MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education

PRE-MOCK EXAMINATIONS 2024

232/1 PHYSICS PAPER 1

MARCH/APRIL 2024 TIME: 2 Hours

MARKING GUIDE

Instructions to candidates

a) Write your name and admission number in the spaces provided above

b) This paper consists of two sections A and B.

c) Answer ALL questions in both section in the spaces provided

d) All working MUST be clearly shown.

e) Silent non-programmable electronic calculators may be used

f) This paper consists of 14 printed pages. Candidates should check the question paper to ascertain all the pages are printed as indicated and no questions are missing.

FOR EXAMINER'S USE ONLY.

Section	Question	Maximum score	Candidate's score
A	1-12	25	
B	13	11	
	14	12	
	15	12	
	16	9	
	17	11	
Total score		80	

Mr. Austine Oduor

SECTION A (25 MARKS)

(Answer all questions in the spaces provided)

1. **Figure 1** shows part of the main scale of a vernier calipers.

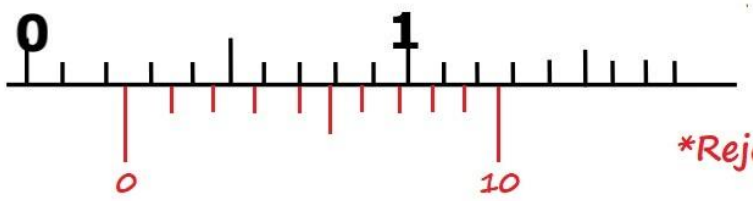


Figure 1

✓1 correct main scale

✓1 correct vernier scale

*Reject a newly drawn diagram

Insert the vernier scale to the main scale, to show a reading of 0.24cm. (2 marks)

2. Explain why steel is selected as a better material for reinforcement of a concrete beam (1 mark)

They have equal linear expansivity ✓1

3. **Figure 2** shows two aluminium containers **A** and **B** placed on a wooden table. The containers **A** and **B** have equal volumes of hot water initially at the same temperature.

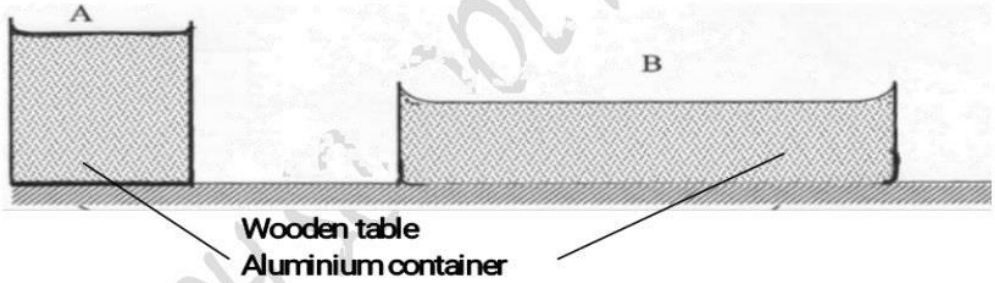


Figure 2

Explain which water in the two containers cools faster than the other after some time (2 marks)

B ✓1

Has a larger surface area ✓1 hence faster rate of evaporation

4. Explain why kinetic energy is not conserved during inelastic collision (1 mark)

-Used in deforming the body ✓1 [any one correct]

-It is converted to other forms of energy (e.g. light, heat, sound)

5. Two samples of bromine vapour are allowed to diffuse separately under different conditions. One in a vacuum and the other in air. State with a reason the condition in which bromine will diffuse faster. (2 marks)

Vacuum. ✓1

In a vacuum there are no other particles that would collide with the bromine particles ✓1 to slow them down

Mr. Austine Oduor

6. a) A stone and a feather are dropped from rest from a building 20m tall. If they reach the ground at the same time, state the condition under which they fall (1 mark)

Free fall ✓1

b) **Figure 3** shows a velocity–time graph for a certain object

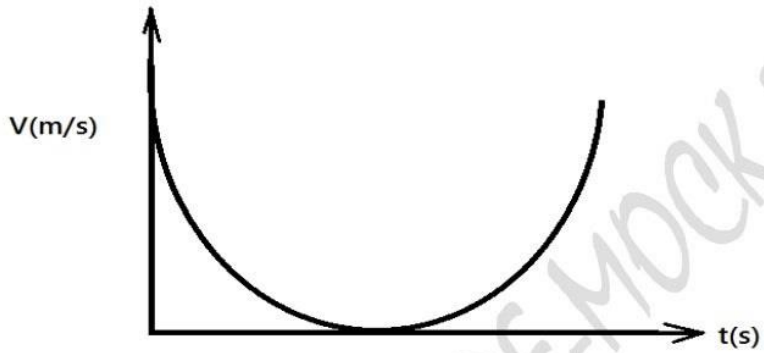


Figure 3

Describe the motion of the object. (2 marks)

