INTERSECONDARY SCHOOLS EXAMINATION SERIES
ISESE
FORM SIX MONTHLY TEST AUGUST
PHYSICS 1

Time: 3 Hours **Year 2024**

INSTRUCTIONS

1. This paper consists of ten (10) questions

2. Answer all questions in section A and only two (2) questions from section B

3. Cheating is strictly prohibited in the examination room

SECTION A (70 MARKS)

Answer all questions in this section

1. a) A scientist studying the behaviour of water in a critical environment project come across the statement ''The density of water is (1000 ± 0.5) kgm^{-3}''. Understanding what this statement means is crucial for his research. Explain what the statement means and its potential impact on his measurements.

b) i) Compute the dimensional formula for electrical resistance R

ii) The kinetic energy K of a rotating body depends on its moments of inertia I and its angular speed ω. Considering the relation to be $K = KI^a\omega^b$ where K is dimensionless constant. Find ''a'' and ''b''. Moment of inertia of a sphere about its diameter is (2/5) Mr^2

2. a) A neutron with mass ''m'' collides elastically with a nucleus of mass ''M'' much larger than its own. The neutron initially has kinetic energy Eo. Show that this maximum energy loss is given by the formula $\frac{4mM}{(m+M)^2}$ Eo

b) i) Briefly explain the fundamental principles behind rocket's lift-off

ii) Sand is poured at a steady rate of 5.0g/s onto a pan of a direct reading balance calibrate in grams. If the sand falls from a height of 0.2m on to the pan and it doesn't bounce off the pan then, neglecting any motion of the pan. Calculate the reading on the balance 10s after the sand first hits the pan

3. a) i) With examples differentiate periodic motion from simple harmonic motion (3 differences)

ii) Two simple pendulums of length 0.4m and 0.6m are set off oscillating in step calculate after what further time the two pendulums will once again be in step then calculate the number of oscillations made by each pendulum at this time.

b) You are designing a new children's toy a plush dog bouncing on a vertical spring. To make the dog reach a specific height, during each bounce, what factors about the spring and dog mass do you need to consider?

4. a) i) A golfer swings his club and hits a golf ball; launching it at a high angle. The ball reaches its peak height and then begins to descend. How does air resistance affects the horizontal and vertical components of the balls motion differently?

ii) Define the terms trajectory and range of a projectile

b) A particle is projected from ground level with an initial speed at an angle θ to the horizontal .

i) Derive an expression for the time t elapsed when its velocity changes sign

ii) Derive an expression for the maximum height reached

5. a) i) Differentiate between heat and temperature

ii) Give a briefly account of the principle underlying the establishment of a temperature scale.

b) What type of thermometer would you choose for use in the experiment involving

i) The plotting of a cooling curve for naphthalene in the region of its melting point

ii) Finding the boiling point of oxygen

iii)The measurement of thermal conductivity of a small crystal. In each case give the reason for your choice

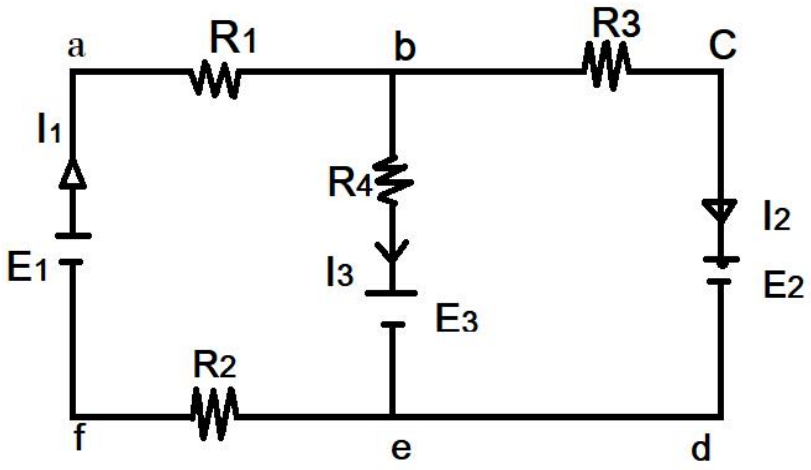
6. a) State the law of development of heat when an electric current flow through

