Name……………………………………..…………………….. Index ……………..…………………...

Candidates Sign…………………….…………..…

Date ………………………….…………..…....

232/1

PHYSICS

Paper 1(Theory)

TIME: 2 HOURS

Atika School

Free Online Academy

PHYSICS

Paper 1(Theory)

Time: 2 Hours

INSTRUCTIONS TO CANDIDATES

- *Write your name and index number in the spaces provided above.*
- *Sign and write the date of the examination 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.*
- *Take: Acceleration due to gravity, g = $10m/s^2$, Density of water $1g/cm^3$, S.H.C. of water is $4200JKg^{-1}K^{-1}$.*

FOR EXAMINER'S USE ONLY

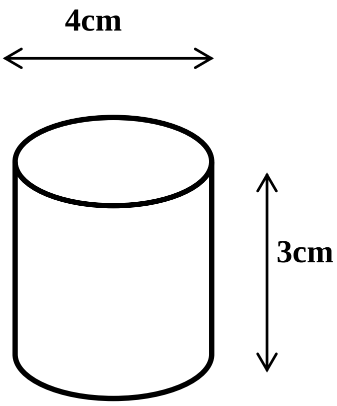
Section	Question (s)	Max. Score	Candidates Score
A	1-11	**25**	
B	12	**11**	
	13	**11**	
	14	**9**	
	15	**13**	
	16	**11**	
	Total	**80**	

This paper consists of 9 printed pages. Candidates should check the question Paper to ensure that all the pages are printed as indicated and no questions are missing

SECTION A (25 MARKS)

Answer ALL questions in this section in the space provided.

1. The mass of the solid cylinder shown in the diagram below is 300g.



Determine the density of the material. (3mks)

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2. A steel needle when placed carefully on water can be made to float. When a detergent is added to the water it sinks. Explain this observation. (2mks)

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3. A pipe of radius 0.4cm is connected to another pipe of radius 0.6cm. If water flows in the wider pipe at a speed of $5ms^{-1}$. What is the speed in the narrower pipe? (2mks)

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4. A block of copper of mass 2 kg and specific heat capacity 400 J/kgK initially at $81^{o}C$ is immersed in water at $20^{o}C$. If the final temperature is $21^{o}C$, determine the mass of water. (3mks)

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5. State how heat losses by convection and radiation are minimized in a thermos flask. (2mks)

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6. A body of mass 25 kg moving with uniform acceleration has an initial momentum of 60 kg m/s and after 10 seconds the momentum is 90 kg m/s. What is the acceleration of the body? (2mks)

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7. State Newton's first law of motion. (1mk)

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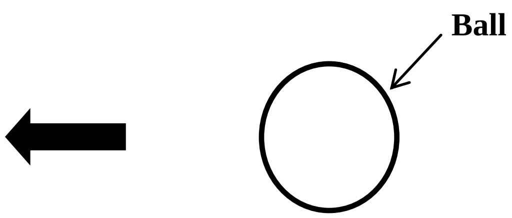
8. The diagram below shows a spinning ball as it moves through air in the direction shown.



Draw streamlines of air around the ball and show the direction in which it spins such that an upward force is created. (2mks)

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9. A certain solid of volume $60cm^3$ displaces $20cm^3$ of a liquid when floating. If the density of the liquid is $600kgm^{-3}$, determine the density of the solid. (3mks)

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10. When a body of mass 0.25kg is acted on by a force, its velocity changes from 5m/s to 7.5m/s. determine the work done by the force. (3mks)

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11. How much work is done in stretching a spring of spring constant 25N/m when length is increased from 1cm to 2cm? (2mks)

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SECTION B (55 MARKS)

Answer ALL questions in this section in the space provided

12. a) Define specific latent heat of vaporization. (1mk)

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b) Steam at 100^0C was passed for some time into ice at 0^0C. At the end, temperature of the water obtained was 52^0C and its mass 2g. Calculate;

I. The heat lost by steam (3mks)

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……

II. Mass of the ice used. (3mks)

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c) Other than using steam, describe briefly using a diagram how you would experimentally determine the latent heat of fusion of ice. (3mks)

d) Give a reason why it is not advisable to melt ice directly using an electric heating coil. (1mk)