[object moves with a certain initial velocity then] decelerates non-uniformly to a stop. Then it accelerates non-uniformly ✓1 back to starting velocity. ✓1

7. **Figure 4** shows a system in equilibrium.

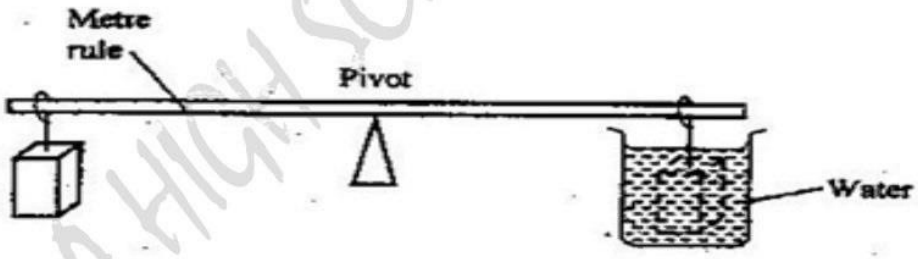


Figure 4

When the temperature of the water is raised the system is observed to tilt to the right, state the reason for this observation. (2 marks)

Upthrust on solid decreases ✓1 due to increase in temp. Apparent increase in weight results in higher moment to the right//higher clockwise moment. ✓1

Mr. Victor Odundo

8. **Figure 5** shows a wooden sphere with a nail hammered into it at **point A** as shown.

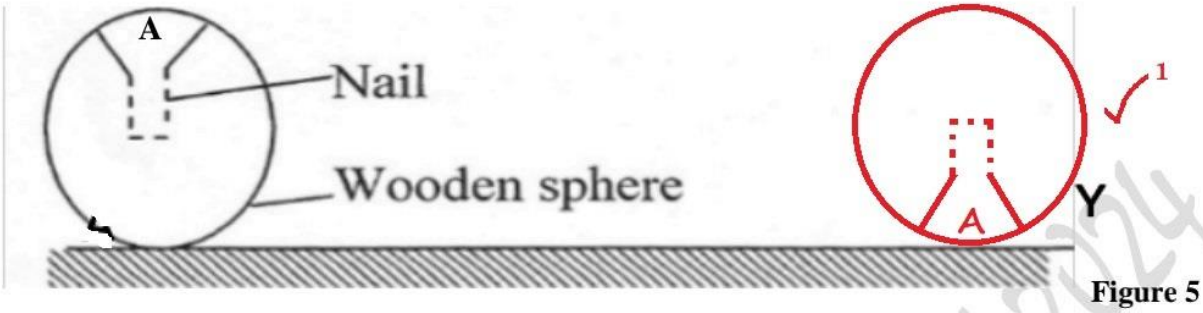


Figure 5

The sphere is rolled on a horizontal ground and comes to rest after some time at **point Y**. Draw the sphere after it comes to rest at **point Y**. (1 mark)

9. a) State the reason why it may be very difficult to suck a liquid using a drinking straw on the surface of the moon (1 mark)

Due to low atmospheric pressure || No atmospheric pressure acting on the liquid surface on the moon. ✓1

b) **Figure 6** shows a car braking system. The brake fluid is an oily liquid

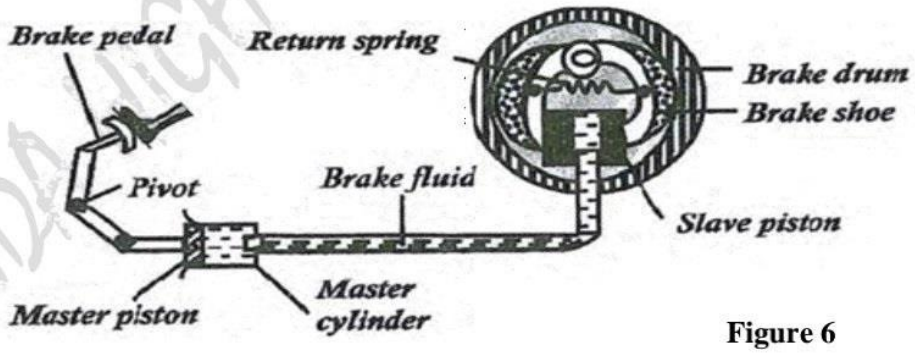


Figure 6

i. State the principle by which a car braking system works. (1 mark)

