20. Electrostatics 39-40
21. Gauss's Law 41-42
22. Capacitors 43-44
23. Current Electricity 45-46
24. Magnetic Field 47-48
25. Magnetic Effects of Current 49-50
26. Electromagnetic Induction 51-52
27. Alternating Circuits 53-54
28. EM Waves 55-56
29. Ray Optics 57-58
30. Wave Optics 59-60
31. Photoelectric Effect 61-62
32. Nucleus 63-64
33. Semiconductor 65-66
34. Communication System 67-68

Units and Dimension



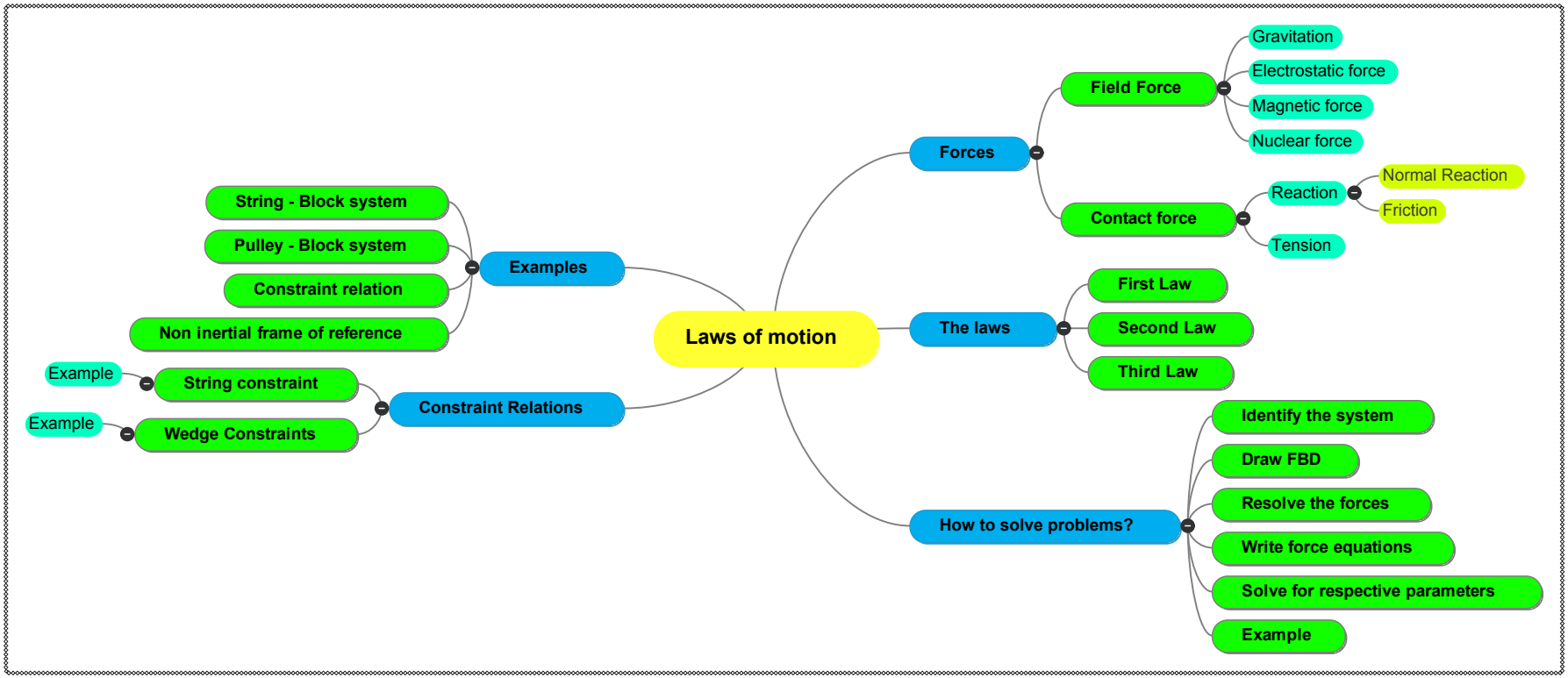
Units and Dimension Formula Practice Page

Kinematics


Kinematics
Relative motion
Rain-Man
Wind-Man
River-Boat/Swimmer
Wind-Airplane
Least distance of approach
Projectile motion
Time of flight
Maximum height
Range
Path of a projectile
Graphs
Position (x) - time (t)
Distance
Displacement
Velocity
Velocity - time
Distance
Displacement
Acceleration
Acceleration - time
Basic definitions
Position vector
Distance
Displacement
Speed
Average speed
Instantaneous speed
Velocity
Average velocity
Instantaneous velocity
Acceleration
Average acceleration
Instantaneous acceleration
Equations of motion
First equation
Derivation
Example
2nd equation
Derivation
Example
3rd equation
Derivation
Example
Displacement in nth second

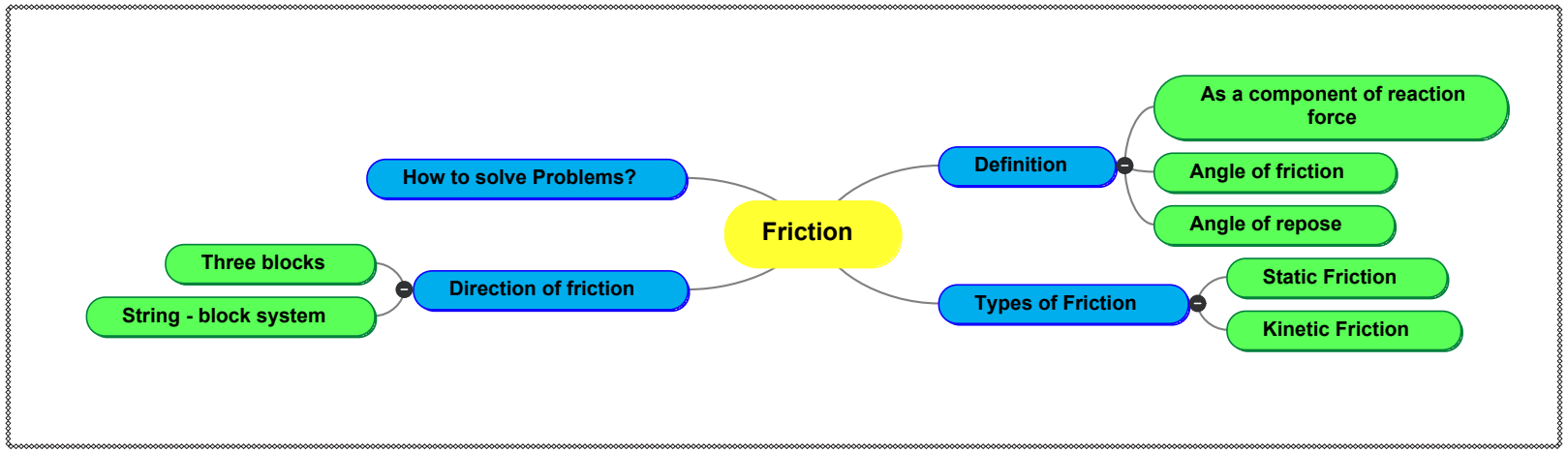
Kinematics Formula Practice Page

Laws of Motion



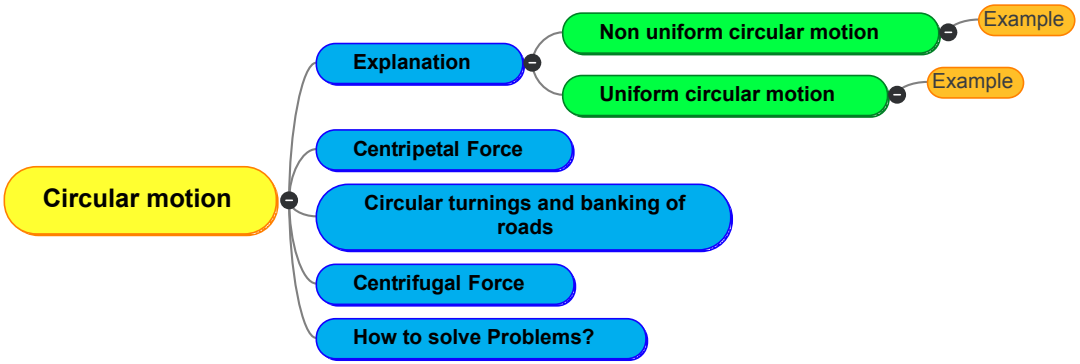
Laws of Motion Formula Practice Page

Friction


Friction
How to solve Problems?
Direction of friction
Three blocks
String - block system
Definition
As a component of reaction force
Angle of friction
Angle of repose
Types of Friction
Static Friction
Kinetic Friction

