Name: ……Adm. No: ……Class:……..

232/1
PHYSICS
Paper 1
(THEORY)
.
Time: 2 Hours

FORM 3

TERM 2

Kenya Certificate of Secondary Education (K.C.S.E)

PHYSICS
Paper 1
Time: 2 Hours

INSTRUCTIONS TO CANDIDATES:-

- *Write your **name**, **index number** and **class** in the spaces provided above.*
- *This paper consists of **two** sections; **A** and **B***
- *Answer **all** the questions in section **A** and **B** in the spaces provided*
- *All working **must** be clearly shown.*
- *Mathematical tables and electronic calculators may be used*
- *This paper consists of 11 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.*
- *Candidates should answer the questions in English.*
- *Take g = 10N/kg*

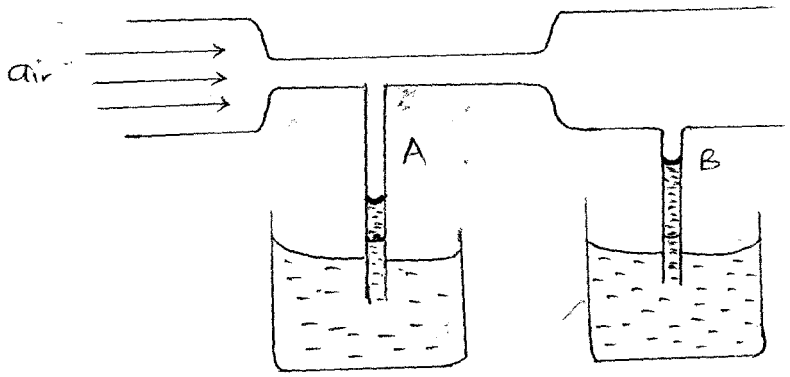
For Examiner's Use Only:

Section	Question	Maximum Score	Candidate's Score
A	1 – 13	25	
B	14	11	
	15	9	
	16	11	
	17	11	
	18	13	
Total Score		80	

SECTION A: 25mks (Answer all the questions)

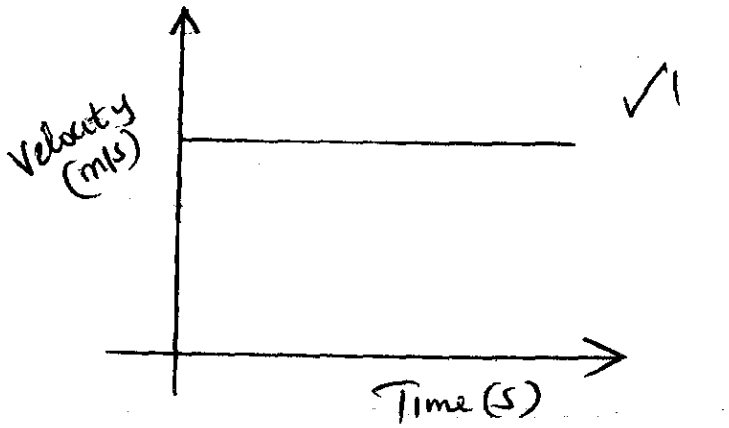
1. State one assumption made when determining the size of a molecule in an oil drop experiment (1 Mark)
   - *The drop is perfectly spherical* } *any one = ✔1 Mark*
   - *The layers/ patch is one molecule thick*
2. Air is blown into the horizontal tube as shown below.

   (a) Indicate the levels of water in tubes A and B when air passes through the horizontal tube at a high velocity . (1 Mark)

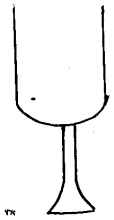


   (b) Explain your observation in (a) above (1 Mark)
   - *In tube A, velocity of air above it is higher ✔ than velocity of air above tube B*
   - *Therefore in table A, pressure is lower than tube B*

3. Sketch a velocity – time graph of a body moving with uniform velocity. (1 Mark)



4. The figure below shows an empty wire glass.



a. How is its stability affected when filled with wine? (1 Mark)

- *Stability is reduced* ✔

b. Explain the observation in (a) above (1 Mark)

