MINISTRY OF EDUCATION AND HIGHER EDUCATION

GRADE 12 EXAMS, 2024

PHYSICS

2024

P/LAND NATIONAL EXAMINATION BOARD

SomExams

MINISTRY OF EDUCATION AND HIGHER EDUCATION
PUNTLAND NATIONAL EXAMINATIONS BOARD

Name of Student			
Roll Number			
Name of School			
Region:		District:	

FORM FOUR EXAMINATION, 2024
TIME: 2 HOURS PLUS 10 MINUTES FOR READING

PHYSICS

Instructions to candidates

- Answer all the Questions
- This paper consists of 11 pages, count it and if any is missing inform your invigilator
- Write your **name and roll number** on the exam paper
- No extra paper is allowed.
- If you make a mistake, **cross out the incorrect** answer and **write your correct answer.**

This exam paper consists of following Parts

Parts	Marks
Part one: Multiple questions	10 marks
Part two: Structured questions	90 marks
Total:	100 Marks

For the markers only

PARTS	MARKS
Part one:	
Part two:	
Total:	

USE THIS PAGE FOR ROUGH WORK. IT WILL NOT BE MARKED.

PART ONE: MULTIPLE CHOICE QUESTIONS (10 MARKS)

Circle the correct answer in each of the following questions.

1. It uses small current between two terminals to control much larger current at another two terminals. This statement describes
   A. A diode
   B. A transistor
   C. A thermistor
   D. A capacitor
2. A transformer uses the principle of
   A. Mutual inDuction
   B. Electromagnetism
   C. Induction coil
   D. Voltage multiplication
3. Which electromagnetic radiation is used for communication?
   A. Ultra-violet
   B. Radio waves
   C. Gamma rays
   D. VisiBle light
4. In a vacuum, all electromagnetic waves have the same
   A. Wavelength
   B. Amplitude
   C. Frequency
   D. Speed
5. NAND gate is simply AND gate followed by
   A. OR gate
   B. NOR gate
   C. NOT gate
   D. AND gate
6. A radioactive source that emits three different radiations is directed towards an electric field between two charged plates. The beta particles
   A. Deflect towards the negative plate
   B. Deflect towards the positive plate
   C. Pass through the field without deflection
   D. Deflect away from both plates
7. Which of the following does NOT show an evidence of measuring radioactivity?
   A. Becquerels
   B. Curies
   C. Counts per second
   D. Calories

8. The following are secondary colours EXCEPT
   A. Yellow
   B. Cyan
   C. Blue
   D. Magenta
9. Fleming's left-hand rule is used to predict the direction of the
   A. Force
   B. Current
   C. Magnetic field
   D. Force and current
10. The relationship between centripetal force and the mass of an oBject is
   A. Direct proportion
   B. Inverse proportion
   C. Exponential proportion
   D. Inverse square proportion

PART TWO: STRUCTURED QUESTIONS (90 MARKS)

Answer all the questions in the space provided.

QUESTION ONE: MAINS ELECTRICITY (10 MARKS)

Diesel generators are used to proDuce steam to drive turbines which in turn rotate dynamo to generate electricity.

A. Mention two advantages and two disadvantages of using diesel generators.

Advantages

_____

_____ 2 marks

Disadvantages

_____

_____ 2 marks

B. A fuse is a short piece of thin wire used for safety. Briefly explain how the fuse works.

_____

_____ 2 marks

C. A 920 W electric heater is connected to 230 V mains supply.

i. Calculate the current flowing through the heater.

_____

_____

_____ 3 marks

ii. Which fuse is suitable to be used for this heater? (suppose that 3 A, 5 A, and 13 A fuses are availaBle) _____ 1 mark

QUESTION TWO: ELECTROMAGNETIC WAVES (11 MARKS)

A. Match the electromagnetic waves in column A to their uses in column B.

Electromagnetic wave	Answer	Uses
Gamma rays		Monitoring broken bones and other foreign objects in the body
X-rays		Making food for the plants
Ultra-violet		Sterilizing foods and medical equipment
Visible light		Cooking food quickly
Infrared		Making vitamin D for the body
Microwaves		Remove controls for TVs

5 marks

B. Give three properties that are common to all electromagnetic waves.

_____

_____

_____ 3 marks

C. Calculate the wavelength of raDio waves that have a frequency of 200 MHz (speed of radio waves is $3 \times 10^8\ m/s$).

_____

_____

_____ 3 marks

QUESTION THREE: ELECTROMAGNETIC INDUCTION (11 MARKS)

A transformer has 100 turns on the primary coil and 250 turns on the seconDary coil. The input voltage is 20 V.

