A LEVEL HeLP PHYSICS SEMINAR TO BE HELD ON SATURDAY 13TH NOVEMBER 2021 AT 10:00AM

INSTRUCTIONS TO STUDENTS AND TEACHERS:

Dear students and teachers we would like to welcome you to participate in the forthcoming Physics seminar for senior five at 10:00a.m as they revise their physics concepts. 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 Saturday **13th November 2021 from 10:00am-1:00pm.** Other students will just be participants.
3. 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. .
4. 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.
5. The teacher or student will hand in the solutions to Ronald Ddungu (0701433878(W)) or Kaziba Stephen (0787698238(W)) by Thursday **11th November 2021**and attend the presenters practice session at 1:00p.m using the same seminar link below.The process here is very important

Holistic eLearning Platform is inviting you to a scheduled A level Physics seminar.

Topic: A LEVEL PHYSICS SEMINAR

Time: NOVEMBER 13TH, 2021 10:00 AM

Join Zoom Meeting: `https://bit.ly/3jHO8DO`

Meeting ID:840 200 3818
Passcode: HeLP

Acceleration due to gravity, g	=	9.81ms^{-2}
Electron Charge,e	=	$1.6 \times 10^{-19}\text{C}$
Electron mass	=	$9.11 \times 10^{-31}\text{kg}$
Mass of the earth	=	$5.97 \times 10^{24}\text{kg}$
Plank's constant,h	=	$6.6 \times 10^{-34}\text{Js}$
Stefan's Boltzmann's constant ,σ	=	$5.67 \times 10^{-8}\text{Wm}^{-2}\text{K}^{-4}$
Radius of the Earth	=	$6.4 \times 10^{6}\text{m}$
Radius of the sun	=	$7 \times 10^{8}\text{m}$
Radius of earth's orbit about the sun	=	$1.5 \times 10^{11}\text{m}$
Speed of light in a vacuum,c	=	$3.0 \times 10^{8}\text{ms}^{-1}$
Thermal conductivity of copper	=	$390\text{Wm}^{-1}\text{K}^{-1}$
Thermal conductivity of aluminium	=	$210\text{Wm}^{-1}\text{K}^{-1}$
Specific heat capacity of water	=	$4200\text{Jkg}^{-1}\text{K}^{-1}$
Universal gravitational constant ,G	=	$6.67 \times 10^{-11}\text{Nm}^{2}\text{kg}^{-2}$
Avogadro's number ,N_A	=	$6.02 \times 10^{23}\text{mol}^{-1}$
Surface tension of water	=	$7.0 \times 10^{-2}\text{Nm}^{-1}$
Density of water	=	1000kgm^{-3}
Gas constant ,R	=	$8.31\text{Jmol}^{-1}\text{K}^{-1}$
Charge to mass ratio,$\frac{e}{m}$	=	$1.8 \times 10^{11}\text{Ckg}^{-1}$
The constant $\frac{1}{4\pi\epsilon_0}$	=	$9.0 \times 10^{9}\text{F}^{-1}\text{m}$
Faraday constant ,F	=	$9.65 \times 10^{4}\text{Cmol}^{-1}$

Where necessary ,assume the constants above

PAPER ONE (Mechanics,Heat and Modern Physics)

1. (a) (i) State the principle of conservation of energy

   (ii) Use the equations of motion to show that when an object is projected vertically downwards from rest the mechanical energy is conserved

   (b) (i) State newton's laws of motion.

   (ii) A ball of mass 500g is allowed to drop from rest from a point a distance $5m$ a bove a horizontal concrete surface.When the ball first hits the floor,it rebounds to a height of $3.0m$ .What is the speed of the ball just after the first collision with the floor

   (iii) If the collision lasts for 0.6minutes,find the average force which the floor exerts on the ball

   (c) (i) Differentiate between impulse and impact

   (ii) Explain why when catching a fast moving ball the hands are drawn back while the ball is being brought to rest

2. (a) (i) Define the terms moment of force and a couple

   (ii) State the conditions for equilibrium of a rigid body under the action of coplanar forces

(b) (i) State the principle of moments.

(ii) A uniform rod AB of length 3m and mass 8kg is freely hinged to a vertical wall at A. A string BC of length 4m attached to B and to a point C on the wall ,keeps the rod in equilibrium .If C is 5m vertically above A ,find the :

(a) Tension in the string

(b) Magnitude of the normal reaction at A

(c) (i) Define centre of gravity

(ii) Explain briefly how to locate the Centre of gravity of an irregular laminar.

3. (a) Define the following

(i) absolute zero temperature

(ii) Tripple point of water

(b) (i) What is a thermometric property?

