23.5 PHYSICS (232)

23.5.1 Physics Paper 1 (232/1)

Name ..... **Index No** ...../.....

232/1
PHYSICS
Paper 1
Oct. /Nov. 2006
2 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education
PHYSICS
Paper 1
2 hours

Write your name and index number in the spaces provided above.
*This paper consists of **TWO** Sections: **A** and **B**.*
*Answer **ALL** the questions in sections **A** and **B** in the spaces provided.*
*ALL working **MUST** be clearly shown.*
Mathematical tables and electronic calculators may be used.

Take: Acceleration due to gravity g = 10 ms^{-2}

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Section	Question	Maximum Score	Candidate's Score
A	1-13	25	
B	14	11	
	15	10	
	16	12	
	17	11	
	18	11	
Total Score		80	

Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

SECTION A (25 marks)

Answer ALL questions in this section in the spaces provided.

1 Figure 1 shows the change in volume of water in a measuring cylinder when an irregular solid is immersed in it.

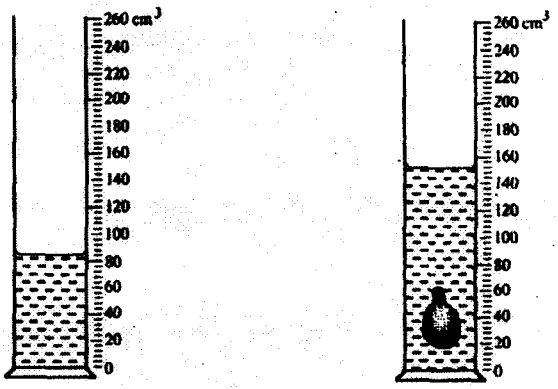


Figure 1

Given that the mass of the solid is 567 g, determine the density of the solid in gcm^{-3} (Give your answer correct to 2 decimal places).

(3 marks)

2 Figure 2 (a) shows a body being acted on by two forces F_1 and F_2.

(a)

On Figure 2 (b) draw the force F_3 that has same effect on the body as the two forces.

(1 mark)

(b)

Figure 2

3 State Pascal's principle of transmission of pressure in fluids. (1 mark)

4 Figure 3 shows a bimetallic strip with a wooden handle, suspended horizontally using a thin thread.

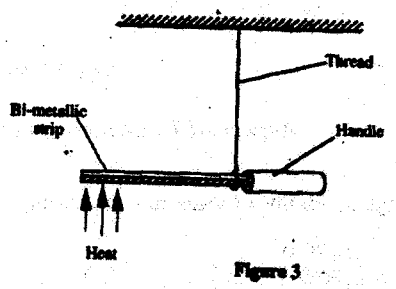


Figure 3

The strip is heated at the point shown. Explain why the system tips to the right.

(2 marks)

5 The spiral springs shown in figure 4 are identical. Each spring has a spring constant. k = 300 N/m.

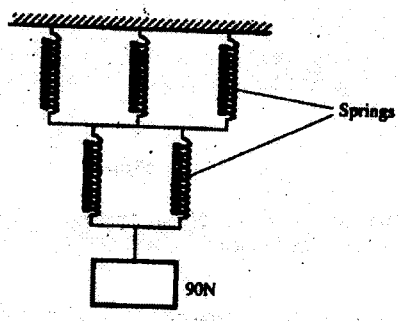


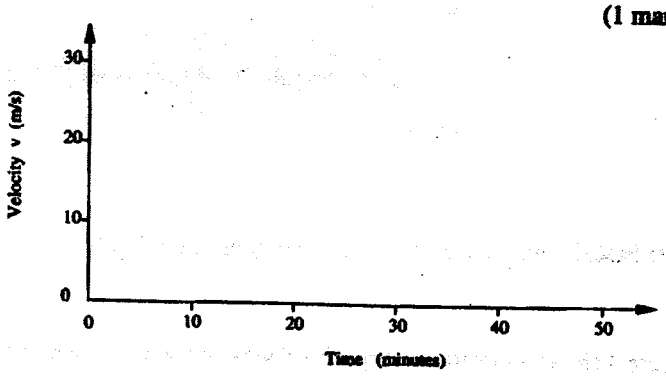
Figure 4

Determine the total extension caused by the 90N weight. (Ignore the weight of the springs and connecting rods).