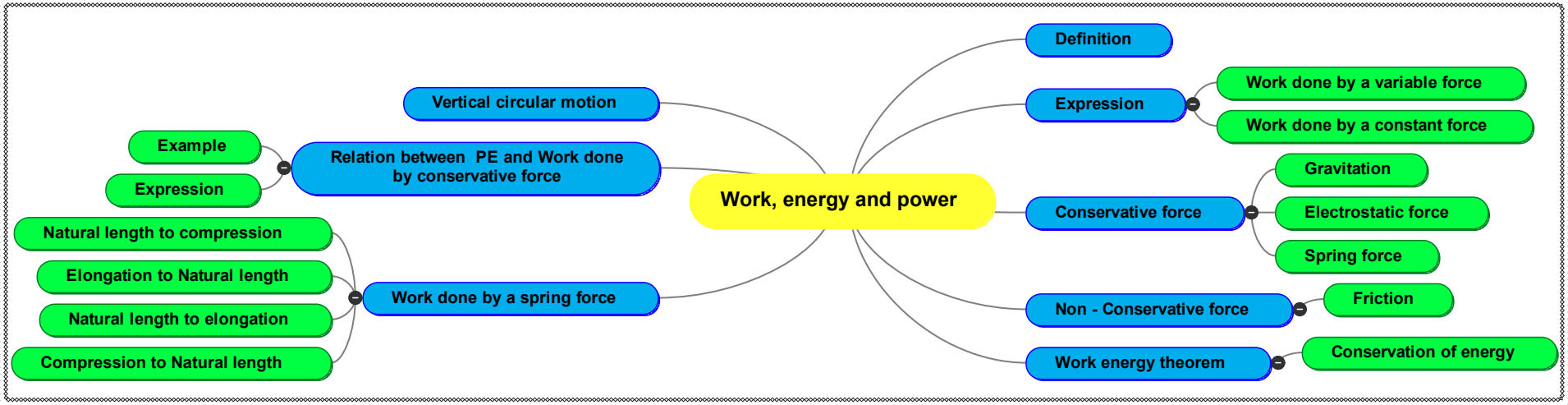
Friction Formula Practice Page

Circular Motion



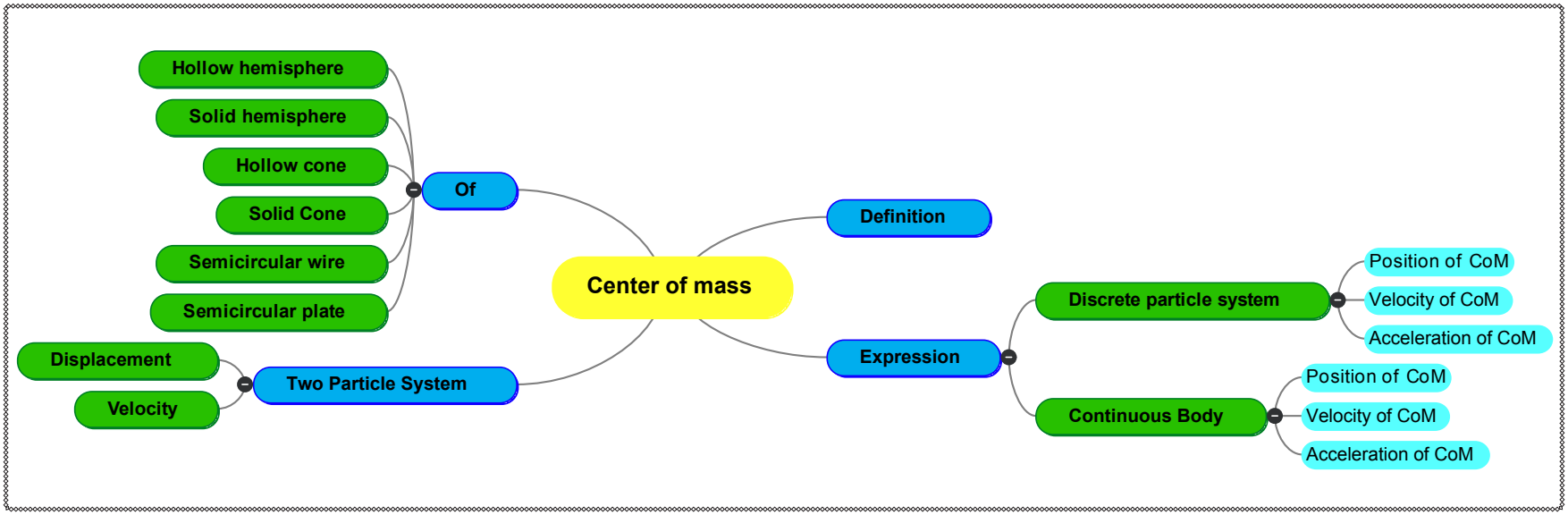
Circular Motion Formula Practice Page

Work, Energy and Power



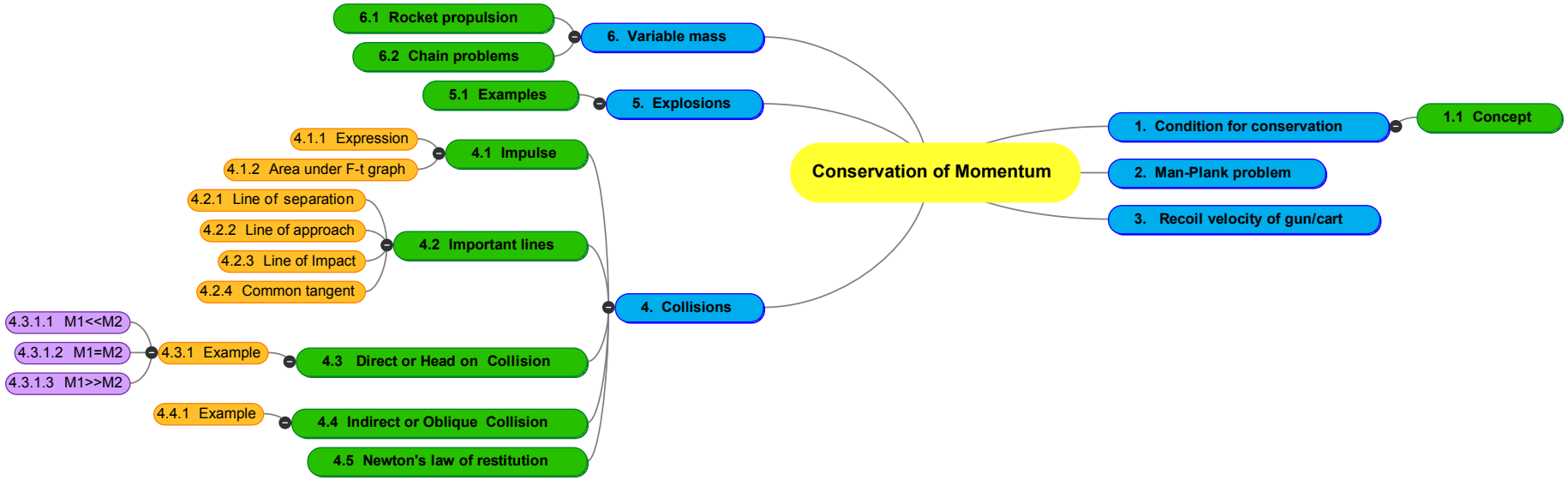
Work, Energy and Power Formula Practice Page

Center of Mass



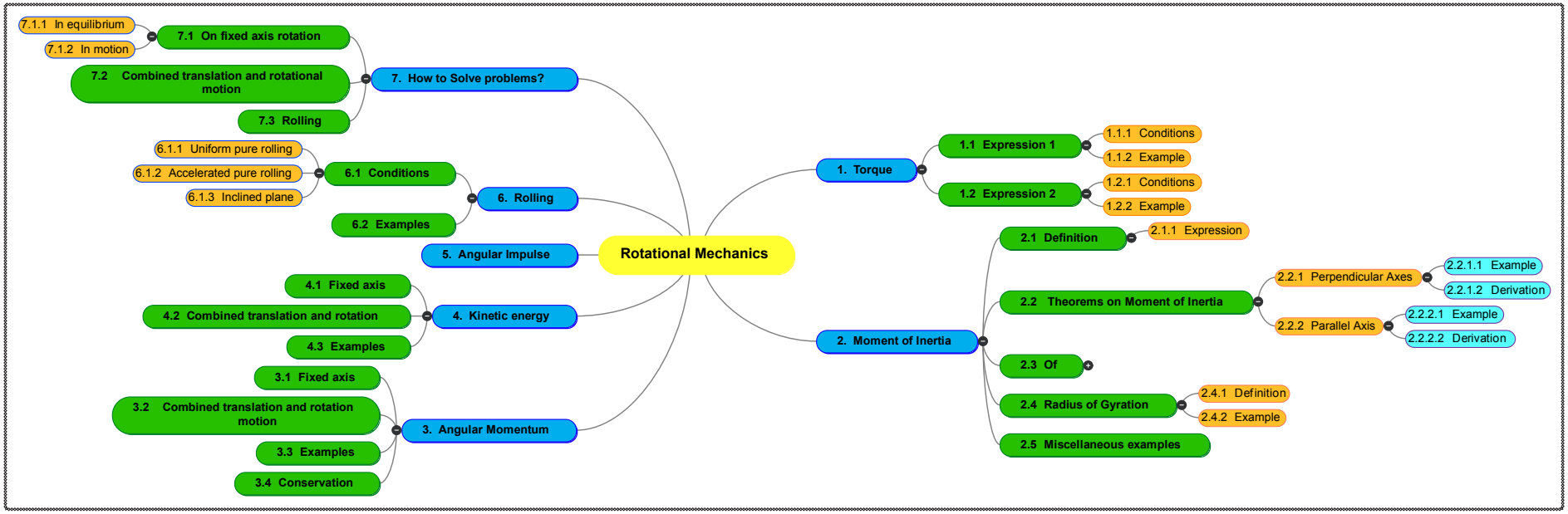
Center of Mass Formula Practice Page

Conservation of Momentum



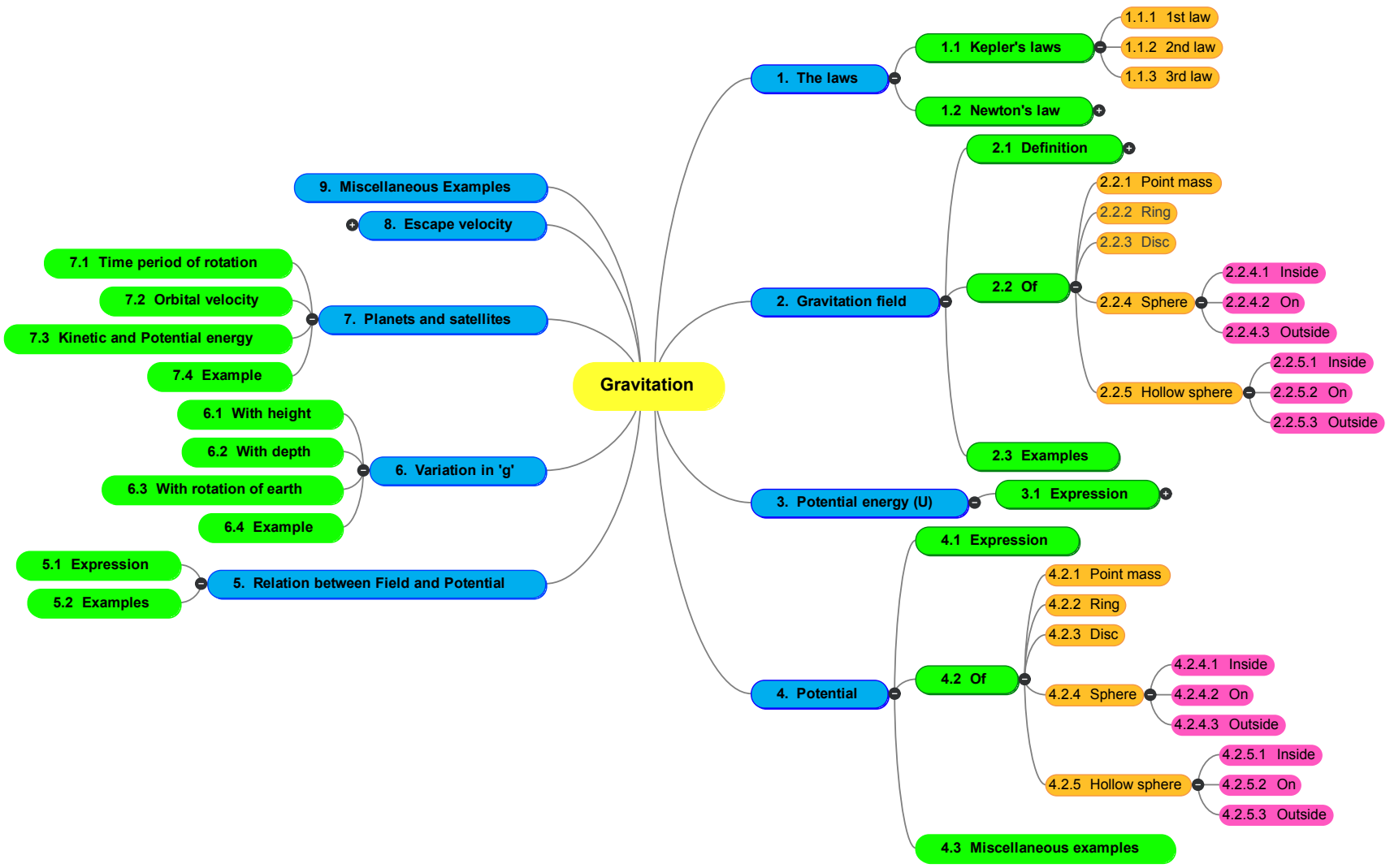
Conservation of Momentum Formula Practice Page

Rotational Mechanics



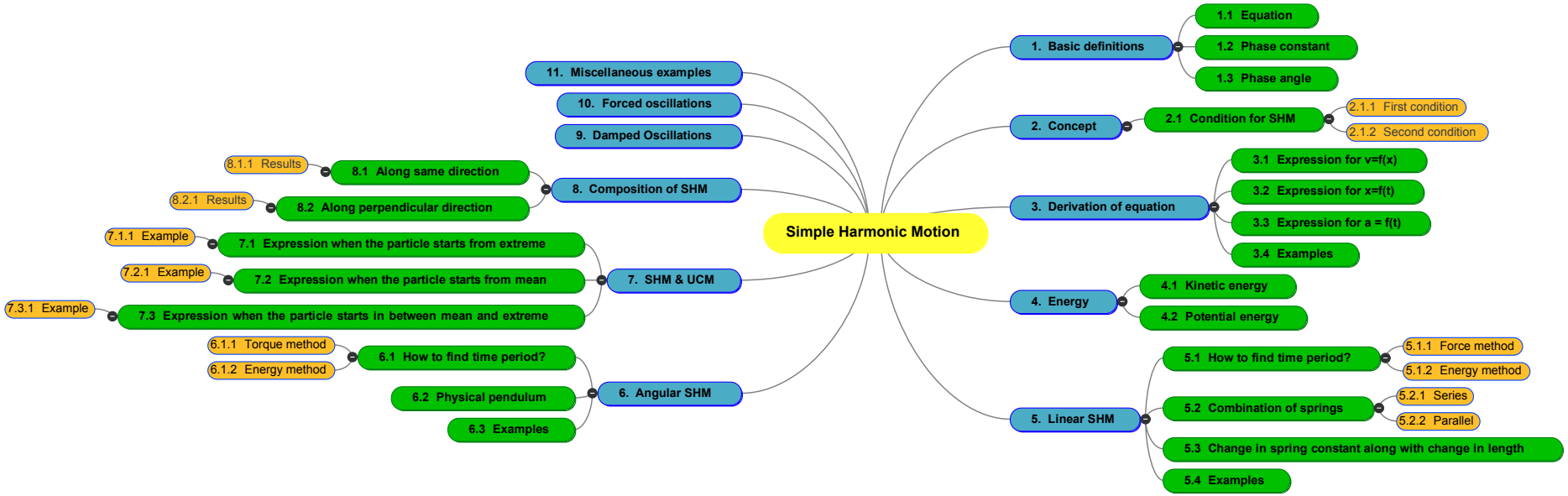
Rotational Mechanics Formula Practice Page

