**NAME………………………………………………...….CLASS……..…ADMN NO…………**

**DATE……………………………………………………………SIGN………………………….**

232/1

PHYSICS

FORM FOUR

APRIL-2023

TIME: 2HRS

**MECS JOINT EXAMINATION**

**Kenya Certificate of Secondary Education 2023**

**PHYSICS PAPER ONE**

**INSTRUCTIONS TO CANDIDATES**

1. *Write your name and admission number in the spaces provided above.*
2. *Sign and write the date of examination in the spaces provided above*
3. *This paper consists of* ***TWO*** *sections* ***A*** *and* ***B.***
4. *Answer* ***ALL*** *the questions in section* ***A*** *and* ***B*** *in the spaces provided.*
5. *All working* ***MUST*** *be clearly shown.*
6. *Non programmable silent calculators may be used.*
7. ***This paper has 12 pages. It is the responsibility of the candidate to ascertain that all the pages are printed as indicated and that no questions are missing.***
8. ***Candidates should answer the questions in English.***

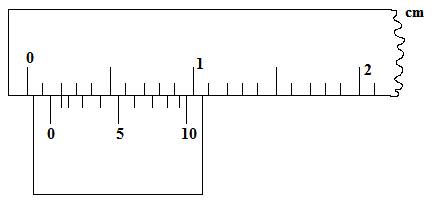
***Constant: g=10N/kg or 10m/s2***

**For Examiners Use Only**

|  |  |  |  |
| --- | --- | --- | --- |
| **Section** | **Question** | **Maximum Score** | **Candidate’s Score** |
| **A** | **1 – 13** | **25** |  |
| **B** | **14** | **10** |  |
| **15** | **12** |  |
| **16** | **11** |  |
| **17** | **11** |  |
| **18** | **11** |  |
| **TOTAL SCORE** | **80** |  |

**SECTION A: (25 MARKS)**

1. 1 The figure below shows part of a vernier callipers when the jaws are closed without an object in between the jaws.



1. State the zero error of the vernier callipers. (1mark)

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b) A student used the same vernier calipers to measure the diameter of a test tube of actual diameter 2.15cm. What was the reading shown by the vernier callipers? (1mark)

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2 State a reason why a burn from steam at 1000C is more severe than a burn from boiling water at the same temperature (1 mark)

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3. Apart from temperature difference between the ends of a material, state any other two factors that determines rate of heat flow in a material (2marks)

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4. A point in the rim of a wheel has a linear velocity of 5.6 m/s. if the rim has a radius of 40cm determine the angular velocity of the point (2marks)

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5. A wooden block of mass 2kg is placed on a horizontal surface. A horizontal force of 12N is exerted on it makes it to accelerate at 5ms-2. Find the coefficient of friction between the surfaces. (3marks)

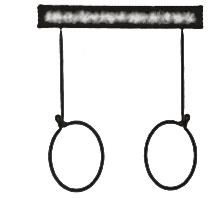
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6. .Explain briefly how the temperature in a green house is kept higher than outside. (2 marks)

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1. The figure below shows two inflated balloons hanging vertically on light threads.

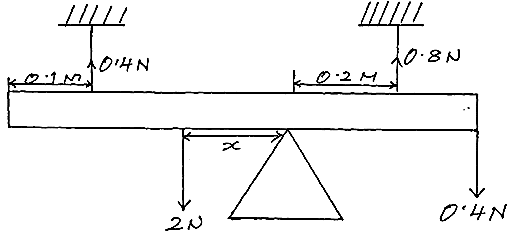


State and explain the observation that will be made when a stream of air is blown in the space between the balloons. (2 marks)

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8. Explain why a hole in a ship near the bottom is more dangerous than the one near the top (1mark) ……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….

9.The diagram bellow shows a uniform meter rule pivoted at its center and balanced by the forces shown. (3marks)

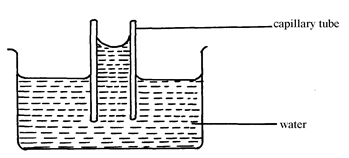


Determine the value of *x*.

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10.The figure shows a capillary tube dipped in water.

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Water

Capillary tube

State **two** differences that will be observed when water is replaced with mercury in the set up above. (2 marks)

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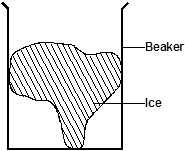
11. Give the transducer used to convert mechanical energy to electrical energy. (1 mark)

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12. A body is uniformly accelerated from rest to a final velocity of 100m/s in 10seconds. Calculate the distance covered. (2marks)

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13. The figure below shows beaker containing a block of ice.



 State and explain the change in stability when the ice melts. (2marks)

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SECTION B (55 MARKS)

14. a) Define the term heat capacity. (1 mark)

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b) A metal block of mass 2.0kg is heated electrically. The voltmeter read 12 volts and ammeter 4.0A. The temperature of the metal block increased from 250C to 750C in 10 minutes. Assuming no heat is lost to the surrounding. Determine:

i) Heat supplied by the heater. (2marks)

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ii) Heat gained by the metal cylinder (1mark) ………………………………………………………………………………………………………………………………………………………………………………………………………………………………..

iii) Specific heat capacity of the metal block. (2marks)

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c) Explain why food cooks faster in a pressure cooker than in an open sufuria (2marks)

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d)The figure below shows two identical containers A and B containing hot water and ice block.