(3 marks)

6 A car starting from rest accelerates uniformly for 5 minutes to reach 30 m/s. It continues at this speed for the next 20 minutes and then decelerates uniformly to come to stop in 10 minutes. On the axes provided, sketch the graph of velocity against time for the motion of the car.

(1 mark)



7 Figure 5 shows two pulley systems being used to raise different loads. The pulleys are identical.

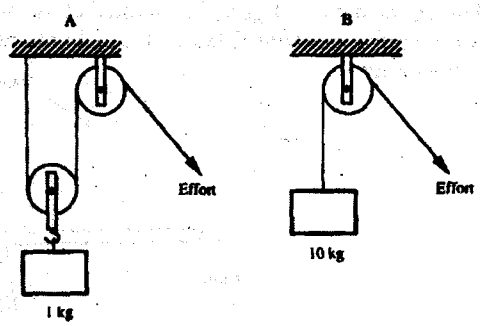
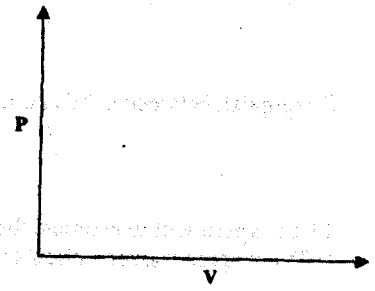


Figure 5

State **one** reason why system B may have a higher efficiency than system A. (1 mark)

8 Beaker A contains 200 g of water at 0°C while beaker B contains 200 g of a mixture of ice and water at 0°C. Two identical metal blocks are removed from a hot furnace. One block is dropped into beaker A while the other is dropped into beaker B at the same time. Explain why more water evaporates from beaker A than from beaker B. (2 marks)

9 On the axes provided sketch the graph of pressure P against volume V for a fixed mass of an ideal gas. (1 mark)



10 Figure 6 shows the path taken by a *matatu* travelling on a horizontal level ground (a winding road).

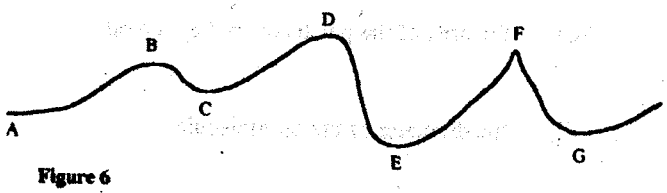


Figure 6

The speed of the *matatu* is constant. Identify with reason the point along the path at which a load placed loosely on the rack (carrier) of the *matatu* is most likely to roll off. (2 marks)

11 A pipe of radius 6 mm is connected to another pipe of radius 9 mm. If water flows in the wider pipe at the speed of 2 ms^{-1}, what is the speed in the narrower pipe? (3 marks)

12 The uniform bar in figure 7 is pivoted at its midpoint. It is in equilibrium under the action of two identical balloons filled with equal volumes of different light gases at the same temperature.

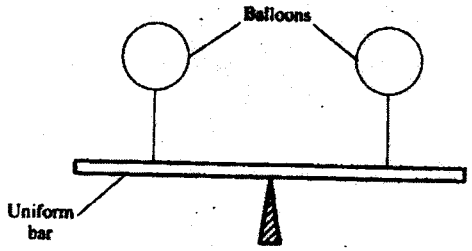


Figure 7

Explain why the bar may not remain in equilibrium if the temperature of the surrounding changes. (2 marks)

13 A footballer kicks a ball of mass 0.6 kg initially at rest using a force of 720N. If the foot was in contact with the ball for 0.1 seconds, what was the take off speed of the ball? (3 marks)

SECTION B (55 marks)

Answer ALL questions in this section in the spaces provided.

14 (a) Distinguish between solid and liquid states of matter in terms of intermolecular forces. (1 mark)

(b) In an experiment to estimate the diameter of an oil molecule, an oil drop of diameter 0.05 cm spreads over a circular patch whose diameter is 20 cm.

Determine

(i) the volume of the oil drop (2 marks)

(ii) the area of the patch covered by the oil (2 marks)

(iii) the diameter of the oil molecule. (3 marks)

(c) State

(i) any assumption made in (b) (iii) above (1 mark)

(ii) two possible sources of errors in this experiment. (2 marks)

15 (a) You are provided with two wires of same material and same thickness. Describe how you would make two spiral springs of different spring constants (assume that other apparatus to make springs are available). (2 marks)

(b) In an experiment, two identical springs are attached end to end. One end of the combined spring is fixed to a rigid support such that the spring hangs vertically. Masses are then hang from the lower end.
The graph in figure 8 shows the relation between the force (weight) and the extension for the combined springs.