Gravitation



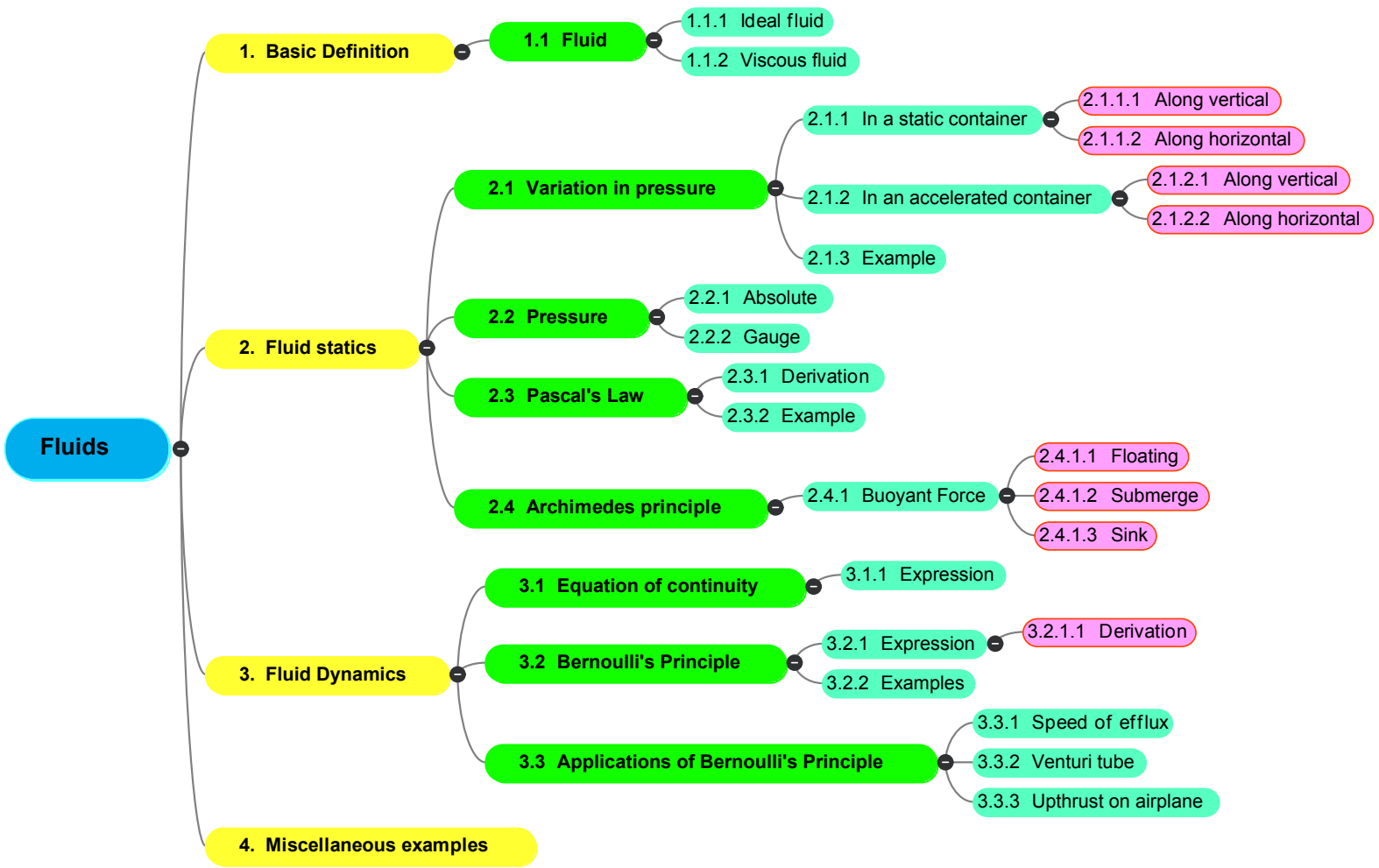
Gravitation Formula Practice Page

Simple Harmonic Motion



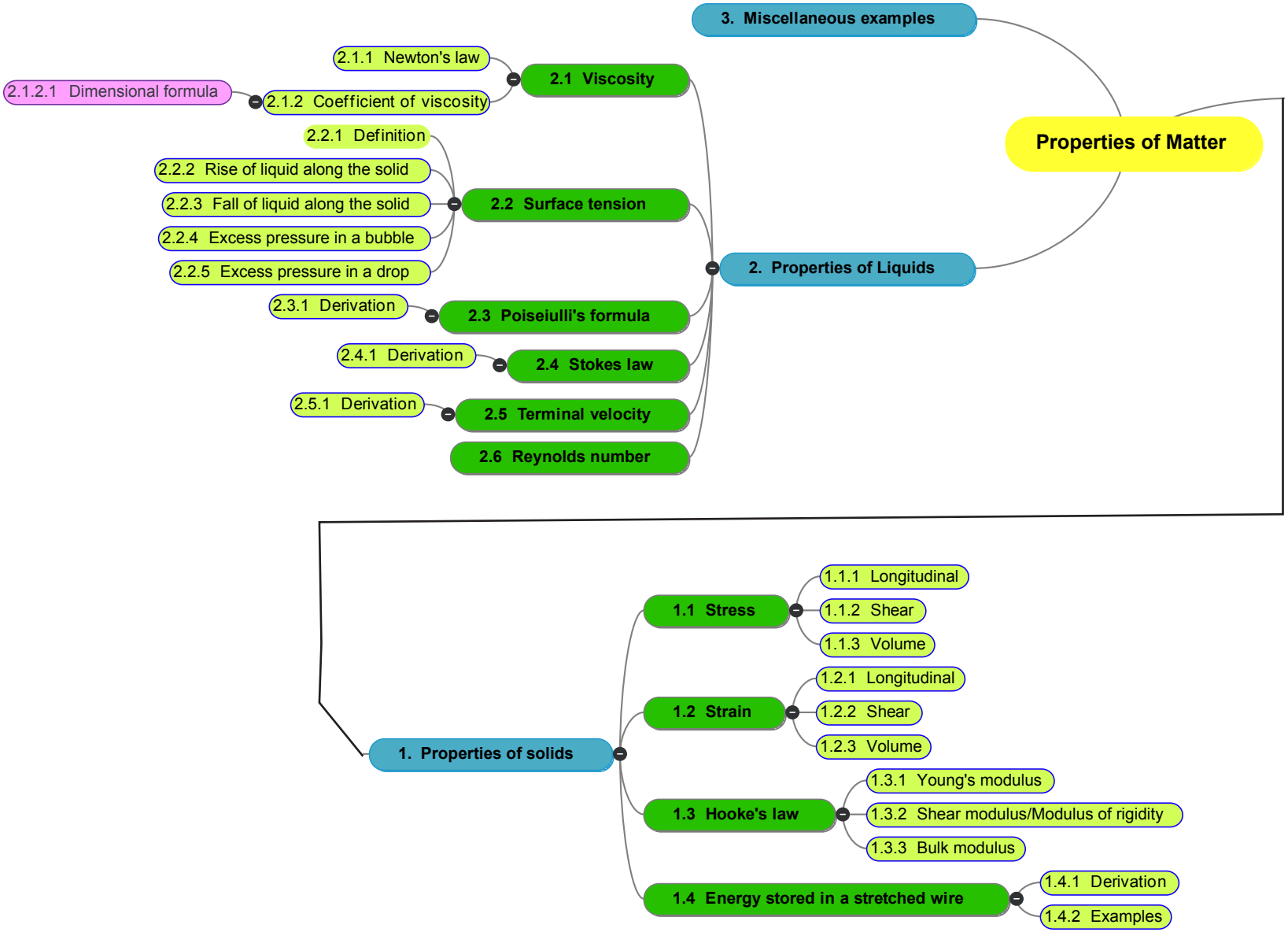
Simple Harmonic Motion Formula Practice Page

Fluids


Fluids
1. Basic Definition
1.1 Fluid
1.1.1 Ideal fluid
1.1.2 Viscous fluid
2. Fluid statics
2.1 Variation in pressure
2.1.1 In a static container
2.1.1.1 Along vertical
2.1.1.2 Along horizontal
2.1.2 In an accelerated container
2.1.2.1 Along vertical
2.1.2.2 Along horizontal
2.1.3 Example
2.2 Pressure
2.2.1 Absolute
2.2.2 Gauge
2.3 Pascal's Law
2.3.1 Derivation
2.3.2 Example
2.4 Archimedes principle
2.4.1 Buoyant Force
2.4.1.1 Floating
2.4.1.2 Submerge
2.4.1.3 Sink
3. Fluid Dynamics
3.1 Equation of continuity
3.1.1 Expression
3.2 Bernoulli's Principle
3.2.1 Expression
3.2.1.1 Derivation
3.2.2 Examples
3.3 Applications of Bernoulli's Principle
3.3.1 Speed of efflux
3.3.2 Venturi tube
3.3.3 Upthrust on airplane
4. Miscellaneous examples