i) A wire of uniform material

ii) A cross the junction between two metals

b) i) Prove the conservation of energy by Kirchhoff's laws

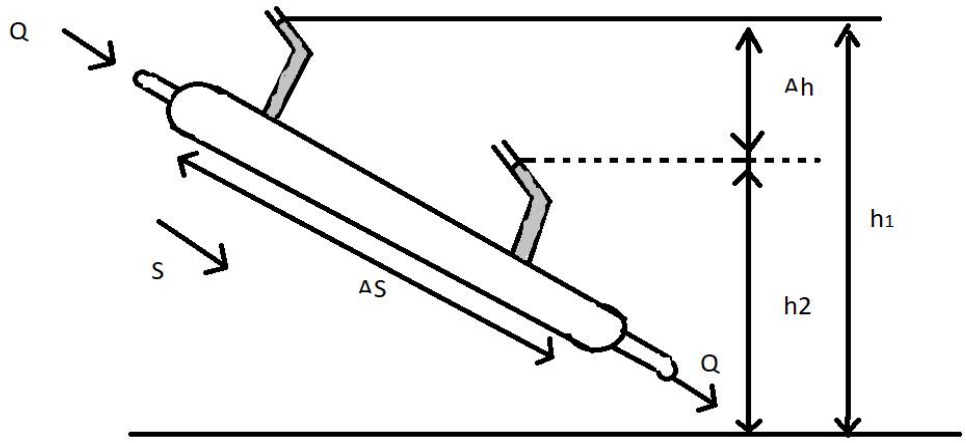
ii) Using figure below write the corresponding equations that can allow you to obtain the three currents I_1, I_2 and I_3



7. a) i) What is atmospheric radiation window?

ii) Define hydraulic conductivity and state two factors on which it depends

b) A sample of loam sound soil is tested in a laboratory to measure its hydraulic conductivity as shown in figure below, the column has an inside diameter of 18cm and the length between manometers is Δs =28cm with steady flow of 1.9 $\frac{cm^3}{min}$ in the head difference between the manometers Δh = 14cm.calculate the hydraulic conductivity



SECTION B (30 MARKS)

Answer two questions from this section

8. a) What is meant by the following terms

i) Peak voltage

ii) Root mean square voltage

b) i) State the relationship between the two terms in (a) above

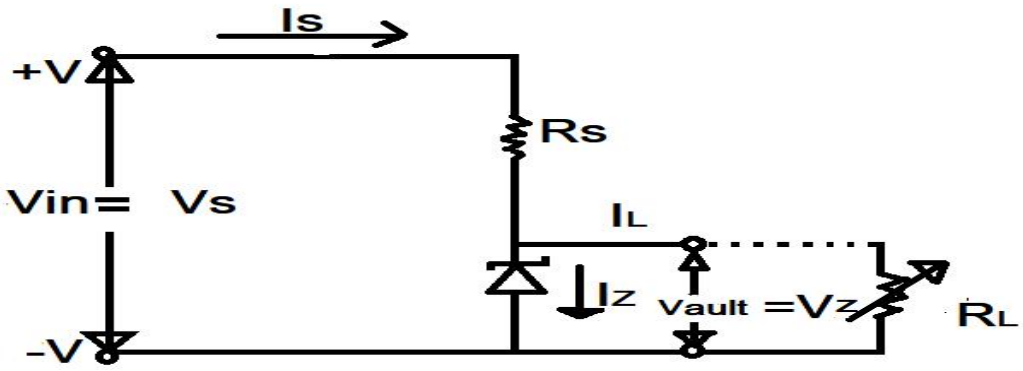
ii) A resistor, R = 10Ω is connected to 230V, 50HZ supply, determine the peak value of voltage, the connect flowing and the power dissipated in the resistor

9. a) i) What are the four ways by which electrons and holes are generated in semi conductor devices?

ii) What is recombination with regard to the valence band?

b) i) Why is silicon preferred over germanium in preparing semi conductor diodes. Give five reasons

ii) A stabilised power supply of 6.0V is required to be produced from 15V d.c power supply input sources. The maximum power rating Pz of the zener diode is 3W. Use the zener diode regulator circuit in fig below to calculate the maximum current flowing through the zener diodes and the minimum value of the series resistor Rs

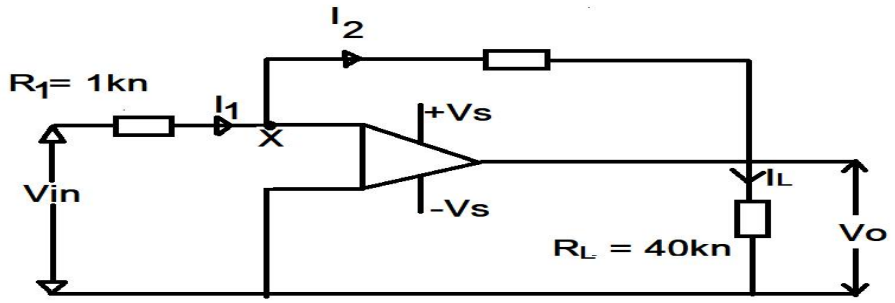


10. a) i) What are the disadvantages of analogue signals (four disadvantages)

ii) Give the basic description of all the parts of AM receiver

b) i) What is the meaning of OPAMP?

ii) In the circuit below, Vin = 10Mv



State why point X is said to be virtual earthy then determine Vo, I_1, I_2, I_L and Io, and the power gain of the circuit.

KWA MAHITAJI YA

1. MONTHLY TEST ZA ADVANCE KWA MASOMO YOTE
2. SERIES ZA ADVANCE ZA KILA SOMO
3. SERIES ZA O'LEVEL ZA KILA SOMO
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N.B
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KARIBUNI SANA