University Physics Summer Assignment for GSIP Seniors 2023/2024

The summer assignment has two parts, including the conceptual questions and the response paper. Please submit the assignment as a single pdf file through Canvas by Wednesday, August 23.

(1) Conceptual Questions

The conceptual questions are organized in seven different topics. Write a short paragraph to answer each individual question. Here are some URLs to instructional and necessary background materials:

http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/2262.html
http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/225113.html
https://apstudent.collegeboard.org/apcourse/ap-physics-1
https://apstudent.collegeboard.org/apcourse/ap-physics-2
http://www.howstuffworks.com
http://www.howeverythingworks.org
http://www.physicsclassroom.com
http://www.physicscentral.com

Topic 1: Objects and systems have properties such as mass and charge. Systems may have internal structure.

- Discuss how the internal structure of a system determines many properties of the system. (5 pts.)
- Explain the concept of mass and electric charge. (5 pts.)

Topic 2: Fields existing in space can be used to explain interactions.

- Describe the concept of a field in physics and give an example. (5 pts.)

Topic 3: The interactions of an object with other objects can be described by forces.

- Discuss the concept of force at the macroscopic level. (5 pts.)
- Explain the relationship between the force and acceleration. (5 pts.)
- What is a free-body diagram? Provide an example. (5 pts.)

Topic 4: Interactions between systems can result in changes in those systems.

- Discuss how interactions with other objects or systems can change the total linear momentum of a system. (5 pts.)
- Discuss how interactions with other objects or systems can change the total energy of a system. (5 pts.)
- Discuss how a net torque exerted on a system by other objects or systems will change the angular momentum of the system. (5 pts.)
- Discuss how the electric and magnetic properties of a system can change in response to the presence of, or changes in, other objects or systems. (5 pts.)

Topic 5: Changes that occur as a result of interactions are constrained by conservation laws.

- What are some conserved quantities in physics? Provide an example. (5 pts.)

Topic 6: Waves can transfer energy and momentum from one location to another without permanent transfer of mass and serve as a mathematical model for description of other phenomena.

- Explain the concept of a periodic mechanical wave. (5 pts.)
- Discuss the interference and superposition that lead to standing waves and beats. (5 pts.)
- Discuss the wave diffraction. (5 pts.)
- Characterize the types of electromagnetic radiation by their wavelengths. (5 pts.)
- Discuss how matter can be modeled as waves or as particles. (5 pts.)

Topic 7: The mathematics of probability can be used to describe the behavior of complex systems and to interpret the behavior of quantum mechanical systems.

- Discuss how the properties of an ideal gas can be explained in terms of a small number of macroscopic variables including temperature and pressure. (5 pts.)
- What does the second law of thermodynamics describe? (5 pts.)
- Discuss the probabilistic description of the microscopic world. (5 pts.)

(2) Physics in the News Response Paper

Find a current (within the past year) physical science article and write a two-paragraph summary following the guidelines below.

Paragraph 1: Source Information (4-5 sentences) (10 pts.)
Please address the following:
• What is the title of the article?
• Who wrote it?
• Where did the article come from?
• When was it published?
• Why did the author(s) write it?
• Who is the intended audience?
• Explain the validity and reliability of the source.

Paragraph 2: Summary Information (9-10 sentences) (10 pts.)
Please address the following:
• Summarize each of the main ideas in your own words.
• Support your topic sentences with evidence from the article.
• Explain how this article connects to your junior physics class.
• What did you find interesting or why did you choose this article?
• Who would use this information?

Please make sure to include a citation of your source using your preferred format, but be sure to include the following information:

- Name of author
- Title of website, magazine, or newspaper
- Article title
- Date written
- URL

Here are some good internet sources, where you might find something interesting:

https://www.sciencedaily.com/
https://phys.org/
https://www.sciencenews.org/
https://www.scientificamerican.com/

Good luck!