The pressure applied at one point in a liquid at rest, is transmitted equally to all parts of the liquid if enclosed. ✓1

ii. Explain why the master piston is ~~wider~~ narrower than slave piston (1 mark)

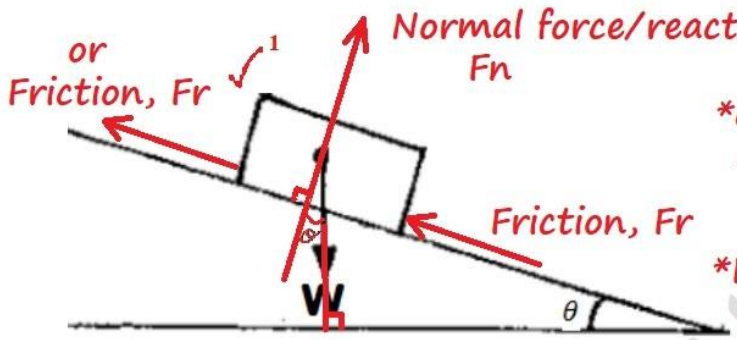
To ensure that only a small effort applied on the pedal, produces a bigger braking force on the slave piston. ✓1

Rev. Peter Okoth

iii. State the function of the return spring in the system (1 mark)

To pull back the brake shoe when the applied force is withdrawn. ✓1

10. **Figure 7** shows a stone of weight **W** placed on an inclined plane and the angle of inclination is θ.



*deny if normal force Fn is not shown to be perpendicular to the surface in contact.

*Fr must act in the direction shown, otherwise deny

Figure 7

a) Indicate with arrows, **two** other forces acting on the stone (2 marks)

b) State how the forces in **a)** above is affected when angle θ increases (1 mark)

-Friction increases
-Reaction decreases
} ✓1 Both must be correct to score the 1 mark

11. Study the set up in **Figure 8** and use it to answer the questions that follows:

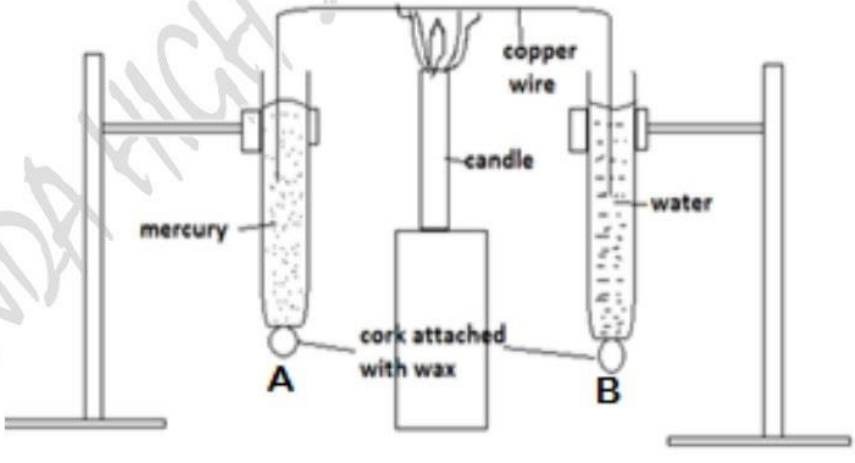


Figure 8

a) State what the experiment illustrates. (1 mark)

Thermal conductivity/rate of conduction/heat conductivity/ conductivity of liquids ✓1

*deny: Thermal/heat conduction/conduction

Rev. Peter Okoth

b) Which cork between **A** and **B** fell off first? Explain (2 marks)

A ✓1

Mercury is a better conductor of heat ✓1

12. **Figure 9** shows a metal wire structure with a loop of thread inside after it was dipped into a soap solution.