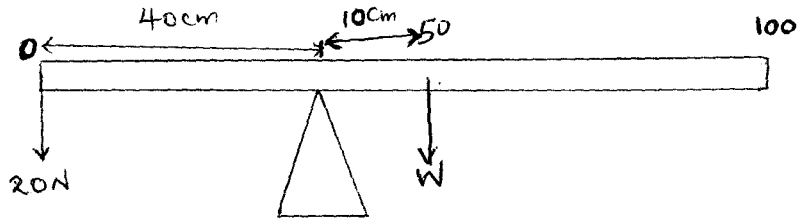
- *The position of the centre of gravity is raised* ✔[1] *when more weight is added on the upper side, reducing stability*

5. State one factor that affects heat transfer in solids. (1 Mark)

- *Length of the conductor*
- *Cross sectional area*
- *Temperature difference of the source*
- *Nature of the material making the conductor.*

any one=✔*1*

6. The figure below shows a uniform bar of length 1 metre. Calculate the weight of the beam. (3 Marks)

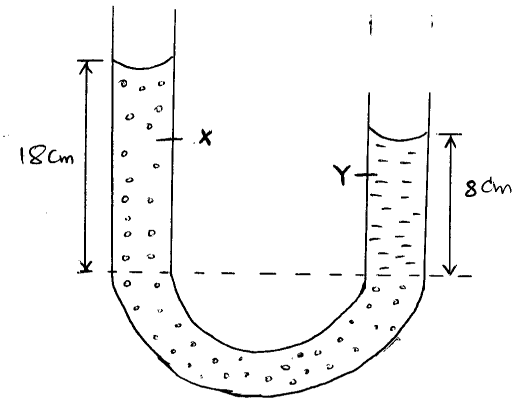


- *Clockwise moments = Anti clockwise moments*

$0.1 \times W = 0.4m \times 20N$ ✔ $W = \frac{0.4 \times 20}{0.1}$ ✔

$W = 80N$ ✔

7. The figure below shows a u-tube containing the liquids X and Y. Given that the density of liquid X is 1.8g/cm^3, calculate the density of liquid Y in g/cm^3. (3 Marks)



$$\rho_x h_x g = \rho_x h_x g \ \checkmark$$

$$\rho_x h_x = \rho_x h_x$$

$$1.8 g/cm^3 \times 18cm = \rho_y \times 8cm \ \checkmark$$

$$\rho_y = \frac{1.8 \times 18}{8}$$

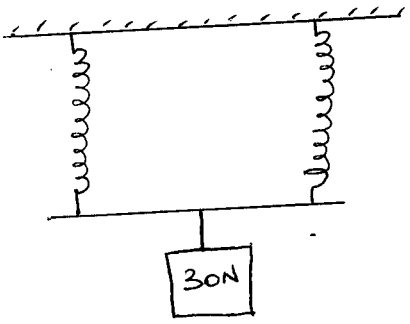
$$\rho_y = 4.05 g/cm^3 \ \checkmark$$

8. Name one factor that affects surface tension. (1 Mark)
   - *Temperature*
   - *Impurities*

   Any= ✔1

9. When a liquid is heated in a glass flask, its level first falls and then starts rising. Explain this observation. (2 Marks)
   - *The level first dropped due to expansion of glass ✔1*
   - *The level then started rising when the heat reaches the water. ✔1*

10. The figure below shows two identical springs with negligible weight. The extension produced on the system is 10cm



Determine the spring constant of each spring. (3 Marks)

$combined\ spring\ constant\ = k_1 + k_2$

$for\ identical\ spring,\ k_e = 2k$

$f = 2ke$✔

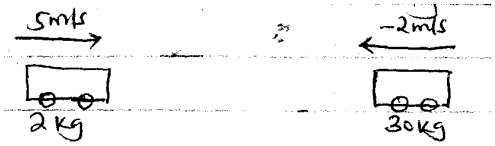
$30N = 2k \times 0.1m$✔

$2k = \frac{30N}{0.1m}$

$2k = 300N/m$

$k = 150N/m$ ✔

11. A body A of mass 2kg moving with a velocity of 5m/s collides with a body B of mass 30kg travelling at 2m/s in the opposite direction. If the collision is perfectly inelastic, find their common velocity after collision. (3 Marks)