(ii) State three qualities of a good thermometric property.

(c) The resistance of a wire at a temperature θ^0C measured on a standard scale is given by $R_\theta = R_0(1 + A\theta + 10^{-3}A\theta^2)$ where A is a constant.When the thermometer is at a temperature of 50^0C on the standard scale,what will be the temperature indicated on the resistance scale?

(d) i. State why scales of temperature based on different thermometric property may not agree

ii. Describe how you would measure the temperature of a body on thermodynamic scale using a thermo couple.

4. (a) Define the following

(i) Convection

(ii) Thermal conductivity

(b) Explain clearly the mechanism of heat transfer in a solid

(c) With the aid of a labeled diagram ,describe the experiment to determine the thermal conductivity of copper

(d) (i) What is meant by a black body

(ii) State Stefan's law of black body radiation

(iii) Explain briefly how a black body can be realized in practice

(e) Assume that the sun is a sphere of radius 7.0×10^8m at a temperature of 6200K ,estimate the temperature of the surface of mars if its distance from the sun is $2.28 \times 10^1 1$m.

5. (a) Define the following

(i) Work function

(ii) Stopping potential

(b) State the laws of photoelectric emission

(c) (i) With the aid of a labeled diagram ,describe how X- rays are produced in an X-ray tube

(ii) State two biological and two industrial use of X-rays.

(d) An Alpha particle of mass 6.65×10^{-27}kg travelling at 2.0×10^{7}ms^{-1} head on towards a gold atom of atomic number 79 is repelled back.Calculate the distance of closest approach between the alpha particle and the nucleus

PAPER TWO (Optics,Waves ,Magnetism ,Electrostatics)

6. (a) For a converging mirror define the terms

(i) Principal focus

(ii) Radius of curvature

(b) Derive the equation $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ using a concave mirror where u,v and f have their usual meanings

(c) Explain how a sextant can be used to measure the angle of elevation of the sun

(d) (i) With the aid of a ray diagram ,describe the structure and action of a reflecting telescope in normal adjustment

(ii) State two advantages of a reflecting telescope over a refracting one

7. (a) (i) What is an electric field?

(ii) Sketch an electric field pattern due to two positive point charges Q_1 and Q_2 , placed a small distance apart and equidistant from a negatively charged metal plate, with Q_2 having a larger charge than Q_1 .

(b) Derive an expression for the electric potential at a point in an electric field.

(c) Sketch using the same axes, graphs of electric potential and electric field intensity against distance from the centre of a positively charged metal sphere.

(d) (i) Explain the term corona discharge.

(ii) Describe the structure and action of a Van-de-Graff generator

8. (a) What is a wave

(b) A mechanical wave in a certain medium is represented by the equation

$$y = 0.3 \sin 2\pi(35t - 0.4x) \qquad \text{Where all distances are in metres}$$

(i) State what each of the symbols x and y represents

(ii) Find the velocity of the wave

(c) (i) What is meant by resonance in waves

(ii) Describe an experiment to determine the velocity of sound in air using the resonance method

(d) (i) What is a harmonic in sound

(ii) A string of length 0.50m and mass 5.0g is stretched between two fixed points.If the tension in the string is $100N$.find the frequency of the second harmonic

9. (a) Define root mean square value of alternating voltage

(b) An alternating current $I = 2.0 \sin 120\pi t$ is passed through a pure inductor of inductance 0.4H

(i) What is the meaning of the term pure inductor

(ii) Find the reactance of the inductor

(iii) Determine the root mean square voltage of the inductor

(c) With the aid of a labelled diagram describe how an attraction type of moving iron ammeter can be used to measure current

(d) (i) A current $I = I_0 \sin 2\pi ft$ is passed through a resistor of resistance R ohms .Derive an expression for the average power expended in the device

(ii) The current in (i) is subjected to a series combination of a pure capacitor of capacitance C and a pure inductor of inductance L,and the circuit resonates at frequency f_0 .Derive the expression for f_0

PAPER THREE

10. Ben carried out an experiment and obtained the following values

h(m)	t(s)
0.200	85.0
0.240	70.5
0.280	59.5
0.320	52.0
0.360	47.0
0.400	42.0

(a) Copy and complete the table including values of T^2 and $\frac{1}{h^2}$ where n= 20 oscillations

(b) Plot a graph of T^2 against $\frac{1}{h^2}$

(c) Find the slope ,S of the graph

(d) Calculate the value of **g** from the expression:

$$g = \frac{1.6 \times 10^2 xK}{S\beta}$$

where K=$7.8 \times 10^{-3} kgm^2$

where $\beta = 0.0934kg$,$x = 0.500m$