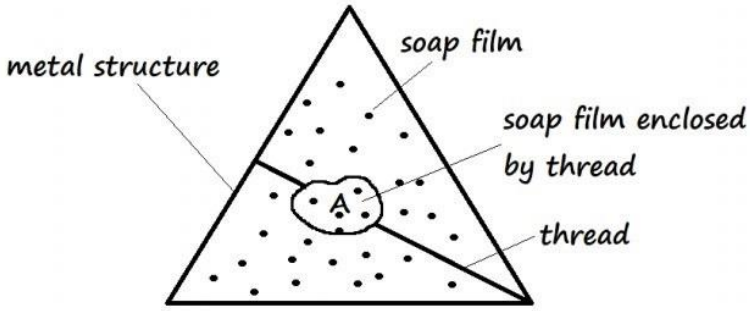
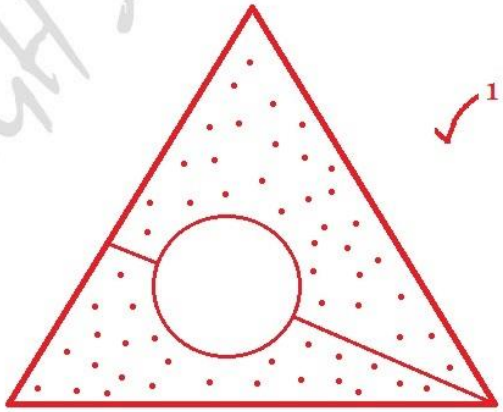


Figure 9

Sketch the appearance of the thread loop after the film is broken at **A** (1 mark)



Mr. Philemon Tambo

SECTION B (55 MARKS)

Answer all questions in the spaces provided

13. a) State the Archimedes principle (1 mark)

A body, partially or wholly immersed in a fluid, experiences an upthrust force equal to the weight of the fluid displaced. ✓1

b) **Figure 10** shows a cube of a certain wood whose density is the same as that of water. The cube is held on the surface of the water in a long cylinder.

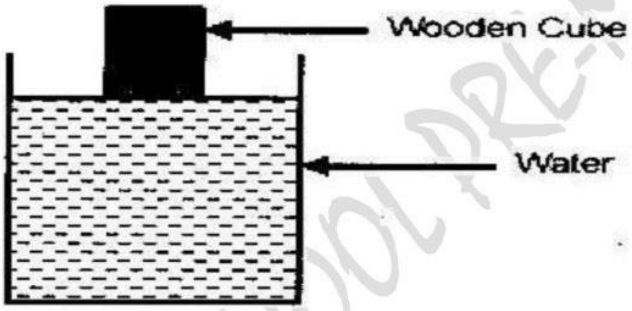


Figure 10

Explain what happens to the cube after it is released. (2 marks)

It sinks with its upper surface at the same level with the water ✓1 surface; displacing water of its own weight. ✓1

c) **Figure 11** shows a cork floating on water and held to the bottom of the beaker by a thin thread

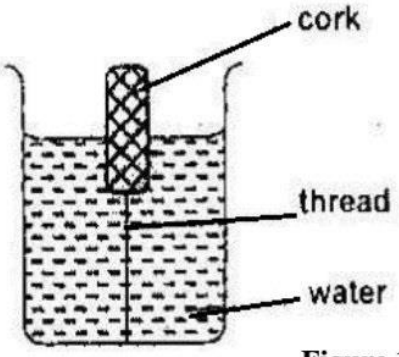


Figure 11

i. Name **three** forces acting on the cork. (3 marks)

-Upthrust ✓1

- Weight of the cork ✓1

-Tension ✓1

Mr. Kennedy Okoth

……

……

……

ii. Describe how each of the forces mentioned in **i)** above changes when water is added into the beaker until it fills up. (3 marks)

-Upthrust increases ✓1 ……

-Weight remains constant ✓1 ……

-Tension increases ✓1 ……

……

d) **Figure 12** shows a tube of varying cross sectional area

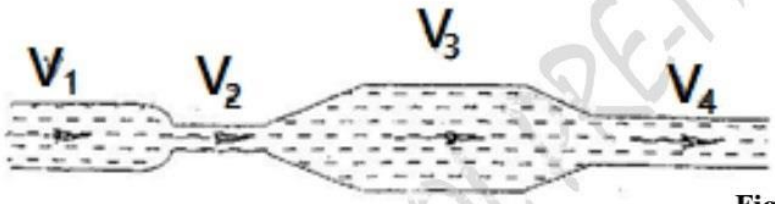


Figure 12

i. Arrange the speed V_1, V_2, V_3 and V_4 in decreasing order starting with the highest. (1 mark)

