

S.5 PHYSICS HOLIDAY WORK TERM 3 2025

INSTRUCTIONS TO THE STUDENTS:

Attempt **all** Items in Part I and Part II.

Part I has sections A and B. Answers to each section should be handed in separately.

Part II consists of an item for research and presentation. Answers to this section should be sent to the e-mail addresses provided before reporting for term 1-2026

PART I

SECTION A

Item 1

During a violent storm, the roof of a nearby shop was partially lifted off. Residents claim “the wind pulled it upward.”

Task

1. Research the statement of Bernoulli’s principle and explain how moving air can lift a roof.
2. Derive Bernoulli’s equation from work–energy ideas, explaining the meaning of each term.
3. Give at least three other everyday situations where Bernoulli’s principle is observed.
4. In each application, sketch and explain how pressure and speed changes occur.

Item 2

A community science exhibition invites schools to design low-cost devices that demonstrate Bernoulli’s principle in action. You must present a working model built from locally available materials.

Task:

Research and model *one* of the devices below:

- A simple spray pump
- A Venturi-based flow meter
- A perfume atomiser
- A model of an aeroplane wing (airfoil)
- A Bunsen burner/charcoal stove airflow model
- A carburettor model

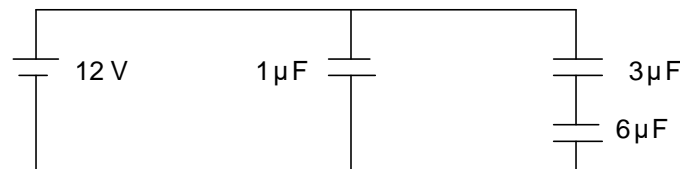
You should produce:

1. A working model (using bottles, straws, syringes, paper wings, pipes, etc.).
2. A labeled diagram of the model.
3. A one-page explanation showing:
 - how Bernoulli's principle applies
 - key design features
 - creativity and innovations
 - challenges faced and how they were solved

SECTION B

Item 3

During a school environmental club project, students are designing a solar-powered water filtration system to help a nearby community reduce water waste. The system uses a capacitor bank to store electrical energy from solar panels for use when sunlight is low. In their design of the project, the capacitor bank consists of three capacitors of $3\mu\text{F}$, $6\mu\text{F}$, and $1\mu\text{F}$ connected to a 12 V solar battery as shown below.



When charged fully the capacitor bank would deliver energy of at least $2.0 \times 10^{-4}\text{J}$ for six hours during the night. The students did not know how the capacitor gets charged fully when connected to a solar battery.

As part of their investigation, the students decided to explore how dielectrics work and how different materials affect their performance and were not sure how these materials affect the capacitance of the capacitor.

Task: Using your knowledge of Physics

- (i) Help the students to answer the issues raised.
- (ii) Ascertain if the circuit of the design for the capacitor bank will serve the purpose of water filtration project.

Item 4

A school with expanse land stretching to the wetland has set up a project of rearing fish in a fish pond. During break time at school, Dickson a S.5 student noticed that the fish in a clear water pond move and hide far before he even reaches the pond; which meant that they could see him from a far distance yet they were down in the pond. On reaching the pond, he lowered a long stick into the pond which appeared bent and he seemed confused at the two

events but the bell rung and he went for his lesson. One of the members in the discussion group told him that there are physics concepts and mathematical derivations that can help him answer his questions and remove his confusion.

During the lesson, the Physics teacher tasked students to work in groups and determine the refractive index of a glass prism. The group for Dickson, used an equilateral triangular prism to observe images of pins and made the following observations:

- Light enters and exists the prism at different angles.
- The lowest deviation of light out of the prism was 40° .

Task: As a physics learner help Dickson to:

- (a) Understand all the issues raised in the scenario above.
- (b) Write a scientific report on experiment carried out by his group.

PART II

(Research work)

Item 5

TOPIC: MAGNETIC EFFECT OF AN ELECTRIC CURRENT

Competency: The learner appreciates that a current carrying conductor in a magnetic field experiences a force and uses this concept to design models of different devices to solve societal needs.

Learning outcome;

- Investigate the existence of a force on a current-carrying conductor in a magnetic field.

Task: Make slide presentations on the following:

- i) Magnetic fields around current carrying conductors;
- ii) Direction of the force on current carrying conductor in a magnetic field
- iii) Factors affecting the magnitude of the force on current carrying conductor in a magnetic field.
- iv) Derive the expressions: $F = BIl\sin\theta$ for the force on a current carrying conductor in a magnetic field $F = Bqv\sin\theta$ for the force on a charge moving in a magnetic field.

NOTE: All presentations must be in font style Comic Sans MS and font size 36

References;

- i) Advanced Physics by Nelkon and Parker 3rd edition with SI units. (find it online by searching its title and author- free pdf download)
- ii) Mastering A Level physics by Ronald Walgada.
- iii) Advanced Physics by Akol Patrick.
- iv) Rowa E-learning platform (You tube)
- v) Digital teachers Web Site.

- All work should be saved as your name and sent to: [***bmatigo@greenhillacademy.ac.ug***](mailto:bmatigo@greenhillacademy.ac.ug) and [***jpkatesigwa@greenhillacademy.ac.ug***](mailto:jpkatesigwa@greenhillacademy.ac.ug) on or before the reporting day for term 1-2026.
- All learners should use one document for each topic.
- Incorporate your work with stimulus material such as photos and videos (not exceeding 2 minutes)
- Learners who submit their work after the due date will not be scored
- Scores for this research work shall contribute to your assessment in term 1-2026
- Be ready to defend your solutions when assigned to.

**THE PHYSICS DEPARTMENT WISHES YOU A NICE HOLIDAY
AND A HAPPY NEW YEAR 2026**