MINEDUC
RUTSIRO DISTRICT

PAPER/SUBJECT: PHYSICS THEORY

Date: 11/03/2024
Period: 9:00AM - 12:00AM

END OF TERM II EXAMINATIONS

GRADE / LEVEL: S4
OPTION /: PCM, PCB, MPG

DURATION: 3HOURS

MARKS: **…... /100**

INSTRUCTIONS

1.This paper consists of two sections: **A** and **B.**

Section A: Attempt **all** questions in this section **(70 marks)**

Section B: attempt only **three questions** **(30 marks)**

3. Use only **blue** or **black** pen and pencil for drawings

4. Non-programmable scientific calculators and mathematical set may be used.

SECTION A: ATTEMPT ALL QUESTIONS (70 MARKS)

1) Complete the following statements using appropriate terms.

a) A ray of light that passes through the optical centre of a lens emerges……. **(1mark)**

b) When white light passes through a prism, it undergoes ……..**(1mark)**

c) Image of pencil placed upright between F entre 2F in front of convex lens where F is focal point is……. **(1mark)**

2) Rainbow is formed due to the phenomenon of **(2marks)**

(a) refraction and absorption

(b) dispersion and focusing

(c) refraction and scattering

(d) dispersion and total internal reflection

3) Optical instrument used to view things that are far away is **(2 marks)**

a) compound microscope

b) simple microscope

c) telescope

d)camera

4) Short sightedness/myopia can be corrected using **(2 marks)**

a) Convex lens

b) convex mirror

c) concave mirror

d) concave lens

5) Use True or False from **A** to **E** **(1mark on each)**

a) Projectile is any object that is thrown or launched into space by a force.

b) The power of the concave lens is positive

c) Lami's theorem states that if three forces acting at a point are in equilibrium, then each of the force is directly proportional to the sine of the angle between the remaining two forces.

d) The energy that can be replaced fairly fast is called non-renewable sources of energy

e) In convex lens, object which is between F and 2F its image will be beyond 2F and it will be virtual.

6) For a particle performing a uniform circular motion, the acceleration is **(2 marks)**

a) constant in direction

b) constant in magnitude but not in direction

c) constant in magnitude and in direction

d) constant in neither magnitude nor in direction

7) a) Complete the following statement with appropriate term related to static equilibrium. Write only the answer in your answer booklet

(i) A filter funnel that is balanced upright on a table on its narrow tip is in ……..equilibrium **(1mark)**

(ii)A filter funnel lying horizontally on its side at rest on a table is in …….equilibrium **(1mark)**

(iii) Another type of equilibrium not mentioned above is … ……equilibrium **(1mark)**

b) If a walking stick with a mass of 300 g can be balanced by placing a mass M of 120 g at a distance L of 30 cm from the fulcrum.

Determine the position of the centre of gravity of the stick with respect to the fulcrum **2marks**

8) a) state the Defects of vision and their correction **/4marks**

b) a man cannot see objects closer than 1 meter from the eyes clearly what is the power of the corrective lens he should use. **/3marks**

9) A compound microscope has an eye piece of focal length 2.50cm and an objective of focal length 1.60cm. If the distance between the objective and eye piece is 22.1cm, calculate the magnifying power produced when the final image is at infinity. **(4marks)**

10) A toy train travels around a circular track of radius 2.5 m in a time of 40 seconds.

a) Calculate the train's angular velocity ω . **(2 marks)**

b) What is its linear speed? **(2 marks)**

11) a. define the term "energy degradation" **(1 mark)**

b. Describe energy degradation/ dilapidation which occurs when a 60 W electric light bulb is in use. **(2 marks)**

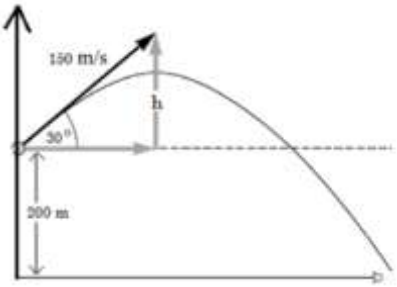
c). How does a hydroelectric power work? **(2 marks)**

12) a. What is meant by the following:

(i) total internal reflection **(1mark)**
(ii) critical angle **(1mark)**
b. A glass prism with refracting angle 60° has a refractive index of 1·64 for red light and 1·66 for violet light. Calculate the angular separation of the red and violet rays which emerge from the prism when a ray of white light is incident on the prism at an angle of 45° **(6marks)**

13) A bullet is fired from a gun placed at a height of 200 m with a velocity of 150 ms^{-1} at an angle of 30^0.Find the

(i) Maximum height attained. **(2 marks)**
(ii) Time taken for the bullet to hit ground. **(4 marks)**



14) a) Distinguish between elastic collision and inelastic collision. **(4marks)**

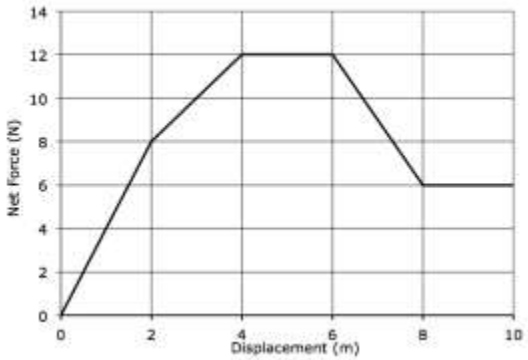
b) On a smooth surface, a soft 100 grams ball A at the velocity of 10 meters per second collides with another 700 grams ball B initially at rest. After collision, the two balls stick together and keep moving in the same direction as ball A. What is the velocity of the two balls after collision? **(4 marks)**