$V_2 \rightarrow V_4 \rightarrow V_1 \rightarrow V_3$ ✓1 ……

……

ii. State **one** application of fluid flow (1 mark)

-Carburettor ✓1 -Aerofoil -Bunsen burner ……

-Spray gun ……

14. a) A car is negotiating an unbanked circular track.

i. State **two** factors that will determine the critical speed of the car. (2 marks)

-Radius of the circular track ✓1 -Amount of friction ……

-Nature of the road surface ✓1 -Mass of the car …… [any two]

-Condition of the tyres …… -Base area of the tyres (wide/narrow)

-Position of c.o.g.

ii. **Figure 13** shows a car of mass **m** moving along a curved part of the road with a constant speed

Mr. Duncan Ouya

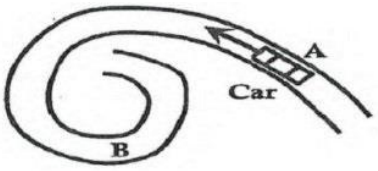


Figure 13

State in which part, **A** or **B** of the road, is the car most likely to skid off if the speed is not changed. (2 marks)

B. ✓1 It has a smaller radius, hence more friction is required to provide sufficient centripetal force. ✓1

b) Given that the car in **a)** above has a mass of 800kg and the circular path is of radius 25m. Determine the maximum speed with which the motorist can travel so as not to skid off. Given the frictional force between the tyres and the road is 6500N. (3 marks)

$F_c = F_r = \frac{mv^2}{r}$ ✓1 formula

$v^2 = \frac{F_c \times r}{m}$

$v = \sqrt{\frac{6500 \times 25}{800}}$ ✓1 correct substitution

$= 14.25 m/s$ ✓1 final answer to at least 4s.f.

c) A 200g mass tied to a string is being whirled in a vertical circle of radius 32cm with uniform speed. At the lowest point, the tension in the spring is 10.5N. Determine:-

i. The speed of the mass (3 marks)

$T = \frac{mv^2}{r} + mg$ ✓1

$10.5 = \frac{0.2 \times v^2}{0.32} + 0.2 \times 10$ ✓1

$v = 3.688 m/s$ ✓1

ii. The tension in the string when the mass is at the uppermost position of the circular path (take g = $10ms^{-2}$) (2 marks)

$T = \frac{mv^2}{r} - mg$

$= \frac{0.2(3.688)^2}{0.32} - 0.2 \times 10$ ✓1

$T = 6.50084N$ ✓1

T.E allowed

Mr. Maurice Asoro

15. a) Explain why water kept in a porous pot on a hot day remains cooler than that contained in a metallic vessel (1 mark)

Water seeps out from the pot, carrying along with it heat of vaporization. ✓1

b) **Figure 14** shows a block of ice with two heavy weights hanging such that the copper wire connecting them passes over the block of ice.

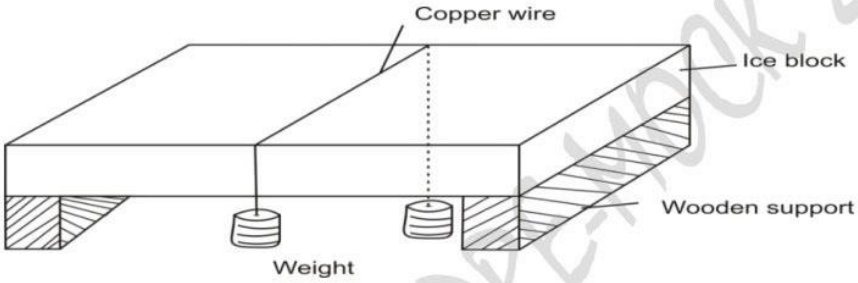


Figure 14

It is observed that the wire gradually cuts its way through the ice block, but leaves it as one piece.

i. Explain this observation. (2 marks)

-Copper wire exerts pressure on the ice, making it to melt at a temperature lower than its melting point ✓1

-The water flows over the wire and immediately solidifies since latent heat of fusion is conducted away from it by the copper wire to melt the ice below. ✓1

ii. State the effect of replacing the copper wire with a cotton thread (1 mark)

It will not cut through the ice block ✓1

c) Distinguish between heat capacity and specific heat capacity. (2 marks)

Heat capacity is the quantity of heat required to raise/change the temperature of a given mass of a material by 1°C or 1K, ✓1 while specific heat capacity is the quantity of heat required to raise the temperature of a unit mass of a substance by 1°C or 1K ✓1

award zero if only one definition is correct

reject if energy alone is used (the word HEAT must appear in the definition).

