NAME:……..……INDEX NO:…….....

CANDIDATE'S SIGN:……..……

232/1
PHYSICS
PAPER 1 **DATE:……..……...**
(THEORY)
AUGUST, 2022
TIME: 2 HOURS

SUKELLEMO JOINT EXAMINATIONS – 2022

INSTRUCTIONS TO THE CANDIDATE:

(a) *Write your **name** and **index number** in the spaces provided above.*
*(b) **Sign** and write the **date** of examination in the spaces provided above.*
*(c) This paper consists of **two** Sections **A** and **B**.*
(d) There are 14 printed pages, with 18 questions check to confirm that your paper is complete.
*(e) Answer **all** the questions in sections **A** and **B** in the spaces provided.*
*(f) All working **must** be clearly shown in the spaces provided.*
*(g) Mathematical tables and electronic calculators **may be** used.*

FOR EXAMINER'S USE ONLY:

Section	Question	Maximum Score	Candidate's Score
A	1 – 13	25	
B	14	12	
	15	12	
	16	12	
	17	09	
	18	10	
Total Score		80	

This paper consists of 13 printed pages. Students should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

SECTION A (25 MARKS)

1. A Vernier calliper was used to measure the diameter of a ball bearing. Given that its diameter is 2.36 cm, draw a Vernier calliper scale showing this reading. (2 marks)

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2. χm^3 of a substance which has a density of $0.8/gcm^3$ is mixed with $1000cm^3$ of sea water of density $1020kg/m^3$. The density of the mixture is $960kg/m^3$. Determine the value of χ. (3 marks)

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3. When building a house using bricks a damp course is laid just above the brick foundation. Explain why the damp course is necessary. (1 mark)

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4. A sprig whose spring constant is 25N/m extends when supporting a certain load. It's length increases from 0.1m to 0.2m. Determine the work done in stretching the spring. (2 marks)

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5. Figure 1 below shows a trolley moving on a circular rail with a vertical plane, given that the mass of the trolley is 250g and the radius of the rail is 1.6m.

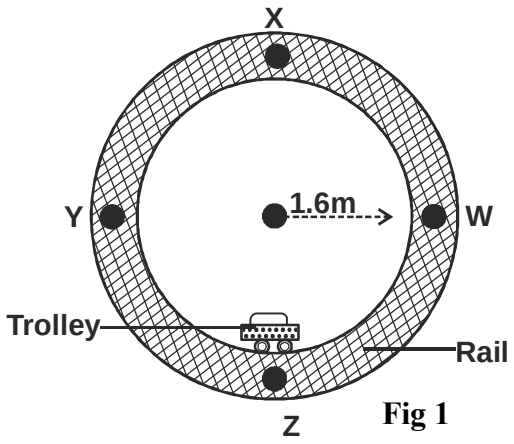

Fig 1

Determine the force exerted on the rail at point Z if the velocity of the trolley at this point is 4m/s.

(3 marks)

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6. Explain why gases are compressible. (1 mark)

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7. A 100cm uniform wooden plank BC of mass 600g is balanced horizontally by a mass M placed at 90cm mark when an inextensible string is tied at 60cm mark as shown in the figure 2 below.

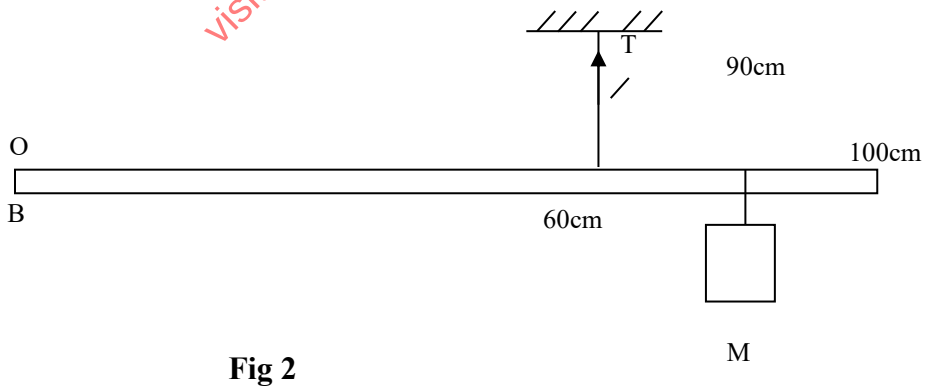

Fig 2

Calculate the tension T in the string. (3 marks)

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8. I) Figure 3 below shows a thermometer used by a doctor to determine the temperature of a patient. Why is it difficult to work with this thermometer? (1 mark)

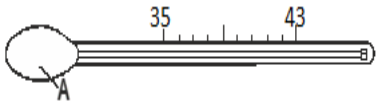

Fig 3

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II) Give a reason why the thermometer above cannot be sterilized by using boiling water.