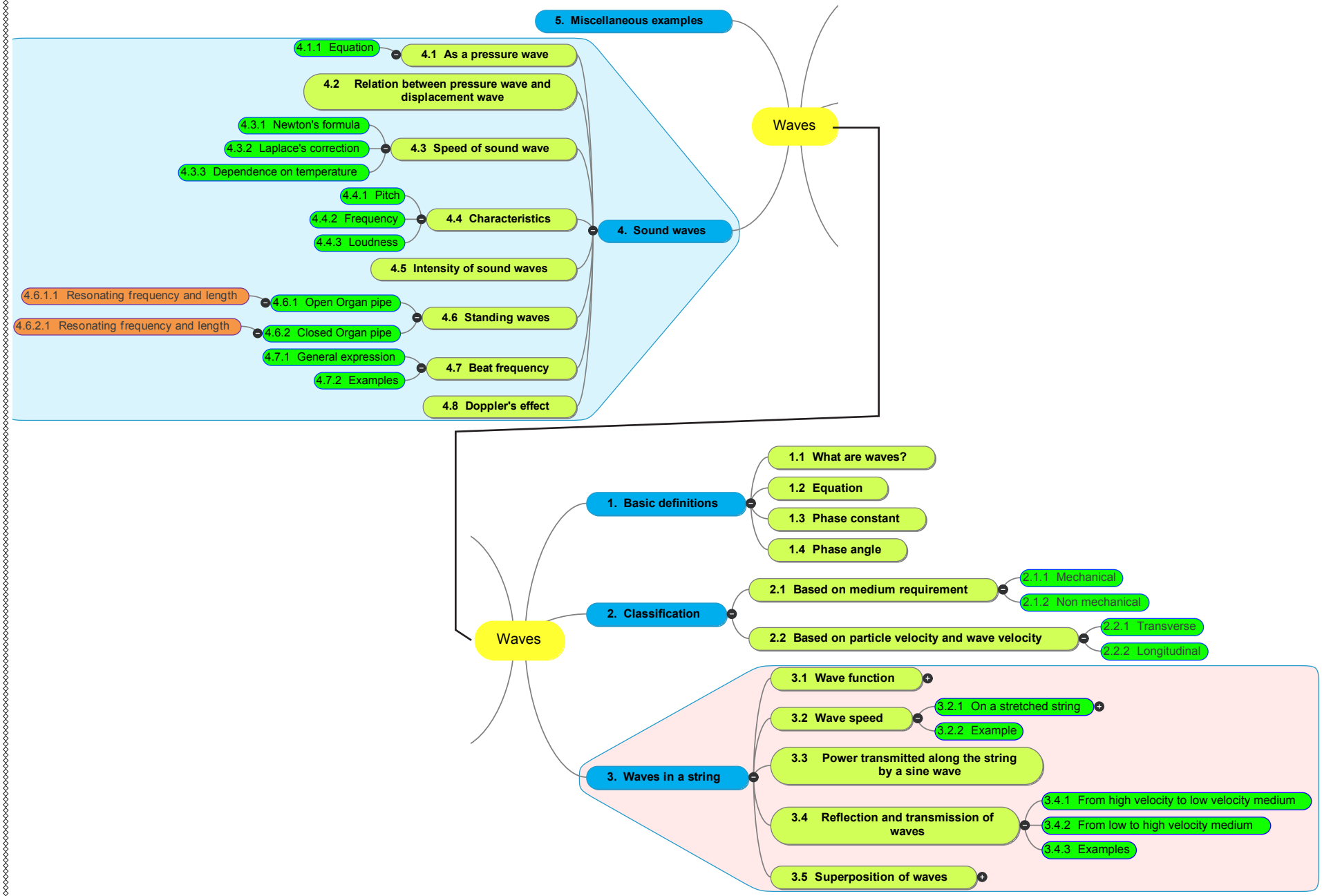
Fluids Formula Practice Page

Properties of Matter



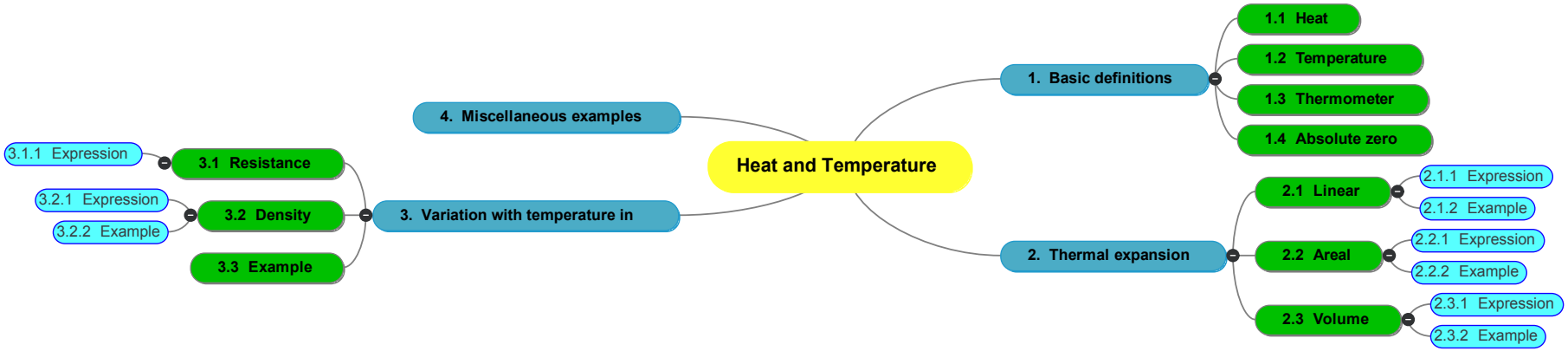
Properties of Matter Formula Practice Page

Waves


Waves
5. Miscellaneous examples
4. Sound waves
4.1 As a pressure wave
4.1.1 Equation
4.2 Relation between pressure wave and displacement wave
4.3 Speed of sound wave
4.3.1 Newton's formula
4.3.2 Laplace's correction
4.3.3 Dependence on temperature
4.4 Characteristics
4.4.1 Pitch
4.4.2 Frequency
4.4.3 Loudness
4.5 Intensity of sound waves
4.6 Standing waves
4.6.1 Open Organ pipe
4.6.1.1 Resonating frequency and length
4.6.2 Closed Organ pipe
4.6.2.1 Resonating frequency and length
4.7 Beat frequency
4.7.1 General expression
4.7.2 Examples
4.8 Doppler's effect
Waves
1. Basic definitions
1.1 What are waves?
1.2 Equation
1.3 Phase constant
1.4 Phase angle
2. Classification
2.1 Based on medium requirement
2.1.1 Mechanical
2.1.2 Non mechanical
2.2 Based on particle velocity and wave velocity
2.2.1 Transverse
2.2.2 Longitudinal
3. Waves in a string
3.1 Wave function
3.2 Wave speed
3.2.1 On a stretched string
3.2.2 Example
3.3 Power transmitted along the string by a sine wave
3.4 Reflection and transmission of waves
3.4.1 From high velocity to low velocity medium
3.4.2 From low to high velocity medium
3.4.3 Examples
3.5 Superposition of waves

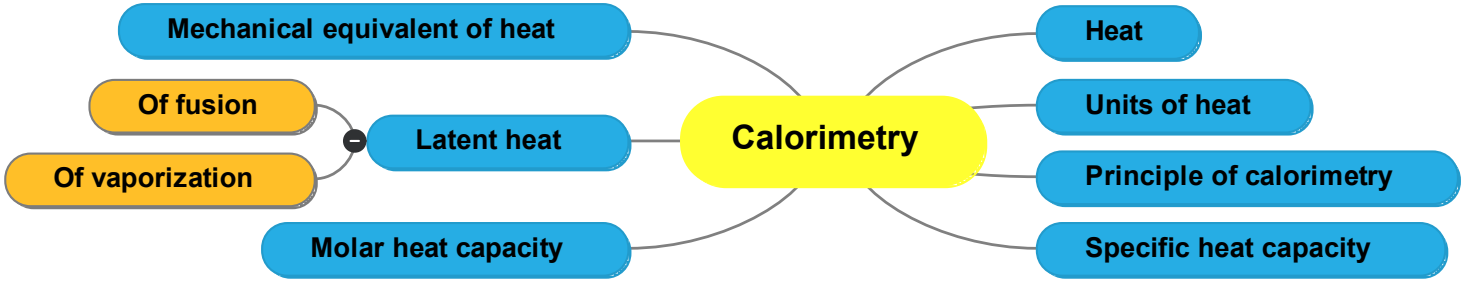
Waves Formula Practice Page

Heat and Temperature



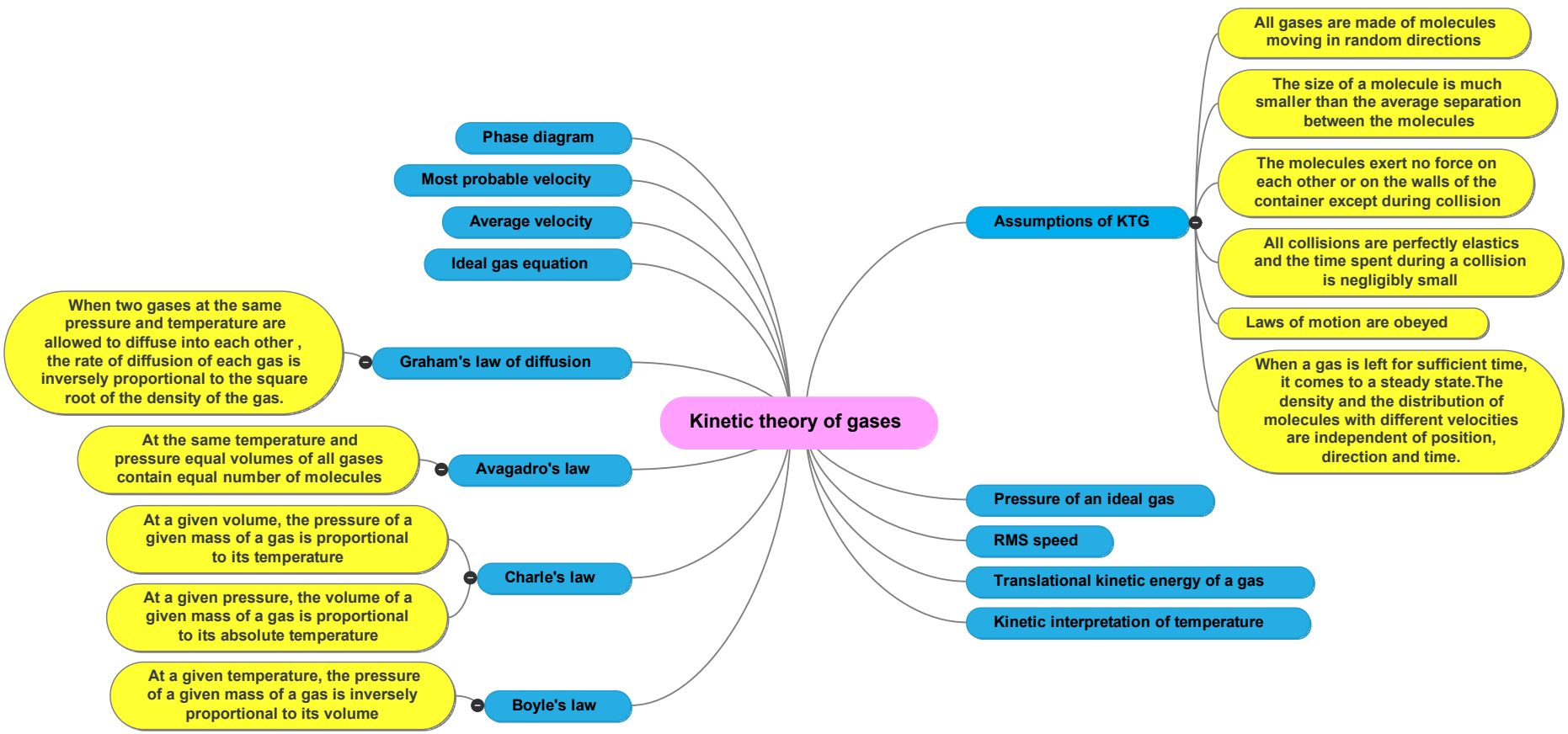
Heat and Temperature Formula Practice Page