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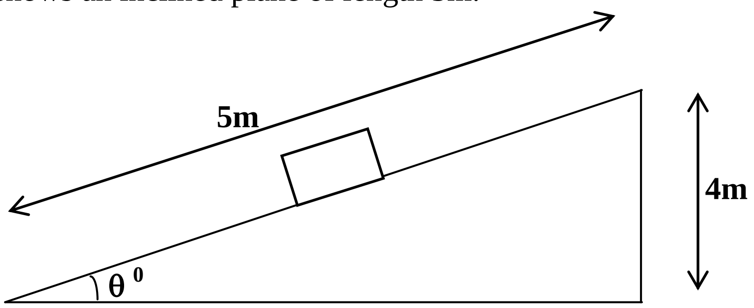
13. The figure below shows an inclined plane of length 5m.



a) Find the velocity ratio of the inclined plane. (2mks)

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b) Sketch the possible arrangement of the pulleys with a velocity ratio of 4. (2mks)

c) The table below shows the readings for various masses hung from a spring balance.

Mass(kg)	0	0.02	0.4	0.6	0.8	1
Reading(mm)	120	131	141	150	162	170
Force(N)						
Extension(mm)						

I. Complete the table above. (2mks)

II. Plot the graph of the force (N) against extension (mm) on the grid provided below. (4mks)

III. From the graph, determine the extension when a mass of 0.045 kg is hung from the spring (1mk)

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14. (a) State the pressure law for an ideal gas. (1 mk)

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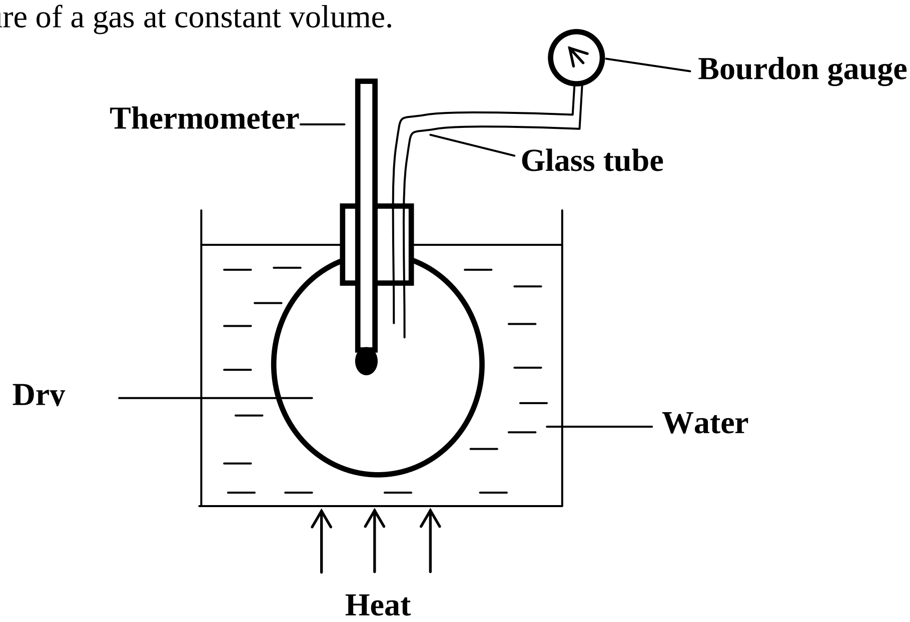
(b) The set up shows an arrangement to determine the relationship between temperature and pressure of a gas at constant volume.



i) Describe how the measurements are obtained in the experiment. (3mks)

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ii) Explain how the results from the experiment can be used to determine the relationship between temperature and pressure. (2mks)

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(c) A bicycle tyre is pumped to a pressure of 2.2×10^5Pa at 23^0C. After a race the pressure is found to be 2.6×10^5Pa. Assuming the volume of the tyre does not change, what is the temperature of the air in the tyre? (3mks)