(1 mark)

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9. Figure 4 below shows samples of the same liquid B and C being heated through a well-lagged copper rod of non-uniform cross-sectional area. A thermometer is placed in each sample for sometime.

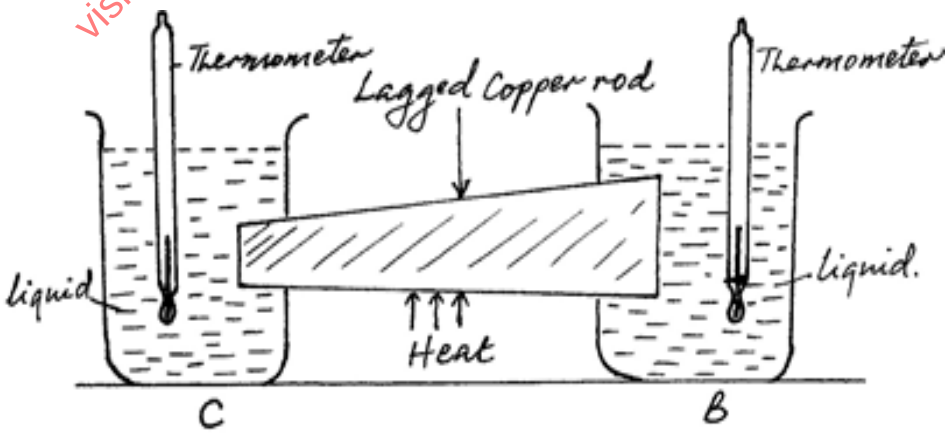

Figure 4

If the rod is being heated at the middle, state and explain which of the thermometers records a higher temperature. (2 marks)

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10. Water flows through a narrow pipe of radius 6cm connected to another pipe of radius 9cm. If the speed of water in the narrow pipe is 3m/s, determine the speed of water in the wider section. (3 marks)

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11. Give the transducer used to convert mechanical energy to electrical energy. (1 mark)

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12. A stone is thrown vertically upwards from an edge of a platform. Eventually the stone lands without bouncing, on the ground below the platform. Taking the upward velocity to be positive, sketch, on the axes provided the velocity-time graph of the motion of the stone. (1 mark)

13. Figure 5 below shows a marble placed on an inverted bowl.

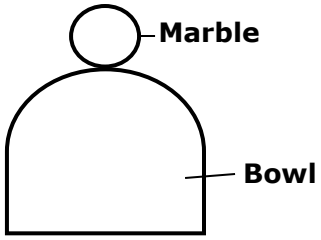

Fig 5

State the type of equilibrium the marble is in. (1 mark)

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SECTION B (55 MARKS)

14. a) Define specific latent heat of vaporization of a substance. (1 mark)

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b) State two ways by which the rate of evaporation of a liquid may be increased. (2marks)

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c) In an experiment to determine the specific latent heat of vaporization of water, steam at 100ºC was passed into water contained in a well-lagged copper calorimeter. The following measurements were made:

- Mass of calorimeter = 60g
- mass of water + calorimeter = 145g
- Final mass of calorimeter + water + condensed steam = 156g
- Final temperature of the mixture = 48ºC

[Specific heat capacity of water = $4200Jkg^{-1}K^{-1}$ and specific heat capacity of copper = $390Jkg^{-1}K^{-1}$]

Determine the;

(i) mass of condensed steam. (1 mark)

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(ii) The heat gained by the water and calorimeter if the initial temperature of the calorimeter and water is 20ºC.

(3mks)

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(iii) Given that $\mathbf{L_v}$ is the specific latent heat of vaporization of steam, write an expression for the total heat given out by steam. (2 marks)

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(iv) Determine the value of $\mathbf{L_v}$ above (2 marks)

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(v) State the assumption made in the above experiment. (1 mark)

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15. (a) State Boyle's law for an ideal gas. (1 mark)

