



SENIOR FOUR HeLP PHYSICS ONLINE SEMINAR TO BE HELD ON 27TH APRIL 2022
(2:00p.m – 4:00p.m)

INSTRUCTIONS TO STUDENTS AND TEACHERS:

Dear students and teachers we would like to welcome you to participate in the forthcoming Physics seminar for senior four students in preparation for their forthcoming final exams and mocks. The seminar is organized by teachers under the Holistic eLearning programme. **This is a free seminar and no one should charge you any fees.** The process to be followed by both the teachers and students is suggested below:

1. Teachers share the Seminar questions with their students and ask for volunteers to discuss any of the questions.
2. Teachers talk to the parents to allow the children participate as presenters in the seminar on Wednesday **27th April from 2 - 4pm**. Other students will just be participants.
3. The teacher or student will hand in the solutions to Kaziba Stephen (0787698238(W)) by mid day on Wednesday **27th April 2022**.
4. If your student is going to present then as the teacher(s) prepare her/him by looking through the calculations made by the student. Then encourage the student to write out the solution neatly in black pen including any graph. Then they scan or take a picture and send to the teacher. They can also type out the solution in a word or PowerPoint document and share with the teacher.
5. The teacher could now train the student on how to present in zoom as far as sharing a screen and using the whiteboard. Alternatively the students' presentation will be loaded on the computer screen and they explain to us their solution.

SEMINAR DETAILS

Holistic eLearning Platform is inviting you to a scheduled Zoom meeting.

Topic: National Physics Seminar

Time: April 27, 2022 2:00 PM

Join Zoom Meeting

<https://us02web.zoom.us/j/9133022418?pwd=cDlYOGNNV1hpdDU3SXZUzdWMXorQT09>

Meeting ID: 9133022418

Passcode: HeLP

Register yourself at <https://help.sc.ug> and enroll yourself in all your subject courses that are open.

Where necessary assume

Acceleration due to gravity, $g=10\text{ms}^{-2}$

Density of water $=1000\text{kgm}^{-3}$

Density of mercury $=13600\text{kgm}^{-3}$

Speed of sound in air $=340\text{ms}^{-1}$

MECHANICS

1. (a) State Newton's laws of motion
- (b) Explain what happens to a person seated in a vehicle when it is suddenly brought to rest.
- (c) The table below shows the velocity of a particle during the course of its motion.

t(s)	0	2	4	7	9	11	12
v(ms^{-1})	0	5	10	10	10	2.5	0

Plot a graph of velocity against time and use it to find.

- i. The acceleration of the body
- ii. The retardation of the body
- iii. The total distance travelled by the body
- iv. Describe the condition of the particle during the period 4s to 9s.
- (d) A ball is projected vertically upwards with an initial velocity of 30 ms^{-1} . Find
 - (i) Its maximum height
 - (ii) The time taken to return to its starting point.
- (e) (i) Distinguish between elastic and inelastic collisions.State one example of each
- (ii) A body ,P,of mass 20kg moving with a velocity of 10ms^{-1} collides with a body ,Q ,of mass 5kg moving at 20ms^{-1} in the opposite direction to that of P.After collision ,both bodies stick together and move together .Determine
 - (a) The common final velocity of the bodies
 - (b) The loss in the kinetic energy
2. (a) (i) State Archimedes's Principle.
- (ii) Describe an experiment to verify Archimedes's Principle.
- (iii) A piece of iron weighs 355 N in air. When completely immersed in water, it weighs 305 N and weighs 315N when completely immersed in methylated spirit. Calculate the relative density of methylated spirit.

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- (iv) State the application of Archimedes's principle.
- (b) (i) State the law of flotation.
- (ii) Describe an experiment to verify the law of flotation.
- (iii) A piece of wood of volume 280 cm^3 floats with only three quarters of its volume submerged. If the density of water is 1000 kgm^{-3} , calculate the mass of wood.
3. (a) Define pressure and state its units.
- (b) Explain why one feels more pain when pricked with a needle than when pricked with a nail .State the assumption made
- (c) With the aid of a diagram, describe how you would show that the pressure of a liquid is independent of cross-sectional area and shape of a container.
- (d) State the principle of transmission of pressure in fluids.
- (e) In a hydraulic press the smaller piston has a diameter of 14 cm while the larger has a diameter of 280 cm. If a force of 77 N is exerted on the smaller piston, calculate the force exerted the larger piston.
4. (a) Define the followings
- joule as a unit of work
 - newton
 - watt
- (b) A boy of mass 50kg runs up a flight of stairs of 20 steps in 10s.If each step is 25cm high,determine the power developed by the boy
- (c) i. Define efficiency as applied to simple machines.
- ii. Describe an experiment to investigate the relation between efficiency and load using a block and tackle pulley system
- (d) Why is the efficiency of machine always less than 100%

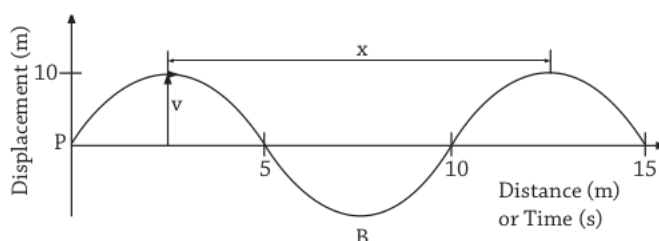
LIGHT

5. (a) i. What is light?
- ii. State the laws of reflection of light.
- (b) By use of a ray diagram, show how a concave mirror may be used as a magnifying mirror.
- (c) (i) Distinguish between real and virtual images.
- (ii) Under what condition is a virtual image formed by a concave mirror
- (d) An object of height 3 cm is placed at a distance of 30 cm in front of a converging mirror of focal length 20 cm perpendicular to the principal axis. By use of a scale ray diagram, determine:

- (i) the position of the image.
 - (ii) the nature of the image.
 - (iii) the size of the image.
- (e) (i) State one possible cause of short sightedness. Illustrate your answer with a diagram
- (ii) Explain how short sightedness can be corrected. reflectors.

