



WUNNA EDUCATIONAL SERVICES

LOWER SECONDARY S.3 LEARNER'S HOLIDAY PACKAGE MATHEMATICS AND PHYSICS

SCHOOL NAME:

STUDENT'S NAME:

CLASS AND STREAM:

INSTRUCTIONS:

- Complete all the exercises in this Package.
- Submit your work on the first day back after the holiday.
- Ensure all your work is neat and well-organized.
- Make Research but when answering the package ensure that you work independently to ensure that your understanding is reflected.

PHYSICS

1. Mike a S.4 student travelled along Masaka- Mbarara high way and kept seeing a pool of water ahead of him, which seemed to disappear as got closer to it. On reaching home, he decided to watch a colored television (TV), but realized he could only do so clearly when he was seated very near to the TV. The next day, he went to the physics laboratory and made a beam white light strike a glass block at an angle of incidence 55° making an angle of refraction 33° . He passed the same light through a glass prism with an adjacent white screen, on which he observed colours of a rainbow.

Task:

As a S.3 Physics student help Mike;

- Understand why he saw a pool of water on the highway.
- Use ray diagrams to explain why he can only see TV pictures at short distances and how this defect can be corrected.
- Briefly show how colour TV is able to display different colored images on the screen.
- Determine the refractive index of the material of glass
- Show with the aid of a diagram, why he sees rainbow colours on the screen.

[illegible]

2. One of the most important components of our solar system is the sun. Another important component of our solar systems are the big masses called planets.

(a) Name all the planets found in our solar system.

(b) (i). Identify the planet that sustains life in our solar system.

(ii). How are the times and seasons of the year explained on the planet mentioned in (b) (i) above?

(c) Explain the statement that “the sun has a life cycle”.

3. A newly recruited dentist was supposed to examine the tooth of the patient. The dentist wants to use a curved mirror of focal length 10cm but he is not so sure of the position of the patient's from the mirror. The possible positions of the tooth from the mirror are A, B, C, D and E.

Support material;

Position	A	B	C	D	E
Distance from the mirror.	10cm	5cm	15cm	20cm	25cm

Task:

(a) Which type of the curved mirror is the dentist supposed to use?

(b) As a physics learner, explain how you would help the dentist to select the best position of the patient's tooth and give a reason why you have not selected the other positions.

Draw a ray diagram to illustrate the image of the tooth in the mirror when the tooth is at a position you have selected in (b) above and give atleast two features of image formed.

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4. A certain old man found a glittering item in his garden and got excited that he had found gold and went back home excited about it. However his son advised him to first carry out an experiment to prove whether it's gold and the old man was confused on which experiment to carry out. In the following days, he realized that the material gets too hot during day and too cold in the morning. One day his son carried the item to play with his friends and during the tug of war game, his son teamed up a friend to play against a village giant man. The man pulled them at once and moved at a high speed that made him lose the item. He however saw it later but wondered what caused it to fall.

Support material

(The son and his friend weigh 35kg and 45kg respectively and the village giant man weighs 105kg and they all apply a force equivalent to their respective weights)

Task:

As a physics student taught by the best teachers,

- Carry out a scientific investigation to help the old man find out whether he found gold or not.
- Help the old man understand why his item is too cold in the morning and too hot during day.
- Why did the son and his friend move at a high speed that made him lose the material?

[illegible]

5.



Long ago in Uganda, people used hunting for survival and played football for fun. By providing specific examples and analyze how Newton's laws of motion, the concept of momentum, and collisions apply to the practical aspects of these activities, and what implications they have for the participants and their objectives?

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Task:

- Help the maid understand what happened when she put water in the fridge for a long time and clear all her curiosity.
- Help her understand the name of the instrument she saw at the clinic and how it works
- Why did the nurse say that the liquid was not water? What is the most suitable liquid to use?

[illegible]

7. Students in a certain school are going for a trip in a mountainous area where the maximum height is allowed to climb is 1 km per day. They were allowed to have stop overs at specific points for various reasons. They had also been warned of the possibility of nose bleeding while climbing the mountain. Another group of students who had visited the same place earlier told them their first stop over was at a place B where a barometer reads 68.2 cmHg, while it read 75.7 cmHg at a place A which was going to be their starting point. The students were told that the cooking would be done at place A but they couldn't understand why that was so.