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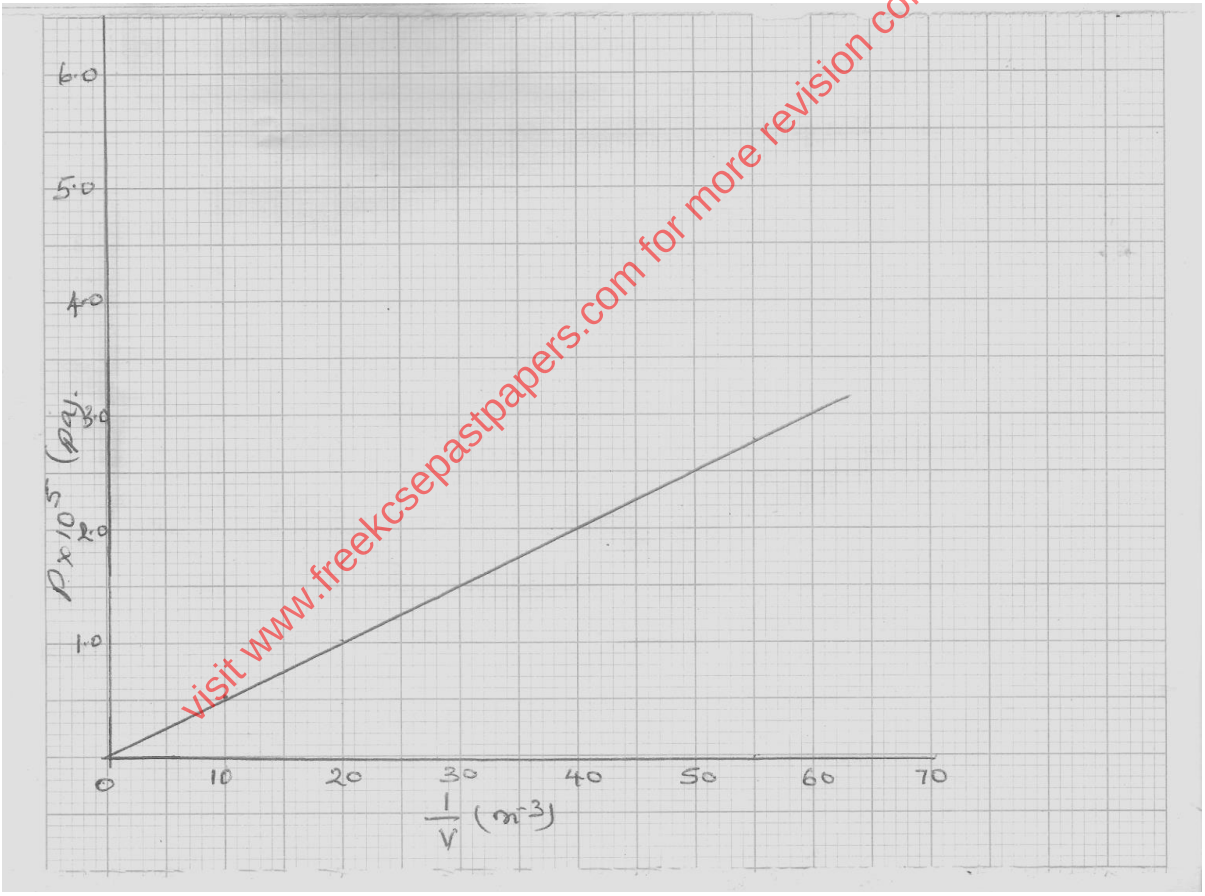
(b) The pressure P of a fixed mass of a gas at a constant temperature of T = 200K is varied continuously and values of corresponding volume recorded. A graph P against $\frac{1}{V}$ is shown on grid below.



Use the graph to

(i) determine the volume of the gas when the pressure reads 2.8 x 10^5pa . (2 marks)

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(ii) the slope of the graph. (2 marks)

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iii) Given that $T = \frac{PV}{2R}$, where R is a constant, use the slope obtained in (ii) above to find the value of R. (3 marks)

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c) A certain mass of hydrogen gas occupies a volume of $1.6m^3$ at a pressure of $1.5x10^5Pa$ and a temperature of 12^0c. Determine the volume when the temperature is 0^0c at a pressure of $1.0x10^3Pa$.

(2 marks)

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d) State any two assumptions made in kinetic theory of gases. (2 marks)

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16. a) A ball bearing x is dropped vertically downwards from the edge of the table and it takes 0.5s to hit the floor below. Another ball bearing Y leaves the edge of the table horizontally with a velocity of 5m/s. Find:

i) The horizontal distance travelled by Y before hitting the floor. (2 marks)

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ii) The vertical distance of the table top above the floor level. (2 marks)

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b. I) State Newton's second law of motion. (1 mark)

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II) A bullet mass of 22g travelling horizontal with a velocity of $300ms^{-1}$ strikes a block of wood of mass 1978g which rests on a rough horizontal surface. After impact the bullet and the block move together and come to rest when the block has travelled a distance of 5m. Calculate:

i) The velocity of bullet and wood after impact. (2 marks)

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ii) The force of friction between wood and surface. (2 marks)

