URANGA PHYSICS EXAMINATION

Kenya Certificate of Secondary Education
JOINT EXAMINATIONS 2021
FORM 3

232/1 PHYSICS Paper 1

June 2021 – TIME 2 Hours

Name: …… **Adm No**: ……..……

Candidate's Signature: ……..... **Date**: ……/06/2021.

INSTRUCTIONS TO CANDIDATES:

- Write your **name**, **admission number** and **date** 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.
- Candidates should answer the questions in **English**.

Take: $g = 10 m/s^2$, ***density of water*** $= 1000 kg/m^3$. ***density of alcohol*** $= 800 kg/m^3$**.**

For Examiner's Use Only:

SECTION	QUESTIONS	MAXIMUM SCORE	CANDIDATE'S SCORE
A	1 – 12	25	
B	13	10	
	14	15	
	15	8	
	16	11	
	17	7	
TOTAL		80	

This paper consists of 11 printed pages. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

SECTION A (25 MARKS)

Answer ALL questions in this section.

1. Name the branch of Physics which deals with the kinetic energy within the molecules of matter. (1 mark)

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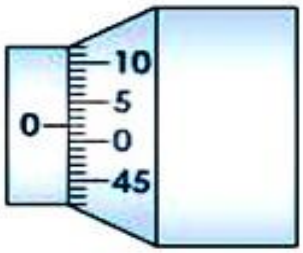
2. The diagram below shows a micrometer screw gauge with its jaws closed.



   a) Identify the zero error in the instrument. (1 mark)

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   b) The above instrument was then used to measure the thickness of a ball bearing whose radius is $1.73mm$. Determine the scale reading of the instrument. (2 marks)

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3. A density bottle was used to measure the density of a liquid L and the following measurements were taken.
   - Mass of empty density bottle = 26.0g.
   - Mass of density bottle filled with alcohol = 66.0g.
   - Mass of density bottle filled with liquid L = 86.0g.

   Calculate the density of liquid L. (2 marks)

4. A group of form 2 students investigated the springs used as shock absorbers in a lorry and those used in a motor cycle. State two physical features differentiating the two types of springs. (2 marks)

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5. Explain how the position of the centre of gravity of a body determines whether it is in *stable* or *unstable* equilibrium. (2 marks)

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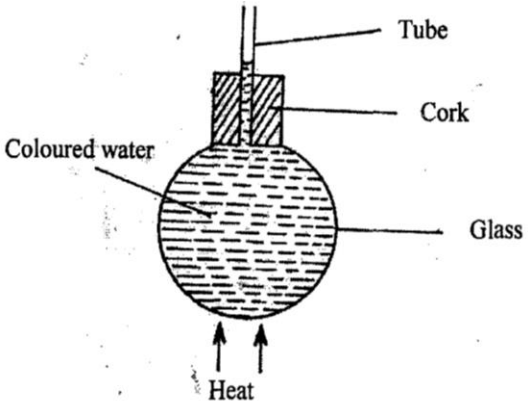
6. In the setup shown below, it is observed that the level of the liquid in the tube initially drops before starting to rise.



Explain this observation. (2 marks)

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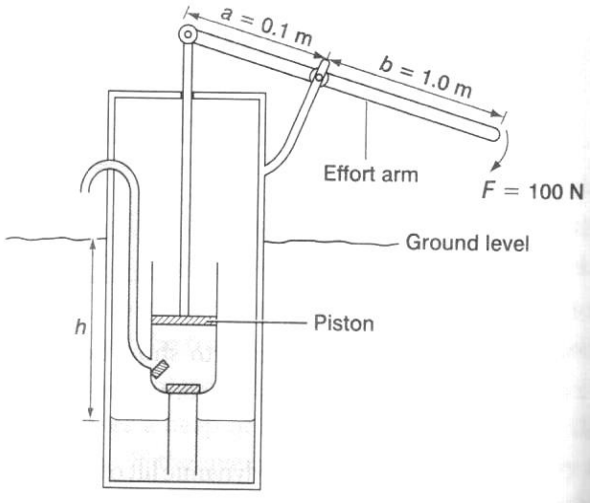
7. The diagram below shows a water pump designed to raise to raise water from a well.