Mr. Peter Andang'o

d) **Figure 15** shows a set-up that can be used to determine the specific heat capacity of a metal block.

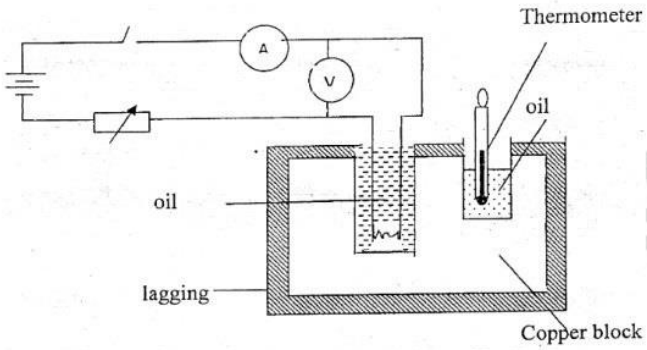


Figure 15

Accept:
*ammeter reading
*voltmeter reading
*potential difference
*stop watch reading

i. State **two** measurements that should be taken in the experiment to determine the specific heat capacity of the block. (2 marks)

*Voltage ✓1 *Current ✓1 *Mass of the metal block and time
*Initial and Final temp of the metal block [any two correct]

ii. Explain how the measurements in **i)** above can be used to determine the specific heat capacity of a metal block. (2 marks)

Electrical heat energy supplied - Heat energy gained by the solid ✓1
[heat energy supplied by heater]

VIt = m c Δθ ✓1 OR VIt = mc($\theta_1 - \theta_2$)

iii. State the functions of the following in the set-up. (2 marks)

a. Lagging

To minimise heat loss through conduction ✓1

b. Oil

To improve thermal contact with the heater and thermometer. ✓1

Mr. Peter Andang'o

16. a) Define the term 'ideal gas' (1 mark)

-A gas that obeys all the gas laws (perfectly) ✓1 OR

-A gas whose volume/pressure/kinetic energy/internal energy is zero/ assumed to be zero/at absolute zero temperature/zero kelvin. ✓1

b) A gas occupies a volume of 4,000 litres at a temperature of 37°C and standard pressure of 1.02×10^5Pa. Determine the new volume of the gas if it is heated at constant pressure to a temperature of 67^0C (3 marks)

Charles' Law $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$\frac{4}{310} = \frac{V_2}{340}$

$V_2 = \frac{4 \times 340}{310} = 4.387m^3$

*accept calculations done using litres

*deny fully if units if units used are wrong

*answer should be correct to about 4s.f.

c) The pressure acting in a gas in a container was changed steadily while the temperature of the gas was maintained a constant value. The values of volume V of the gas were measured for various values of pressure. The graph in **figure 16** shows the relationship between the pressure P and the reciprocal of volume $\frac{1}{V}$