WAVES

6. (a) (i) Define wavelength of a wave
- (ii) Differentiate between transverse and longitudinal wave and give one example of each.
- (b) The figure represents a wave motion of a vibrating particle.



- (i) Identify what the letters X and V represent
 - (ii) Determine the amplitude and velocity of the wave
- (c) (i) Describe an experiment to determine the speed of sound in air by echo method
- (ii) State two possible sources of errors for experiment c(i) above
- (d) A student stands between two cliffs and makes a loud sound. If he hears the first echo after 90 minutes and the second echo after 2s, find the distance between the cliffs.
- (e) Why are open pipes more preferred than closed pipes.

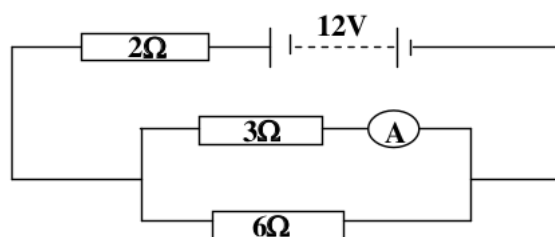
HEAT

7. (a) (i) Distinguish between heat and temperature.
- (ii) What is meant by a thermometric property?
- (iii) List the qualities that make mercury a better thermometric liquid than water.
- (b) (i) Define a Celsius scale.
- (ii) What is meant by absolute zero temperature?
- (c) (i) Define fundamental interval of a thermometer.

- (ii) When an uncalibrated thermometer is immersed in melting ice, the length of the mercury is 8.0 cm. When the thermometer is immersed in steam from boiling water, the length of the thread becomes 28.0 cm. What is the temperature when the length of the thread is 3.0 cm.
- (iii) Describe an experiment to determine the upper fixed point of a thermometer.
- (d) (i) Differentiate between conduction and convection.
- (ii) Explain how conduction takes place in metals.

ELECTRICITY

8. (a) (i) Define electrical resistance
- (ii) State three physical properties that affect resistance of a metal wire
- (b) Draw sketch graphs of current against p.d for the following
- (i) a metal wire
 - (ii) a semi conductor diode
- (c) A battery of e.m.f 12V and negligible internal resistance is connected to resistances of 2Ω , 3Ω and 6Ω as shown below. Find



- (i) The reading of the ammeter, A
 - (ii) Current passing through 6Ω resistor
- (d) Explain why a wire heats up when current is passed through it

MAGNETISM

9. (a) What is meant by
- (i) Magnetic field
 - (ii) magnetic saturation
- (b) (i) Write down the properties of the magnet
- (ii) Use the domain theory to describe demagnetisation
- (c) (i) Distinguish between ferromagnetic and non ferromagnetic materials. Give examples in each case

(ii) Describe the following methods of magnetizing a metal

- Stroking method
- Induction method
- Electrical method

MODERN PHYSICS

10. (a) (i) What is meant by Radioactivity.
- (ii) Describe a simple experiment to distinguish the three radiations that are emitted by radioactive materials.
- (b) (i) A radioactive gas sample has a half life of 14 hours. What is meant by this statement
- (ii) The time taken for the activity of a radioactive sample to reduce from 960 counts per second to 60 counts per second is 30 hours .Determine the half life of the radioactive material
- (c) What happens to the activity of a radioactive material when its
- (i) temperature is increased
- (ii) mass is increased
- (d) State
- (i) two industrial and two medical uses of radioactivity
- (ii) two health hazards of radioactivity
- (e) i. What are X-rays
- ii. With the aid of a labelled diagram ,describe how X-rays can be produced
- (f) (i) Distinguish between nuclear fusion and nuclear fission
- (ii) Give any one example where nuclear fission is applied

PRACTICAL

11. During an experiment a S.4 candidate obtained the following results .Copy and complete the table below

$x(cm)$	$t(s)$			
90.0	19.04			
80.0	21.49			
70.0	24.11			
60.0	27.96			
50.0	33.63			
40.0	42.24			

- (a) Include values of $x(m)$, T , T^2 for $n=20$ oscillations
 (b) Plot a graph of T^2 against x
 (c) Find the slope S of your graph
12. During an experiment a S.4 candidate obtained the following results .Copy and complete the table below

$x(cm)$	$\theta(^{\circ})$	$y(cm)$		
0.9	10	6.4		
1.6	20	6.6		
2.4	30	6.8		
3.0	40	7.0		
3.8	50	7.3		
4.5	60	7.6		

- (a) Include values of $\frac{x}{y}$, x^2 , $\sin \theta$.
 (b) Plot a graph of $\sin \theta$ against $\frac{x}{y}$
 (c) Find the slope n of your graph
13. The table below shows the results that were obtained by students during a practical

$l(m)$	$V (V)$	$I (A)$
0.200	1.05	0.82
0.300	1.15	0.50
0.400	1.25	0.40
0.500	1.30	0.38
0.600	1.35	0.30
0.700	1.45	0.20

- (a) Include values of $\frac{V}{I}$, IV , $\frac{1}{I}$
 (b) Plot a graph of $\frac{V}{I}$ against l
 (c) Find the slope S of the graph