SOUTHERN PROVINCE

MUHANGA DISTRICT

ORDINARY LEVEL EXAMINATION

SCHOOL YEAR: 2023-2024

SUBJECT: PHYSICS II

DURATION: 3 HOURS

SECOND TERM PHYSICS EXAMINATION FOR S1ALL/100Marks

INSTRUCTIONS:

1. This paper consists of **three** sections **A**, **B** and **C**
   - Answer **ALL** questions in section A. **(55 marks)**
   - Answer **THREE** questions in section B. **(30 marks)**
   - Section C is **compulsory**. **(15 marks)**
2. You may use a calculator and mathematical instruments.

SECTION A: Attempt all questions from this section. (55 marks)

1) Define the following terms: (i) distance, (ii) displacement, (iii) speed, iv) velocity and (iv) acceleration. **(2.5marks)**

2) a) What is a science? **(1mark)**

b) Differentiate between natural and social sciences. **(2marks)**

3) a) Define force and state its SI unit. **(2marks)**

b) State two types of contact and non-contact forces. **(2marks)**

4) Name six different branches of physics. **(3marks)**

5) Match an instrument with what it measures. **(3marks)**

Instrument	quantity measurement
1. Metre rule	a) Time
2. Thermometer	b) Small volume
3. Vernier callipers	c) Length in mm, cm, m
4. Beam balance	d) Temperature
5. Stop watch	e) Mass
6. burette	f) Diameters of objects

6) Differentiate between a fundamental (base) quantity and derived quantity. Give three examples of each. **(4marks)**

7) Enumerate any four effects of force. **(4marks)**

8) Describe three contributions of physics to the development of Rwanda as a nation. **(3marks)**

9) Describe an experiment to find the center of mass of an irregular lamina like the diagram below (Figure 5). **(2.5 marks)**

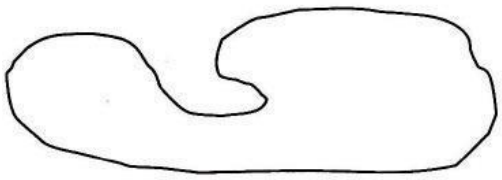
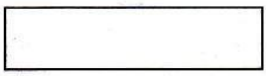
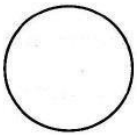


Figure 5

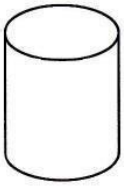
(b) Copy and label with a dot the centre of gravity of each of the following objects (figures 6, 7, 8, 9). Use the diagram to show how this centre of mass is obtained.

(i)  **(1mark)**

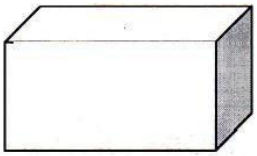
Rectangular lamina (figure 6)

(ii)  **(1mark)**

Circular object (figure 7)

(iii)  **(1mark)**

Cylindrical object (figure 8)

(iv)  **(1mark)**

Rectangular parallelepiped object (figure 9)

10) a) Why does a rotten egg float on water? **(1marks)**

b) What is the mass of air in room measuring$5m \times 10m \times 10m$? (Take the density of air to be$1.293kg/m^3$). **(2marks)**

11) A racing cyclist starts from rest and accelerates uniformly to a velocity of $20m/s$ in$4s$.

a) What is the acceleration of the cyclist? **(1marks)**

b) What is the distance covered in the$4s$? **(2marks)**

12) A bus changes its speed from $180m/s$ to rest in$10s$. Calculate the:

a) Deceleration of the bus. **(1marks)**

b) Displacement of the bus. **(2marks)**

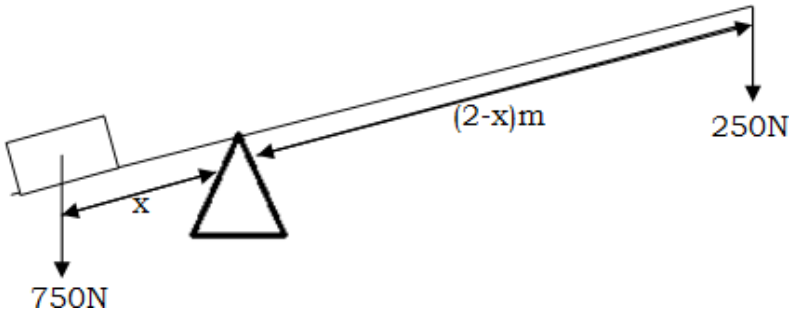
13) a) Distinguish between mass and weight. **(2marks)**

b) Calculate the weight of the following: (take$g$ = $10N/kg$)

(i) $300g$ Mass of water **(1mark)** (ii) $700kg$ Mass of sand **(1mark)**

(iii) $0.05mg$ Mass of wool **(1mark)**

14) A worker uses a crow bar 2m long to lift a rock weighing 750N. (a) Calculate the position of the pivot in order to apply an effort of 250N. (b)Find the (i) V.R (ii) M.A and (iii) efficiency. (c) What assumptions have you made?**(4 marks)**



15) For each of the pulley systems shown below calculate (a) V.R, (b) M.A and (c) efficiency. **(6 marks)**

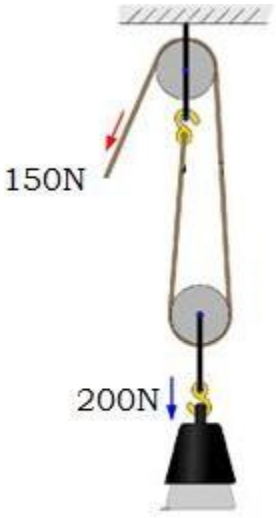


Fig.1

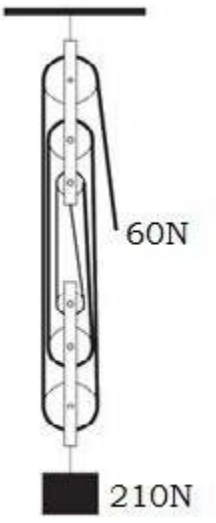


Fig.2

SECTION B: ATTEMPT ANY THREE QUESTIONS. (3O marks)

