**NAME: -------------------------------------------------CLASS--------ADM. NO. -------------- DATE: ----------------------------------Sign. ---------------------------------------------**

**OCT. EXAM 2014**

**FORM THREE**

**PHYSICS**

**PAPER 1 (THEORY)**

**2 HOURS**

**INSTRUCTIONS TO THE CANDIDATES:**

1. ***Write your name, class and admission number in the spaces provided above.***
2. ***Answer all the questions both in section A and B in the spaces provided below each question***
3. ***All workings must be clearly shown; marks may be awarded for correct steps even if the answers are wrong***
4. ***Non programmable scientific calculators and mathematical tables may be used.***
5. ***All numerical answers must be expressed in decimal notation.***
6. ***This paper has 13 printed pages .It is the responsibility of the student to ensure that there are no missing* *pages.***
7. ***All answers must be written in English***

**CONSTANTS**

80

g=10N/Kg

Density of mercury=13600kg/m3

Density of water=1000kg/m3

Density of Air=1.25kg/m3

**SECTION A 25 MARKS**

***Answer all questions in this section***

1) When an inflated balloon is placed is a refrigerator, its volume reduces .Explain.

------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(1 mark)

2)A student holds a sheet of paper at an end so that it hangs in the position **A** as shown below

**B**

**A**

**Blow air**

**Sheet of paper**

Explain why the paper rises to the position B when the student blows air in the direction shown by the arrow (2marks)

------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

3) A turning effect of force depends on the magnitude of the force. State **one** other factor that determines the moment of a force (1mark)

--------------------------------------------------------------------------------------------------------------------4) Two objects made of the same material and having the same mass are heated to a temperature of 35oC above that of the atmosphere and then allowed to cool in still air for 30 minutes. State one factor that will determine their final temperature (1mark)

--------------------------------------------------------------------------------------------------------------------

5) The figure below shows the change in volume of water in a measuring cylinder when an irregular solid is immersed in it.

**160cm3**

**160cm3**

**120cm3**

**120 cm3**

**80 cm3**

**80 cm3**

**40 cm3**

**40 cm3**

**0 cm3**

**0 cm3**

Given that the mass of the solid is 555g, determine the density of the solid in SI units. (Give your answer correct to 2 decimal places.) (3marks)

--------------------------------------------------------------------------------------------------------------------

-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

6) An immersion heater rated at 200 W is placed in a liquid of mass 2 kg. When the heater is switched on for 7.5 minutes the temperature of the liquid rises by 300C. Determine the specific heat capacity of the liquid. (2marks)

--------------------------------------------------------------------------------------------------------------------

---------------------------------------------------------------------------------------------------------------------

--------------------------------------------------------------------------------------------------------------------

---------------------------------------------------------------------------------------------------------------------

7) State how the velocity of a moving fluid varies with pressure. (1mk)

---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

8) The figure below shows a uniform bar pivoted at its centre and is at equilibrium.

W 35 cm

30 cm 50 cm

30 N 5 N

Determine the value of **W**. (3marks)

--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

9) The figure shows the velocity time graph of two identical spheres released from the surfaces of two liquids **A** and **B**.

**Velocity m/s)**

**Time (s)**

**BA**

Give a reason why the terminal velocity of the sphere In B is higher than in A (1mark)

--------------------------------------------------------------------------------------------------------------------

---------------------------------------------------------------------------------------------------------------------

10) A box of mass 500g is dragged along a level ground at a constant speed of 15 m/s. If the force of friction between the box and the floor is 2000N, calculate the power developed. (2marks)

--------------------------------------------------------------------------------------------------------------------

---------------------------------------------------------------------------------------------------------------------

11) Sketch on the axes provided, a graph to show how mass per unit volume of water varies with temperature when water is heated from 00C to 100C (2marks)

**Mass per unit volume (g/cm3)**

Temperature (0C)

12) The spiral springs shown in figure below are identical. Each spring has a spring constant k = 250N/m



Determine the total extension of the system (take the weight of the cross bars to be negligible) (3 marks)

--------------------------------------------------------------------------------------------------------------------

---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

13) A mercury barometer reads 700mmHg at the top of a hill 550m high. What will be the barometer reading at the bottom of the hill?-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(3marks)

**SECTION B (55 MARKS)**

***Answer all questions in this section***

14) a) In a hydraulic brake system a force of 60N is applied on the foot pedal connected to the master piston of area 0.0005m2 and this causes a stopping force of 7500N.Calculate the :

i) Pressure in the master piston

---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(2marks)

ii) Area of the slave piston.

---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(2marks)

iii) State **one** property of the liquid that makes it more suitable for use as a brake fluid

-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(1mark)

iv) Why would the system not function properly if air leaked into the cylinder?

