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232/ 1

PHYSICS

PAPER 1/232

TIME 2hrs

SUKELLEMO JOINT EXAMINATION

Kenya Certificate of Secondary Education 2020

INSTRUCTIONS TO CANDIDATES

- *write your name and your class in spaces provided*
- *This paper consists of two sections, **section A** and **section B***
- *Answer **ALL** the questions in each section in the spaces provided.*
- *Mathematical tables and Electronic calculators may be used*
- *All working must be clearly shown where necessary.*

For Examiner's Use Only

SECTION	QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
A	1-10	25	
B	11	12	
	12	11	
	13	15	
	14	17	
		80	
		TOTAL	

SECTION A (25 MARKS)

Answer ALL the questions in this section in the spaces provided

1. The level of water in a burette is at 30 cm³. 400 drops of water each of volume 0.015 cm³ was removed from the burette.

   Determine the new level of water in the burette [3 mks]

   Volume of drops $= (400 \times 0.015)\ cm^3$. ✓

   $6\ cm^3$. (3)

   New level $= (30 + 6)$ ✓

   $36\ cm^3$. ✓

2. Calculate the temperature change of water as it falls through a height of 20 m. (Take g = 10 N/kg and s.h.c of water = 4200 J/kg/K) [3 mks]

   G.P.E = Heat gain

   $m_w g h = m_w c_w \Delta\theta$ ✓ (3)

   $10 \times 20 = 4200\ \Delta\theta$ ✓

   ⇒ Temperature change, $\Delta\theta = 0.0476^\circ C$ ✓

3. State the SI unit of density [1 mk]

   Kilograms per cubic metre ✓ (1) [DO NOT AWARD SYMBOLS]

4. Give a reason why heat transfer by radiation is faster than heat transfer by conduction [1 mk]

   Radiation is propagated by means of e.m waves while conduction involves movement of particles which are prone to distraction through collisions. (1)

5. A railway truck of mass 4000 kg moving at 3 m/s collides with a stationary truck of mass 2000 kg. The couplings join and the trucks move off together. Calculate their common velocity after collision. [3 mks]

   $m_1u_1 + m_2u_2 = (m_1 + m_2)v$ ✓

   $4000 \times 3 + 0 = 6000v$ ✓ (3)

   $v = 2\ m/s$. ✓

6. State the principle of moments {Must be stated in words}. [1 mk]

Sum of clockwise moment about a point is equal to the sum of anticlockwise moments about the same point ✓ (1)

7. An air bubble with a volume of 1 cm³ escapes from the helmet of a diver at a depth of 200 m below the water surface.

What will be the volume of the bubble immediately it breaks the surface of water? (Take atmospheric pressure = 10 m of water) [4 mks]

$P_1V_1 = P_2V_2$ ✓

$P_1 = (200 + 10)\ m$.

$V_1 = 1\ cm^3$. ✓

$P_2 = 10\ m$.

$V_2 = ?$

$\Rightarrow 210\ m \times 1\ cm^3 = 10\ m \times V_2$ ✓

$V_2 = \frac{210}{10}$

$21\ cm^3$. ✓ (4)

8. Calculate the acceleration due to gravity on a planet where an object released from rest falls through a height of 54.2 m in 1.08 s. [3 mks]

$S = ut + \frac{1}{2}gt^2$. ✓

$54.2 = 0 + \frac{1}{2} g \times 1.08^2$ ✓

$g = 92.94\ m/s^2$ ✓ (3)

9. State the three factors on which the rate of heat flow depends on. [3 mks]

Length of the conductor ✓

The cross section Area of the conductor ✓

The material of the conductor. ✓

The temperature difference of the ends of a conductor. ✓

{Any correct 3 responses}

10. Under a driving force of 3000 N, a car of mass 1200 kg has an acceleration of 1.3 m/s². Find the frictional resistance acting in the car. [3 mks]

$F = ma$.

1200×1.3 ✓

$F = 1560N$

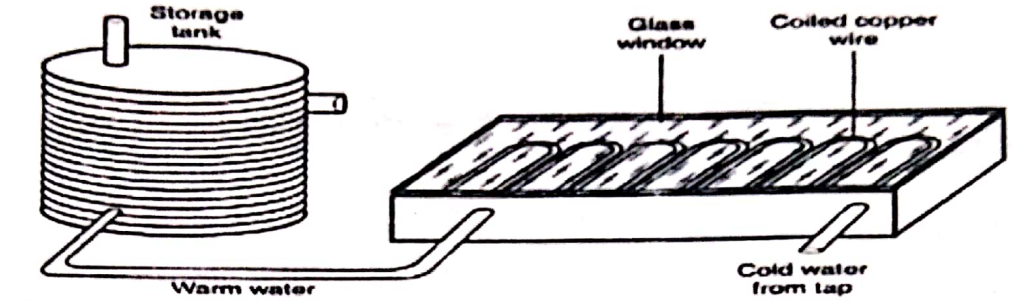
$F_r = 3000 - 1560$ ✓

$1440\ N$. ✓ (3)