***Ice block wrapped in wire gauze***

***Hot Water***

***Floating ice block***

**B**

**A**

State with reason which water cools faster assuming that the wire gauge absorbs negligible heat. (2marks)

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1. a) State Newton’s second law of motion in terms of in momentum. (1mark)

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1. (i) A bullet of mass 20.0 g is fired with a velocity of 300m/s into a wooden block of mass 4.98 kg suspended from a long in extensible string. The bullet sticks into the wood and the two moves together.

Find the velocity of the block and bullet immediately after collision took place. (2marks)

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(ii) Calculate the height to which both swings upwards. (2marks)

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c) Figure shows a hydraulic press system using a lever of negligible mass on the side of a small piston pivoted at point **P**. A force of 200N is applied at **R**.

**P**

**100 cm**

**50 cm**

**Liquid**

**Area= 180cm2**

**A Bale**

**200 N**

**A =50 cm2**

**R**

Calculate ;

1. The force **F** exerted by small piston on the liquid. (2marks)

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1. The weight of the Bale supported by the large piston (2marks)

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1. Efficiency of the system. (3marks)

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1. (a) State Archimedes principle (1mark)

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(b) A cylinder of length 5.0 cm and uniform cross section area 50.00 cm2 is suspended from a spring balance and totally immersed in water. If the density of the material of the cylinder is 1.25g/cm3 and density of water 1g/cm3, determine:

* + 1. The up thrust on the cylinder (2marks)

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* + 1. Weight of the cylinder (2marks)

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* + 1. The reading on the spring balance (2marks)

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(b)(i) State the reason why lead shots are fixed at the bottom of hydrometer. (1 mark)

**Length (cm)**

0 1.0 2.0 3.0 4.0 5.0

0.1

………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(ii) A hydrometer of mass 30.0 g floats in water of density 1.0g/cm3.If the bulb of the hydrometer had a volume of 2.8x10-5 m3 and stem has a cross – section area of 1.0 cm2, what length of the stem would be submerged in the water. (3marks)

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17. a) Define the term angular velocity. (1mark)

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b) The graph below was obtained from an experiment to investigate the variation of the centripetal force, F with the radius, r of the circle on which a body rotates was performed.

**0**

**0.1**

**0.2**

**0.3**

**0.4**

**0.5**

**0.1**

**0.4**

**0.3**

**0.5**

**0.2**

**0.6**

**r (m)**

**F (N)**

From the graph, determine the angular velocity, Ꞷ of the body given that m = 100g and

**F = mꞶ2r + c** where c is a constant. (3 marks)

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1. A stone of mass 40g is tied to the end of a string 50cm long and whirled in a vertical circle at 2 revolutions per second. Calculate the maximum tension in the string. (3marks)

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1. A stone is thrown horizontally with a velocity of 45m/s from the top of a vertical tower 50m high. Determine:
2. The time taken by the bullet to reach the ground (2marks)

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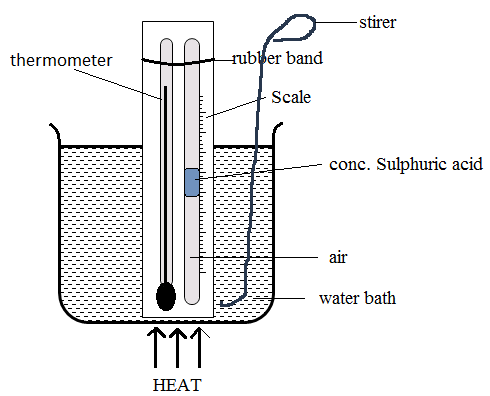
1. The maximum horizontal distance covered by the bullet (2marks)

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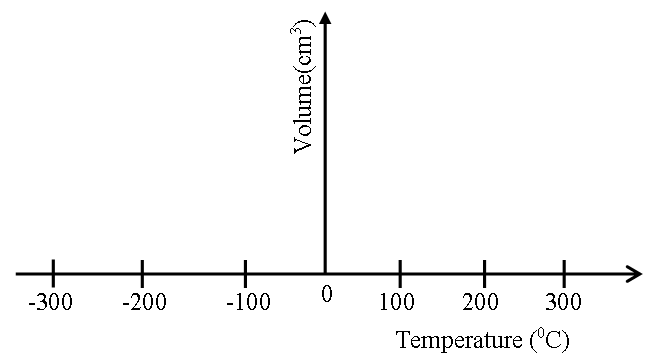
18. a) Define the absolute zero of the Kelvin temperature scale. (1 mark)

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(b) The diagram below shows an experiment to investigate the relationship between volume and temperature of a fixed mass of gas at constant pressure



1. While stating any measurements to be made, explain how the set up would be used to verify Charles law. (3marks) ……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………......

(iii)On the grid shown in the figure below sketch a graph of volume (cm3) against temperature (0C) for the experiment above. Clearly mark with the letter T the absolute zero temperature. (1 mark) 

c) A mass of air of volume 750cm3 is heated at constant pressure from 100 C to 1000 C. determine the final volume of the air. (2marks)

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d) The figure below shows a graph of weights of persons entering a lift against the extension of four similar springs supporting a lift. From the graph determine,

1. The spring constant of the springs (3marks)

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1. The spring constant of a single spring (1mrk)

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