Name: MARKING SCHEME Class: ..... Adm.No. .....

Candidate's Signature: .....

232/1
PHYSICS
THEORY
Paper 1
June 2022
Time: 2 hours

KASSU JOINT EXAMINATION

JUNE 2022

Kenya Certificate of Secondary Education

PHYSICS

PAPER 1

Instructions to Candidates

- *Write your name, admission number, class and signature in the spaces provided at the top of the page. This paper consists of two sections; **A** and **B**.*
- *Answer **ALL** the questions in the spaces provided.*
- *Mathematical tables and electronic calculator may be used.*
- *All working MUST be clearly shown.*
- *This paper consists of **11** printed pages.*
- *Candidates should answer the questions in English and check to ensure that no question(s) is missing.*

FOR EXAMINER'S USE ONLY

SECTION	QUESTIONS	MAXIMUM SCORE	CANDIDATE'S SCORE
A	1 – 10	25	
B	11	10	
	12	11	
	13	13	
	14	09	
	15	07	
	16	05	
	TOTAL SCORE	80	

SECTION A (25 MARKS)

Attempt all the questions in the spaces provided.

1. Define mechanics as used in Physics **(1 mark)**

Study of motion of bodies under the influence of force

2. The mass of an empty density bottle is 15g and 60g when full of oil of density $0.8gcm^{-3}$. Determine volume of water that would fill the density bottle completely. **(3marks)**

Mass of oil = 60g − 15g

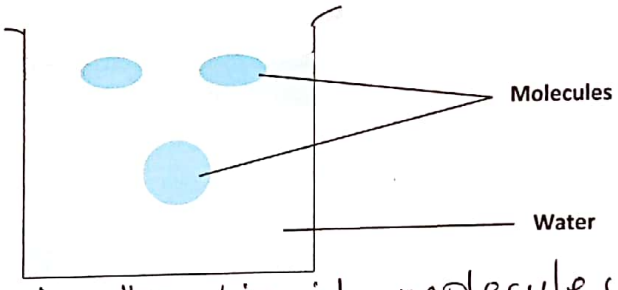
= 45g ✓

volume = $\frac{m}{\rho}$

= $\frac{45g}{0.8}$ ✓

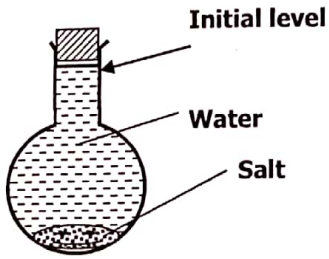
volume = $56.25cm^3$ ✓

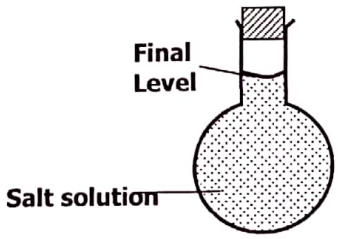
3. Give the molecular explanation of surface tension **(2 marks)**



Deep in the liquid, molecules have a net force of zero. While molecules of the surface have fewer molecules on upper vapour side hence experience net inward force causing tension.

4. The diagram below shows a flask with common salt and water. The adjacent diagram shows the same flask after it has been shaken and the salt has dissolved. State the purpose of experiment and explain what is observed. **(2 marks)**



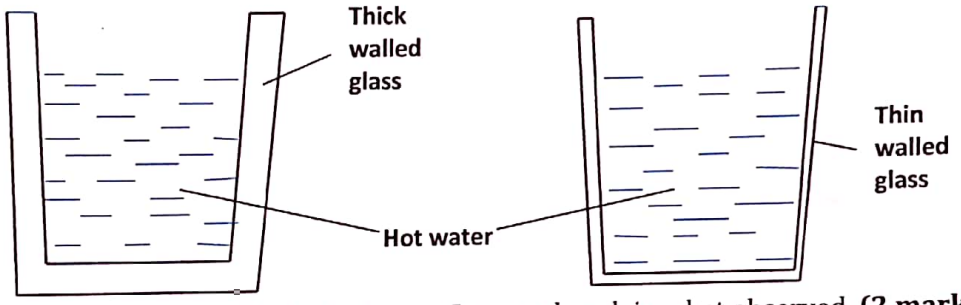


The experiment shows that, matter is made tiny ~~mat~~ particles / matter is particulate / volume of liquid is not constituent.

b) A drop of milk when carefully put in a glass of water turns the water white after sometimes, explain this observation **(1mark)**

The particulate of milk spread throughout water by diffusion.