Calorimetry



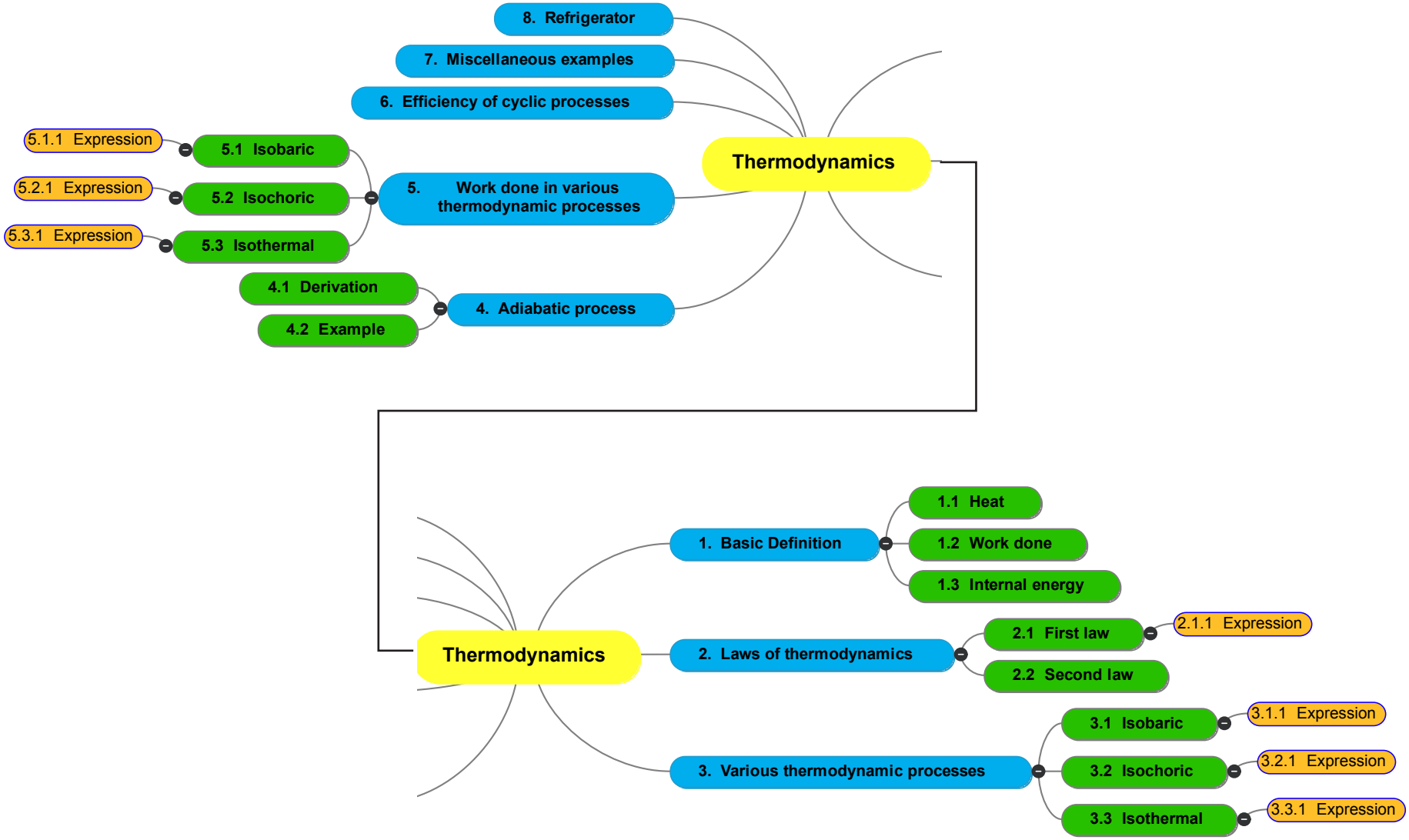
Calorimetry Formula Practice Page

Kinetic Theory of Gases

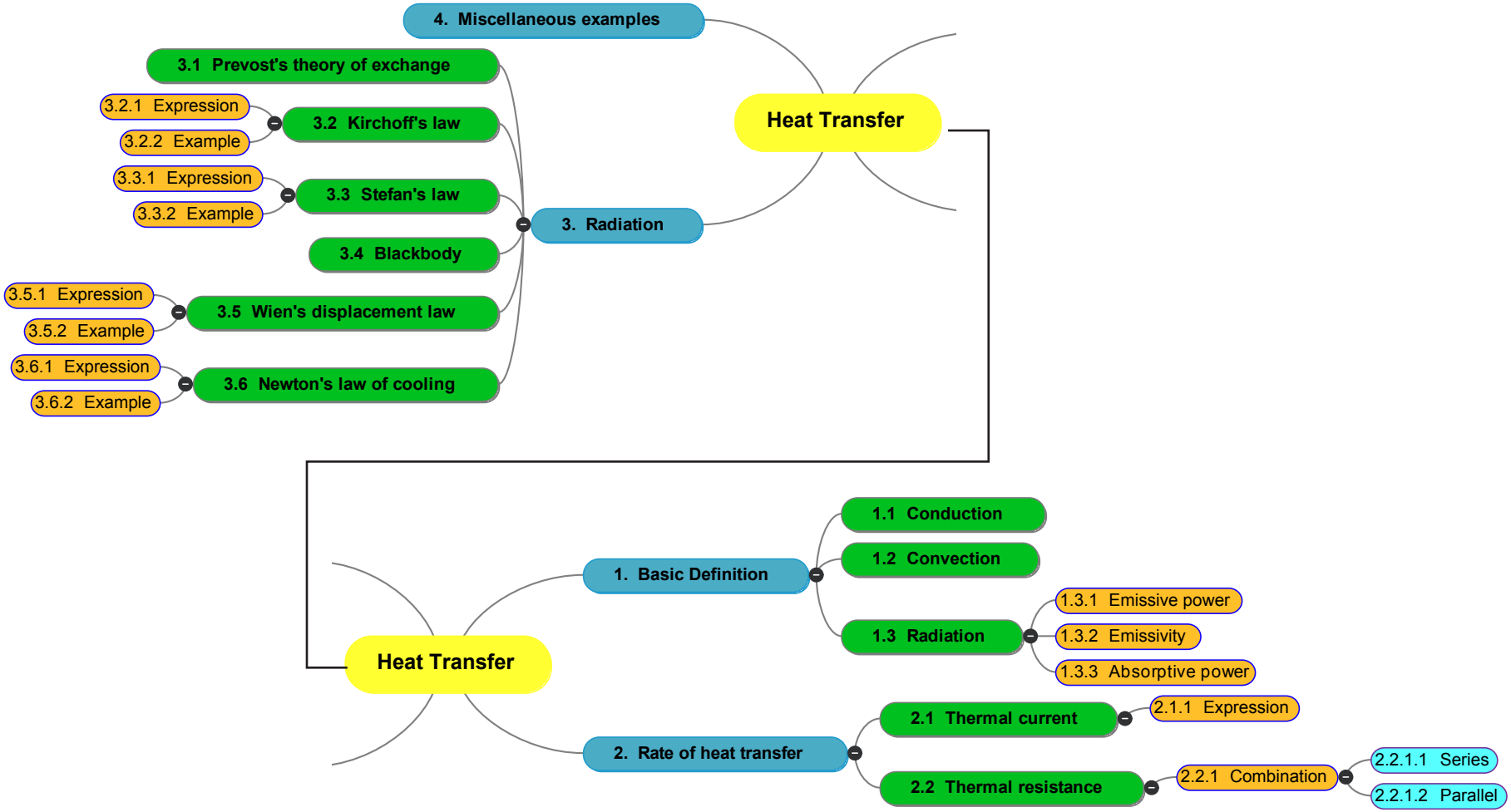


Kinetic Theory of Gases Formula Practice Page

Thermodynamics

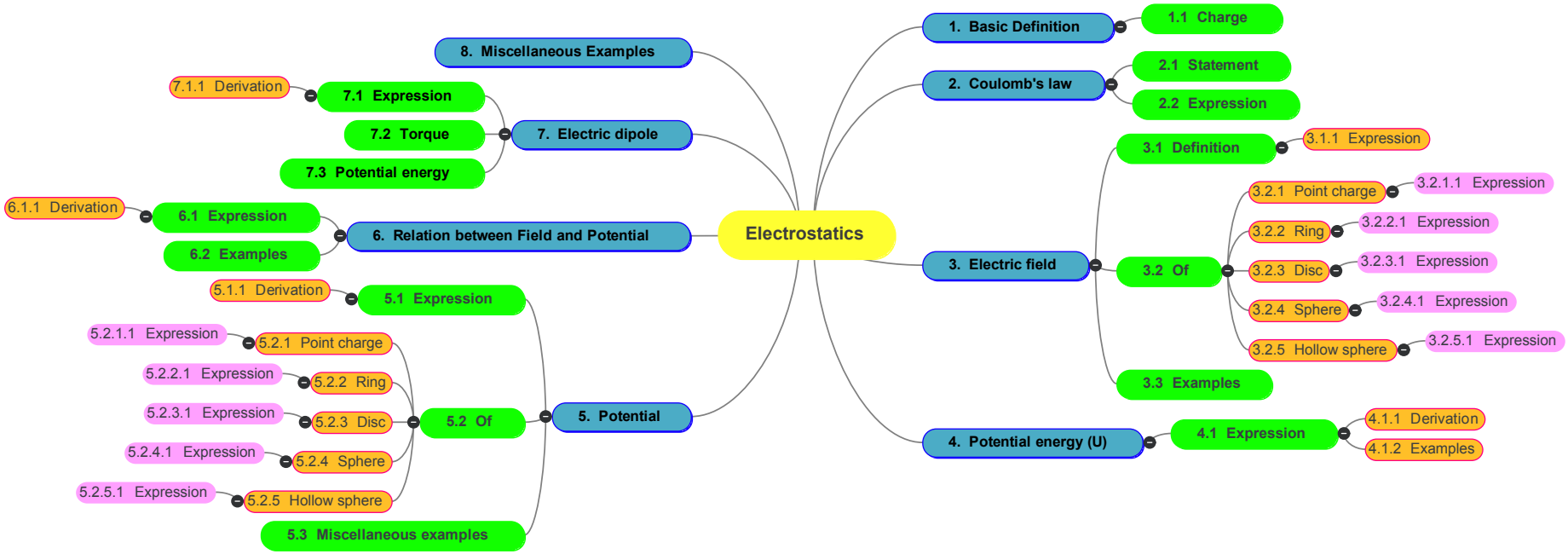


Thermodynamics Formula Practice Page


Heat Transfer
4. Miscellaneous examples
3. Radiation
3.1 Prevost's theory of exchange
3.2 Kirchoff's law
3.2.1 Expression
3.2.2 Example
3.3 Stefan's law
3.3.1 Expression
3.3.2 Example
3.4 Blackbody
3.5 Wien's displacement law
3.5.1 Expression
3.5.2 Example
3.6 Newton's law of cooling
3.6.1 Expression
3.6.2 Example
Heat Transfer
1. Basic Definition
1.1 Conduction
1.2 Convection
1.3 Radiation
1.3.1 Emissive power
1.3.2 Emissivity
1.3.3 Absorptive power
2. Rate of heat transfer
2.1 Thermal current
2.1.1 Expression
2.2 Thermal resistance
2.2.1 Combination
2.2.1.1 Series
2.2.1.2 Parallel

