

# Physics Summative Exam

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## 1 Information

The exam will be worth 125 marks total.

**The marks will be distributed as follows:**

- Unit 1 - Dynamics and Motion (35)
- Unit 2 - Fields (20)
- Unit 3 - Momentum + Energy (35)
- Unit 4 - Light as a Wave (35)
- Unit 5 - Quantum (10 Bonus Marks)

**Mark Distribution Matrix:**

like the one mrs beamer shows in the examples

## **2 Unit 1 - Dynamics and Motion (35)**

### **2.1 Solve for each of the following (20)**

Your solutions must include a diagram and a written conclusion to be considered for full marks.

#### **2.1.1 Incline Plane (5)**

#### **2.1.2 90° Pulley System (5)**

#### **2.1.3 Solve using Newton's Laws (5)**

#### **2.1.4 Projectile Motion Type 1 (5)**

### **2.2 Theory (5)**

#### **2.2.1 What is Isaac Newton's Second Law of Motion?**

- a) For every action there is an equal and opposite reaction.
- b) For every action there is an unequal reaction in the opposite direction.
- c) Earth's gravity causes objects to fall to the ground.

#### **2.2.2 What is Isaac Newton's Third Law of Motion?**

- a)  $v = \frac{\Delta d}{\Delta t}$
- b)  $F_{net} = ma$
- c)  $E_k = \frac{1}{2}mv^2$

#### **2.2.3 How does uniform motion differ from non-uniform motion?**

Your answer should contain a minimum of 100 characters.

## **2.3 Labs (10)**

### **2.3.1 What is the procedure for the Projectile Motion Lab? (5)**

Your procedure must be a minimum of 5 steps.

### **2.3.2 What is the procedure for the Fletchers Trolley Lab? (5)**

Your procedure must be a minimum of 5 steps.

## **3 Unit 2 - Fields (20)**

### **3.1 Milikans Oil Drop Experiment (10)**

#### **3.1.1 Draw the diagram for this experiment (5)**

Your diagram must be labeled properly.

#### **3.1.2 What is the significance of this experiment? (5)**

Your answer should contain a minimum of 300 characters.

### **3.2 Solve for each of the following (10)**

Your solutions must include a diagram and a written conclusion to be considered for full marks.

#### **3.2.1 Electrostatic Forces and Electric Field Intensity (20)**

Three charged objects are located at the vertices of a right triangle. The first charge (Charge A) has a charge of  $+6.7\mu C$  and is located at the coordinate  $(0, 0)$ . The second charge (Charge B) has a charge of  $-3.5\mu C$  and is located at the coordinate  $(0, 3)$ . The third charge (Charge C) has a charge of  $-2.0\mu C$  and

is located at the coordinate  $(4, 0)$ . Point D is located at the coordinate  $(4, 3)$ .

The difference in coordinates is measured in centimeters.

- a) What is the magnitude of the force on Charge A? (5)
- b) What is the magnitude of the force on Charge B? (5)
- c) What is the magnitude of the force on Charge C? (5)
- d) What is the magnitude of intensity on point D? (5)

## **4 Unit 3 - Momentum + Energy (35)**

### **4.1 Theory (5)**

#### **4.1.1 Describe how Banked Curves work (3)**

Your answer should contain a minimum of 100 characters.

#### **4.1.2 What are two ways to reduce the force of a collision? (2)**

Your answer should contain a minimum of 200 characters.

### **4.2 Labs (10)**

#### **4.2.1 What is the procedure for the 2D Momentum Lab? (5)**

Your procedure must be a minimum of 5 steps.

#### **4.2.2 What is the procedure for the Pith Ball Lab? (5)**

Your procedure must be a minimum of 5 steps.

### **4.3 Solve for each of the following (20)**

Your solutions must include a diagram and a written conclusion to be considered for full marks.

#### **4.3.1 2D Momentum (5)**

#### **4.3.2 Inelastic Momentum (5)**

#### **4.3.3 Energy with a Spring (5)**

#### **4.3.4 Energy + Momentum (5)**

#### **4.3.5 Momentum + Energy + Kinematics + Forces (Bonus 5)**

## **5 Unit 4 - Light as a Wave (35)**

### **5.1 Theory (25)**

#### **5.1.1 Why does an interference pattern appear for single slits? (5)**

Your answer should contain a minimum of 200 characters.

#### **5.1.2 Why does an interference pattern appear for double slits? (5)**

Your answer should contain a minimum of 200 characters.

#### **5.1.3 Draw the intensity chart for both double and single slits (5)**

Your intensity charts must be labeled properly.

#### **5.1.4 Briefly summarize each of the following (10)**

Your summaries should contain a minimum of 120 characters.

a) Diffraction Gratings

b) Polarization

c) Red light vs Green light

## **5.2 Solve for each of the following (10)**

Your solutions must include a diagram and a written conclusion to be considered for full marks.

### **5.2.1 Double Slit (5)**

Monochromatic light is shone through two slits  $4 \times 10^5$  nm apart. The fringes on the screen are  $d \times 5 \times 10^3$  away from the slits and have a central maxima width of  $2 \times 10^{-4}$  km. What is the wavelength of the light? What color would the light be?

### **5.2.2 Single Slit (5)**

How wide is a single slit if it diffracts a 470 nm beam of light such that it produces a central maxima width of double 3.0 cm on a screen 1.2 m away?

## **6 Unit 5 - Quantum (10 Bonus Marks)**

### **6.1 Describe Wave-Particle Duality (5)**

Your description should contain a minimum of 300 characters.

### **6.2 Elaborate on one of the following (5)**

Your description should contain a minimum of 300 characters.

a) Schrödinger's Cat

b) Superposition

c) Heisenberg Uncertainty Principle