**NAME: ………………………………………………………………..**

**INDEX NO:……………….…… CLASS:…….. ADM.NO:………………**

**JOINT TRIAL EXAMS DECEMBER 2021**

**KENYA CERTIFICATE OF SECONDARY EDUCATION**

**PHYSICS 232/1**

**PAPER 1**

**TIME: 2 HOURS**

**INSTRUCTIONS TO CANDIDATES.**

***Write your name and Index Number in the spaces provided above.***

***Attempt ALL questions in the spaces provided.***

***All working MUST be shown.***

**For Examiner’s use only**

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| --- | --- | --- | --- |
| **SECTION** | **QUESTION** | **MAXIMUM SCORE** | **CANDIDATE’S SCORE** |
| **A** | **1-12** | **25** |  |
| **B** | **13** | **10** |  |
| **14** | **09** |  |
| **15** | **9** |  |
| **16** | **10** |  |
| **17** | **9** |  |
| **18** | **7** |  |
| **T o t a l** | | **80** |  |

***The paper consist of 15 printed pages.***

***Candidates should check to see that no page is missing.***

**SECTION A (25marks)**

1. A micrometer is used to measure the diameter of a uniform wire



State what is done in order to obtain an accurate answer. (1mark)

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2. The figure below shows a mercury thermometer



This thermometer has a suitable range for use in laboratory experiments, but has a **low**

**sensitivity** for some experiments.

**(i)** With reference to this thermometer, what is meant by **low sensitivity**. (1mark)

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**(ii)** State **one** change in the design of a thermometer that increases its sensitivity.(1mark)

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3. The figure below shows a very light polystyrene ball placed in a flask. When a jet of air is violently blown over the mouth of the flask, the ball is observed to rise from the bottom



**Explain** the observation. (2 marks)

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4 A fixed mass of gas undergoes a change of volume at constant temperature

Sketch a graph showing the relationship between the volume and the pressure of the gas. (1mark

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5. The figure below shows a graph of Force (N) against extension for a spring with elastic limit

not exceeded:



Determine the work done in stretching the spring. (2 marks)

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6. A child slides down a slide.



The weight of the child is 250 N. The height of the slide is 7.0 m. The work done against friction as the child travels down the slide is 1300 J.Determine the speed the child reaches the ground with. (3marks)

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7 The figure below shows a liquid in a pail



(a). If the pressure exerted at the bottom of the pail by the liquid is **3555N/m2** determine the density of the liquid. (2marks)

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b) Suggest a reason why pail manufactures prefer the shape shown to other shapes.(1mark)

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8. A large spring is stretched by an athlete to increase the strength of his arms.

The athlete extends the spring, as shown in the figure below, and then releases it gently. He extends and releases the spring several times during a period of 60 s.

. During **one** extension of the spring, its length increases from 70 cm to 93 cm. The average force exerted by the athlete is 400 N.

Calculate the work done by the athlete in one extension. (2marks)

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9 The diagram shows a wheelbarrow and its load, which have a total weight of 150 N. This is supported by a vertical force F at the ends of the handles.



Calculate the value of F (2marks)

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10. At the start of the day the temperature of the air in the classroom is 18 °C.

Calculate the energy needed to raise the temperature of the air in the classroom from 18 °C to 30 °C.The specific heat capacity of air is 970 J/(kg °C). (2marks)

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11. A beaker of liquid is placed under a bell jar. The pressure of the air above the liquid is reduced.



State and explain the observation which will be made in the liquid. (2marks)

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12. Water of depth 10 m exerts a pressure equal to atmospheric pressure.

An air bubble rises to the surface of a lake which is 20 m deep. When the bubble reaches the surface, its volume is 6.0 cm3.

