BIOL/PHYS 438
Zoological Physics

- **Poster Session** recap.
- **Logistics**: papers; exam
- **Overview** of the course:
  - **Outline** of topics covered
  - **Concept Map**

Poster Sessions

Tuesday: "Best poster" prize to ???
for ???

Thursday: "Best poster" prize to ???
for ???

Can't be awarded until all Titles are entered!

Prize(s): **Mandriva One** Linux CD or **gift certificate** from UBC Bookstore (winners' choice)

Logistics

- Thursday (last day of classes): **Papers Due**!
- **Final Exam**: Friday 27 April, 08:30-11:00 in Angus 425
  (but don't take my word for it!)

Open Book + **Lists of Constants** etc.

No Collaboration; **no computers**.

All Topics are Fair Game

Concepts, **Calculations** & **Essays**

+ **Write Your Own Exam Questions**!

THE UNIVERSITY OF BRITISH COLUMBIA

Physics 438
Sessional Examination
08:30 PM — 27 April 2007 — ANGU 425

Unofficial time/date/venue

TIME: 2½ HOURS

FULL NAME: _____ STUDENT #: _____

SIGNATURE: _____

This Examination paper consists of pages (including this one). Make sure you have all

INSTRUCTIONS:

Write your name on every sheet.

Open Book

Try every question — easy ones first! A diagram is usually a good start.

Read carefully!

MARKING:

Q1	/50	Q4	/.0
Q2			/.0
Q3	/10	Q6	/.0
TOTAL			/100

SAMPLE

NAMES OF INSTRUCTORS: Jess H. Brewer and Jeremy Goldbogen

+ Zoological Data (send me your suggestions!)

Mathematical Formulae:

$$(1+\delta)^{-1} = 1 - \delta + \delta^2 - \delta^3 + \delta^4 - \cdots$$

Fundamental Physical Constants:

Universal Gravitational Constant	G	6.672×10^{-11} m^3 kg^{-1} s^{-2}
Planck's constant	h	6.6262×10^{-34} J-s $= 4.1357 \times 10^{-15}$ eV-s
Planck's constant / 2π	$\hbar \equiv \frac{h}{2\pi}$	1.0546×10^{-34} J-s $= 0.6582 \times 10^{-15}$ eV-s
Permittivity of free space	$\epsilon_0 = \frac{10^7}{4\pi c^2}$	8.8854×10^{-11} C^2/N-m^2 [F/m]
constant in Coulomb's Law	$k_E = \frac{1}{4\pi\epsilon_0}$	8.988×10^9 N-m^2/C^2
Permeability of free space	μ_o	$4\pi \times 10^{-7} = 1.2566 \times 10^{-6}$ N/A^2 [H/m]
constant in Biot-Savart Law	$k_M = \frac{\mu_0}{4\pi}$	10^{-7} T-m/A [H/m]
Electric charge of a proton	e	1.602×10^{-19} C
Speed of light in vacuum	c	2.99792458×10^8 m/s
Avogadro's number	N_a	6.022×10^{23} molecules per mole
Proton rest mass	M_p	1.673×10^{-27} kg
Neutron rest mass	M_n	1.675×10^{-27} kg
Electron rest mass	m_e	9.11×10^{-31} kg
Bohr magneton	μ_B	9.274×10^{-24} J/T [1 T $\equiv 10^4$ G]
Boltzmann constant	k_B	1.3807×10^{-23} J/K
Stefan-Boltzmann constant	$\sigma_B \equiv \left(\frac{\pi^2 k_B^4}{60\hbar^3 c^2}\right)$	$= 5.67 \times 10^{-8}$ W m^{-2} K^{-4}

Empirical Physical Constants & Conversion Factors:

Acceleration due to gravity	g	$= 9.81$ m-s^{-2} (at Earth's surface)
Mass of the Earth	$M_\oplus$	$= 5.974 \times 10^{24}$ kg
Mass of the Moon	$M_\mathbb{C}$	$= 7.348 \times 10^{22}$ kg
Mass of Mars	M_{σ^*}	$= 6.418 \times 10^{23}$ kg
Mass of the Sun	$M_\odot$	$= 1.989 \times 10^{30}$ kg
Mean radius of the Earth	$R_\oplus$	$= 6.367 \times 10^6$ m
Mean radius of the Moon	$R_\mathbb{C}$	$= 1.737 \times 10^6$ m
Mean radius of Mars	R_{σ^*}	$= 3.400 \times 10^6$ m
Mean radius of the Sun	$R_\odot$	$= 6.96 \times 10^8$ m
Mean Earth-Moon distance	$R_{\oplus\mathbb{C}}$	$= 3.844 \times 10^8$ m
Mean Sun-Earth distance	$R_{\odot\oplus}$	$= 1.496 \times 10^{11}$ m
Mean Sun-Mars distance	$R_{\odot\sigma^*}$	$= 2.28 \times 10^{11}$ m
Surface Temperature of the Sun	$T_\odot$	$= 5785$ K
Insolation at the Earth's orbit:	$P_{\odot\oplus}$	$= 1353$ W m^{-2}
Speed of sound in air (typical)	c_{sound}	≈ 340 m/s
Freezing point of water	0°C	$\equiv 273.15$ K at 1 atm
Triple point of water	0.01°C	$\equiv 273.16$ K at 0.0060373 atm
electron volt	1 eV	$= 1.602 \times 10^{-19}$ J $= t_B \times 11,600$ K
Atmospheric pressure:	1 atm	$= 760$ torr $= 1.013 \times 10^5$ pascal (N/m^2)

SAMPLE

How to write a good PAPER

- Have something to say!

Outline first, then fill in →

(These are just guidelines!)

- Spelling, Grammar & Style
- Submit as PDF or Tree Carcass

- Abstract
- Introduction
- Theory
- Experiment &/or Data
- Data Analysis & Results
- Conclusions
- Acknowledgements
- References

Journal Format

- Phys Rev & REVTEX

  See http://authors.aps.org/revtex4/

- *Nature* & Word

  See http://www.nature.com/nature/authors/

- **Other**: Specify which journal!

Outline of Course

- Heat & Energy
- Statics & Fluids
- Dynamics

- Waves
- Light
- Sound
- Electromagnetism

- Food & Metabolism
- Body & Organ Design
- Locomotion

- Data Transmission
- Vision & Display
- Hearing & Speech
- 6th & 7th Senses

Concept Maps

Make your own (study aid!) &
Bring to the exam if you like.