A. Calculate the output voltage

3 marks

B. Calculate the output current if the input current is 2.5 A

3 marks

C. Is this a step-down or step-up transformer? Explain your answer.

2 marks

D. State three causes of power loss in a transformer.

3 marks

QUESTION FOUR: NUCLEAR PHYSICS (13 MARKS)

A. Complete the following table using the worDs **high, low,** and **medium.**

Radiation	Penetration power	Ionization power
Alpha		
Beta		
Gamma		

3 marks

B. Uranium-234($^{234}_{92}U$) decays to Lead-214($^{214}_{82}Pb$).

i. Write a nuclear equation for the reaction

_____

_____ 2 marks

ii. Find the numBer of alpha particles emitted in this decay process.

_____

_____

_____ 3 marks

C. Define nuclear fission

_____

_____ 2 marks

D. A sample of old wood from prehistoric site was found to have an activity of 6 counts per minute. A same sample cut recently from a tree has also an activity of 48 counts per minute. Estimate the age of the old prehistoric wood if the half-life of carbon-14 is 5730 years.

_____

_____

_____

_____ 3 marks

QUESTION FIVE: ELECTRONICS (9 MARKS)

A. Define **forbidden gap.**

_____

_____

_____ 2 marks

B. Distinguish between insulators and conductors in terms of the forBidden gap between the banDs.

Insulators

_____

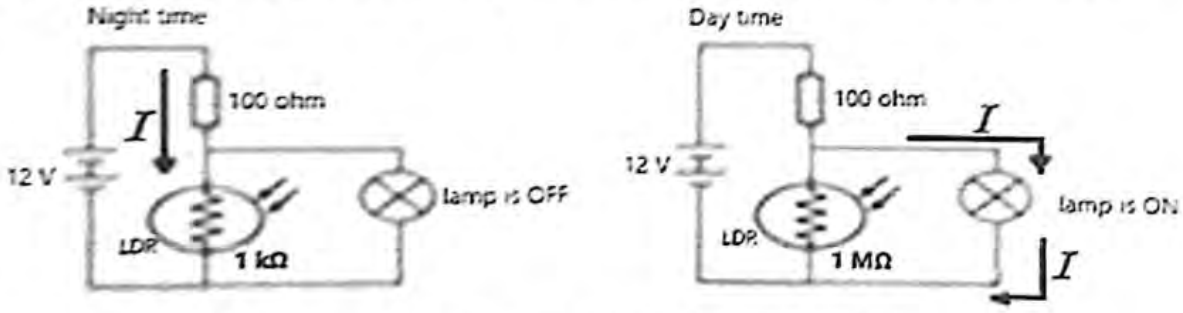
_____ 2 marks

Conductors

_____

_____ 2 marks

C. Street lamps are OFF during day time and ON during night time as shown below.



Explain how this happens with the help of the circuit diagrams above.

_____

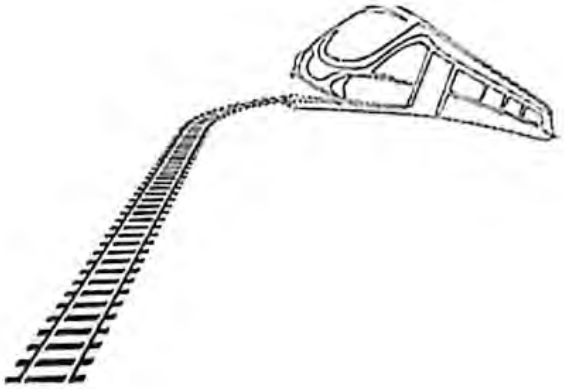
_____

_____

_____ 3 marks

QUESTION SIX: CIRCULAR MOTION (11 MARKS)

A train is travelling on a track which is part of a circle of raDius 600 m at a constant speed of 50 m/s.



A. Find:

i. The angular velocity of the train

_____

_____

_____ 3 marks

ii. The centripetal acceleration of the train

_____

_____

_____ 3 marks

iii. The centripetal force that acts on the train if its mass is 2000 kg.

_____

_____

_____ 3 marks

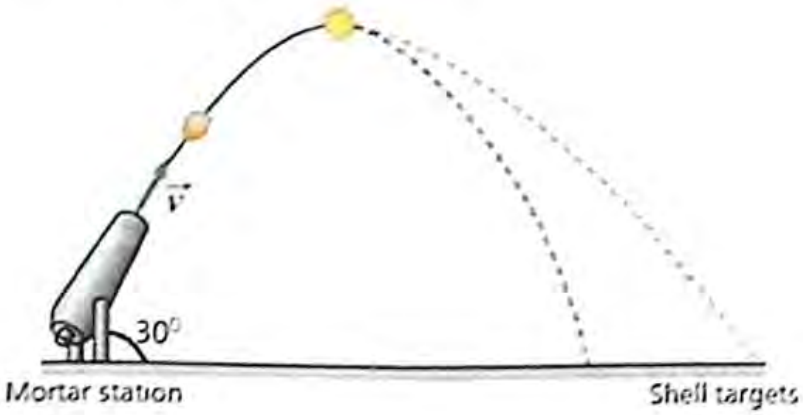
B. State any two uses (applications) of artificial satellites.