Calculate the volume of the air bubble at the bottom of the lake. (3marks)

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**SECTION B(55 marks)**

13.(a) State the law of conservation of energy. (1mark)

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(b) The figure below shows a 3.0kg block attached to a 2.0kg mass by a light inextensible string which passes over a frictionless pulley. The force of friction between the horizontal surface and the block is 5N. The block is released from rest so that both masses move a distance of 0.8m.

3kg

2kg

Calculate

1. the acceleration of the system. (3marks)

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1. the velocity of the 2kg mass after falling through the height of 0.8m.(2marks)

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1. the work done against friction. (1mark)

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1. the tension of the string before the block hits the ground. (3marks)

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14. (a) State Boyles law (1mark)

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(b) Sketch a set-up of apparatus that can be used to verify the Boyles law. (4marks)

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(c) Air is trapped inside a glass tube by a thread of mercury 250mm long. the air column is 200mm when the tube is held horizontally.

Air mercury

200mm 250mm

Given that the atmospheric pressure is 750mm Hg, determine the length of air column when the tube is held as shown in the diagrams below. (4marks)

i) ii)

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15. Define the term friction. (1mark)

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b. A spherical steel ball is released from rest just above the surface of a column of oil which is in a long wide tube.

i). Draw the diagram of the experiment described in (b) above. (2marks)

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ii). State **three** forces affecting the movement of the ball as it falls in the oil. (3marks)

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ii. Explain which of the forces in b (i) above varies as the ball falls. (1mark)

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iii. What is the net force acting on the ball that is moving at terminal velocity? (1mark)

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iv. Sketch a graph to show the variation of resultant force on the ball with velocity from the moment it was released. (2marks)

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16. Define the term atmospheric pressure. **(1 marks)**

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(b) The Figure below shows a hydraulic lift supporting a load of 150kg. Its cross-sectional areas A1 and A2are 0.02m2 and 0.4m2 respectively. The length of the effort arm is 1m and the length of the plunger from the pivot is 0.4m.

1m

0.4m

Pivot

**150 kg**

F1

Fe



**Fig. 11**

Determine:

(i). the pressure exerted by 150kg mass. **(1 mark)**

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(ii). the pressure exerted by F1 on the smaller piston. **(1 mark)**

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(iii). the force F1. **(2 marks)**

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(iv). the applied force, Fe. **(2 marks)**

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(v). the mechanical advantage. **(2 marks)**

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(vi). the velocity ratio of the system. **(2 marks)**

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(vii) the efficiency of the system. **(2 marks)**

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17.(a)(i) State the law of floatation. (1mk)

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(ii) A hydrometer of mass 25g floats in an acid of density 1.8g/cm3 with 3cm of its stem above the acid. If the cross-section area of stem is 0.5cm2 determine the total volume of the hydrometer.(3mks)

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(b) Water flows through a pipe of varying diameter as shown below.

Hole B

Hole A

Flow of water

(i) The pipe has two identical holes A and B. Briefly explain the hole that has its jet of water rising highest. (2marks)

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(ii) If the diameter of the wider section of the pipe is 7cm while the narrower end is 2.1cm, determine the speed of the water in the

narrow end if that at the wider end is 10m/s. (3marks)

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18. A stone is thrown with a horizontal velocity ***u*** from the top of a building of height 125m so as to hit a target on the ground 75m from the base of the building as shown in Figure 9 below.

***u***

125m

**Fig. 9**

75 m

Calculate:

(i) the time taken for the stone to hit the target. **(2 marks)**

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(ii) the horizontal velocity, **u**, of the stone. **(2 marks)**

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(c) A stone of mass 0.5kg is attached to a string of length 0.5m which will break if the tension exceeds 20N. The stone is whirled in a vertical plane, the axis of rotation being above the ground, as shown in the Figure 10 below.

**Fig. 10**

0.5mm

Stone

5.5m

The angular velocity is gradually increased until the string breaks.

(a) In what position is the string most likely to break? **(1 mark)**

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(b) At what angular velocity, ***w***, will the string break? **(3 marks)**

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