--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(1mark)

15(a) When smoke particles are observed through a microscope in a smoke cell which is illuminated from the side by a strong beam of light, they are observed to move in a random motion.

i) State the name given to the random motion. ---------------------------------------------------------------------------------------------------------------------------------------------------------------------- (1mark)

ii) What is the purpose of the microscope? ------------------------------------------------------------------------------------------------------------------------------------------------------------------------- (1mark)

iii) What causes the random motion?------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------- (1mark)

iv) How can one differentiate small smoke particles from the large particles?

------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(1mark)

v) Why are smoke particles preferred in this experiment?

--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(1mark)

b) In the figure below, ammonia gas and an acid gas (concentrated hydrochloric acid- HCL) diffuse and react to form a white deposit on the walls of a long glass tube as shown.

Cork A white deposit B

Ammonia gas acid gas

Cotton wool soaked in concentrated ammonia

Cotton wool soaked in concentrated HCl

i) What conclusion can be made from the result of this experiment? (1mark)

---------------------------------------------------------------------------------------------------------------------

ii) The experiment is performed at a higher temperature. Explain how the time taken to form the white deposit would be affected.

-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(2marks)

16) a) Define the term specific latent heat of vaporization.

------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(1mark)

b) In an experiment to determine the specific latent heat of vaporization of water, steam at 1000C was passed into water contained in a well lagged calorimeter. The following measurements were made:

Mass of calorimeter = 60g

Initial mass of water = 80g

Initial temperature of water = 50C

Final mass of water + calorimeter + condensed steam = 145.5g

Final temperature of mixture = 400C

Specific heat capacity of water = 4200J Kg-1K-1

Specific heat capacity of copper = 390 JKg-1K-1

Determine

(i) Mass of condensed steam (1mark)

.-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(ii) Heat gained by water and calorimeter (2marks)

.-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

(c) Given that L is the specific latent heat of vaporization of steam above.

(i) Write down an expression for the heat given out by steam to the final temperature (1mark)

-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

---------------------------------------------------------------------------------------------------------------------

(ii) Determine the value of L

.-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(3marks)

d) State **one** difference between evaporation and boiling

-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(1mark)

**17**a) State the law of conservation of linear momentum

------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(1mark)

(b) A student pulls a block of wood of mass 5kg along a horizontal surface with uniform velocity by applying a force of 12N. Calculate the co- efficient of friction on the surface.

---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(3marks)

c) A trolley of mass 0.6kg moving with a velocity of 1.5m/s collides inelastically with a second trolley of mass 1.4kg moving in the same direction with a velocity of 0.2m/s. Determine the velocity of the trolleys after collision--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(3marks)

d) State two methods of minimizing solid friction.

-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(2marks)

**18**) a)State Boyle’s law

------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(1mark)

(c) Dry air is trapped inside a long glass tube by a thread of mercury 210mm long. The air column is 240mm when held horizontally. The atmospheric pressure is 760mmHg,

Air mercury

240mm 210mm

i) State the pressure of the enclosed air in mmHg.

--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(1mark)

ii) The tube is now held as shown in the diagram below:

210mm

Mercury

Air

Determine

1. The pressure of the enclosed air in Pascal.

------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(3marks)

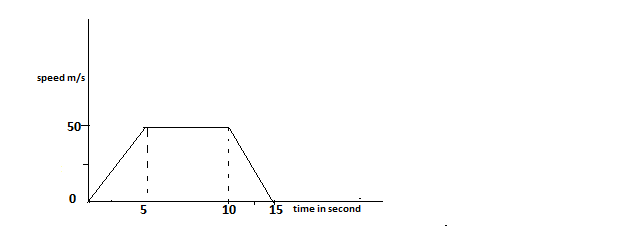
1. he length of the enclosed air column

-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------(3marks)

19. (a) Define the term acceleration (1mark)

------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

b) Below is a velocity-time graph of a public service vehicle.



Determine the distance covered. (2marks)

----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

(c) A bullet is fired horizontally at a velocity of 400m/s from a cliff of height 50m.

Calculate the; i) Time taken for the bullet to hit the ground. (2marks)

------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

ii) Range. (2marks)

-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

20) In an experiment to estimate the diameter of an oil molecule, an oil drop of diameter 0.05cm spreads over a circular patch whose diameter is 20cm:-

a) Determine the:-

1. Volume of the oil drop. (2 marks)

---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

1. Area of the patch covered by the oil. (2 marks)

--------------------------------------------------------------------------------------------------------------------

------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

1. Diameter of the oil molecule. (3 marks)

---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

b) State:-

1. Any **one** assumption made in a(iii) above. (1 mark)

---------------------------------------------------------------------------------------------------------------------

1. **One** possible source of error in this experiment. (1 mark)

--------------------------------------------------------------------------------------------------------------------

**THIS IS THE LAST PRINTED PAGE**