University of Victoria
Sample Final Exam
Physics 125: Fundamentals of Physics

Duration: 3 Hours.

Name:_____

Student Number:_____

*** It should be noted that **this SAMPLE EXAM serves only as a general guide to prepare for the final exam**. Only numerical answers are provided for your reference. ***

Students are permitted to bring with them into the examination a single 8 ½ x 11 sheet of paper with hand or computer writing on both sides.

Students are permitted to use a non-programmable, non-graphing calculator. **The only acceptable calculator is the Sharp EL-510R.**

This examination paper contains 20 questions (6 multiple choices, 10 short questions, and 4 long questions), and is marked out of 100 marks. *** This sample exam contains 5 questions. *** The marks for all questions are indicated in parentheses after the question. Please attempt all questions.

Answer the questions in the space provided. Make sure to include justification for your answers. Correct answers without appropriate justification may not be awarded full (or any) marks. If you need additional space, use the reverse of the previous page, clearly indicating where your work is.

Students who make use of unauthorized materials, communicate with each other during the exam, or appear to engage in similar dishonest practices may be dismissed from the exam and subject to further academic discipline.

You may find the following constants useful:

$c = 2.998 \times 10^{8}$ m/s
$h = 6.626 \times 10^{-34}$ Js
$e = 1.602 \times 10^{-19}$ C
$g = 9.80$ m/s^2
$G = 6.67 \times 10^{-11}$ Nm^2/kg^2
$\varepsilon_0 = 8.854 \times 10^{-12}$ C^2/Nm^2
1 eV $= 1.602 \times 10^{-19}$ J
$m_e = 9.11 \times 10^{-31}$ kg

1. [2] The amplitude of a system moving in simple harmonic motion is doubled. The total energy is then:

a. 4 times larger
b. 3 times larger
c. 2 times larger
d. reduced by half
e. unchanged → (Answer: a)

2. [2] You produce sound with frequency *f*. A friend is running towards you at velocity *v*. If you want your friend to hear the same frequency you hear, you should:

a. remain stationary.
b. remain stationary and play a note of higher frequency *f*'.
c. run towards your friend at *v*.
d. run towards your friend and play a note of higher frequency *f*'.
e. run away from your friend at *v*. → (Answer: e)

3. → 6. (Similar to problems 1 and 2.)

7. [5] A string with a mass of 8.00 g and a length of 5.00 m has one end attached to a wall (i.e., the distance between the wall and pulley is 5.00 m); the other end is draped over a small fixed pulley and attached to a hanging object with a mass of 4.00 kg. If the string is plucked, what is the fundamental frequency of its vibration ?

→ (Answer: 15.7 Hz)

8. [5] A muon formed high in the Earth's atmosphere travels at speed $v = 0.990c$ for a distance of 4.60 km before it decays. For what time interval does the muon live as measured in its reference frame ? ($c = 3 \times 10^8$ m/s)

→ (Answer: 2.18 μs)

9. → 16. (Similar to problems 7 and 8.)

17. [10] Molybdenum has a work function of 4.2 eV.
(a) Find the cutoff wavelength and cutoff frequency for the photoelectric effect.
(b) What is the stopping potential if the incident light has a wavelength of 180 nm?
(c) When molybdenum is illuminated with light of a certain wavelength, the electrons ejected from the surface have kinetic energies ranging from 0 to 2.2 eV. What is the minimum wavelength of the light?

→ (Answer: 296 nm, 1.01×10^{15} Hz; 2.71 V; 190 nm)

18. → 20. (Similar to problem 17.)