Use your knowledge of physics to help the students:

- Determine if they will be allowed to climb beyond point B.
- Identify when they were more likely to nosebleed.
- To explain why the cooking had to be done at Point A.

[illegible]

8. (a) (i) Sound is quite a useful form of energy in daily life

Identify any three properties of sound

(ii) Why would a dog detect a tiptoeing thief at night which man cannot do?

(b) How can you use (an electric bell inside a jar having one outlet leading to a source of electricity connected to the bell and the other outlet leading to a vacuum pump) to demonstrate the effect of air on movement of sound

(c) A girl stands 640m from a wall and makes loud sound. After 4 seconds, she hears her sound repeated by the wall

(i) Account for the sound from the wall

(ii) Establish how fast the sound was moving based on the measurements

9. (a) Having attended a lesson on magnetism, you found students singing a song “your love is magnetic”. When you ask them how love can be magnetic, they get angry saying it’s just a song.

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10. Learners at a farm were tasked with loading a 250 kg cow onto a truck of height 1.5m. They however didn't know how to perform that task. On approaching their boss, he gave them a metallic ramp of length 6m and told them it could be operated at 80% efficiency but he did not know how much force they were to use while pulling up the cow. While trying to pull up the cow at on a hot day, it stepped on the ramp and then quickly stepped off. One of the workers noticed the ramp was very hot when he touched it. The workers however couldn't explain how the ramp got hot and needed to know how much force they would need to pull the cow up. (Temperature of the ramp = 45°C)

Use your knowledge of physics to;

Help the workers determine if a force of 1000 N will be enough to move the cow up at an efficiency of 80%.

Suggest ways on how the efficiency of the ramp can be improved.

Explain what made the ramp hot and what can be done to ensure the ramp maintains its temperature.

[illegible]

11. (a) During covid-19 lock down, temperature guns were introduced to tell people's temperature even when there were thermometers in medical facilities. Some politicians complained that it was a waste of tax payer's money

- (i) Assist such politicians to appreciate that such a government strategy was necessary in handling the pandemic
- (ii) What **two (2)** limitations can you point out in relation to using temperature guns to tell temperature of a person
- (b) Having taken your sister to a nearby clinic suspecting that she has Malaria, you see the nurse touching her cheek to tell her temperature. You realize the readings on their clinical thermometer are faded due to overuse
 - (i) What **two** common liquids are used in the thermometer they have?
 - (ii) Identify **any two** reasons for the choice of each liquid stated in b(i) above
 - (iii) What steps would you advise the makers of the thermometer to follow to put the readings back on the thermometer

12. A certain man built a three storied apartment. Because he wanted to cut costs, he constructed an underground water tank and installed pipes from the tank to all the apartments including those on upper floors. When he got tenants, those especially on the upper floors complained about the slow rate at which water flows out of the pipes.

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13. In a certain district struck by lightning, schools suffered significant loss of life and property damage. When government officials visited one of the affected schools, they engaged with the students. Among the conversation a student recounted an incident where he and his friend were caught in heavy rainfall as they moving in school. His friend who was holding a broken metal-handled umbrella was struck by lightning and perished while for him had an umbrella with a plastic handle and survived. Despite this, the school owner attributed the incident (lightning) to bad luck and dismissed the need for lightning conductors on the buildings as the government officials had advised him. Due to internet failure, the government team resorted to using a campus needle (magnetic campus) for navigation as they headed back to their destination despite it being their first encounter with the device.

Task:

As a physics student;

- a) Explain to the friend of the deceased why luck wasn't the determining factor in the lightning strike and why he wasn't struck by lightning.

- b) Help the school owner understand the science behind the incident that happened and as to why he should take the officials' advice (details of how the incident could have been prevented).
- c) Help the government team understand the functionality of the available instrument for determining direction.

14. In the space section of a certain newspaper, various articles were published, including statements about changes in the motion of the earth, moon and sun over time, the challenges facing the solar system and ongoing exploration for habitable places in the universe. However, the locals found it difficult to understand the significance of these news items.