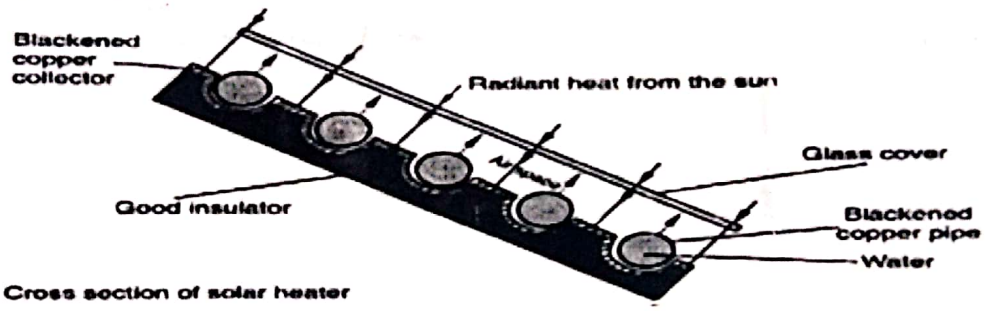
SECTION B (55 MARKS)

Answer ALL the questions in this section

11. a) Explain the following as regards the solar heater:



(a) Solar heater



(b) Cross section of solar heater

i) Why the pipe is fixed to a dark-coloured collector plate. [1 mk]

To get heated faster since dark is a good absorber and emitter. ✓ (1)

ii) Why the pipe is made of copper [1 mk

To conduct heat needed for heating water. ✓ (1)

iii) Why the pipe is coiled several times [1 m

To increase the surface area for heating. ✓ (1)

iv) Why the collector plate is fixed to an insulator. [1 m

To minimize heat loses to the environment ✓ (1)

v) Why the panel front is covered with glass. [1 mk]

To prevent escape of the reflected radiant heat which has longer wavelength ✓ (1)

b). Liquids expand when heated and contract when cooled. However this is not always true for water.

i. What name is given to the behavior of water? [1 mk]

Anomalous Expansion of Water. ✓ (1)

ii. States two importance of this behavior of water. [2 mks]

- Enables the survival of aquatic animals during winters. ✓
- Enables Weathering of rocks to take place. ✓ (2)

{Any correct 2 responses.

iii. State any two disadvantages of this behavior. [2 mk]

Can cause accidents in water transportation. ✓

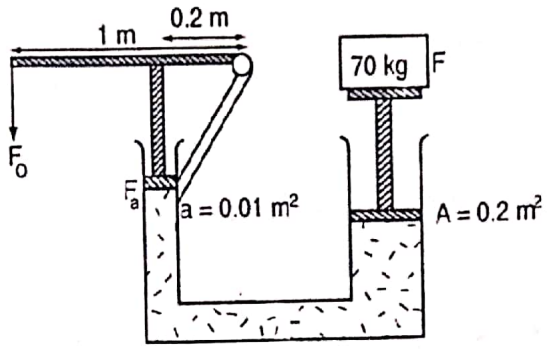
Can cause pipe bursts. ✓

{Any correct 2 responses

iv. A man wants to fit a brass ring onto a steel rod of diameter equal to the inner diameter of the ring. Explain how this can be achieved [2 mk]

Heat the ring to allow its diameter increase. Fix the rod into the hole and allow the ring to cool. ✓ ✓ (2)

12. The figure below shows a hydraulic press supporting a load F.



a) What properties of liquids make them suitable for use in hydraulic machines such as the one above? [2 mks]

Incompressible ✓

Non - corrosive ✓ (2)

b) If **A** and **a** are areas of cross-section of the pistons, and the lengths of the arm are as given, find:

i. The force F_o [3 mks]

$\frac{F_a}{0.01} = \frac{700}{0.2}$ ✓ $F_o \times 1 = F_a \times 0.2$ ✓

$F_a = 35\ N$ $F_o = 35 \times 0.2$

$7\ N$ ✓ (3)

ii. The mechanical advantage [1 mks]

$M.A = \frac{L}{E}$

$\frac{700}{7}$ (1)

$M.A = 100$ ✓

iii. The efficiency of the machine [3 mks]

$V.R = V.R_L \times V.R_H$

$\frac{0.2^{\bullet}}{0.01^{\bullet}} \times \frac{1}{0.2}$ ✓

$V.R = 1000$

$\eta = \frac{M.A}{V.R} \times 100\%$ ✓

$\frac{100}{1000} \times 100\%$

~~$\eta = 5\%$~~ ✓

$\eta = 100\%$

3

iv. State two reasons why the efficiency of a pulley system is always less than 100% [2 mks]

- Part of the applied effort is raising the blocks. ✓
- Some energy is overcoming friction between the Moveable parts ✓

2

13. a) You are provided with the following:-

- A block of wood
- A spring balance
- Thin thread
- Overflow can
- A small measuring cylinder
- Some liquid

With the aid of a labeled diagram describe an experiment to the law of floatation. [4 mks]

- Measure the weight of block of wood in air.
- Fill the overflow can with the liquid and let the excess liquid flow out; then place an empty measuring cylinder below the spout.
- Place the block of wood in the overflow can and measure the volume of the displaced liquid inside the cylinder.
- Using the density of the liquid, calculate the mass and then weight of the displaced liquid.
- Compare the weight of the block with the value of the weight of the duplaced liquid.