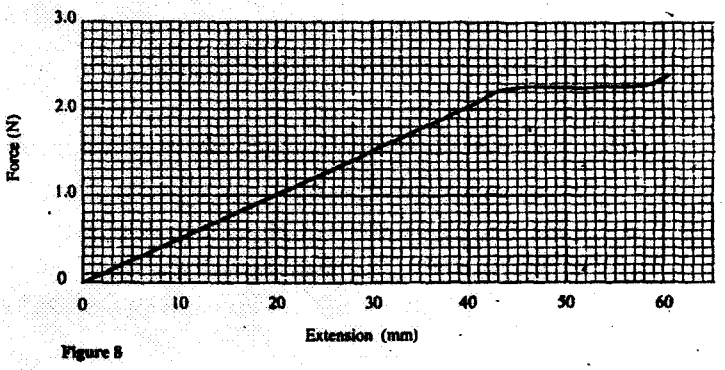


Figure 8

From the graph determine

(i) the elastic limit for the combined springs (1 mark)

(ii) the spring constant of the combined spring and hence for each spring. (4 marks)

(iii) the work done in stretching the combined spring from 15 mm to 32 mm. (3 marks)

16 (a) State what is meant by *an ideal gas*. (1 mark)

(b) The pressure acting on a gas in a container was changed steadily while the temperature of the gas was maintained constant. The value of volume V of the gas was measured for various values of pressure. The graph in Figure 9 shows the relation between the pressure, p, and the reciprocal of volume, $\frac{1}{V}$.

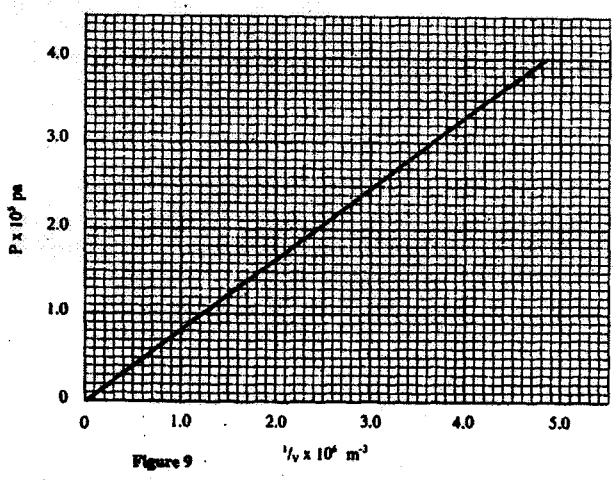


Figure 9

(i) Suggest how the temperature of the gas could be kept constant. (1 mark)

(ii) Given that the relation between the pressure P_1 and the volume, V_1 of the gas is given by

$$PV = k$$

When k is a constant, use the graph to determine the value of k.

(4 marks)

(iii) What physical quantity does k represent? (1 mark)

(iv) State one precaution you would take when performing such an experiment.

(1 mark)

(c) A gas occupies a volume of 4000 litres at a temperature of 37°C and normal atmospheric pressure. Determine the new volume of the gas if it is heated at constant pressure to a temperature of 67°C (normal atmosphere pressure $p = 1.01 \times 10^5\ p_a$).

(4 marks)

17 (a) State Archimedes Principle. (1 mark)

(b) In an experiment to determine the relative density of methylated spirit applying Archimedes Principle, the following were provided: a spring balance, some masses, a piece of thread, water in a beaker and methylated spirit in a beaker. The table below shows the results obtained.

Mass (g)	100	150	200
Weight in air (N)	1.00	1.50	2.00
Weight in water (N)	0.88	1.32	1.76
Weight in spirit (N)	0.91	1.36	1.82

(i) Draw labelled sketch diagrams to show how the readings in the table were obtained. (1 mark)

(ii) For each mass, determine the upthrust in water and the upthrust in the spirit.