_____

_____ 2 marks

QUESTION SEVEN: LINEAR MOTION (9 MARKS)

A mortar shell is fired a 100 m/s at an angle of 30^0 aBove the ground. (assume g = 10 m/s^2 and sin 30° = 0.5).



A. Find

i. The initial vertical velocity.

_____

_____

_____ 2 marks

ii. The maximum height reacheD by the shell.

_____

_____

_____

_____ 3 marks

iii. The time to reach this maximum height.

_____

_____

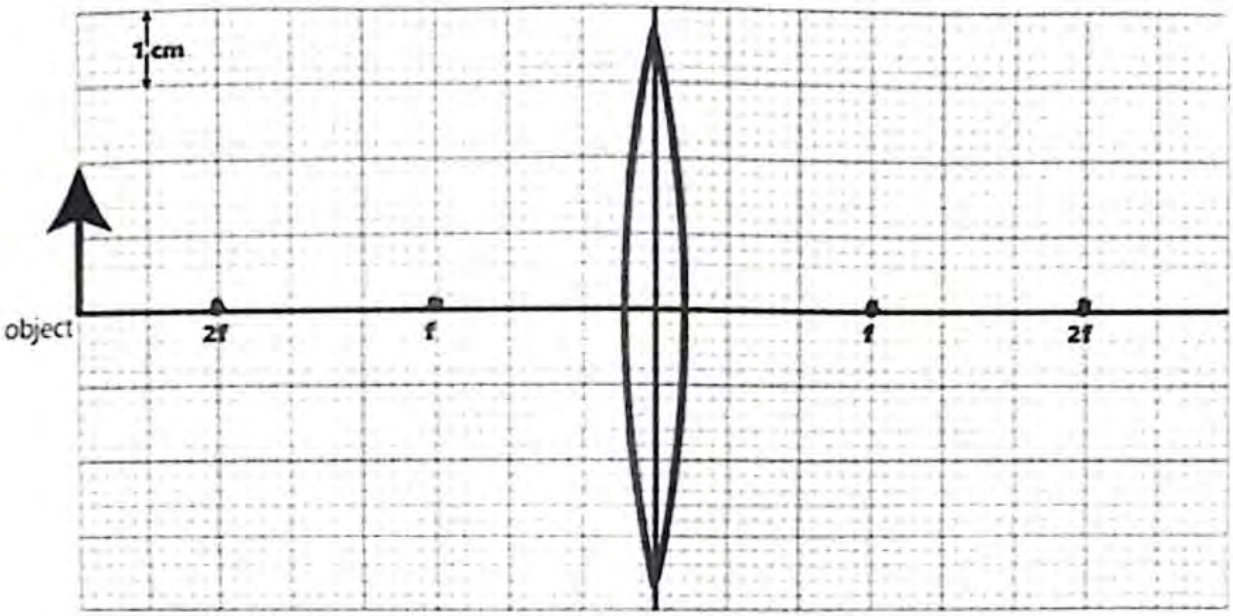
_____ 3 marks

B. For what angle of projection will the mortar shell travel the longest range(distance)?

_____ 1 mark

QUESTION EIGHT: LIGHT (9 MARKS)

A. An object is placed Infront of a convex lens as shown below.



i. Use two rays from the top of the object to locate the image. 3 marks

ii. Identify the focal length of the lens

_____ 1 mark

iii. How high is the oBject in cm?

_____ 1 mark

iv. Is the image formed real or virtual? Suggest a reason for your answer.

_____

_____ 2 marks

B. Total internal reflection is the bouncing back of the refracted rays as they pass through meDia with different optical densities. State two conditions for total internal reflection to occur.

_____

_____

_____

_____ 2 marks

QUESTION NNE: FLOATING AND SINKING (7 MARKS)

A. A concrete block weights 142 N. When it is fully suBmerged in water, its apparent weight becomes 94 N and the volume of the water it displaces is 0.0048 m^3.

i. Calculate the upthrust force on the block

_____

_____ 2 marks

ii. What weight of water is displaced by the block?

_____ 1 mark

iii. Calculate the density of the water (g = 10 N/kg).

_____

_____

_____

_____

_____ 2 marks

B. Ships are fitted with Plimsoll lines on their siDes. What is the purpose of using these lines?

_____

_____

_____ 2 marks

END