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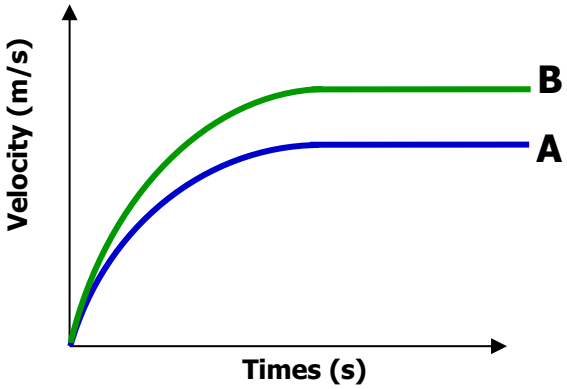
c. Figure below shows the velocity time graph of two identical spheres released from the surfaces of two fluids A and B



(i) State with reason, the fluid with a higher viscosity. (2 marks)

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(ii) Mark on the diagram the terminal velocity on the sphere in each fluid. (1 mark)

17. a) i) Dams which hold water reservoirs are thick at the base than at the top. Explain. (1 mark)

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(i) Define the term pressure and state its SI units. (2 marks)

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ii) The diagram below shows a brick of mass 4kg. The brick measures 30cm x 6cm x 3cm

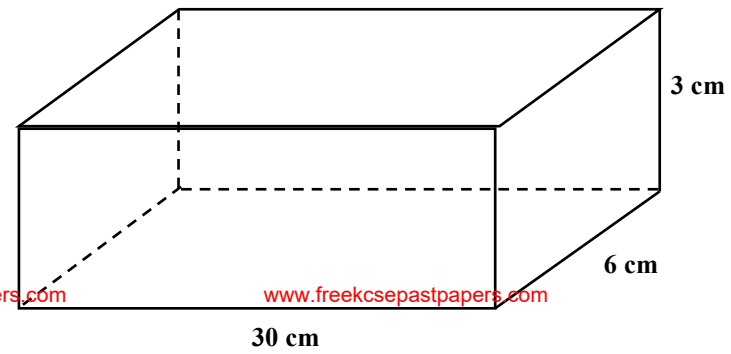

Fig 5

The brick is laid in a away such that it exerts maximum pressure. Calculate the maximum pressure the brick will exert on the surface. (3 **marks**)

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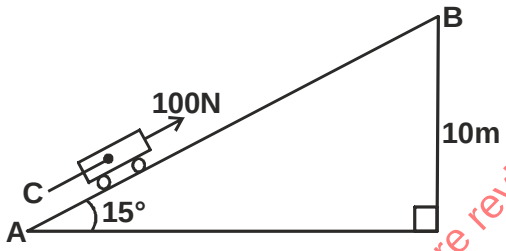
b) Figure 7 below shows an inclined plane, a trolley of mass 30kg is pulled up a slope by a force of 100N parallel to the slope. The trolley moves so that the centre of mass C travels from points A to B.



Determine the efficiency of the system. (3 marks)

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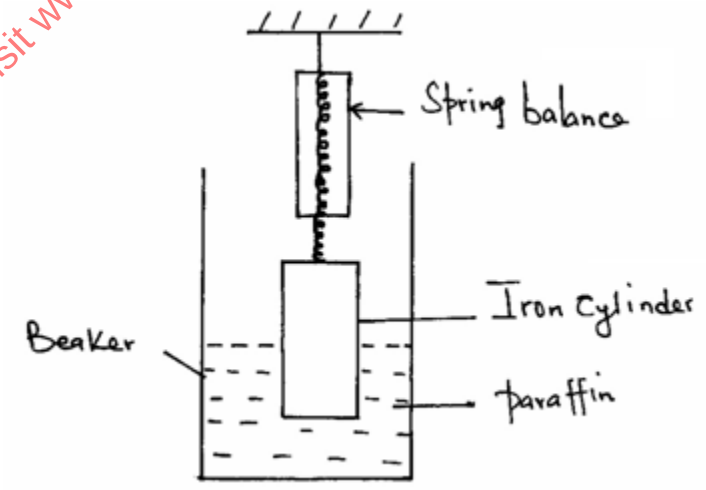
18. The figure below shows an iron cylinder of length 10cm and uniform cross-section 2cm² suspended from a spring balance with half of its length immersed in paraffin oil of density 0.8gcm⁻³.



(i) Show on the diagram, the forces acting on the iron cylinder. (3 marks)

(ii) If the density of iron is $7.5gm^{-3}$ determine.

(i) the weight of the iron cylinder. (3 marks)

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(ii) the reading of the spring balance. (3 marks)

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(d) Explain how a submarine is made to sink to a point below the surface of water. (1 mark)

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