(2 marks)

(iii) Determine the average relative density of the spirit. (3 marks)

(c) A weather baloon of volume 1.2 m^3 is tied to a rigid support while being filled with helium gas. The mass of the fabric making the baloon is 0.30 kg.
Determine the maximum tension on the string tying the baloon to the rigid support.
(Density of air is 1.25 kg m^{-3} and density of helium is 0.18 kg m^{-3}). (4 marks)

18 (a) Define *specific latent heat of fusion* of a substance. (1 mark)

(b) Water of mass 200 g at a temperature of 60°C is put in a well lagged copper calorimeter of mass 80 g. A piece of ice at 0°C and mass 20 g is placed in the calorimeter and the mixture stirred gently until all the ice melts. The final temperature, T, of the mixture is then measured.

Determine

(i) the heat absorbed by the melting ice at 0°C (2 marks)

(ii) the heat absorbed by the melted ice (water) to rise to temperature T (answer may be given in terms of T) (2 marks)

(iii) the heat lost by the warm water and the calorimeter (answer may be given in terms of T) (2 marks)

(iv) the final temperature T of the mixture.
(Specific latent heat of fusion of ice = 334 000 J kg^{-1}
Specific heat capacity of water = 4 200 J kg^{-1} k^{-1}.
Specific heat capacity of copper = 900 J $kg^{-1}k^{-1}$.) (4 marks)

23.5.2 Physics Paper 2 (232/2)

Name ..... **Index number** ...../.....

232/2
PHYSICS
Paper 2
Oct./Nov. 2006
2 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education
PHYSICS
Paper 2
2 hours

Write your name and your index number in the spaces provided above.
This paper consists of TWO sections: A and B.
Answer ALL the questions in sections A and B in the spaces provided.
All working MUST be clearly shown in the spaces provided in this booklet.
Mathematical tables and Electronic calculators may be used.

For Examiner's Use Only

Section	Question	Maximum Score	Candidate's score
A	1 - 16	25	
B	17	9	
	18	15	
	19	13	
	20	10	
	21	8	
Total Score		80	

Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

SECTION A (25 marks)

*Answer **ALL** the questions in this section in the spaces provided.*

1. Figure 1 shows two bar magnets placed with the south poles close together.

Figure 1

In figure 1 sketch the magnetic field pattern between the two south poles. (1 mark)

2. In a certain pinhole camera, the screen is 10cm from the pinhole. When the camera is placed 6m away from a tree, a sharp image of the tree 16cm high is formed on the screen. Determine the height of the tree. (3 marks)

3. A metallic body shaped as shown in figure 2 is positively charged and insulated from the ground as shown in the figure.

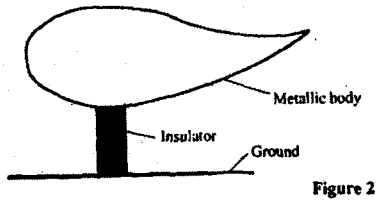


Figure 2

On the figure show the charge distribution. (1 mark)

4. State a reason why the caps of the cells of a lead-acid battery are opened when charging the battery. (1 mark)

5. A long coil is attached to a vibrating blade as shown in figure 3

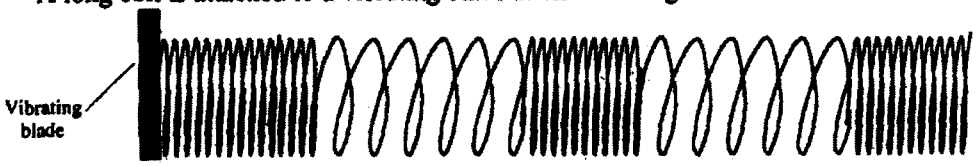


Figure 3

State the type of mechanical wave generated by the set-up and mark alongside the coil, the length corresponding to the wavelength, λ, of the wave. (2 marks)

6. Figure 4 shows a solenoid carrying an electric current.

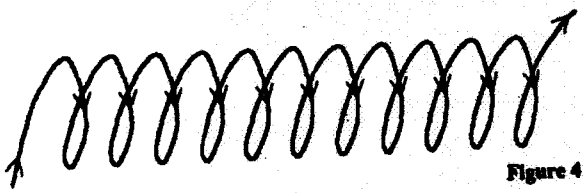


Figure 4

Sketch the magnetic field pattern inside and at the ends of the solenoid. (1 mark)