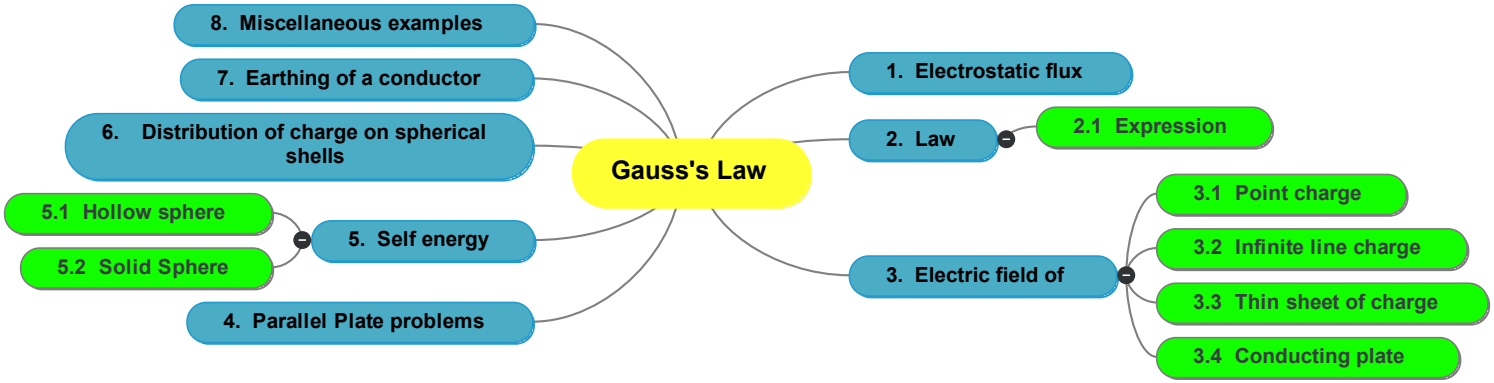
Heat Transfer Formula Practice Page

Electrostatics



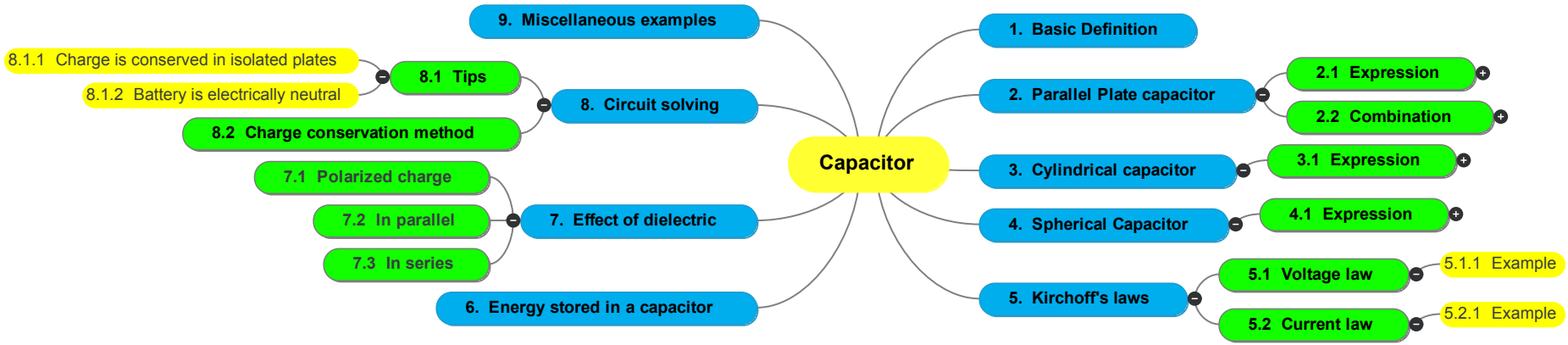
Electrostatics Formula Practice Page

Gauss's Law Formula Practice Page



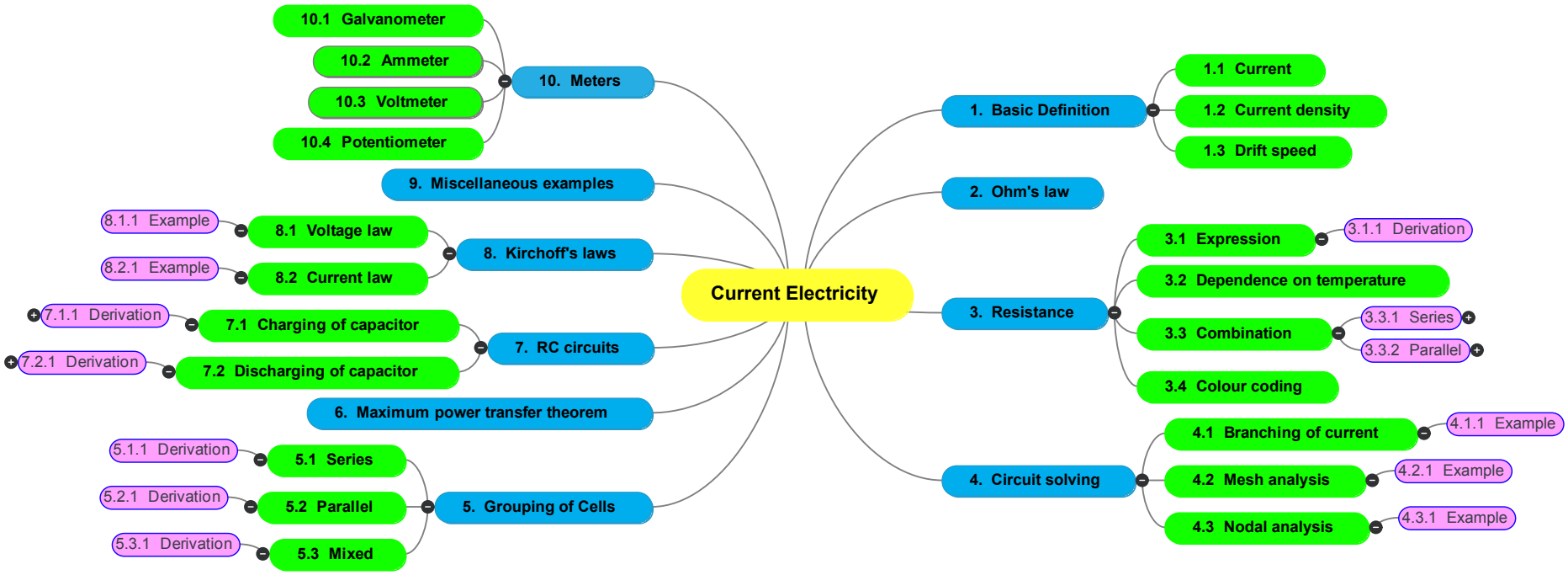
Gauss's Law Formula Practice Page

Capacitors


Capacitor
1. Basic Definition
2. Parallel Plate capacitor
2.1 Expression
2.2 Combination
3. Cylindrical capacitor
3.1 Expression
4. Spherical Capacitor
4.1 Expression
5. Kirchoff's laws
5.1 Voltage law
5.1.1 Example
5.2 Current law
5.2.1 Example
6. Energy stored in a capacitor
7. Effect of dielectric
7.1 Polarized charge
7.2 In parallel
7.3 In series
8. Circuit solving
8.1 Tips
8.1.1 Charge is conserved in isolated plates
8.1.2 Battery is electrically neutral
8.2 Charge conservation method
9. Miscellaneous examples

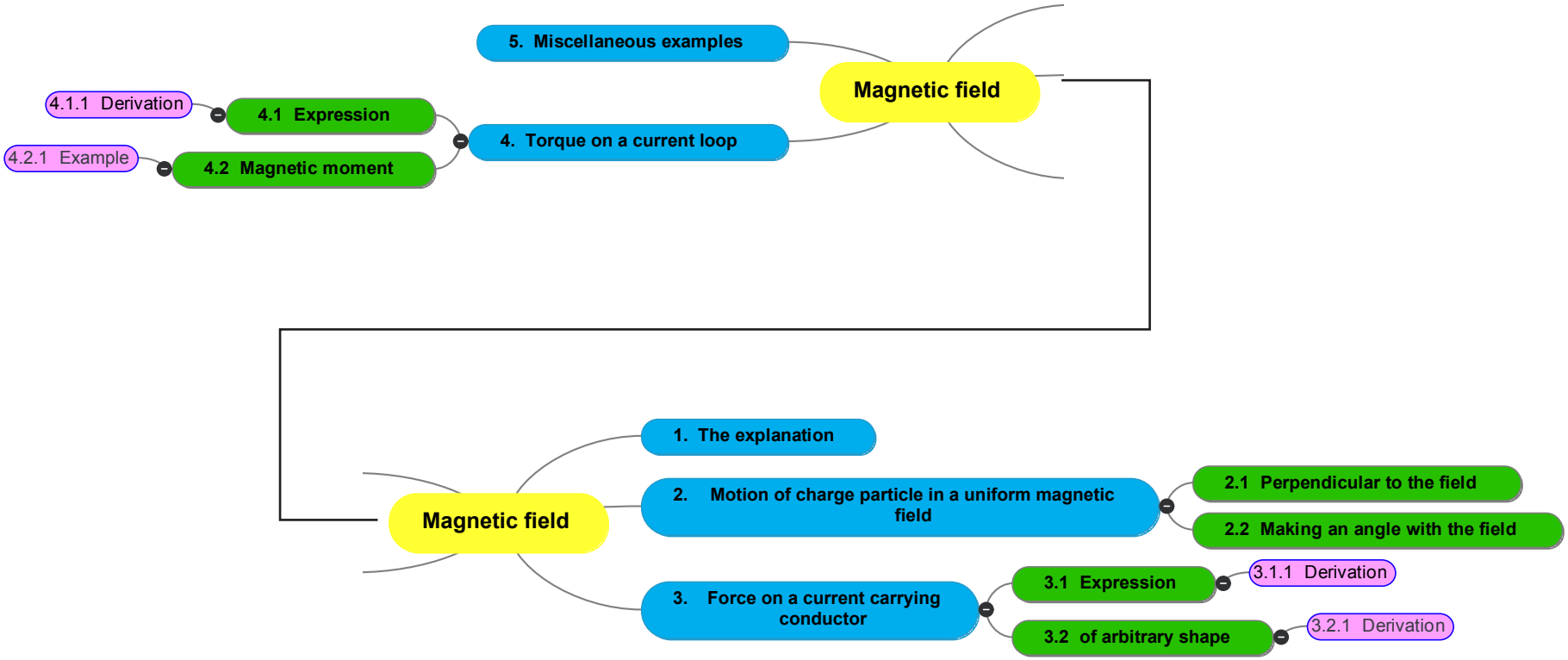
Capacitors Formula Practice Page

Current Electricity



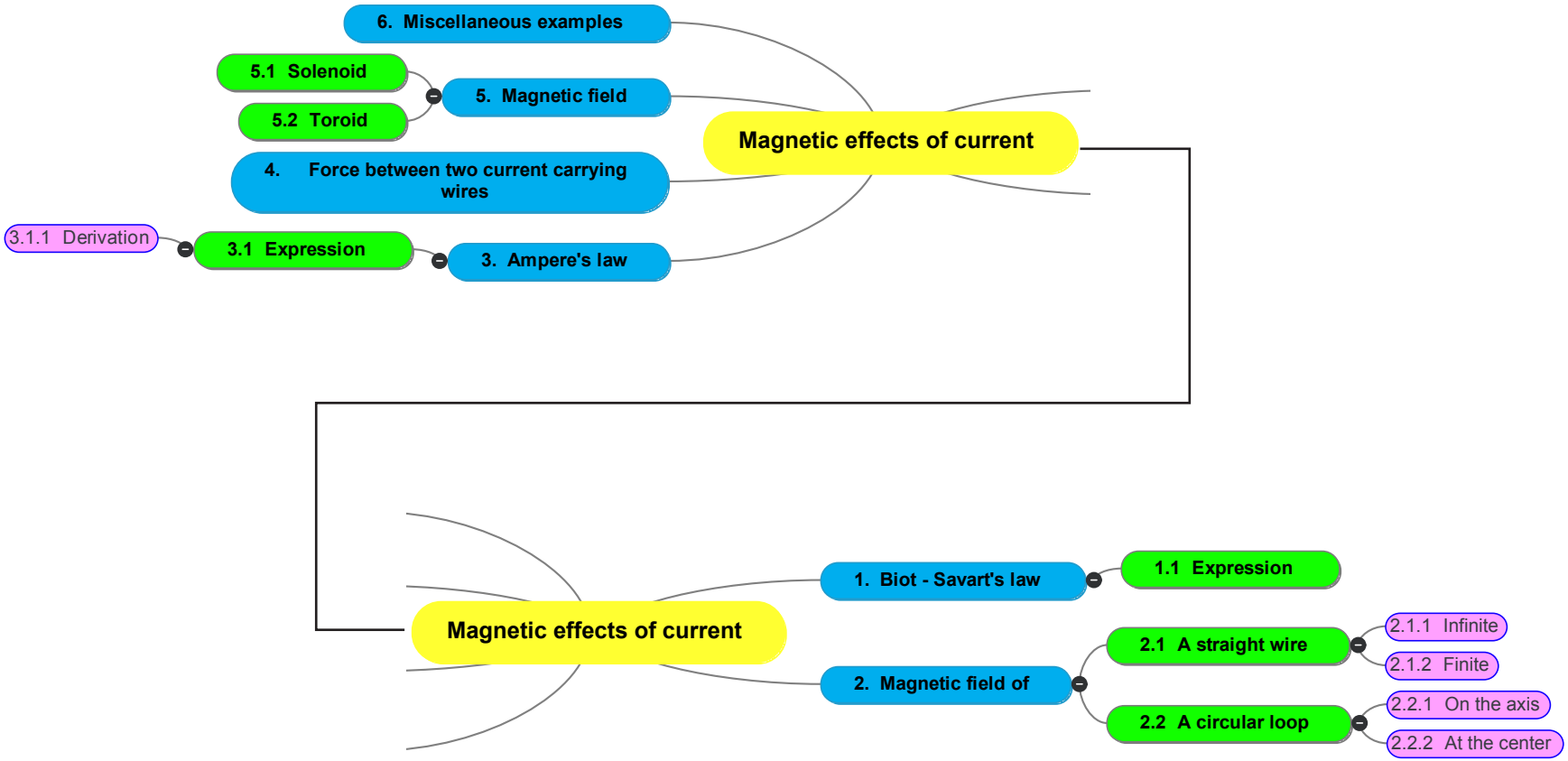
Current Electricity Formula Practice Page