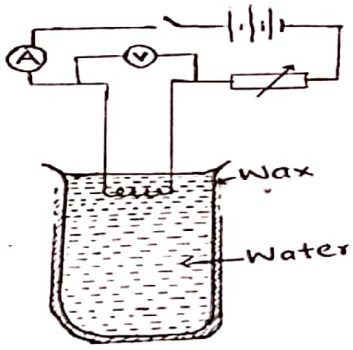
5. The figure below shows two glasses of different thickness



Hot water was poured in both glasses. State and explain what observed. **(2 marks)**

Thick one will break, this is because of unequal expansion, or/and glass is a poor conductor of heat hence heat does not reach outer parts.

6. The diagram below shows a heater immersed in water in a test tube coated with uniform layer of candle wax



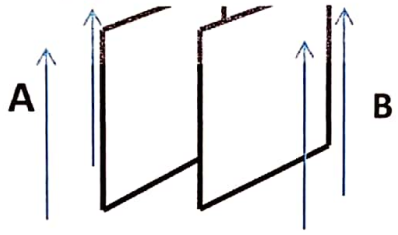
a) State and explain the observation after the switch is closed. **(2marks)**

Wax near the top will melt due to heat transfer by convection while the wax down the tube does not melt because water is a poor conductor of heat

b) What observable changes would be made if water was replaced with mercury. (1mk)

All the wax on the test tube will melt off with a shorter time than that of water

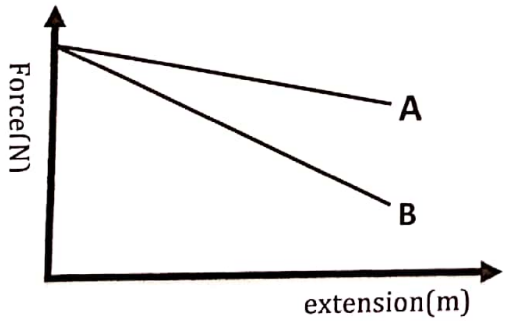
8. The figure below shows two light sheets of paper arranged as shown.



Explain the observation made when air is blown at the same speed at the same time at point **A** and **B**. **(2marks)**

Paper move apart. Increase in velocity at A and B causes decrease in pressure. The greater the atmospheric pressure in between pushes them apart.

9. The figure below shows a graph of Force against extension of two springs made from different materials



a) Compare the spring constants of the springs above **(1 mark)**

Spring B has a higher spring constant that A ✓

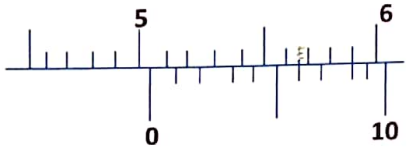
b) State two ways in which the spring constant can be increased

- less number of turns per unit length ✓
- Smaller diameter of the spring ✓
- Larger diameter of the wire used ✓
- Smaller length of the spring. ✓

SECTION B (55 MARKS)

Attempt all the questions in the spaces provided.

11. a) The figure below shows part of a scale of a vernier caliper with an error of 0.03cm. What is the actual reading? **(2 marks)**



Reading $5.0 + 8 \times 0.01$ ✓
Total reading $= 5.08$ cm

Actual reading $= 5.08$
-0.03
5.05 cm ✓

b) In an experiment to estimate the thickness of an oil drop of diameter 0.1cm spread onto a circular patch of diameter 10cm.

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

$V = \frac{4}{3}\pi r^3$ ✓
$= \frac{4}{3} \times 3.142 \times (0.05)^3$

$V = 0.000052367\ cm^3$
$V = 5.24 \times 10^{-4}\ cm^3$ ✓

ii) Calculate the area covered by the oil patch **(2marks)**

$A = \pi r^2$ ✓
$= 3.142 \times 5^2$

$A = 78.5\ cm^2$ ✓

iii) Determine the thickness of the oil molecule **(2marks)**

$t = \frac{V}{A}$

$t = \frac{5.24 \times 10^{-4}}{78.5}$
$t = 6.67 \times 10^{-6}$ cm ✓

iv) State **one** assumptions made in c(iii) above **(1mark)**

- The oil patch is one molecule thick (monolayer)
- The oil drop is a perfect sphere.