Utilizing your knowledge of physics, clarify the following points for them:

- a) The motion of the earth, moon and the sun.
 - b) The components of the solar system.
 - c) Why earth remains the only known habitat for humans.
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15. A group of scouts on a camping trip noticed something unusual about their flag at the lake shore. During hot days, the flag flew towards land and at night, it flew toward the sea, even though there was no wind. They were puzzled by this observation. Later, they met a local farmer who had recently built a dam on his farm. He was unsure about whether it was safe to fill the dam to its full capacity and why

the walls of the dam were so thick at the bottom of the dam. Additionally, the farmer was concerned about the quality of milk produced on his farm and suspected that his employees might be diluting it.

Hint: the dam is 8m deep and can support a maximum pressure of $70000Pa$.

Task:

As a student of physics;

- Explain to the scouts why the flag behaved that way.
- Help the farmer understand the purpose of thick walls at the bottom of the dam and advise him on whether to fill the dam to capacity.
- Suggest a way for the farmer to determine if his milk was being diluted or if there were other factors affecting it.

Use: *density of water* = 1000kgm^{-3} , *acceleration due to gravity*, $g = 10\text{ms}^{-2}$

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16. During a boat cruise at Kazinga Channel in Queen Elizabeth National Park, tourists recorded the following data as they sailed along the Channel.

TIME	AVERAGE SPEED OF THE BOAT(KM/HR)
At 08:00 a.m.	0
08:00-08:30 a.m.	10
08:30-09:00 a.m.	20
09:00-09:30 a.m.	30
09:30-10:00 a.m.	40
10:00-10:30 a.m.	40
10:30-11:00 a.m.	25
11:00-11:30 a.m.	10
At 11:30 a.m.	0

Task:

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17. Some bottles of colorless liquids were being labelled by the lab technician and accidentally mixed them up and lost a track of the content. 15.0cm^3 of the sample of the liquid weighing 22.3g was withdrawn from one bottle which the technician suspect to be either acetone, benzene, chloroform or carbon tetrachloride. He however has a challenge of identifying the right chemical so that he can label all the bottles correctly.

Support material:

LIQUID	Acetone	Benzene	Chloroform	Water	Carbon-tetrachloride
DENSITY (gcm^3)	0.792	0.899	1.487	1.000	1.595

Task:

- (a) What was the identity of the liquid? Clearly show your working.
- (b) With a reason which of the liquids shown in the table above can float on water? And identify the liquids on which water floats
- Give any two practical applications of the knowledge of density.
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Use your knowledge of physics to help the viewer understand why;

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19. During a dry season, a school resorted to drawing water from an underground well 8m deep. Originally, they did it manually by lifting a metallic bucket of mass 4kg and volume 20 litres. The school workers however complained that the bucket was very cold in the morning, and very hot in the afternoon when the sun was up. It was very tiring to keep pulling the bucket manually. They suggested a pulley system of 4 wheels and an efficiency of 80% be used to help them work quicker. None of them could however tell how the pulley works and how much effort would be required to raise the bucket.

Use your knowledge of Physics to;

- Explain what makes the bucket very cold in the morning and hot when the sun is up?
- Show that the pulley system suggested above looks like and how it works.
- Determine if a force of 5N will be enough to give the pulley an efficiency of 80%.
- Suggest ways in which the efficiency of the pulley system above can be improved.

[illegible]

20. A man set off for a destination 250km away from his home at 4:00 a.m to be at his workplace at 8:00 a.m. The speed limit on that road is 80kmh^{-1} . He set off on the journey without fastening his seatbelt and drove at an average of 60kmh^{-1} for the first 2 hours. He saw a truck that had fallen covering the whole road and stepped on his brakes which brought the car on a sudden stop. This made him jerk forward almost crushing into his windscreen.

The man stopped for 45 minutes and resumed his journey, reaching his workplace on time. He got out of his car and discovered that it was very cold so decided to wear a black sweater which was against the choice of his workmates who said he looked smart in his white shirt.