7. Figure 5 shows wavefronts approaching a concave surface.

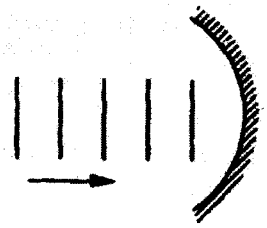


Figure 5

Complete the diagram to show the wavefronts formed after striking the surface. Show how the focal point of the surface is located. (2 marks)

8. A soldier standing some distance from a wall, blows a whistle and hears its echo 1.8seconds later. How far is the wall from the soldier? (Speed of sound in air is $330ms^{-1}$) (3 marks)

9. State one condition under which Ohm's law is obeyed in a metal conductor. (1 mark)

Use the information given below to answer questions 10 and 11.
The Kinetic energy (K.E) of an electron, ejected from the surface of a metal illuminated by radiation of frequency, f is given by

$$K.E = hf - \emptyset$$

where h is Planck's constant and Ø is the work function of the surface.

10. What is meant by the term work function? (1 mark)

11. If the frequency of the illuminating radiation is just equal to the threshold frequency of the surface explain why no photoelectric effect is observed. (2 marks)

Figure 6 shows a tube for investigating the properties of a beam of electrons. *Use the information in the figure to answer questions 12 and 13.*

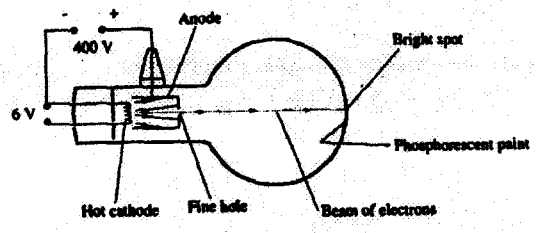


Figure 6

12. What property of the beam of electrons show that the electrons are travelling at a very high speed? (1 mark)

13. The beam of electrons is subjected to a strong uniform magnetic field which is perpendicular to the path and into the paper. Sketch on the same figure, the new path of electrons.

(1 mark)

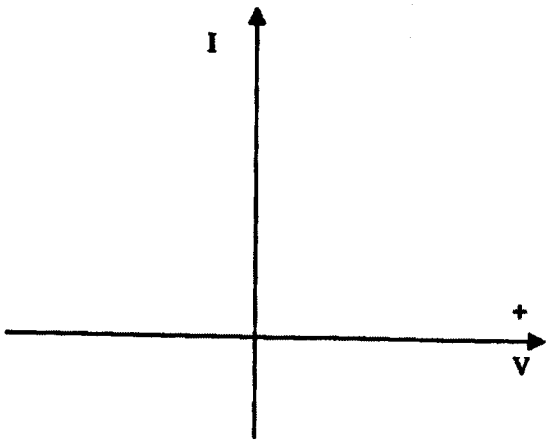
14. State with a reason the effect on the X-rays produced in an X-ray tube, when the p.d. across the tube is increased. (2 marks)

15. A nuclear reaction is represented by the following equation.

$$^{a}_{92}X \rightarrow ^{234}_{b}Y + \textit{Alpha particle}$$

Determine the values of a and b. (2 marks)

16. In the axes provided sketch the current-voltage characteristics for a reverse-biased p - n junction. (1 mark)



SECTION B (55 marks)

Answer ALL questions in this section in the spaces provided.

17. Figure 7 shows a circuit where a battery of emf 4.5V, switches A and B, two capacitors C_1=0.3μF and C_2=0.5μF and a voltmeter are connected.

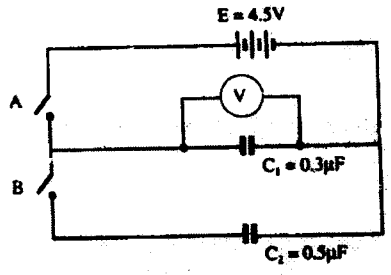


Figure 7

(a) Determine the charge on C_1 when switch A is closed and switch B is open. (3 marks)

(b) What is the effective capacitance C_T when both switches A and B are closed? (2 marks)

(c) State what is observed on the voltmeter when

(i) Switch A is closed and switch B is open (1 mark)

(ii) Switch A is closed and opened, and then B is closed. (1 mark)

(iii) Explain the observation made in c(ii) above. (2 marks)

