

ALGEBRA-BASED PHYSICS-1: MECHANICS (PHYS135A-01): UNIT 0

Jordan Hanson

September 5, 2019

Whittier College Department of Physics and Astronomy

1. Professor Jordan Hanson
2. Contact: jhanson2@whittier.edu, SLC 212
3. Syllabus: Moodle
4. Office hours: Mondays, 16:30-17:30, and Tuesdays from 13:00-16:00 in SLC 212
5. Text: College Physics (openstax.org)
6. Homework: Assigned from the book Mondays, due the following Monday

OPENING REMARKS - EXPLORATION

*“We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time. .”*

T.S. Eliot, *Little Gidding*, from *Four Quartets*, 1936-42.

SUMMARY

1. Why explore?
 - *Little Gidding*, secs. IV and V
 - You can explore, but why?
 - The other part...
2. Course syllabus
3. The books and journal
4. Warm up exercises: mileage
5. Force, energy, work, and friction
6. Unit conversions
 - Currency
 - Energy
7. The extent of the Solar System, part I

WHY EXPLORE?

Why explore?

1. The world is a beautiful place
2. To learn things you do not know that you do not know
3. To learn about about yourself

That other part...

1. How to handle yourself in strange situations
2. How to use your brain to survive
3. *What really matters*

THE SYLLABUS

See moodle:

<https://cms.whittier.edu/course/view.php?id=23388>

WARM-UP EXERCISES

1. How many gallons of gasoline will your vehicle hold? (Or that of your family, friends).
2. What is the gas mileage on the highway?
3. How far can you go?

UNIT CONVERSIONS

We must learn how to deal with *units*.

1. In 1900-1915, 1.0 USD equals 3.8 krone.
2. One Calorie, which equals 1 kilocalorie, is 4184 *Joules*.

We must learn how to deal with *units*.

1. In 1900-1915, 1.0 USD equals 3.8 krone.
2. One Calorie, which equals 1 kilocalorie, is 4184 *Joules*.

Question - The *Primus stove* was invented in 1892 by Franz Wilhelm Lindqvist, from Sweden. Suppose it cost 12.00 krone. What did it cost in USD?

Question - A northern sled dog was required for sledging in the early 1900s. Suppose one could be purchased for 50.00 USD. What is that cost in krone?

We must learn how to deal with *units*.

1. In 1900-1915, 1.0 USD equals 3.8 krone.
2. **One Calorie, which equals 1 kilocalorie, is 4184 Joules.**

Question - An inactive person requires about 2000 Calories per day.
How many Joules does she require per day?

Question - A typical source of protein contains 4.0 Calories per gram.
How many Joules are in 200 grams of protein?

FORCE, WORK, AND ENERGY

Force:

$$F = ma \quad (1)$$

- F: Force, in Newtons (British unit: pounds or lbs.)
- m: mass, in kilograms (British unit: stone)
- a: acceleration, in meters per second squared (British unit: feet per second squared)

Professor: work several examples.

Work, or energy:

$$W = Fd \quad (2)$$

- F: Force, in Newtons (British unit: pounds or lbs.)
- d: Distance, in meters (British unit: feet)

Professor: work several examples.

Force of friction:

$$f = \mu mg \quad (3)$$

- f : Force of friction, in Newtons (British unit: pounds or lbs.)
- μ : Greek letter mu, unit-less constant ($\approx 0.01 - 0.1$)
- g : acceleration downward due to gravity, or 9.81 meters per second squared.

Professor: work several examples.

ASTRONOMY AND EARLY ANTARCTIC EX- PLORATION

James Cook and Charles Green, 1769

1. Kepler's Laws: $T^2 \propto r^3$
2. Kepler: Predicted when Venus would *transit* the Sun, from our perspective
3. What is an AU?
4. Sir Edmund Halley (1656 - 1742). Halley's comet passed by in 1758 (16 years after he died).
 - Devised a method for determining distance to the Sun.
 - Astronomers sent out all over the world (Baja California, Tahiti, etc.) to make the recordings.

CONCLUSION

SUMMARY

1. Why explore?
 - *Little Gidding*, secs. IV and V
 - You can explore, but why?
 - The other part...
2. Course syllabus
3. The books and journal
4. Warm up exercises: mileage
5. Force, energy, work, and friction
6. Unit conversions
 - Currency
 - Energy
7. The extent of the Solar System, part I.