

## Physics

Fascia, Bowers, Butler

### Midterm Exam Outline 2023-2024

#### Format

- 60 Multiple Choice Questions (60% - 1 Point Each)**
- 8 Free-Response Problems (40% - 5 Points Each)**

#### Exam includes the following topics:

##### Chapter 1: The Science of Physics

*What is Physics – Provide Definitions*

*List Areas or Branches of Physics – Explain What Each Describes*

*Significant Figures and Rounding: Applying Rules for*

- *Identifying the number of significant digits in a number*
- *Rounding a number to the correct place*
- *Adding and subtracting numbers (Rounding the Result with Sig Figs)*
- *Multiplying and dividing numbers (Rounding the Result with Sig Figs)*

*Scientific Notation (Expressing numbers in Sci. Not. - Adding, Subtracting, Multiplying, Dividing in Sci. Not.)*

*Powers of Ten – Orders of Magnitude Estimates*

##### Chapter 2: 1D Kinematics – Motion in One Dimension

*Frames of Reference*

*Interpreting Ticker-Tape Dot Patterns*

*Applying General Motion Equations*

*Displacement, Velocity and Acceleration (Defining and Formula Application)*

*Speeding Up/Slowing Down (Comparing Directions of Velocity and Acceleration)*

*Distinguishing Between Average and Instantaneous Velocity and Acceleration (Secant-Tangent Lines)*

*Describing Motion from Interpreting  $x$ ,  $v$  and  $a$  Graphs (Slope and Area)*

*Describing and Applying Free-Fall Motion and Galileo's Law of Falling Bodies*

*Uniform Acceleration - Applying Kinematic Equations of Motion*

*Interpreting/Drawing  $x$ ,  $v$ , and  $a$  Graphs*

*Interpreting/Drawing Motion Diagrams*

*Kinematic Graph Matching*

##### Chapter 3: 2D Kinematics – Vectors and Projectiles

*Distinguishing Vectors from Scalars*

*Describe Vector Features*

*Applying Vector Properties*

- *Resultant Vectors*
  - The sum of two or more vectors*
    - Tip-to-Tail Method (Polygon) and Parallelogram Method*
    - Can replace a system of vectors producing the same effect*
- *Commutative Property of Vector Addition*
- *Finding Vector Difference from Vector Subtraction*
- *Multiplying and Dividing Vectors by Scalars*

### *Applying the Graphical Method of Vector Addition*

- *Drawing a vector scale diagram using ruler and protractor*
- *Determining the Resultant from Measuring Using the Scale*

### *Applying Vector Operations*

- *Resultant - Mathematical Method (Applying Pythagorean Theorem and Inverse Tangent Function)*
- *Resolving Vectors into Components using Trig Functions*
- *Finding the Resultant by Component Method*

### *Projectile Motion*

- *Describing Effects of Air Drag on Projectile Trajectory*
- *Describing Projectiles in terms of Two Independent x and y Linear Motions*  
*X Motion > Uniform Velocity*  
*Y Motion > Uniform Acceleration (Free-Fall)*
- *Use Vector Components to Resolve Velocity*
- *Describe the Effect of Gravity on a Projectile – Parabolic Trajectory*
- *Using Pythagorean Theorem and Trig Functions to Determine Total Velocity Vector at a Point*  
*Magnitude and Direction*
- *Distinguishing Horizontal Projectiles from those Launched at an Angle*
- *Apply Kinematic Equations of Motion to Solve Projectile Problems*

## **Problem Section:**

Covers the following topics:

Problem 1 – Significant Figures & Scientific Notation

Problem 2 – 1D Kinematics (General Motion)

Problem 3 – 1D Kinematics (General Motion)

Problem 4 – 1D Kinematics (Uniform Acceleration)

Problem 5 – 1D Kinematics (Free-Fall)

Problem 6 – Vectors (Calculating Resultant)

Problem 7 – Vectors (Calculating Components)

Problem 8 – Projectile Launched at an Angle