15) a) define work **(1mark)**

b) A 6.00 kg mass is acted on by a net force shown in the graph below.

i) if the object started from rest, what is its velocity after it has moved 10.0 m? **(4marks)**

ii) If the object in initially was moving at 5.00 m/s in the direction of the net force, what was its speed after it had moved a distance of 6.00 m? **(2marks)**

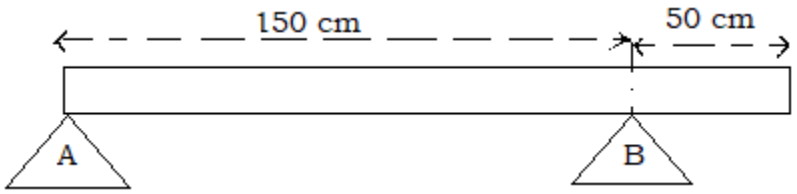


SECTION B: ATTEMPT ONLY THREE QUESTIONS (30 marks)

16) a) State the conditions of equilibrium of a rigid body. **(2 marks)**

b) A uniform board with a weight of 240 N and a length of 2 m rests horizontally on two supports as shown below.

The support A is under the left end of the board while support B is 50 cm from the right end.



(i)Name the point where the weight of the board is applied **(1mark)**

(ii)Determine the location of the point of application of the weight of the board with respect to the support A. **(1mark)**

(iii)Draw a free body diagram showing the direction of each of the forces exerted on the board. **(2 marks)**

(iv)Use the conditions of equilibrium of a rigid body to determine the support force F_A and F_B. Take the support point A as a reference point **(4 marks)**

17) (a) what is meant by a projectile? (1mark)

(b) A projectile is fired at an angle of 60° to the horizontal with an initial velocity of 800 m/s:

(i) Find the time of flight of the projectile before it hits the ground. **(1mark)**

(ii) Find the distance it travels before it hits the ground (range) **(2marks)**

(iii) Find the time for the projectile to reach its maximum height. **(1 marks)**

c) If α is the angle of projection, R the range, h the maximum height, T the time of flight. Show that:

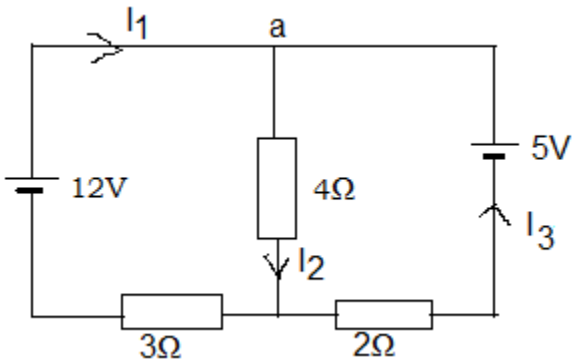
a) $\tan\alpha = \frac{4h}{R}$ **(3 marks)**

b) $h = \frac{gT^2}{8}$ **(2 marks)**

18) a) State Kirchhoff's laws **(2 marks)**

b) You are provided with two resistors of 3 Ω and 6 Ω, a dry cell of electromotive force 4 V and connecting wires.
The internal resistance of the dry cell is negligible.
Use these electrical components to draw a labelled electric circuit comprising the two resistors in parallel **(2 marks)**

c) Use Kirchhoff's laws to determine the electric currents I, I_1, I_2 through each resistor in the circuit below **(6 marks)**



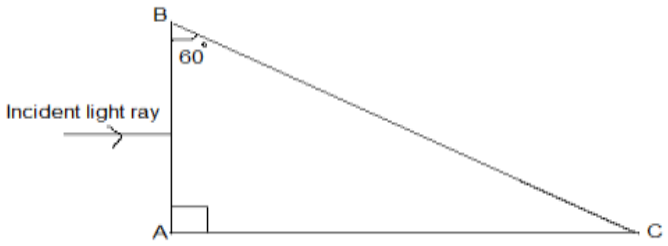
19) a) A 1cm object AB is placed perpendicular to the principal axis of a convex lens of focal length 2 cm.
Use ray diagram to find **graphically (**Don't use calculations)

(i)the image position when the object is at a distance 4 cm from The lens. **(4 marks)**

(ii) image size **(0.5 mark)**

(iii)properties of the image **(1 mark)**

b) A light ray fall perpendicular to one of the face of a glass prism of angle 60° and refractive index 1.5 as shown below



(i)Copy the diagram and show how the light ray passes through the face AB **(1mark)**

(ii)Determine the angle of incidence at the second face BC inside the prism **(1 mark)**

(iii) Determine the critical angle for this prism **(1 marks)**

(iv) What will happen to the incident ray at the face AB? Explain **(1.5 marks)**

20) Essay type question

One of the Causes of global warming is burning of fossil fuels which release greenhouse gases into the atmosphere. Discuss causes of global warming. **(10 marks)**

……..END……..