

Exam 1 Review

Details: The exam will be open resource. You may use any materials posted for the class. You MAY NOT consult any other student. Any evidence of cheating will result in a grade of ZERO.

The exam will be distributed on Tuesday Oct. 6 at 5pm, and you will have until 5pm on Wednesday Oct. 7 (24 hours) to complete the exam. It should take you about 1 hour to complete the exam. There will be no Zoom session that day, but students may join the regularly scheduled meeting to ask questions.

The exam will be given in two parts: Section 1 will be completed online as an E360 test (linked in the Exam 1 learning module). Section 2 will be an Excel assignment, which you will submit to the Exam 1 dropbox by 5pm on Wednesday 10/7. Your exam grade will be the sum of the Section 1 & 2 scores.

The exam will be similar to the homework problems. You should have a scientific calculator, a pencil and eraser, and your handout on the metric system and derived units.

Topics to be covered:

1. Conversions/calculations

- a. Simple units (ex: 5 mi to km)
- b. Rates (ex: 10 ft/hr to m/s)
- c. Areas (ex: 4.5 ft² to in²)
- d. Volumes (ex: 5600 m³ to km³)
- e. Temperatures: $F = 9/5 * C + 32$ or $C = 5/9 * (F - 32)$

2. Significant Figures

3. Metric System

- a. Basic units: grams (mass), meters (length), liters (volume)
- b. Prefixes determine the conversion factor
 - i. kilo- km = 1000 m
 - ii. milli- mm = 1/10³ m
 - iii. micro- μm = 1/10⁶ m
 - iv. nano- nm = 1/10⁹ m
 - v. pico- pm = 1/10¹² m
- c. Conversions (3.2 m to nm, or 3.2 m to km)
- d. Derived units: N (force), J (energy), W (power), Pa (pressure), V (voltage)
- e. Equivalency of units (similar to HW 2 problems)

4. Simple Formulas (memorize these)

- a. Force = mass * acceleration
- b. Weight = mass * g
- c. Velocity = distance/time
- d. Acceleration = $(V_2 - V_1)/(t_2 - t_1)$
- e. Density ρ = mass/volume
- f. Specific gravity $SG = \rho / \rho_{\text{water}}$, where $\rho_{\text{water}} = 1 \text{ g/cm}^3 = 1000 \text{ kg/m}^3$
- g. Efficiency η = power output/power input

5. Energy and Energy Conversions

- a. Energy can be converted from one form to another
- b. Conversion process is never 100% efficient (some energy always lost to heat/friction)
- c. Kinetic, potential, thermal energy and work- all same units, can convert between them.

6. Excel basics

- a. Terminology: Cell, Row, Column, Formula bar- be able to identify on spreadsheet
- b. Format: know how to format a cell and some of the available formats (% , \$, text formats, decimal places displayed, justification, borders, etc)
- c. Insert/delete cells, rows, and columns
- d. Switch between sheets within an .xlsx file, create and name new sheets

7. Excel formulas, functions and references

- a. Formulas
 - i. Starts with "="
 - ii. Uses operations (+, -, *, /, ^) and/or functions
 - iii. Type in cell references or simply click on cells to insert in formula.
 - iv. Use order of operations.
- b. Functions: SUM, AVERAGE, COUNT, SQRT, MAX, MIN
- c. IF function: =IF(logical test, value-if-true, value-if-false)
- d. Copying formulas
 - i. How: drag box in bottom right corner
 - ii. Why: to avoid retyping same formula over and over
- e. Absolute vs. relative references
 - i. Relative references: change when copied (ex. B5)
 - ii. Absolute references: do not change when copied (ex. \$B\$5)

8. Excel plotting

- a. Know how to insert a blank scatterplot into your spreadsheet
- b. Know how to choose the appropriate data for chart
- c. Know how to insert titles, axis labels, data labels, etc.

9. Associated Mathematical Concepts

- a. Best-fit line or trendline for scatterplot datasets.
 - i. Slope, y-intercept of trendline
 - ii. Positively and negatively correlated variables
 - iii. R^2 values for trendlines and what they represent.
- b. Weighted average calculations