$m_1u_1 + m_2u_2 = (m_1 + m_2)\mathbf{V}$✔

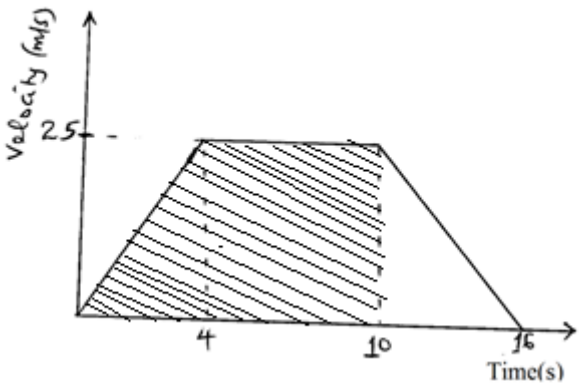
$(2kg \times 5m/s) + (30kg \times -2m/s) = (30kg + 2kg)V$ ✔

$10kgm/s - 60kgm/s = 32kgV$

$V = -1.56m/s$

$moves\ in\ the\ direction\ of\ 30kg\ body$

12. The figure below shows a velocity time graph for a trolley



From the graph, calculate the distance covered by the trolley in the first 10 seconds (2 Marks)

Distance = Area under the graph from 0-10seconds

$Area = \left(\frac{6+10}{2}\right)\times 25$✔

$8\times 25 = 200m$

Distance = 200m ✔

13. State the reason why gases are easier to compress than solids. (1 Mark)

- ***Gas particles have larger intermolecular distances than solids*** ✔

SECTION B: 55mks

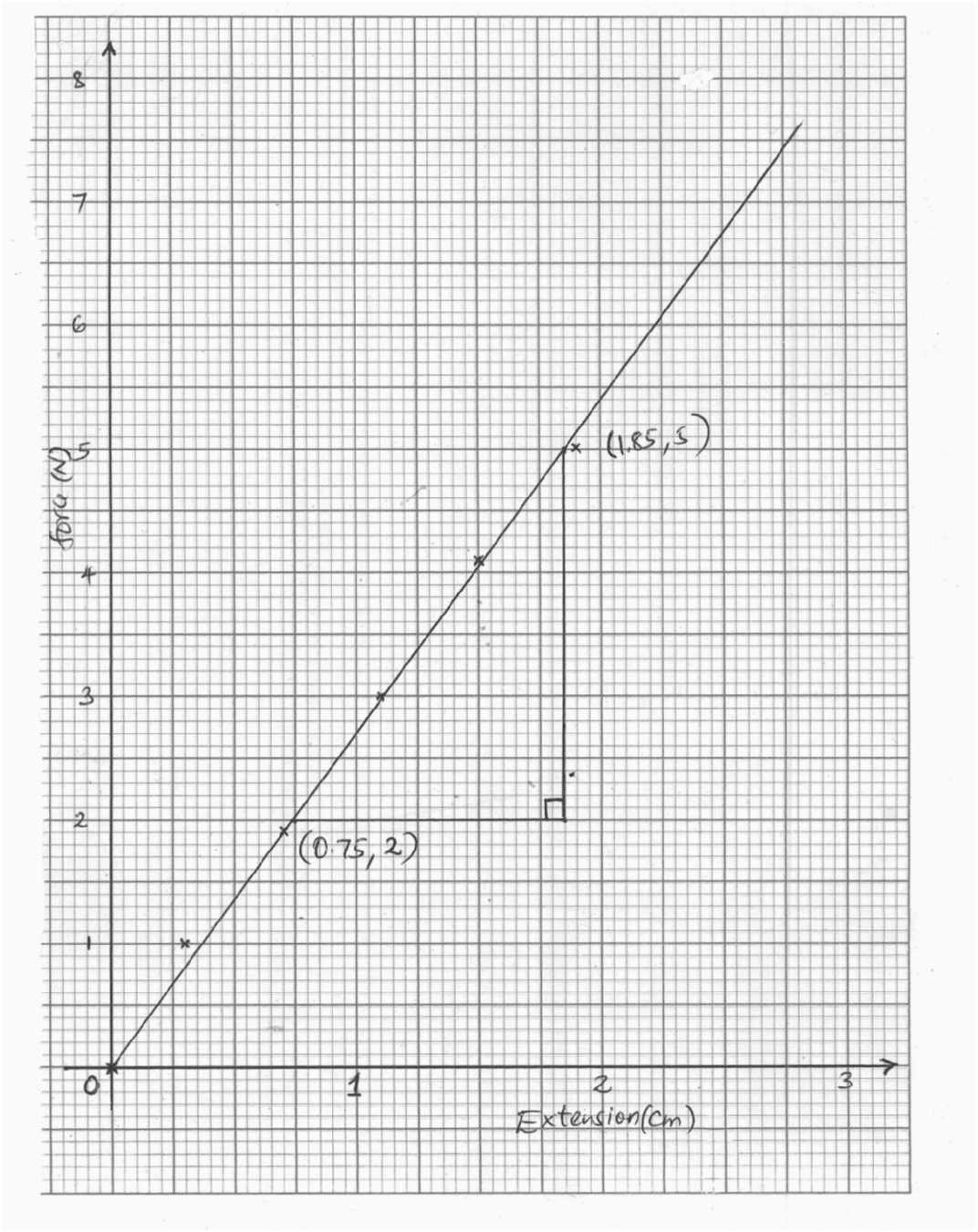
14. a. State Hook's law (1 Mark)

