REPUBLIC OF RWANDA

EASTERN PROVINCE

ALTERNATIVE TO PHYSICS PRACTICAL

A/Y:2023-2024
DATE.../03/2024

PERIOD: 8:30AM-10:00 AM

RWAMAGANA DISTRICT

ADVANCED LEVEL DISTRICT COMPREHENSIVE ASSESSMENT FOR SECOND TERM,2023-2024.

SUBJECT: PHYSICS

LEVEL: SENIOR five (S5)

/20marks

DURATION: 1.5 HOURS

COMBINATIONS:

PHYSICS–CHEMISTRY- BIOLOGY	**(PCB)**
PHYSICS - CHEMISTRY- MATHEMATICS	**(PCM)**
MATHEMATICS-PHYSICS–GEOGRAPHY	**(MPG)**
MATHEMATICS-PHYSICS–COMPUTER	**(MPC)**

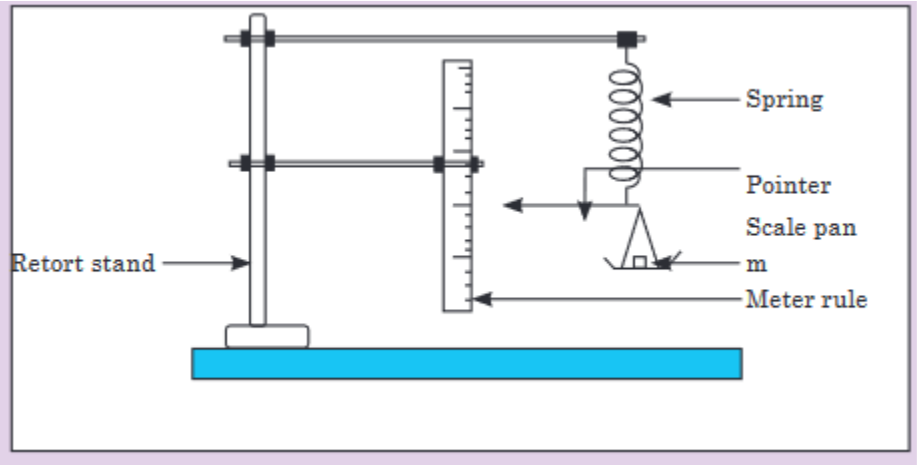
INSTRUCTIONS:

1) Do not open this question paper until you are told to do so.
2) This paper consists of **ONE** compulsory question.
3) Non-programmable calculator and set of mathematical instruments may be used
4) Use only a blue or black pen.
5) Use a pencil for drawing.

ATTEMPT ALL QUESTIONS (20 MARKS)

The S5 Learners carried out an experiment to determine the spring constant k and the mass m_o of a helicoidal spring by plotting T^2-m graph using the method of oscillation.

Procedures: They used the following experimental set up.



They suspended the load or slotted weight with mass 0.150kg on the spring gently. They waited till the system came to rest. This was the equilibrium position for the given load.

They pulled the load slightly downwards and then released it gently so that it was set into oscillations in a vertical plane. It is suggested that the period of oscillations $T = 2\pi\sqrt{\frac{m_0+m}{k}}$ where m_0 and m define the effective mass of the spring system (the spring and the hanger) and the suspended object (load) respectively.

They recorded the time for 10 complete oscillations using stop clock and then made average in order to obtain the period T. they repeated the procedure using different masses and they obtained the following results.

Table of results

Trial	Load m/kg	Time for 10 oscillations /s				Period T/s	T^2/s^2
		Trial 1	Trial 2	Trial 3	Average t		
1	0.150	7.16	7.12	7.20			
2	0.200	8.16	8.22	8.16			
3	0.250	9.10	9.16	9.03			
4	0.300	10.0	9.90	9.90			
5	0.350	10.56	10.75	10.44			
6	0.400	11.22	11.32	11.26			

Questions

a) Copy and complete the table of results to two decimal places including load **m/kg**, average **t/s**, period **T/s** and **T^2/s^2** as shown below.

Load m/kg	Average t/s	Period T/s	T^2/s^2
0.150			
0.200			
0.250			
0.300			
0.350			
0.400			

b) Plot a graph of T^2 (Y-axis) against the mass m (X-axis).
Draw a line of the best fit. Y-intercept and X-intercept will be useful.
Show on the graph the indication of the slope.

c) Find the slope S of the line of the best fit.

d) i. calculate the value of the spring constant of the spring used in this experiment using the expression $S = \frac{4\pi^2}{k}$ because $T^2 = \frac{4\pi^2}{k}m + \frac{4\pi^2}{k}m_0$
ii. Find the effective mass of the spring system m_0.
First of all determine Y-intercept or X-intercept because one of the two intercepts will help you find m_0.