Use the knowledge of Physics to;

- a) Determine if the driver exceeded the speed limit.
- b) Explain what made the man jerk forward
- c) Explain to the man's workmates why he chose a black sweater.

[illegible]

MATHEMATICS

1) Your mathematics teacher has promised to award his best three students Maria, Monica and Mariam with 126 counter books. Each counter book costs UGX12000 in the market. Maria will receive 42 counter books in base 6. Monica will receive 36 counter books in base 8. Mariam will receive the share of her counter books in base 10. To provide accountability to the school head teacher, the mathematics teacher intends to present the data on appropriate chart to the head teacher.

- Determine how much money was spent in buying Mariam's Counter books.
- Help the teacher to present the data to the school head teacher.

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2) Your school has received a new set of mathematics books for the lower secondary school curriculum from the ministry of education and sports. The school is arranging the books into boxes to hand them over to the school librarian. The school decides to arrange the books in rows on different number bases. The first box is arranged in base 2, the second box in base 3 and the third in base 5. Each box has equal number of books in each row. The first box contains 5 rows of books. The second box contains 9 rows of books and the third box contains 8 rows of books. The librarian is creating selves and each self will contain equal number of books. Each book costs UGX25000

- Determine the total number of books that the school received from the ministry of education and sports.
- How many books will the librarian arrange in each shelf?
- Determine the amount of money spent in buying each box of books.

[illegible]

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[illegible]

4. Your school is located at $(2, -1)$, which is 2 blocks east and 1 block south of the centre of town. To get from your house to the school, you walk 5 blocks west and 2 blocks north. The school is near the houses of four of your friends Alex, Bernard, Cathy and Dalton. Alex's house is 600 meters north of the school, Bernard's house is 300 metres on 60° east of north of the school. Cathy's house is half kilometer on south of east of the school while Dalton's house is south west of the school. Dalton's house is 400 metres from the school.

a) Is your school or your school closer to the centre of town? use a suitable graph

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5. A new football coach of an English premier club is designing a new style of play for his team on a coordinate plane that represents a football pitch. The goalposts are located at points $A(2, 4)$ and $B(2, -4)$. The football coach wants the team to practice running a play to facilitate counter attack against the opponent where the centre back starts the ball at point $Q(-3, 1)$ and throws the ball in a straight line to the wide midfielder at point $R(4, -2)$. The football club has a total of 40 players. 28 of the players can defend, 14 can attack while 2 of the players can neither attack nor defend. A player who can both defend and attack receives a weekly bonus

Task

- a) The football coach would like to present his new style to the board of directors of the club, help him to address this challenge.
- b) Write an equation that represents the path of the ball
- How many players receive the weekly bonus?

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When he reached Kayunga he bought **400** cows and each costs **UGX850**, per cow. The farmer and owner of the cow first gives a **5%** discount on each cow plus an additional **10%** discount for any number of cows bought in excess of **250**.

- Direct the honorable MP on the shortest route he should take and the shortest distance between Mbarara and Kayunga.
- Find the total cost he incurred in purchasing the cows.
- What is the maximum amount of Yoghurt be bought for his guests.

[illegible]

7. Holistic Prayers Ministries International for a long time has been soliciting money to construct a church which can congregate all the church members. The Senior Pastor has a vision of a Hexagonal church which can fit exactly in the plot of land available. He wants to know the actual cost of constructing the church. He also has to buy a Sino Truck to transport all building materials and requirements. The

contractor informs him that the area of each triangle that can be formed from the hexagonal church will cost him **UGX 128,000,000**.

He then proceeded to Nina Motors to buy the Sino truck. A brand new Sino Truck costs four hundred eighty millions on cash. It can also be bought by paying a deposit of a quarter of the

Cash price value and either pay **UGX7. 5 millions** weekly for **50 weeks** or pay **24. 5 millions** monthly for **15 months**. The pastor does not have the required money to obtain the Sino Truck on cash.