For a helical spring or any other elastic material, the extension is directly proportional to the stretching force, provided that elastic limit is not exceeded. ✔

b. The table below shows the extension produced in a spring by various forces.

Extension (cm)	0	0.3	0.7	1.10	1.5	1.9	2.4
Force (N)	0	1.0	1.9	3.0	4.1	5.0	8.0

i. Plot a graph of force against extension. (5 Marks)



ii. From the graph, determine the spring constant. (3 Marks)

Gradient = Spring constant

$K = \frac{5-2}{1.85-0.75}$ ✔

$K = \frac{3}{1.1}$ ✔

$K = 2.73\ N/cm$ ✔

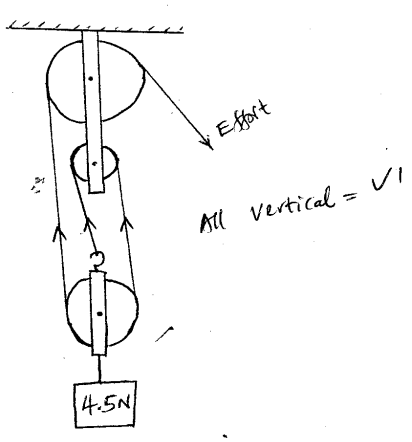
iii. What force would cause an extension of 1.2cm on the spring? (2 Marks)

Force = Ke

F = 2.73N/cm X 1.2cm✔

F = 3.276 N✔

15. The figure below shows a block tackle system



(a) State the velocity ratio of the system (1 Mark)

3 ✔

(b) Mark the direction of tension in the springs (1 Mark)

All vertical tensions✔*1*

(c) If an effort of 2N is applied, calculate the mechanical advantage of the system. (3 Marks)

$MA = \frac{Load}{Effort}$ ✔

$MA = \frac{4.5N}{2N}$ ✔

$MA = 2.25$ ✔

(d) Calculate the efficiency of the system. (3 Marks)

$Efficiency = \frac{MA}{VR} \times 100\%$ ✔

$\frac{2.25}{3} \times 100\%$ ✔

$Eff = 75\%$ ✔

(e) Explain why the efficiency of the system is less than 100%. (1 Mark)

- *Weight of the pulley blocks/ dead weight* ✔*1*
- *Friction*

16. A body of mass 2kg is thrown vertically upwards with a velocity of 14m/s. Determine;

(a) The maximum height reached by the body (3 Marks)

$V^2 = U^2 - 2gh$✔

$V = 0$

$U^2\ 2gh$

$14^2 = 2\times10\times h$✔

$h = \frac{196}{20}$

$h = 9.8m$ ✔

(b) Its velocity after 0.5 seconds. (3 Marks)

$$V = u - gt$$✔

$$V = 14m/s - (10\times0.55)$$✔

$$V = 14 - 5$$

$$V = 9m/s$$ ✔

(c) The time taken to reach maximum height. (3 Marks)

$V = u - gt$✔

$O = 14m/s - 10t$

$10t = 14$✔

$T = \frac{14}{10} = 1.4\ seconds$✔

(d) Calculate the net force acting on the ball as it moves upwards if it experiences an air resistance of 8N. (2 Marks)

$Net\ force\ = mg - Air\ resistance$

$= (2kg\times10N/kg) - 8\ N$✔

$= 20N - 8N$

$= 12N$✔

17. a. State the Newton's 2nd law of motion (1 Mark)

The rate of change of momentum of a body is directly proportional to the force applied and take place in the direction of the force ✔

b. A lady of mass 90kg is standing on the floor of a lift. Determine the reading on the weighing machine when

i. Lift is at rest (2 Marks)