18. Figure 8 shows an object placed in front of a concave mirror of focal length 10cm. C is the centre of curvature.

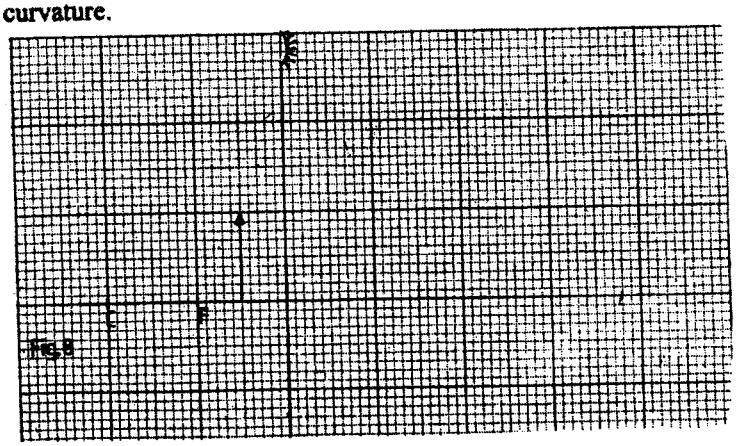


Fig. 8

(i) On the same figure draw a ray diagram showing the location of the image. (4 marks)

Use the ray diagram drawn in (i) above to determine the

(ii) image distance (2 marks)

(iii) magnification. (2 marks)

(b) A vertical object is placed 20cm in front of a convex lens of focal length 5cm.

(i) Determine

I the image distance (3 marks)

II the magnification. (2 marks)

(ii) State two characteristics of the image. (2 marks)

19. (a) Define the refractive index of a substance. (1 mark)

(b) In an experiment to determine the refractive index of a liquid, the liquid was poured into a measuring cylinder. A pin was placed at the bottom of the cylinder and another pin was used to locate the apparent position of the first pin. The real depth and apparent depth were measured. The experiment was repeated with other values of real depth. The table below shows the results obtained.

Real depth (cm)	5	10	15	20	25
Apparent depth (cm)	3.3	6.7	10	13.3	16.7

(i) Plot the graph of real depth against apparent depth. (5 marks)

(ii) From the graph determine the refractive index of the liquid. (4 marks)

(c) Figure 9. Shows a ray of light incident on a glass-air interface.

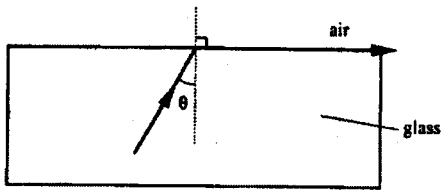


Figure 9

Given that the refractive index of the glass is 1.6, determine angle θ. (3 marks)

20. Figure 10 shows a simple electric generator.

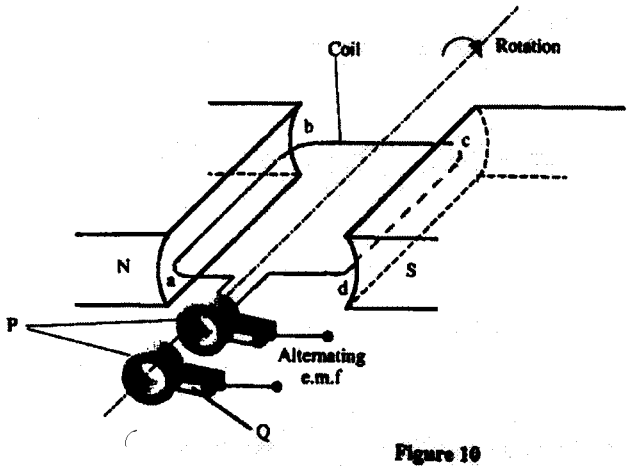


Figure 10

(a) (i) Name the parts labelled P and Q. (2 marks)

(ii) The emf generated as the coil rotates is represented in the graph in Figure 11.

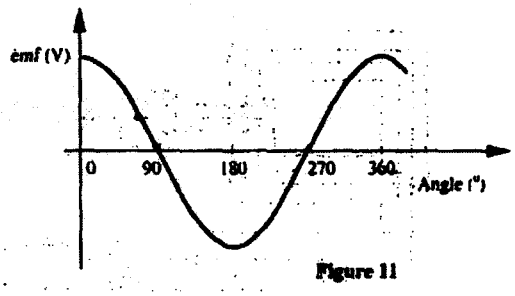


Figure 11

Give reasons for the changes in the emf as the coil rotates from 0° to 90°, and 90° to 180°. (3 marks)

(b) The primary coil of a transformer has 1200 turns and the secondary coil has 60 turns. The transformer is connected to a 240V a.c. source.