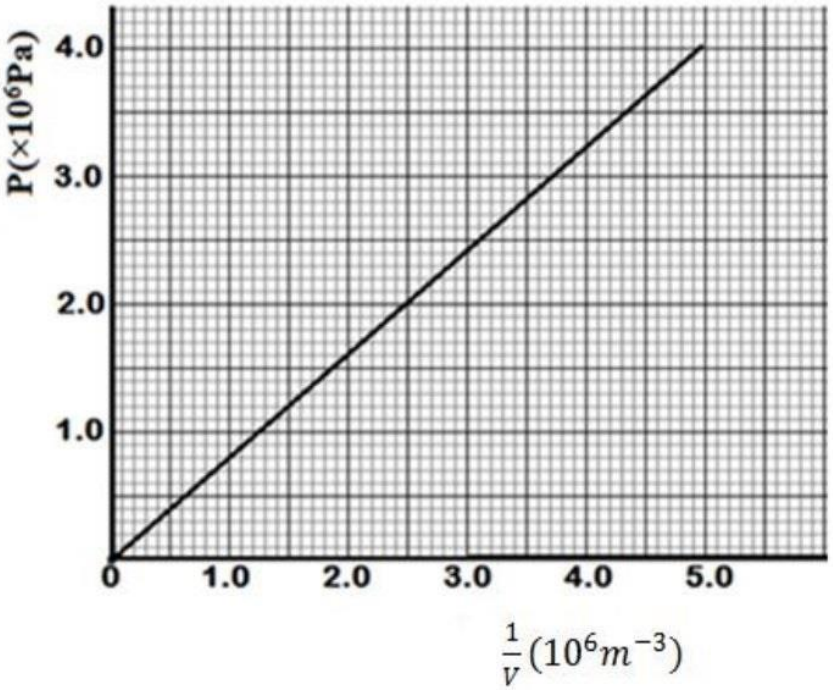


Figure 16

i. Suggest **one** way how the temperature of the gas is kept constant (1 mark)

H.O.D.

.....

.....

ii. Given that the relationship between pressure **P** and volume **V** is given by $PV = k$, where k is a constant. Use the graph to determine the value of k (3 marks)

K = slope/gradient ✓1

$K = \frac{(2.9 - 0)X10^{5}}{(3.5 - 0)X10^{4}}$ ✓1

K = 8.286Nm ✓1

iii. Identify the physical quantity represented by the constant **k** (1 mark)

Work done on the gas ✓1

.....

17. **Figure 17** shows a block and tackle made up of three pulley wheels on top and two pulley wheels at the bottom.

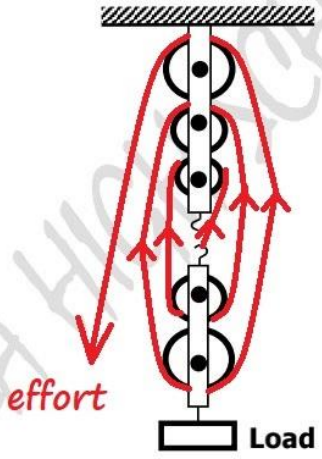


Figure 17

✓1 correct running of the rope and all the tension indicated correctly

✓1 effort direction indicated correctly

a) Complete the diagram by drawing the chain which passes over the wheels and indicate where the effort is applied (2 marks)

b) What is the velocity ratio of the system? (1 mark)

5

c) A load of **1120N** is lifted by an effort of **250N**. Determine

i. The mechanical advantage **(M.A.)** of the system (3 marks)

$M.A. = \frac{L}{E}$ ✓1

$= \frac{1120}{250}$ ✓1 $= 4.48$ ✓1

ii. The efficiency, **E**, of the system (3 marks)

$\eta = \frac{M.A.}{V.R.} \times 100\%$ ✓1 ✓1

$= \frac{4.48}{5} \times 100\%$ ✓1 $= 89.6\%$ *Allow T.E.

iii. How much percentage energy is wasted in the above system (1mark)

$100 - 89.6 = 10.4\%$ ✓1

iv. Using the axes given in **figure 18**, sketch a graph of efficiency, against load for the system (1 mark)

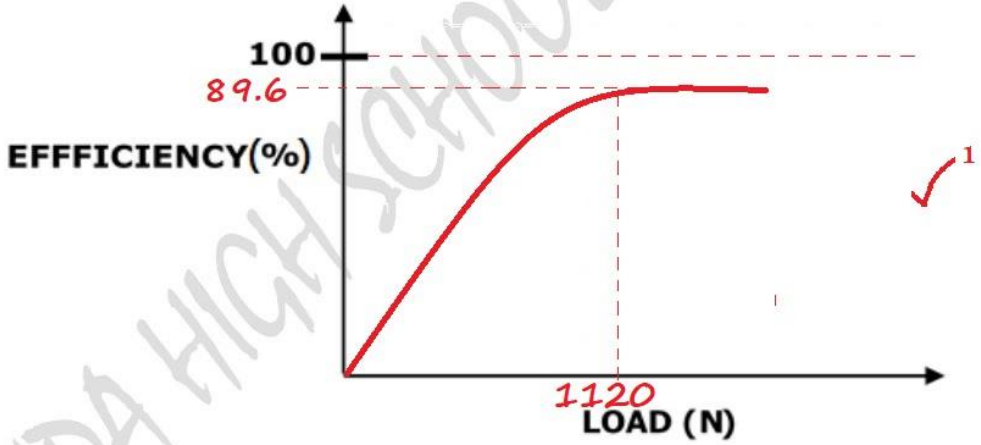


Figure 18

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