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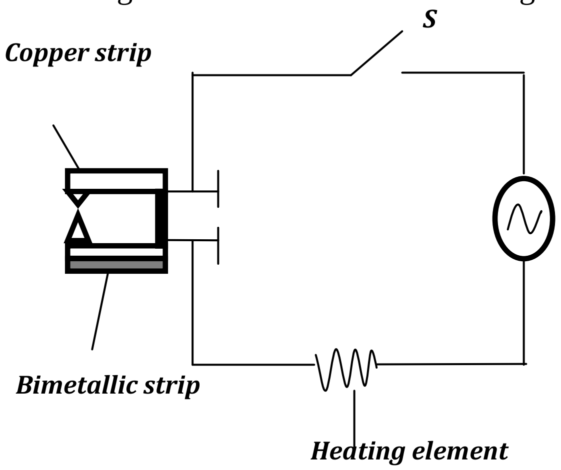
15. a) The figure below shows a circuit diagram for a device for controlling the temperature in a room.



i) Explain the purpose of the bimetallic strip. (2mks)

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……

ii) Describe how the circuit controls the temperature when the switch is closed. (2mks)

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b) i) Explain why bodies in circular motion undergo acceleration even when their speed is constant. (2mks)

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ii) A particle moving along a circular path of radius 5cm describes an arc of length 2cm every second. Determine:

I. Its angular velocity. (2mks)

……

……

II. Its periodic time. (2mks)

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iii) A stone of mass 40g is tied to the end of a string 50cm long and whirled in a vertical circle at 2rev/s. Calculate the maximum tension in the string. (3mks)

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16. a) State Archimedes' principle. (1mks)

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b) A rectangular block of cross-sectional area $0.08m^2$ is immersed in a liquid of density $1200kg/m^3$. The top and the lower surfaces are 20cm and 80cm below the surface of the liquid respectively.

i. What is the upward force on the bottom surface of the block? (2marks)

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………

ii. Calculate the up thrust on the block. (2mks)

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A wooden block of mass 400kg is floating with 20% of its volume above the water level.

Determine:

i) The force needed to submerge it completely. (3mks)

ii) The density of the wood. (density of water is $1000kgm^{-3}$) (3mks)

PHYSICS PAPER1 MAKING SCHEME

1. Volume = $\pi r^2 h$

   $= \pi \times 0.02^2 m^2 \times 0.03m$

   Density = m/v

   $= \frac{0.3}{3.14 \times 0.02^2 \times 0.03}$

   $= 7962\ kgm^{-3}$

2. The cohesive forces of water molecules are weaken and finally broken by the entry of the detergent molecules

   - Since the detergent molecules are impure in water, the forces holding water molecules are weakened and finally broken

3. $A_1 V_1 = A_2 V_2$

   $A_1 = {}^{22}/_7 \times (0.4 \times 10^{-2})^2 = 5.03 \times 10^{-5} m^2$

   $A_2 = {}^{22}/_7 \times (0.6 \times 10^{-2})^2 = 1.13 \times 10^{-4} m^2$

   $V_2 = 15 m/s$

   $V_1 = \frac{A_2 V_2}{A_1} = \frac{1.13 \times 10^{-4}}{5.03 \times 10^{-5}} \times 15$

   $= 33.7 m/s$

4. $M_c C_c \Delta\theta = M_\omega C_\omega \Delta\theta$

   $2 \times 400 Jkg^{-1} \times (81 - 21) =$

   $Mw \times 4200 (21 – 20)$

   $Mw = \frac{800 \times 60}{4200} = 11.34kg$

   Convection – having vacuum between double walls

   Radiation – shinny/ silvery walls

5. Ft = mv- mu

   Mv= 60 kg m/s

   T = 10s

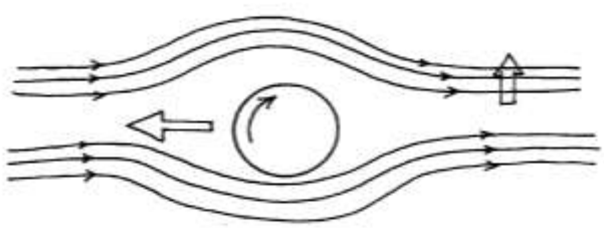
   $F = \frac{90 – 60}{10} = 3N$

But F = ma ⟶ a = f/m = 3/25 = 0.12m/s

$a = 0.12 m/s^2$

7. If a body is at rest it remains at rest or if it is in motion it moves with uniform velocity until it is acted on by a resultant force.

8.