Determine

(i) the output voltage (2 marks)

(ii) the output current when the primary coil has a current of 0.5A. (Assume there are no energy losses). (3 marks)

21. (a) Figure 12 shows a section of a house wiring system.

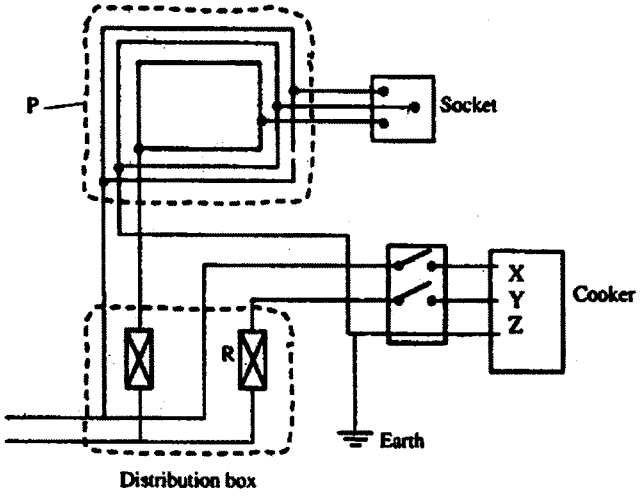


Figure 12

(i) Name:
the circuit labelled P

..... (1 mark)

the terminals labelled X and Y.

X .....Y ..... (2 mark)

(ii) I State the purpose of R in the circuit. (1 mark)

II Give a reasons why R is connected to Y but not to X. (1 mark)

(iii) Why is the earthing necessary in such a circuit? (1 mark)

(b) Determine the cost of using an electric iron rated 1500W, for a total of 30 hours given that the cost of electricity per kWh is Ksh. 8. (2 marks)

23.5.3 Physics Paper 3 (232/3)

Name ..... **Index Number** ...../.....

232/3
PHYSICS
PRACTICAL
Paper 3
Oct./ Nov. 2006
2½ hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

Kenya Certificate of Secondary Education
PHYSICS
PRACTICAL
Paper 3
2½ hours

Write your name and index number in the spaces provided above.
Answer ALL the questions in the spaces provided in the question paper.
You are supposed to spend the first 15 minutes of the 2½ hours allowed for this paper reading the whole paper carefully before commencing your work.
Marks are given for a clear record of the observations actually made, their suitability, accuracy, and the use made of them.
Candidates are advised to record their observations as soon as they are made.
Mathematical tables and electronic calculators may be used.

For Examiner's Use Only

Question 1

	a	b(i)	b(ii)	c	d(i)	d(ii)	d(iii)
Maximum Score	2	1	1	6	5	3	2
Candidate's Score							

Total ☐

Question 2

	a	b(i)	b(ii)	b(iii)	d	e(i)	e(ii)	f	g
Maximum Score	3	2	1	1	3	5	1	2	2
Candidate's Score									

Total ☐

Grand Total ☐

Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

QUESTION ONE

You are provided with the following:

- a glass marble
- a stop watch
- a 105 cm plastic tube split open with a mark near one end
- vernier callipers (to be shared)
- a metre rule or half-metre rule
- a balance (to be shared)
- retort stand, one boss and one clamp.

Proceed as follows:

(a) Use the vernier callipers provided to measure the diameter of the marble and hence determine the radius.

Diameter of the marble = ...cm

Radius of the marble r = ...cm

(b) (i) Using the balance provided obtain the mass M of the marble.

M = ...g

(ii) Determine the constant P given that $P = 0.4\ Mr^2$.

The experiment involves timing a marble as it runs down the split tube as a runway.

(c) Clamp the marked end of the split tube with the inside uppermost. Ensure the end with the mark is on the greater slope. Raise this end such that the mark is at a height h = 8 cm above the bench level. The other end should rest on the bench as shown in figure 1.

