The Chapter and Figure (diagram or picture) references are from the course textbook *Conceptual Physics* by Paul G. Hewitt.

**Chapter 1 – About Science**

**Scientific Method:** 1) Recognize a problem, 2) Make a hypothesis about the answer, 3) Use the hypothesis to make a prediction, 4) Test the prediction with experiments, 5) Create a general rule that organizes the results.

**Vocabulary:** hypothesis, experiment, prediction, theory, scientific principle, scientific law

**Chapter 2 – Linear Motion**

**Table:** 2.2, **Figure:** 2.6

**Formulas:**
- speed = (distance)/(time) \( v = \frac{d}{t} \)
- distance = (speed)(time) \( d = vt \)
- acceleration = (change in speed)/(time) \( a = \frac{\Delta v}{t} \)
- speed = (acceleration)(time) \( v = at \)
- distance = (1/2)(acceleration)(time)^2 \( d = \frac{1}{2} at^2 \)

**Units:**
- speed units = (meters)/(seconds) = m/s
- acceleration units = (meters)/(seconds)^2 = m/s^2
- acceleration of gravity = \( g = 9.8 \text{ m/s}^2 \) [approximately: \( g \approx 10 \text{ m/s}^2 \)]

**Vocabulary:** speed, average speed, instantaneous speed, velocity, acceleration, free fall

**Chapter 3 – Projectile Motion**

**Figures:** 3.6, 3.8, 3.9, 3.13, 3.16

**Vocabulary:** projectile, vector, component

**Chapter 4 – Newton’s First Law of Motion – Inertia**

**Figure:** 4.8, 4.11

**Vocabulary:** inertia, mass, weight, force, net force, newton

**Chapter 5 – Newton’s Second Law of Motion – Force and Acceleration**

**Figures:** 5.6, 5.11, 5.12

**Formulas:**
- force = (mass)(acceleration) \( F = ma \)
- acceleration = (force)/(mass) \( a = \frac{F}{m} \)
- weight = (mass)(acceleration of gravity) \( F = mg \)
- force units = newton = (kilogram)(meter)/second)^2 \( N = \text{kg m/s}^2 \)

**Vocabulary:** friction, air resistance

**Chapter 6 – Newton’s Third Law of Motion – Action and Reaction**

**Figures:** 6.5, 6.6, 6.7, 6.9

**Vocabulary:** action force, reaction force

**Chapter 7 – Momentum**

**Figures:** 7.3, 7.4, 7.7, 7.8

**Formulas:**
- momentum = (mass)(velocity) \( p = mv \)
- impulse = (force)(time) = \( Ft \)
- Impulse = change in momentum \( Ft = \Delta (mv) \) [usually \( Ft = m \Delta v \)]

**Vocabulary:** momentum, impulse, conservation of momentum
Chapter 8 – Energy
Figures: 8.3, 8.7, 8.8
Formulas: work = (force)(distance) \( W = Fd \), power = (work)/(time) = (energy)/(time)\[\text{gravitational potential energy} = (weight)(height) \quad \text{PE} = mgh, \]
kinetic energy = \( (1/2)(mass)(speed)^2 \) \( KE = \frac{1}{2} mv^2 \)
energy units = joule = \( \text{(kilogram)(meter)}^2/\text{(second)}^2 \) \( J = \text{kg m}^2/\text{s}^2 \)
power units = watt = \( \text{(joule)/(second)} \) \( W = J/s \)
Vocabulary: work, power, mechanical energy, potential energy, kinetic energy, joule, watt, conservation of energy, efficiency

Chapter 9 – Circular Motion
Formulas: centripetal force = \( (mass)(\text{tangential speed})^2/\text{(radius)} \) \( F = mv^2/r \)
Vocabulary: rotation, revolution, tangential speed, rotational speed, centripetal force

Chapter 10 – Center of Gravity
Figures: 10.2, 10.4, 10.18, 10.24
Vocabulary: center of gravity, center of mass, stability, stable equilibrium

Chapter 11 – Rotational Mechanics
Figures: 11.4, 11.5, 11.9, 11.10, 11.15, 11.17, 11.26
Formulas: torque = \( \text{(perpendicular force)(lever arm)} \) \( \tau = F \perp r \)
Vocabulary: torque, rotational inertia, conservation of angular momentum

Chapter 12 – Universal Gravitation
Figures: 12.4, 12.11
Formulas: gravitational force = \( \text{(gravitational constant)(mass one)(mass two)/(distance)}^2 \) \( F = \frac{Gm_1m_2}{d^2} \)
Vocabulary: universal gravitational constant, inverse-square law

Chapter 13 – Gravitational Interactions
Figures: 13.6, 13.12, 13.13, 13.19
Vocabulary: tide, weighlessness, black hole

Chapter 14 – Satellite Motion
Figures: 14.3, 14.13
Formulas: orbital speed = \( \sqrt{\text{(gravitational constant)(mass of central body)/(radius of orbit)}} \) \( v_{\text{orbit}} = \sqrt{\frac{Gm}{r}} \)
Vocabulary: orbital speed

Chapters 15 & 16 – Special Relativity \[\text{[next semester after the California Standards Tests]}\]
Properties of Matter

Chapter 17 – The Atomic Nature of Matter
Figures: 17.7
Concepts: atoms are recyclable (17.2), atoms are small (17.3)
Vocabulary: atom, molecule, electron, nucleus, nucleon, proton, neutron

Chapter 18 – Solids
Figures: 18.2
Formulas: density = (mass)/(volume) \( d = \frac{m}{V} \)
Vocabulary: crystal, density

Chapter 19 – Liquids
Formulas: pressure = (force)/(area) \( P = \frac{F}{A} \)
pressure at the bottom of a liquid = (density)(acceleration of gravity)(depth) \( P = dg_h \)
pressure units = pascal = newton/(meter)^2 \( \text{Pa} = \frac{N}{m^2} \)
Vocabulary: pressure, buoyant force, displacement

Chapter 20 – Gases
Vocabulary: barometer, Bernoulli’s principle, lift