16) (a) State Newton's second law of motion. **(2 marks)**

(b) Use Newton's second law of motion to derive the equation $F = ma$**. (2Marks)**

(C) Define the unit of force, "Newton using $F = ma$" **(1 mark)**

(d) Give three real life situations where newton's third law of motion is experienced**. (3 marks)**

(e) When a soccer goal keeper is being trained on how to catch hard balls, he/she is taught how to pull back the hands while catching the ball. Explain how the technique works. **(2 marks)**

17) a) State the law of conservation of energy. **(2 marks)**

b) Differentiate between renewable and non-renewable sources of energy and give two examples of each. **(4 marks)**

c) Explain the energy transformation in a hydroelectric power station. **(4 marks)**

18) In addition to your knowledge and skills, use the concepts of state of equilibrium in relation to the position of center of gravity to answer the following sub questions.

a. Explain the following types of static equilibrium:

i. Neutral equilibrium. **(1 mark)**

ii. Stable equilibrium. **(1 mark)**

iii. Unstable equilibrium. **(1 mark)**

b. Observe the following diagrams (figure 3) and specify the type of equilibrium for each spherical object (ball) A, B and C**.(3marks)**

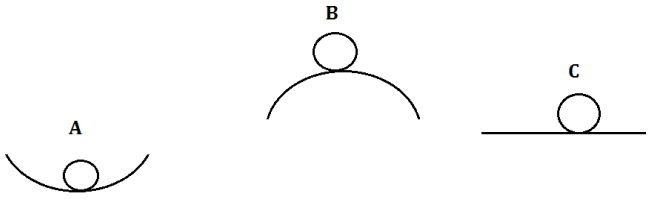


Figure 3

c. The diagram below (figure 2) shows three solid blocks (made of the same wood) A, B and C with their cross-sectional areas resting on a horizontal table. **(4 marks)**

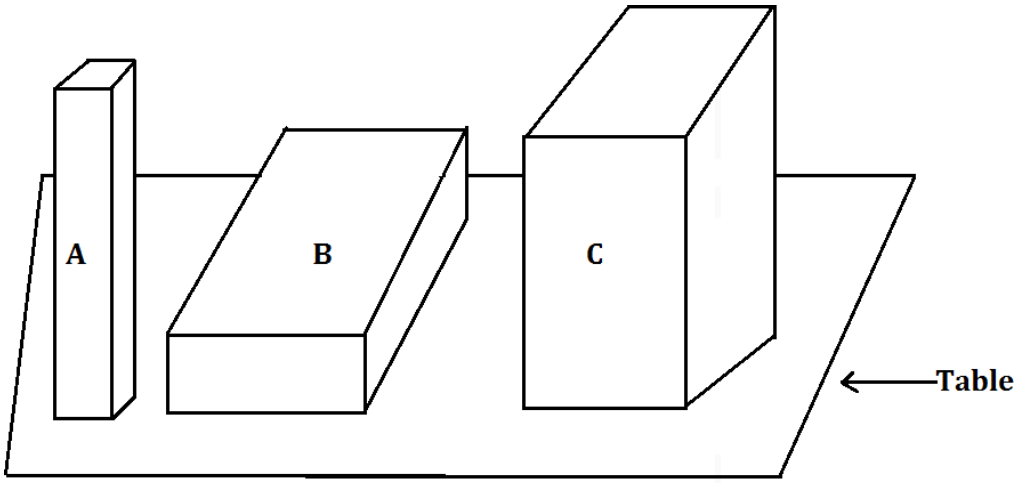


Figure 2

List the blocks in order from the least stable and justify your answer.

19) a) Differentiate between speed and velocity. **(4marks)**

b) A car travelled from town A to town B 200*km* east of A in 3*hours*. It then changed direction and travelled a distance of 150*km* due north from town B to town C in 2*hours*.Calculate the average:

a) Speed for whole journey in m/s. **(3marks)**
b) Velocity for the whole journey in m/s. **(3marks)**

20) A box is moving constantly across a rough horizontal floor, pulled by two horizontal ropes. One of the ropes has a tension of 150*N* and makes an angle 20° with the direction of motion of the box. The other rope with a tension force of 90*N* makes an angle 40° with the direction of motion of the box.

a. Sketch the arrangement. **(5marks)**

b. By scale drawing find the resultant forward force acting on the box**. (5Marks)**

21) Table below shows the data collected to study the motion of the cyclist.

Velocity(m/s)	0	3	6	6	6	6
Times)	0	2	4	6	8	10

a. Plot a graph of velocity (y-axis) against time (x-axis). **(8marks)**

b. Use your graph to determine the acceleration of the cyclist in the first four seconds**. (2marks)**

SECTION C: THIS SECTION IS COMPULSORY (15 Marks)

22)The table below shows the velocity of a moving body and the time taken by the body.

Time /s	**Velocity /ms^{-1}**
0	0
1	2
2	4
3	6
4	8
5	10

(a) Plot the graph of velocity along vertical axis and time along horizontal axis using the data given in the above table. **(10 marks)**

(b) Determine the slope of the graph. Show on the graph how you find the slope. **(3 marks)**

(c) What does the slope represent? **(1 mark)**

(d) From the graph determine the velocity of the body when time is 2.5 s. **(1mark)**

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