Physics Video Analysis Assignment

Analysis of Forces and Newton's Laws in Real-World Applications

Purpose

To analyze a real-world video using physics concepts from Chapter 4, demonstrating understanding through precise application of formulas and principles with explicit textbook references.

1 Group Structure and Roles

This is a group project requiring 4-6 team members. Each member must contribute to all aspects, but will have primary responsibility for their assigned role:

1.1 Project Leader (1 person)

- Coordinates team meetings and timeline
- Ensures all references are properly cited
- Reviews final submission for completeness
- Submits final work
- Maintains communication with instructor

1.2 Physics Analyst (1 person)

- Leads mathematical analysis
- Verifies all force calculations
- Ensures proper use of Newton's Laws
- Checks units and vector directions

1.3 Technical Illustrator (1 person)

- Creates all required free-body diagrams (Fig 4.2, 4.3)
- Ensures proper labeling of forces and vectors
- Maintains consistent vector notation
- Produces clear, professional diagrams

1.4 Documentation Specialist (1 person)

- Manages page and equation references
- Writes explanations and interpretations
- Ensures clear documentation of process
- Maintains organized project files

2 Required Materials

- Chapter 4 textbook (pages 116-142)
- Selected internet video
- Screenshot capability
- Drawing tools for force diagrams
- Shared workspace for collaboration

3 Core Formula Reference

All formulas must be cited with page and equation numbers from the textbook.

3.1 Newton's First Law

$$F_{net} = 0 \text{ or } \Sigma F = 0 \quad \text{(p.118, Eq. 4.1)} \tag{1}$$

3.2 Newton's Second Law

$$F_{net} = ma \text{ or } \Sigma F = ma \quad \text{(p.122, Eq. 4.2)} \tag{2}$$

3.3 Force of Friction

$$f = \mu N \quad \text{(p.119, Eq. 4.3)} \tag{3}$$

3.4 Normal Force

$$N = mg \quad \text{(p.129, Eq. 4.17)} \tag{4}$$

4 Assignment Requirements

4.1 Video Selection & Documentation

- Include video URL/source
- Screenshot of analyzed frame
- Timestamp of analyzed moment
- Brief description of forces involved

4.2 Required Analysis Components

Each section must include explicit textbook references:

4.2.1 Force Analysis

- Complete free-body diagram (p.116, Fig 4.2)
- Vector notation for all forces
- Net force calculations
- Classification of forces (contact vs field forces)

4.2.2 Newton's Laws Analysis

- Application of First Law (equilibrium conditions)
- Second Law calculations
- Third Law force pairs identification
- System definition and external forces

4.2.3 Calculations & Results

- Mass and weight determinations
- Acceleration calculations
- Force component analysis
- Complete step-by-step solutions

5 Documentation Requirements

Each analysis section must include:

1. Concept explanation (with page reference)
2. Relevant formula (with equation number)
3. Variable identification
4. Step-by-step calculations
5. Units analysis
6. Physical interpretation

6 Citation Format

Example: "Using the work-energy theorem (p.274, Eq. 7.10), we calculate..."

7 Group Presentation Requirements

Each group will prepare and deliver a 5-10 minute presentation analyzing their video. The presentation must include:

7.0.1 Required Slides (Minimum 5)

Slide 1. Introduction

- Title and group members
- Video source and timestamp
- Preview of key physics concepts to be analyzed
- Physical scenario overview and relevance

Slide 2. Physical Analysis

- Professional technical diagrams
- Clear labeling of all relevant quantities
- System/boundary definitions
- Key variable identification and relationships

Slide 3. Theory Application

- Application of relevant physical laws
- Key equation implementations

- Theoretical predictions
- Textbook references and citations

Slide 4. Calculations and Results

- Step-by-step mathematical analysis
- Quantitative determinations
- Units and significant figures
- Comparison of theory vs. observation

Slide 5. Conclusions

- Summary of key findings
- Real-world applications
- Sources of uncertainty
- Connection to textbook principles

7.0.2 Presentation Requirements

- Professional slide formatting
- Clear, readable diagrams and equations
- Equal participation from all members
- Proper citation of textbook concepts
- Prepared for peer questions

8 Grading Rubric

8.1 Score Interpretation

- 90-100: Excellent - Demonstrates complete mastery of concepts and applications
- 80-89: Good - Shows solid understanding with minor errors or omissions
- 70-79: Satisfactory - Basic understanding present but needs improvement
- 60-69: Needs Improvement - Significant gaps in understanding or application
- Below 60: Unsatisfactory - Major deficiencies in understanding and execution

Important Notes

- All equations must include textbook equation numbers
- All concepts must include page number references
- Direct quotes must include quotation marks and page numbers
- Calculations must show complete work
- Units must be carried through all calculations

Category	Criteria	Points	Score
Physics Analysis	• Correct application of Chapter 7 concepts • All calculations complete and accurate • Proper equation selection with references • Clear step-by-step problem solving	30	
Documentation	• All textbook page numbers cited • Equation numbers referenced • Clear variable definitions • Professional presentation	20	
Diagrams	• Complete free body diagrams (p.271, Fig 7.2) • Force vs. displacement graphs (p.274, Fig 7.3) • System diagrams with all forces labeled • Vector notations properly shown	20	
Technical Execution	• Correct units throughout • Proper significant figures • Logical solution flow • Clear conclusions	15	
Group Participation	• Active contribution to team meetings • Completion of assigned role tasks • Support of other team members • Meeting of deadlines	15	
Total		100	

Table 1: Video Analysis Group Project Grading Rubric