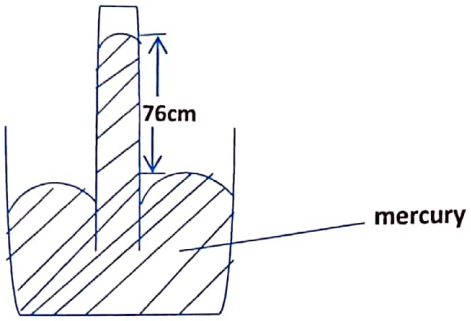
v) State **one** possible sources of errors in this experiment **(1mark)**

Measurement of diameter of oil drop ✓
Measurement of diameter of patch

12. a) State Pascal's Principle of transmission of pressure in liquids **(1mark)**

Pressure applied at one part in liquids is ~~made~~ transmitted equally to all other parts of the enclosed liquid.

b) The figure below shows an instrument used to measure atmospheric pressure State with a reason the modification that would be required in a similar set-up if mercury was to be replaced with water **(2marks)**



A longer tube would be required
Atmospheric pressure supports a long column of water due to its lower density.

c)The barometric height of a town is 640mmHg. Given that the standard atmospheric pressure is 70cmHg and density of mercury is 13.6gcm^{-3}, determine the altitude of the town in metres (density of air = 1.3kgm^{3}) **(3marks)**

$h\rho g = h_2\rho_2 g$

$\frac{6}{100} \times 13600 \times 10 = h \times 1.3 \times 10$

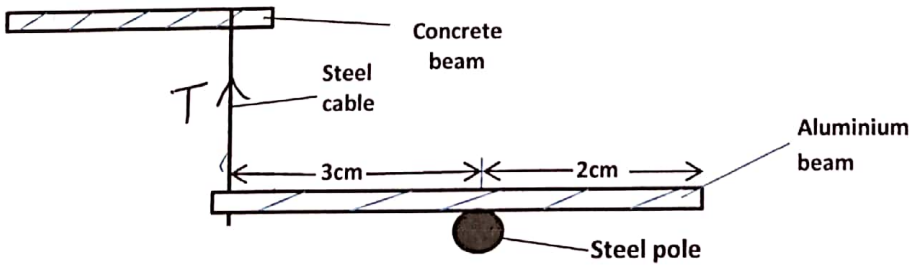
$h = \frac{816}{1.3}$

$h = 627.7m$

c) i) State two factors that affect the moment of a force **(2marks)**

— Magnitude of force applied
— Perpendicular distance between the force is pivoted

ii) An aluminum beam 5.0m long and whose mass is 200g is suspended by a steel cable from a concrete beam and pivoted on a stool pole as shown below



Calculate the tension T in the steel cable **(3marks)**

C.M = A.C.M

$\left(T \times \frac{3}{100}\right) = \left(\frac{0.5}{100} \times \frac{200}{1000} \times 10\right)$

$T = \frac{2 \times 0.5}{3}$

$T = 0.3333N$

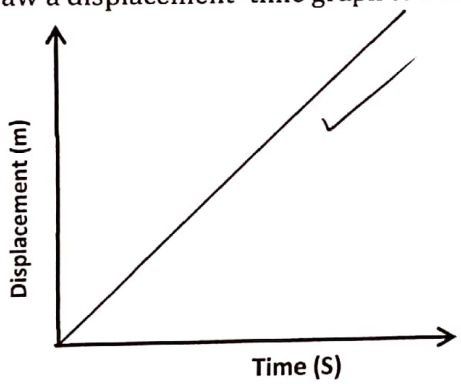
13. a) Define displacement and state its SI Unit **(2marks)**

Distance covered in specified direction

SI unit metre (m)

b) A body is projected horizontally at a velocity of 120cms^{-1} from a cliff 90m tall

Draw a displacement–time graph to show the motion **(1mark)**



c) Calculate

i) The time taken to hit the ground **(2marks)**

$S = \frac{1}{2}gt$

$90 = \frac{1}{2} \times 10 \times t^2$

$90 = 5t^2$

$t^2 = 18$

$t = 4.24s$

ii) The horizontal range. **(2marks)**

$R = ut$

$R = 120 \times 4.25$

$R = 508.8m$

d) A stone is whirled with a uniform speed in horizontal circle having a radius of 12cm. It takes the stone 9seconds to describe an arc of length 6cm. Calculate:

I. The angular velocity **(2marks)**

$\omega = \frac{\theta}{t}$

$= \frac{s}{rt}$

$\omega = \frac{6}{12 \times 9}$

$\omega = 0.05556 \, rads^{-1}$

$\omega = 5.556 \times 10^{-2} \, rads^{-1}$

II. Linear velocity of the stone **(2marks)**

$V = \omega r$

$V = 0.05556 \times \frac{12}{100}$

$V = 0.006667 \, m/s$

III. Its periodic time T **(2marks)**

$T = \frac{2\pi}{\omega}$

$= \frac{2 \times 3.142}{0.05556}$

$T = 113.1s$

14. (a) State Newton's 2nd Law of Motion (1mark)

The law states that the rate of change of momentum of a body is directly proportional to the resultant external force producing the change and takes place in the direction of force