$At\ rest\ Reaction\ = mg$

$= 90Kg \times \frac{10N}{kg}$ ✔

$= 900N$ ✔

ii. Lift is moving upwards with an acceleration of 3m/s^2 (2 Marks)

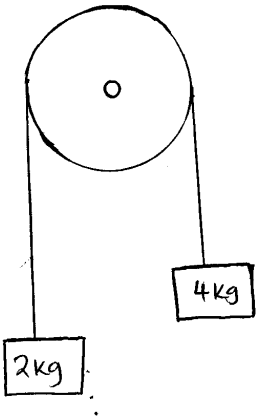
$R = mg + ma$

$= (90\times10) + (90\times3)$ ✔

$= 900N + 270N$

$= 1170N$ ✔

c. Two masses of 4kg and 2kg are connected by a light string passing over a frictionless pulley as shown below.



Calculate the acceleration of the masses when left to move freely. (3 Marks)

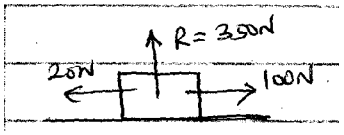
$Net\ force = 40N - 20N = 20N$ ✔

$Force = Mass \times acceleration$

$20N = 6kg \times a$ ✔

$a = \frac{20N}{6kg} = 3.33m/s^2$ ✔

d. A block of mass 35kg is pushed along a horizontal surface whose frictional force is 20N. If the force moving the block is 100N, calculate the co-efficient of friction between the block and the surface. (3 Marks)

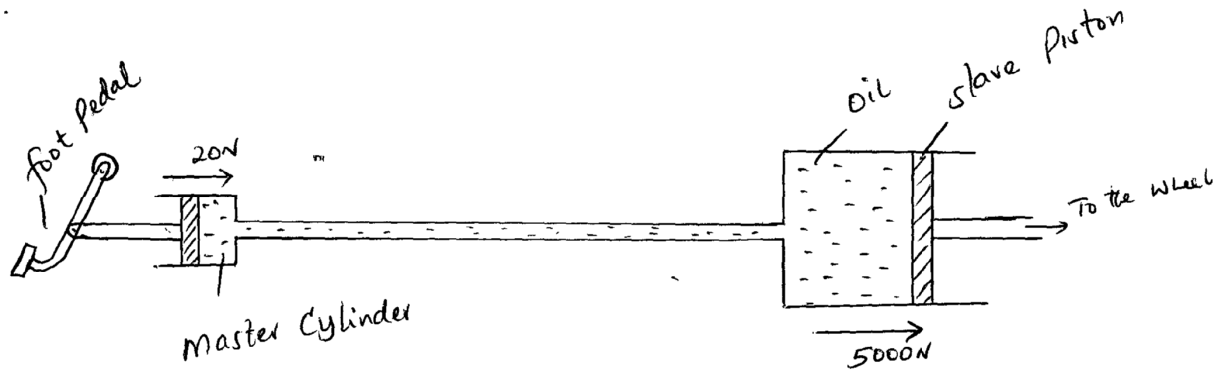


$\mu = \frac{F}{R}$ ✔

$\mu = \frac{20N}{350N}$ ✔

$\mu = 0.06$ ✔

18. The figure below shows a hydraulic brake system.



A force of 20 N is applied on the foot pedal connected to a master piston of area 0.05m^2. This causes a stopping force of 500N on one wheel. Calculate.

a. Pressure in the master cylinder (3 Marks)

$Pressure = \frac{force}{area}$ ✔

$= \frac{20N}{0.05m^2}$ ✔

$Pressure = 400N/m^2$ ✔

b. Area of the slave piston. (3 Marks)

Pressure is transmitted equally

$\frac{400N}{m^2} = \frac{5000N}{Area}$ ✔

$Area = \frac{5000}{400}$ ✔

$Area = 12.5m^2$ ✔

c. Velocity ratio of the system. (3 Marks)

$V.R = \frac{Area\ of\ the\ load\ piston}{Area\ of\ effort\ piston}$ ✔

$V = R = \frac{12.5}{0.05}$ ✔

$= 250$ ✔

d. Give two reasons why oil is used in the hydraulic brake system. (2 Marks)

- *Incompressible ✔1*
- *Does not corrode the system ✔1*

e. State two factors affecting pressure in liquids. (2 Marks)

- *Density*
- *Depth of the liquid* *Each = ✔1*