

Physical Science 303 – Test Review Topics

1. The material covered on the test will include
 - Hewitt Chapters 1, 2, 3, 11, 12 and Appendices A-D,
 - Lab Manual Units 0 through V and Appendices I through IV
 - only Activity 1 of Unit V
 - all homeworks, and quizzes.
2. The test questions can include
 - short answers,
 - reasoning critiques
 - point out assumptions, logic, and flaws of an argument
 - be willing consider and critique criticism, and possibly act
 - exercise good scientific judgment.
 - experimental design,
 - graphing of numerical data,
 - basic deductive reasoning,
 - word problems,
 - writing in complete sentences,
 - and solving algebraic equations.
3. Uncertainty
 - how to calculate it (two ways)
 - Accuracy vs. precision
 - 3 components of a measurement: value, uncertainty, and units
 - Know how to find the average of a number.
 - Know how to find the magnitude of a number.
 - Know how to compare two measurements using their uncertainty.
4. Plotting
 - histograms with labels and units and average and uncertainty
 - x,y plots with labels and units
 - estimating best fit with uncertainty
 - how to decide if fit goes through (0,0) or not
 - how to find the constants of an equation from data
 - i.e. find m and b in $y = mx + b$ or find α in $y = \alpha x^2$.

5. Conceptual Physics
 - the symptoms of pseudoscience
 - how to calculate an upper and lower bound
 - how to check that units are consistent in an equation
 - e.g. units of period and frequency
 - how to calibrate a measurement device
 - how to understand a physical situation with many parameters
 - vary one parameter at a time, keep all others constant.
 - scaling of length, surface area, and volume
 - calculating the circumference and area of basic geometric shapes
 - e.g. circle, square, triangle, etc.
6. Mathematical Operations
 - Vectors (using the map convention)
 - adding and subtracting vectors
 - converting between rectangular and polar coordinates
 - Significant figures
 - Scientific notation
 - Conversion of units
 - centi-, milli-, micro-, nano-, kilo-, mega-, giga-
7. Physical Concepts
 - density, mass, and volume
 - density = mass divided by volume, $\rho = M/V$
 - how to find an average density, $\rho_{total} = M_{total}/V_{total}$
 - area and volume calculations
 - volume displacement method
 - displacement (distance), velocity (speed), and acceleration
 - use of the equations $v = at$ and $d = \frac{1}{2}at^2$
8. Laws of Physics
 - Hooke's law: $W = kx$, where W is the weight on a spring, x is displacement from equilibrium, and k is the spring constant.
 - frequency of a pendulum
 - Newton's first law of motion
 - convert weight into mass, $W = Mg$, where W is weight (in Newtons), M is mass (in kilograms), $g = 9.8 \text{ m/s}^2$.
 - force diagrams with net force, support forces, noncontact, and contact forces