- (a) Help the pastor determine the cost of the church.
(b) How much extra will he pay for the Sino Truck and explain why. (25 scores)

[illegible]

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8. A certain tourist in USA is planning to visit the following places in Africa next month. The tourist has highlighted the following places on the map of Africa. These include; South Africa, Burundi, Kampala, Dodoma, Accra, Bujumbura, Nairobi , Ghana, Johannesburg, Tanzania, Uganda, Kenya, Cairo, Kigali, Egypt and Rwanda. Mr. Apeku Elias is an agent for three companies of soda: Coca cola. Pepsi and Riham beverages. He earns 10% commission on every carton of soda sold. He sells each carton of Coca cola at UGx.1 1,000, Pepsi at UGx.11,000 and Riham at UGx.10.000 On a good day, he sells 30 cartons of coca cola, 20 cartons of Pepsi and 10 cartons of Riham.

- a) Help the tourist to sort the places by use of an arrow diagram.
- b)
 - i. List the places in the Domain set.
 - ii. List the members of the range
 - iii. What is the relationship between the domain and the range?
 - iv. Describe the type of mapping in the arrow diagram in (a) above
- c) Help Apeku to know the commission earned on a good day from all the sales.

[illegible]

9. Mr. Lwanyaga the head of mathematics department organized a mathematics study trip to Namanve where assembling of Toyota vehicle and manufacturing of Coca-Cola products are done, and in his report to the members of mathematics department shows the cost of hiring a school bus is constant for any a bus and other varies as the distance covered by the bus. He later reviled that if a bus covers 100km then charged kshs.4500 and kshs.4000 for a distance of 60km. The distance between the school and Namanve is 480km and they expected to live the school at 8:00am at an average speed of 100km/hr according to the school's study trip rules and procedures and after the trip they students would rest for forty-five minutes and then proceed back to school.

Tasks:

- a) As the treasure of the mathematics department help Mr. Lwanyaga to know total expenses for the total journey.
 - b) By representing the journeys on a suitable graph explain the motion of the bus to the school administrators.
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[illegible]

- How old do you think is Kalumba and his father Katamba?
- Help Kalumba figure out all the possible values that his neighbor could have typed in the in the calculator to get the number on the screen.
- Help the two brothers explain to their father how much he would spend if he wanted to buy three vests and five shirts for their cousin brother Isaac.

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11. Customers of your family cake making company have always complained of too much sugar ingredient in the cakes bought. The company has 25 bakers together who can make 480 cakes in three days. However, your company has been hired to make 960 cakes in the five days remaining for a fourth coming cake festival in your town. The managing director has hired more 8 bakers and you have been selected to do a survey from the nearby related company to solve the problem of too much sugar in cakes. It has been realized that a delicious cake requires Sugar, coconut oil and flour that are mixed in the ratio of 2:3:5 respectively, each cake contains 0.75kg of flour.

Hint:

1 kilogram of sugar costs Shs 5,000.

500 Grams of coconut oil cost Shs 3,500

1kilogram of flour costs Shs 8,000

Task:

- (a) Help your family to find if the available number of bakers can produce the required number of cakes in the stipulated time and advise them accordingly
- (b) Establish the total cost of sugar, coconut oil and flour required to make 960 delicious cakes. (20 scores)

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12. A telecommunication company plans to introduce a new minutes bundle on the menu and employs callers to investigate people's opinion on the minutes of the package that will cost 1200Shs. The callers made a survey on random calls of the customers to gather their opinion and use the average minutes. They collected the data collected below.

Task:

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[illegible]

13. In the bid to determine the likelihood of a particular cell phone being successful on the market, your uncle who owns an electronics workshop tasked you to conduct a survey on 150 people on the streets of your town about the usage of any of these cell phones. Galaxy (G), Flip phone (F), and I-phone (I), then he will decide whether to purchase more of a given type if the likelihood of those who used only that one type exceeds 0.1. 45 owned a flip phone, 60 owned an I-phone, 63 owned a Galaxy, 15 owned a Flip phone and an I-phone, 25 have owned both a Galaxy and an I-phone, 15 have owned both a Galaxy and a Flip phone only and 5 have owned all the three.

Task:

- (a) Find out if there are people who have not owned any of the three.
- (b) Calculate the probability of people who owned only one type of cell phone.
- (c) Advise your uncle on whether to purchase more of these types (20 scores)

[illegible]

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