(b) A bus of mass 2000kg initially moving at $20ms^{-1}$ is brought to rest over a distance of 40m. Determine the force required to achieve this. **(3marks)**

$v^2 = u^2 + 2as$ ✓

$0^2 = (20)^2 + 2 \times a \times 40$

$0 = 400 + 80a$

$-80a = 400$

$\frac{-80a}{-80} = \frac{400}{-80}$

$a = -5 m/s^2$ ✓

$F = ma$

$F = 2000 \times (-5)$

$F = -10000N$ ✓

(c) A mason uses six wheel pulley system to raise stones to a storey building for construction. He raises a weight of 3000N through a vertical height of 5m using the machine. If the mason pulls using an effort of 500N, calculate;

i) The velocity ratio of the pulley system. **(1 mark)**

V.R = 6 ✓1

ii) The work done by the mason. **(2 marks)**

Distance Moved by the effort = 5m x 6 = 30M ✓1

Work done = Effort x Effort distance

= 500 x 30 = 15,000J ✓1

iii) The useful work done by the pulley system. **(2marks)**

Useful work done = Load x distance

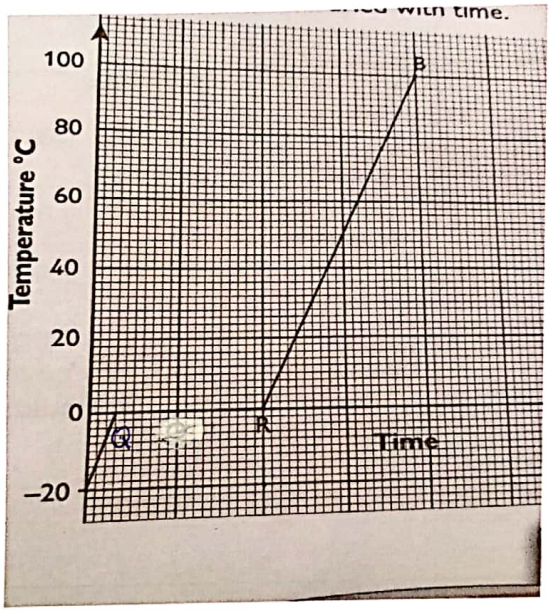
= 5 x 3000 ✓1

= 15,000J ✓1

15. (a) State two ways in which the melting point of a substances can be raised **(2marks)**

- Increasing the pressure ✓
- Adding of impurities ✓

(b)A 200g mass of ice at -20°C was slowly heated by an element heater of power 30W. The figure below shows the graph of temperature against time.



Use the values given below to calculate the time in minutes corresponding to;

i) The line QR in the graph (*specific latent heat of fusion is 357000Jkg-1)* **(3marks)**

$Pt = mL_f$ ✓

$\frac{30 \times t}{30} = \frac{0.2 \times 357000}{30}$ ✓

$t = 2380\,s$ ✓

ii) The line RS in the graph hence label the time axes with suitable values and units *(specific heat capacity of water is 4050Jkg-1k-1)* **(1mark)**

$Pt = mc\Delta\theta$

$30t = 0.2 \times 4200 \times 100$

$t = \frac{84000}{30}$

$t = 2700s$

2800 = 140s for 1 small square.

2700/20 = 135s / small sq

c) Calculate the specific heat capacity of ice **(1mark)**

$30 \times 140 \times 3 = 0.2 \times c \times 20$

$c = \frac{12600}{4}$

$c = 3150 J/kg/k$

16. a) State the law of floatation. **(1mark)**

A floating object displaces its own weight on the fluid in which it floats on.

b) A solid of mass 100g and density 2.5g/cm³ weighs 0.5N when totally submerged in a liquid. Determine the density of the liquid. **(2marks)**

$vol = \frac{m}{\rho}$

$= \frac{100}{2.5}$

$Vol = 40cm^3$

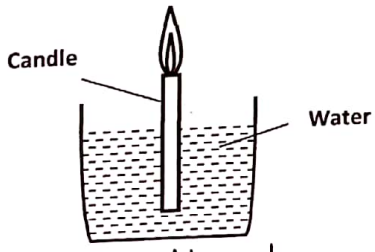
mass of liquid = 0.5N / 10 = 0.05kg = 50g

$\rho = \frac{m}{v}$

$= 50/40$

$\rho = 1.25 g/cm^3$ / 1250Kg/m³

(c) The figure below shows a burning candle, weighted, dripless candle floating upright in water. Explain what happens after the candle burns for sometimes. **(2marks)**



As candle burns, its weight reduces hence weight displaced reduces (upthrust reduces).

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