Magnetic Field



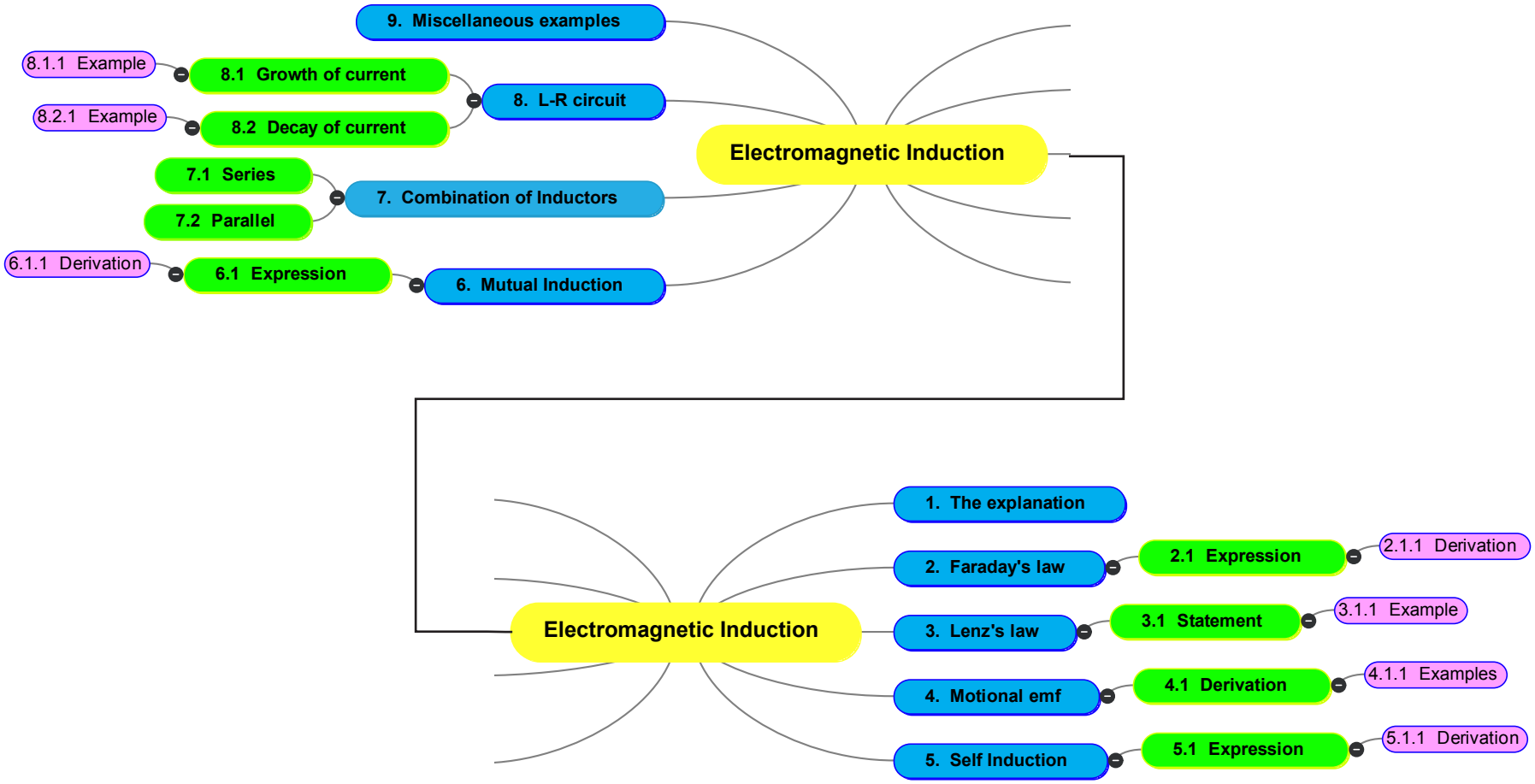
Magnetic Field Formula Practice Page

Magnetic Effects of Current



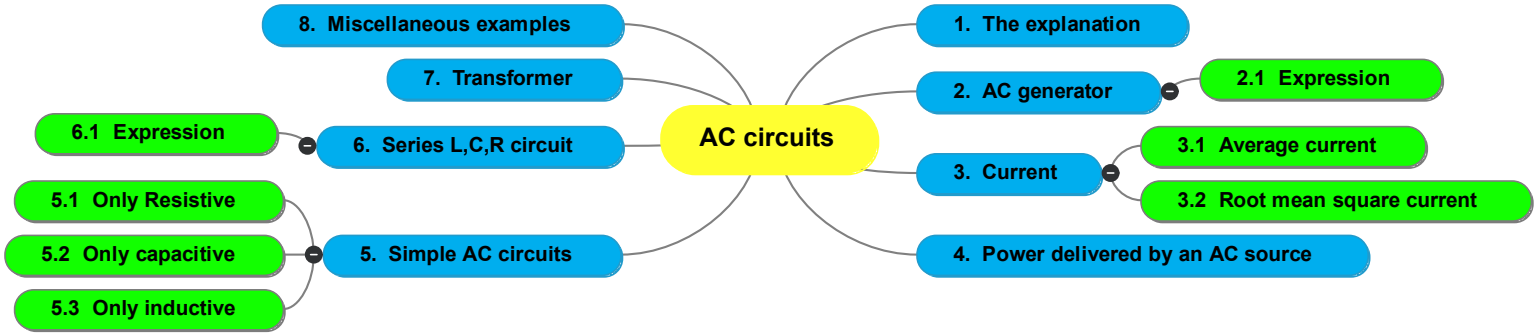
Magnetic Effects of Current Formula Practice Page

Electromagnetic Induction



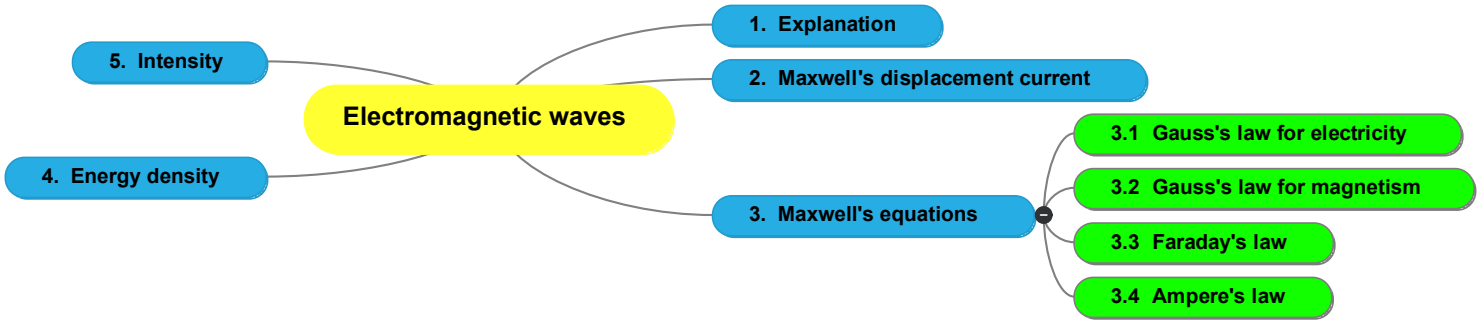
Electromagnetic Induction Formula Practice Page

AC Circuit


AC circuits
1. The explanation
2. AC generator
2.1 Expression
3. Current
3.1 Average current
3.2 Root mean square current
4. Power delivered by an AC source
5. Simple AC circuits
5.1 Only Resistive
5.2 Only capacitive
5.3 Only inductive
6. Series L,C,R circuit
6.1 Expression
7. Transformer
8. Miscellaneous examples

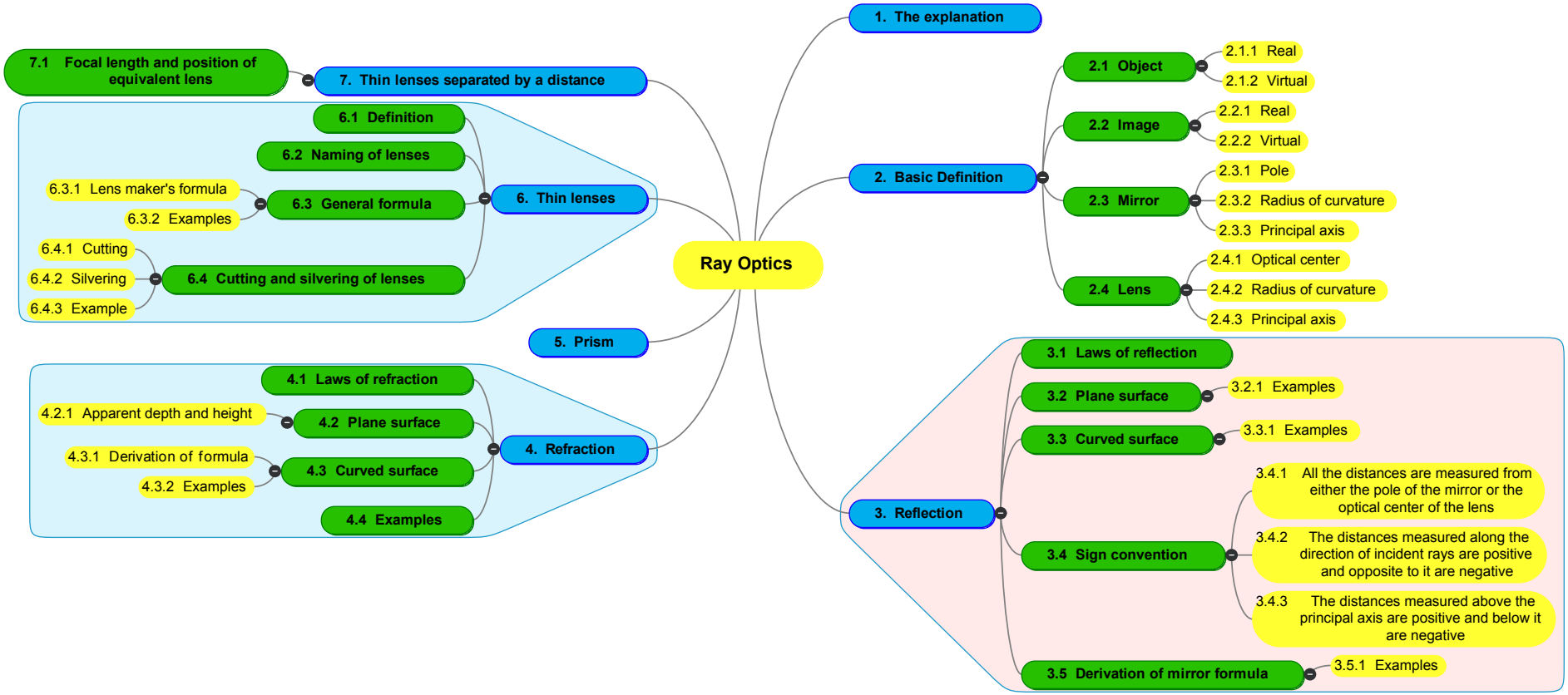
AC Circuit Formula Practice Page

EM Waves


Electromagnetic waves
1. Explanation
2. Maxwell's displacement current
3. Maxwell's equations
3.1 Gauss's law for electricity
3.2 Gauss's law for magnetism
3.3 Faraday's law
3.4 Ampere's law
4. Energy density
5. Intensity

