**TERM 2 - 2023**

**PHYSICS – PAPER ONE (232/1)**

**FORM THREE (3)**

**Time - 2 Hours**

**Name …………………………………………….……… Admission Number …………….**

**Candidate’s Signature ………………….…...………... Date ……………………………**

**Instructions to candidates**

* This paper consists of two sections ***A*** and ***B***.
* Answer **all** the questions in the two sections in the spaces provided after each question
* All working **must** be clearly shown.
* Electronic calculators, mathematical tables may be used.
* All numerical answers **should be expressed** in the **decimal** notations.
* You may use:
* ‘Gravitational acceleration, g, as 10m/s2
* Density of water = 1000kg/m3

**For Examiner use only**

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| --- | --- | --- | --- |
| **SECTION** | **QUESTION** | **MAX MARKS** | **CANDIDATE’S SCORE** |
| **A** |  **1 – 12** | **25** |  |
| **B** | **13** | **11** |  |
| **14** | **11** |  |
| **15** | **14** |  |
| **16** | **10** |  |
| **17** | **09** |  |
|  | **TOTAL** | **80** |  |

***This paper consists of 12 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.***

1. A stop watch reads 06:30:94 and 09:10: 20 at the start and end of an experiment respectively. Determine:
2. The accuracy of the stop watch used (1 mark)
3. The duration of the experiment in SI units. (2marks)
4. In an experiment to demonstrate Brownian motion, smoke was placed in an air cell and observed under a microscope, Smoke particles were observed to move randomly in the cell.
5. Explain the observation (1mark)

1. Give a reason for use of smoke in this experiment (1 mark)
2. The reading on a mercury barometer at Mombasa is 760mm. Express this pressure in SI units. (density of mercury = 1.36 x 104 Kg/m3) (2 marks)
3. When a mercury thermometer is used to measure the temperature of hot water, it is observed that the mercury level first drops before beginning to rise. Explain. (2marks)
4. Figure below shows a u-tube manometer containing a liquid L. One end of the tube is connected to a gas tap. Given that the atmosphere pressure is 1.0×105pa, determine the pressure of the gas (density of liquid L is 900kg/m3, g=10N/kg) (2marks)



**Figure 1**

1. For a fluid flowing at a velocity, V in a tube of cross-sectional area, A, VA= constant. State two assumptions made in deriving this equation. (2 marks)

1. The figure 2 shows the graph of extension against force for a certain spring.



**Figure 2**

On the same diagram, sketch the graph of extension against force for a spring with a lower value of spring constant. (1 mark)

1. An object is thrown vertically upwards at an initial velocity of 30m/s. Determine its maximum height. (2 marks)
2. A solid marble is resting in a bowl as shown below.



**Figure 3**

Suggest its state of equilibrium. Explain your answer (2 marks)

1. The diagram below (not drawn to scale) shows part of the motion of a tennis ball, which is projected vertically upwards from the ground and allowed to bounce on the ground.

**Figure 4**

Calculate the height of the ball above the ground at the end of the 3rd second

 (3 marks)

1. The figure below shows a uniform metal rod balanced at its centre by various forces.


**Figure 5**

Determine the tension, T. (3 marks)

1. A high jumper lands on saw dust. Explain how the saw dust helps in reducing the force of impact. (1 mark)

**SECTION B (55 MARKS)**

1. Define ‘Centre of gravity’ of a body (1 mark)
2. Explain why a lorry loaded with bags of maize packed high up is likely to topple when negotiating a corner. (2 marks)
3. The figure below is an aluminium metal sheet used for manufacturing bodies of motor vehicles.

**Figure 6**

Determine its Centre of gravity (2 marks)

1. You are provided with the following apparatus: Plumb-line, thread, stand, irregular cardboard. Using a suitable set-up diagram, describe how you would determine the Centre of gravity of the irregular cardboard. (6 marks)
2. State Bernoulli’s principle (1 mark)
3. It is dangerous to stand close to a railway line on which a fast-moving train is passing. (2 marks)
4. The diagram below shows the mercury levels when no air is blown into the tube.



**Figure 7**

On the same diagram, indicate the new level of mercury when air is continuously moving fast through the tube. Explain your answer. (3 marks)

1. A pipe has a cross-sectional area of 40cm2. The speed of water is 9 m/s at this end. if the speed increases to 15m/s in a constriction in the pipe, find the area of the narrow part of the pipe. (3 marks)
2. Other than density, state any other factor which affect pressure in fluid (1 mark)
3. State the assumption on which Pascal’s principle is based (1 mark)
4. Define the term ‘velocity ratio’ of a machine (1 mark)
5. The figure below shows part of a hydraulic press. The plunger is the position where the effort is applied while the Ram piston is the position where the load is applied. The plunger has cross-section area, a m2 while the Ram piston has cross-section area, A m2.



**Figure 8**

When the plunger moves down a distance, d the Ram piston moves up a distance, D.

1. State one property of the oil used in the hydraulic press (1 mark)

1. Determine the velocity ratio of the press in terms of A and a (4 marks)
2. A machine of velocity ratio 45 overcomes a load of 4500N when an effort of 135N is applied. Determine:
3. the mechanical advantage of the machine (2 marks)
4. the efficiency of the machine (3 marks)
5. percentage of work that goes to waste (2 mark)
6.  Figure 9 shows a threaded bolt.

**Figure 9**

1. Explain how a metre-rule can be used to measure the pitch (distance between adjacent peaks) of the threading (2 marks)
2. Figure 10 is a screw-jack whose pitch is 1mm and has a handle of 25 cm long. Determine the velocity ratio of the jack (3 marks)



**Figure 10**

1. A bullet of mass 60g is travelling at 800m/s hits a tree and penetrates a depth of 15 cm before coming to rest.
2. Describe the energy changes of the bullet as it penetrates the tree (2 marks)

1. Determine the average retarding force of the bullet (3 marks)
2. Define ‘atmospheric pressure’ and state it’s SI unit (1 mark)
3. In an experiment to demonstrate the existence of atmospheric pressure, a plastic bottle is partially filled with hot water and the bottle is then tightly corked. After sometime the bottle starts to get deformed.
4. State the purpose of the hot water (1 mark)
5. Explain why the bottle gets deformed (2 marks)
6. A trolley is pulled a long a smooth horizontal surface by a constant force as shown below:



**Figure 11**

1. On the axes provided, sketch the velocity-time graph for the motion (1 mark)



1. State the assumption made in part (i) above (1 mark)
2. A parachute falling through air soon attains terminal velocity. Explain the meaning of the term terminal velocity (2 marks)
3. State the equation showing the relationship among the various forces acting on the parachute soon after it attains the terminal velocity. (1 mark)

***This is the last printed page.***