9. Mass of liquid displace = density x volume

   $= 0.6 g/cm^3 \times 20 cm^3 = 12g$

   Law of flotation – a body displaces its own weight and w = mg i.e

   Mass of liquid displaced = mass of solid

   Density of solid $= \frac{12g}{60cm^3} = 1/5$

   $= 0.2 g/cm^3$ or $200 kg/m^3$

10. Work done = Δ K .e.

    $= ½ mv^2 – ½ mu^2$

    $= ½ \times 0.25 \times 7.5^2 – ½ \times 0.25 \times 5^2$

    = 3.92J

11. Work done = ½ Ke   K- Spring constant

12.5 e - extension

= ½ x 25 N /m x 0.01m^2

= 0.125 x 0.01 = 1.25 x 10^{-4} Nm

SECTION B

(a) Quantity of heat required to change the state of a liquid (1kg) into gas at constant temperature

(b) (i) (2.6 x 10^6)+ 4200 (2x 10^{-5})= 4.93 x 10^3J

(ii) m (3.3 x 10^5)+ 4200 (52-0)= 4.93 x 10^3

M= 8.9x 10^{-2}kg

(c) Electrical method

- Switch on control and start the clock simultaneously
- Record the ammeter and the voltmeter readings I and V respectively
- When an appreciable amount of water has collected in the beaker, record its mass m and time take t

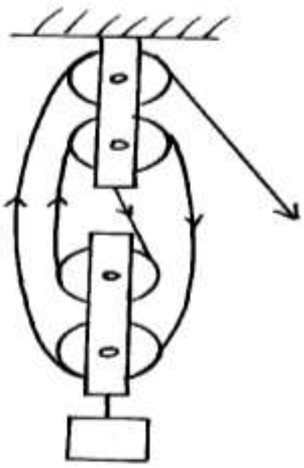
Use Lf = VIt/m

(d) The melt water is a poor conductor of hear so local heating could raise the temperature slightly beyond

13. (a) Velocity ratio = $\frac{1}{\sin\theta}$ = $\frac{1}{0.8}$

= $^{10}/_8$ = 1.25

(b)



V.R=4

Load

(c)

Force	0	2.0	40	6.0	8.0	10
Extension (mm)	0	11	21	30	42	50

Graph

(e) Extension = 22.5 +- 1mm

14 (a) Pressure of a fixed mass of gas is directly proportional to the absolute temperature provided volume is kept constant.

(b) (i)- Initial pressure and temperature noted and recorded

- The water bath is heated and in turn heats the air in the flask. The values of T and P are taken at a given intervals
- (ii) The results obtained are used to draw a graph of pressure against temperature.
- A straight line graph is obtained, if the temperature is in Kelvin , the line passes through the origin

(iii) $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

$\frac{2.2 \times 10^5}{} = \frac{2.6 \times 10^5}{}$

$\frac{}{296} \quad \frac{}{T_2}$

$T_2 = 76.82$ K

15. (a) (i) To make and break the contact or circuit

The strip bends and straightens when the metals contracts or expands at different rates.

(ii) When the switch is closed, current flows and heating takes place when the strip is heated, it bends a way from the contact. This disconnects the heater. When the strip cools down, it reconnects and the process continues

(b) (i) Velocity is not constant since its direction changes at every instant

(ii) (I) $V = r\omega = V/r = \frac{0.02}{0.05}$ $Rads^{-1}$

(II) $\omega = 2\pi f$

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

$= \frac{2x3.14}{0.4} = 15.71s$

(III) Maximum tension $= mg + m\omega^2 r$

$= mg + mv^2/r$

$= \frac{40}{1000} \times 10 + \frac{40}{1000} \times \frac{0.02}{0.5}$

$= 3.56N$

16. (a)When a body is wholly or partially immersed in a fluid, it experiences un upthrust equal to the weight of the fluid displacement

(b) (i) force on the top surface= weight of fluid above the surface

= area x pressure

= 0.08 x 0.2 x 1200 x 10

=192N

(ii) weight of liquid displaced = upward force

$=\rho gh$

= 0.08x1200x10x0.8

= 768N

(iii) upthrust = 768N – 192N

= 576N

(c) (i) weight of the water displaced = 4000N

Volume of water displace $= m/\rho$

$= \frac{400}{1000} = 0.4m^3$

Volume above the water surface

= 0.5- 0.4

$= 0.1m^3$