a) Determine the maximum force on the piston when a force of $100N$ is applied at the end of the effort arm during the downward stroke. (2 marks)

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b) The diameter of the piston is $5cm$, determine the pressure exerted by the piston on the water. (2 marks)

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8. State two ways of reducing the surface tension of a liquid. (2 marks)

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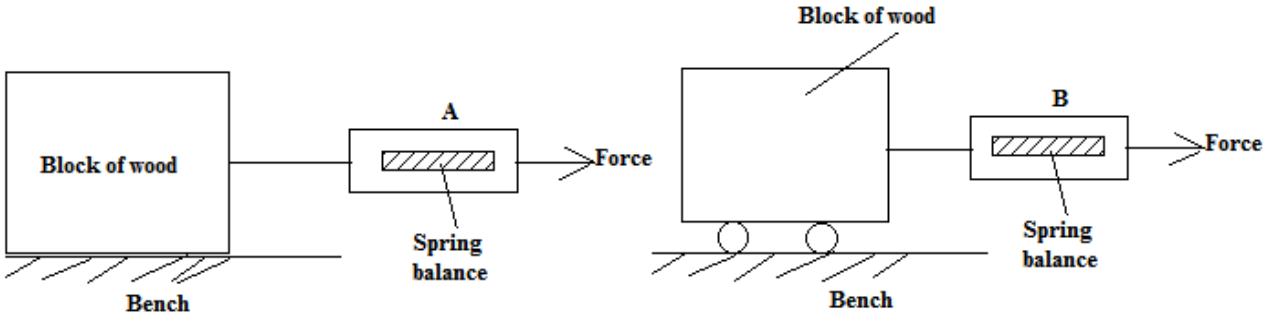
9. A student carried out an experiment to measure static friction using identical wooden blocks arranged as shown in the figure below.



State and explain which spring, A or B, will indicate a smaller reading when the block just starts to move. (2 marks)

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10. A nurse wanted to sterilize a clinical thermometer using steam from boiling water. State and explain whether this method is appropriate or not. (2 marks)

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11. State *two* assumptions in fluid flow. (2 marks)

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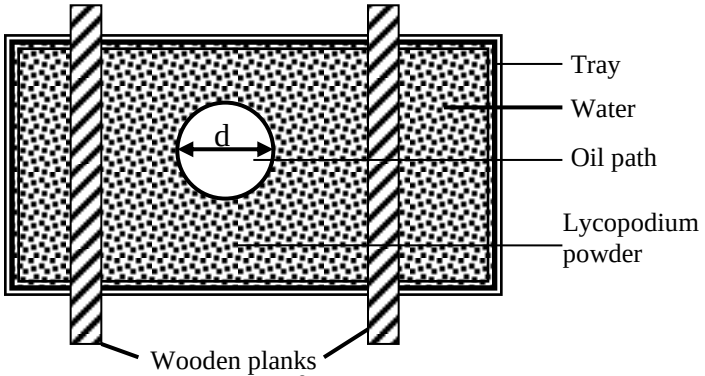
12. When a steel ball is allowed to fall freely in a viscous fluid, it is observed to attain terminal velocity after some time. State the reason why the ball attains terminal velocity. (1 mark)

SECTION B (55 MARKS)

Answer ALL questions in this section

13.

(a) The figure below shows an experimental set-up for estimating the diameter of an oil molecule.

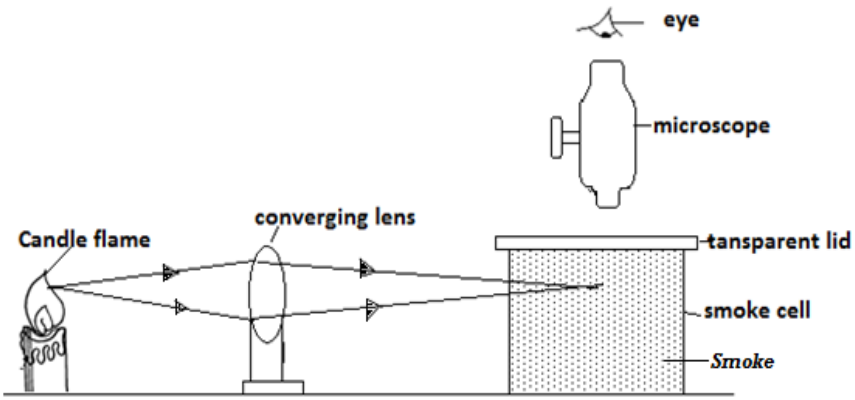


(i) Describe how the oil patch is formed. (2 marks)

(ii) State one source of error that can arise while performing the experiment. (1 mark)

(b) What is *Brownian motion*? (1 mark)

(c) The figure shows a set-up used to study Brownian motion in gases.