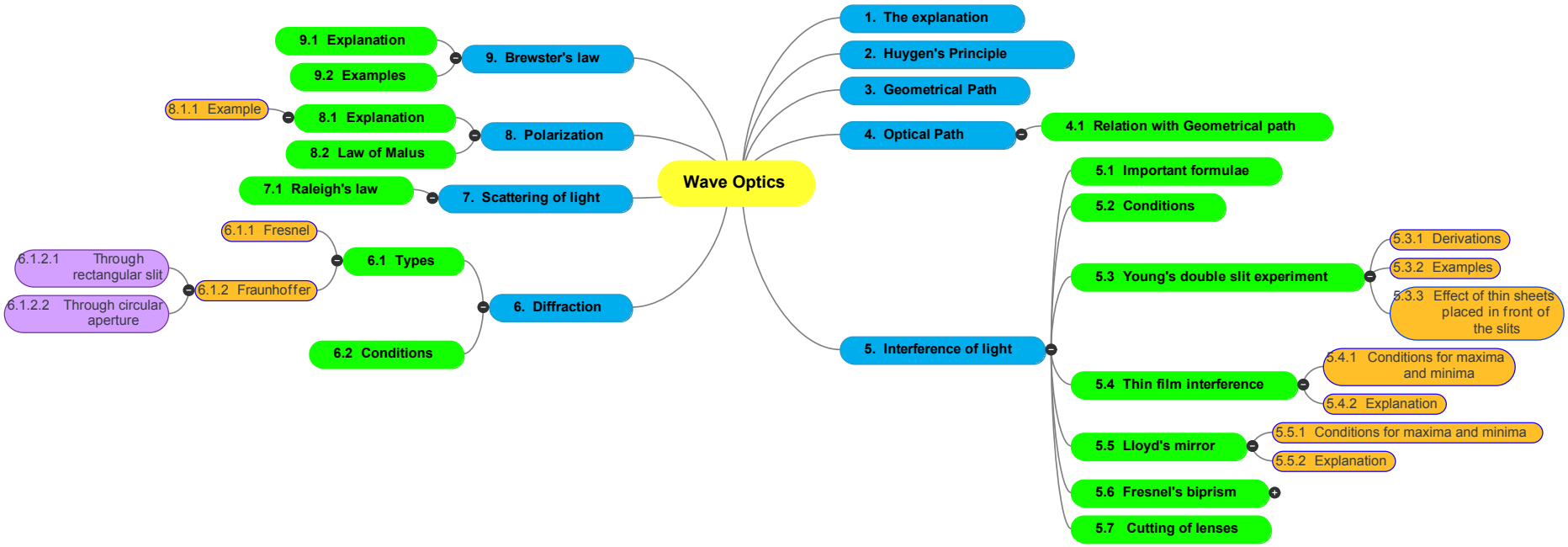
EM Waves Formula Practice Page

Ray Optics


Ray Optics
1. The explanation
2. Basic Definition
2.1 Object
2.1.1 Real
2.1.2 Virtual
2.2 Image
2.2.1 Real
2.2.2 Virtual
2.3 Mirror
2.3.1 Pole
2.3.2 Radius of curvature
2.3.3 Principal axis
2.4 Lens
2.4.1 Optical center
2.4.2 Radius of curvature
2.4.3 Principal axis
3. Reflection
3.1 Laws of reflection
3.2 Plane surface
3.2.1 Examples
3.3 Curved surface
3.3.1 Examples
3.4 Sign convention
3.4.1 All the distances are measured from either the pole of the mirror or the optical center of the lens
3.4.2 The distances measured along the direction of incident rays are positive and opposite to it are negative
3.4.3 The distances measured above the principal axis are positive and below it are negative
3.5 Derivation of mirror formula
3.5.1 Examples
4. Refraction
4.1 Laws of refraction
4.2 Plane surface
4.2.1 Apparent depth and height
4.3 Curved surface
4.3.1 Derivation of formula
4.3.2 Examples
4.4 Examples
5. Prism
6. Thin lenses
6.1 Definition
6.2 Naming of lenses
6.3 General formula
6.3.1 Lens maker's formula
6.3.2 Examples
6.4 Cutting and silvering of lenses
6.4.1 Cutting
6.4.2 Silvering
6.4.3 Example
7. Thin lenses separated by a distance
7.1 Focal length and position of equivalent lens

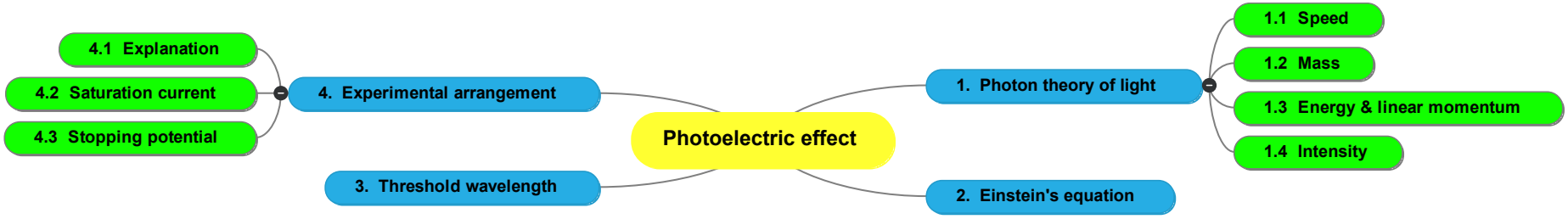
Ray Optics Formula Practice Page

Wave Optics


Wave Optics
1. The explanation
2. Huygen's Principle
3. Geometrical Path
4. Optical Path
4.1 Relation with Geometrical path
5. Interference of light
5.1 Important formulae
5.2 Conditions
5.3 Young's double slit experiment
5.3.1 Derivations
5.3.2 Examples
5.3.3 Effect of thin sheets placed in front of the slits
5.4 Thin film interference
5.4.1 Conditions for maxima and minima
5.4.2 Explanation
5.5 Lloyd's mirror
5.5.1 Conditions for maxima and minima
5.5.2 Explanation
5.6 Fresnel's biprism
5.7 Cutting of lenses
6. Diffraction
6.1 Types
6.1.1 Fresnel
6.1.2 Fraunhoffer
6.1.2.1 Through rectangular slit
6.1.2.2 Through circular aperture
6.2 Conditions
7. Scattering of light
7.1 Raleigh's law
8. Polarization
8.1 Explanation
8.1.1 Example
8.2 Law of Malus
9. Brewster's law
9.1 Explanation
9.2 Examples

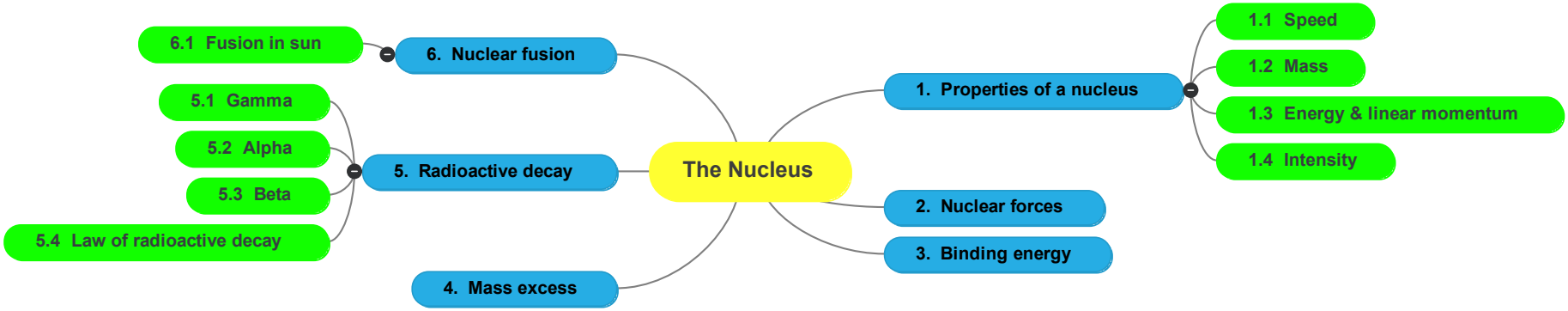
Wave Optics Formula Practice Page

Photoelectric Effect



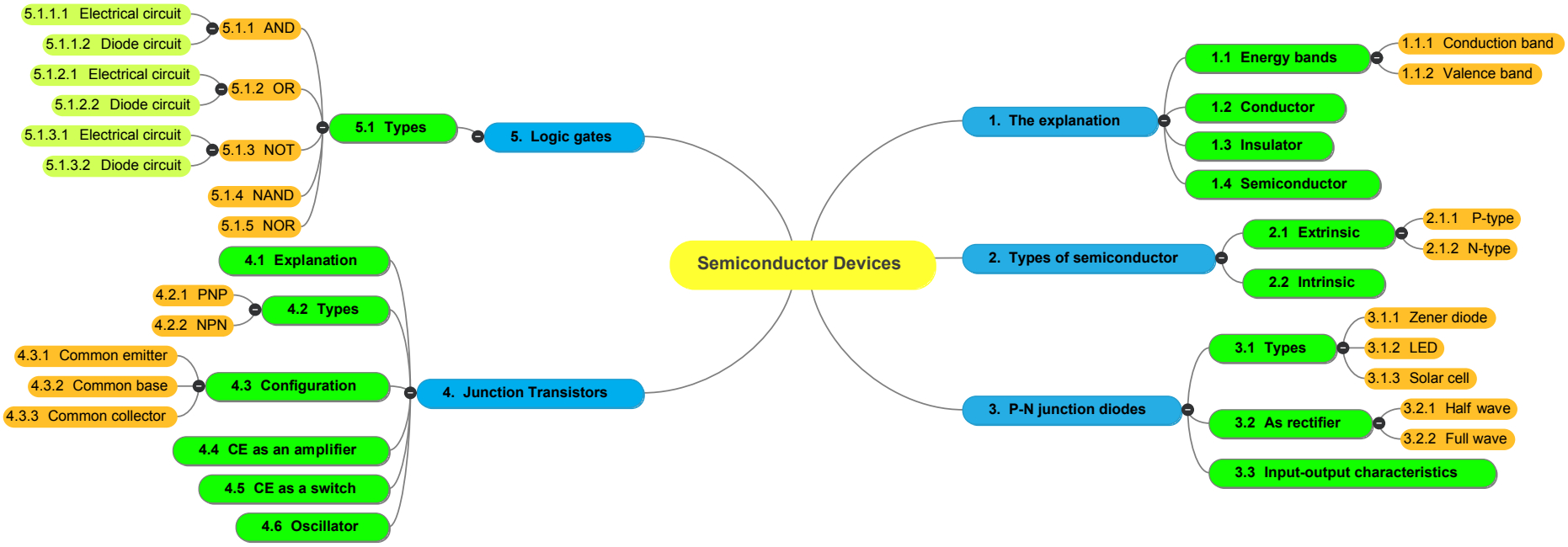
Photoelectric Effect Formula Practice Page

Nucleus


The Nucleus
1. Properties of a nucleus
1.1 Speed
1.2 Mass
1.3 Energy & linear momentum
1.4 Intensity
2. Nuclear forces
3. Binding energy
4. Mass excess
5. Radioactive decay
5.1 Gamma
5.2 Alpha
5.3 Beta
5.4 Law of radioactive decay
6. Nuclear fusion
6.1 Fusion in sun

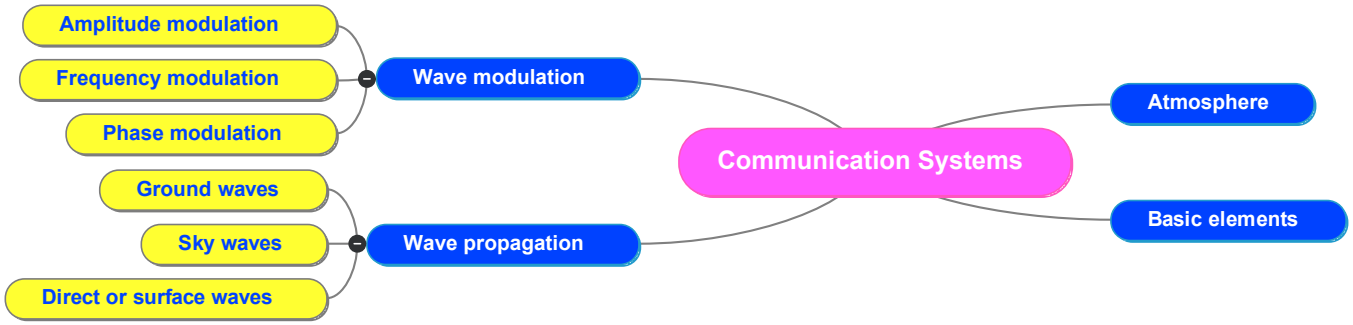
Nucleus Formula Practice Page

Semiconductors



Semiconductors Formula Practice Page

Communication Systems



Communication Systems Formula Practice Page

The End