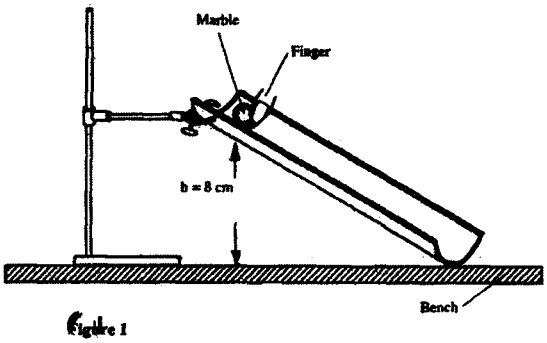


Figure 1

Place the marble at the mark on the runway and hold it in place gently with the finger as shown in the figure 1. By simultaneously releasing the ball and starting the stop watch measure and record in table 1, the time, t, taken by the marble to reach the lower end of the runway. (It is advisable to measure the time twice and record the average value).

Vary the height h, to other values shown in table 1. Measure and record in the table the corresponding average values of t. Complete the table.

Table 1

height, h (cm)	8	9	10	11	12	13	14	15
Average time, t (s)								
t^2 (s^2)								
$\frac{1}{h}$ (cm^{-1})								

(d) (i) On the grid provided plot the graph of t^2 (y-axis) against $\frac{1}{h}$.

(ii) Determine the slope S of the graph.

(iii) Determine the constant G for the marble given that

$$G = Mr^2\left(\frac{S}{20} - 1\right)$$

QUESTION TWO

You are provided with the following:

- a voltmeter
- two dry cells and a cell holder
- a switch
- a resistor labelled R (4Ω)
- a wire mounted on a mm scale and labelled G
- a micrometer screw gauge (to be shared)
- six connecting wires with six crocodile clips.

Proceed as follows:

(a) Record the length L_0 of the wire labelled G.

L_0 = ...

Use the micrometer screw gauge provided to measure the diameter of the wire labelled G at two different points and determine the average diameter, d.

The diameter d_1 = ... mm, d_2 = ...mm

Average diameter d = ... mm

Determine the radius r of the wire in metres.

Radius r = ... m

(b) Set up the apparatus as shown in the circuit diagram in figure 2.

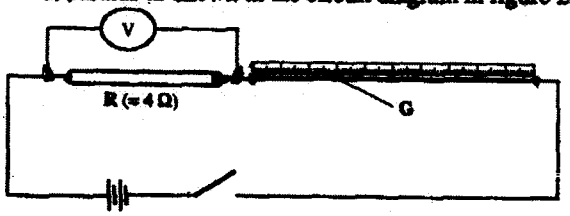


Figure 2

(i) Use the voltmeter provided to measure the p.d, V_R across R and the p.d, V_G across G when the switch is closed.

V_R = ... Volts

V_G = ... Volts

Open the switch.

(ii) Use the value of R provided and the value of V_R in b (i) above to calculate the current I flowing through R when the switch was closed.

I = ... Amperes

(iii) Determine the constant H given that

$$H = \frac{100V_G}{I \times L_o}$$

H = ... Ωm^{-1}

(c) Connect the volmeter across R as shown in figure 3.

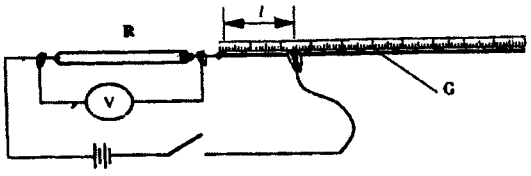


Figure 3

Adjust the position of one crocodile clip on the wire G to a point such that the length *l* of the wire in the circuit is 5 cm. (see figure 3). Close the switch.

Read and record in table 2, the value of the p.d. across R. Open the switch.

(d) Repeat the procedure in (c) above for the other values of *l* shown in table 2.

Table 2

Distance *l* (cm)	0	5	10	20	30	40	60	70
p.d. V across R(V)								

(e) (i) On the grid provided plot the graph of V (y-axis) against *l*.

(ii) From the graph, determine l_1, the value of l when $V = \frac{V_o}{2}$ where V_o is the p.d. where $l = 0$.

(f) Determine the constant D for the wire given that

$$D = \frac{R}{l_1} x \frac{300}{v_o}$$

(g) Determine the constant ρ given that

$\rho = \frac{\pi r^2}{2}(D + H)$, where r is the radius of the wire in metres.