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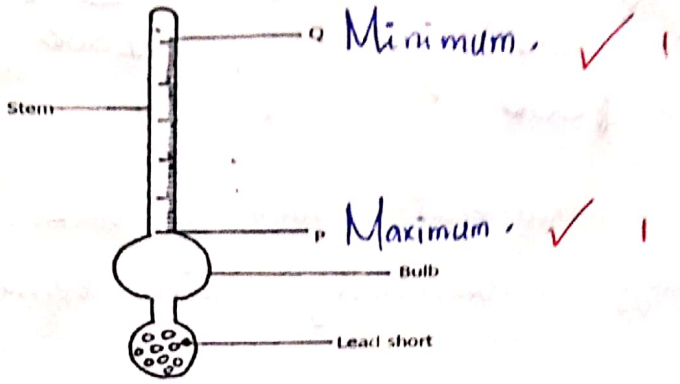
b) The diagram below shows a car acid hydrometer.

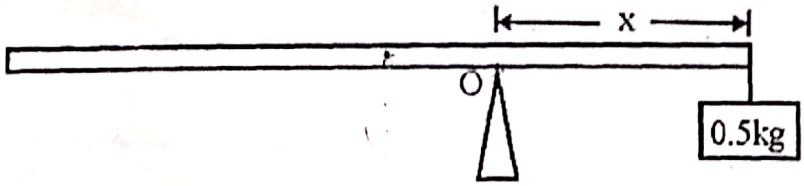


(i) Indicate on the diagram above the minimum and the maximum measurement to be taken. (2) [2 mks]

(ii) State the reason why the bulb is wide. [2 mks]

To displace a large volume of liquid to provide sufficient Upthrust necessary for floating. (2)

c) (I) Figure below shows a uniform plank of weight 20N and length 1.0m balanced by a 0.5kg mass at a distance x from the pivot point O.



Determine the value of X [2 mks]

$20(0.5 - X) = 5X$ ✓ 1

(2)

$X = 0.4\,m$. ✓ 1

(II) When the block is completely immersed in water the pivot O must shift by 0.05 m to the left for the system to balance. The density of water is 1000 kgm^{-3}. Determine:

i) The upthrust U on the block. [3 mks]

$F \times 0.45 = 20 \times 0.05$

$F = 2.222$ N ✓

$U = 5 - 2.222$ ✓

$U = 1.471$ N ✓

$U = 2.778$ N (3)

ii) The volume of the block. [2 mks]

$U = \rho V g$

$1000 \times 10 \times V = 2.778$ ✓

$V = 2.778 \times 10^{-4}\ m^3$ ✓ (2)

14. a) i) Distinguish between elastic and inelastic collisions. [2 mks]

For elastic collision, Both K.E and momentum are conserved while for inelastic collision only momentum is conserved. ✓✓

ii) A body of mass 5 kg is ejected vertically to a height of 7.2 m from the ground when a force acts on it for 0.1s.

Calculate the force used to eject the body. [3mks]

$V^2 = u^2 - 2gs$

$0 = u^2 - 2 \times 10 \times 7.2$

$u = 12$ m/s ✓

$V = 0$

$Ft = \Delta$ momentum ✓

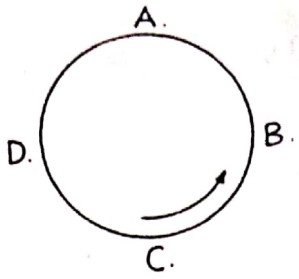
$\Rightarrow F = \frac{5 \times 12}{0.1}$ ✓

600 N ✓ (3)

b) i) Explain why the moon is said to be accelerating when revolving around the earth at constant speed [2mks]

Because instantaneous change ✓ in velocity interms of direction. ✓✓

c) A stone is whirled in a vertical circle as shown in the figure below using a string of length 40 cm. A, B, C and D are various positions of the stone in its motion. The stone makes 2 revolutions per second and has a mass of 100g.



i) Calculate:

I. The angular velocity [3mks]

$\omega = 2\pi f$ ✓

$2 \times 3.142 \times 2$ ✓

12.568 rads^{-1} ✓ (3)

II. The tension on the string at position A [3 mks]

$T_A = mr\omega^2 - mg$ ✓

$0.1 \times 0.4 \times 12.568^2 - 0.1 \times 10$ ✓ (3)

$T_A = 5.318 \text{ N}$ ✓

(ii) At C where the stone has acquired a constant angular speed, the string cuts. The stone takes 0.5 seconds to land on the ground. How high is point C above the ground. [2 mks]

$h = \frac{1}{2} g t^2$ ✓ (2)

$0.5 \times 10 \times 0.5^2$

$h = 1.25 \text{ m}$ ✓

iii) How far does it travel horizontally before hitting the ground. [2 mks]

$V = \omega r$

12.568×0.4

5.027 m/s ✓ (1)

$R = ut$

5.027×0.5

2.514 m ✓ (1)