(i) State the reason why smoke is preferred to be used in the experiment. (1 mark)

(ii) State the function of the microscope. (1 mark)

(iii) State and explain the nature of the smoke particle in the cell. (2 marks)

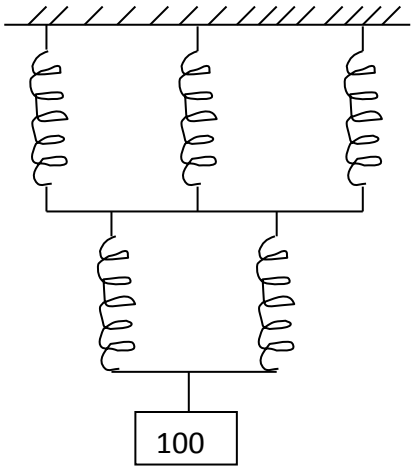
(iii) What observation would be made if the temperature of the surrounding is reduced? (1 mark)

(d) State one assumption in the kinetic theory of gases. (1 mark)

14.

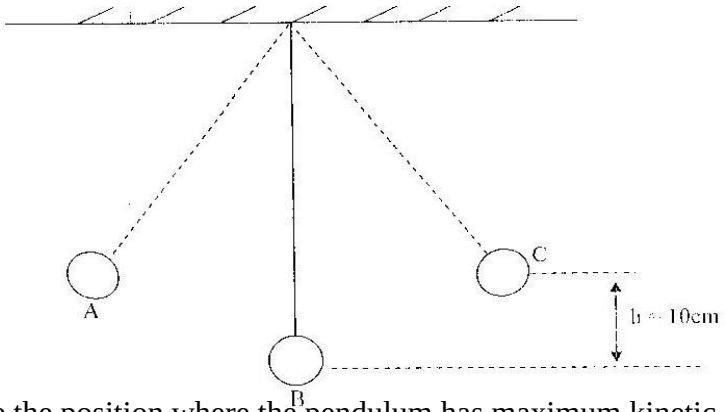
(a) State Hooke's law. (1 mark)

(b) A single spring stretches by $2cm$ when supporting a load of $50N$. The system below consists of such identical springs with negligible weights attached to a load of $100N$.



(i) Calculate the total extension of the system. (3 marks)

(c) The diagram below shows a freely swinging pendulum through points A, B and C. The maximum vertical displacement of the bob is $h = 10cm$.



(i) State the position where the pendulum has maximum kinetic energy. (1 mark)

(ii) Determine the velocity of the bob at the position identified in (i) above. (2 marks)

(d) A minibus of mass 1600kg travelling at a constant velocity of $20m/s$ collides with a stationary car of mass 800kg. The impact takes 2 seconds before the two vehicles move together and come to rest after 15 seconds. Determine:

i) The common velocity with which the two vehicles moved after collision. (3 marks)

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ii) The distance moved by the vehicles after the impact. (3 marks)

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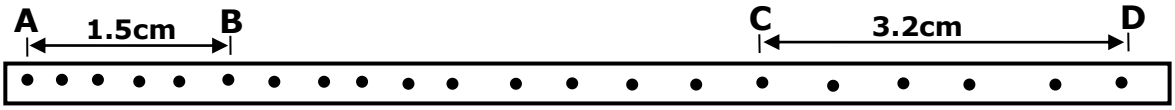
iii) The impulsive force. (2 marks)

15.

(a) Differentiate between speed and velocity. (1 mark)

(b) A paper tape was attached to a moving trolley and allowed to run through a ticker-timer. The figure below shows a section of the tape. The length $AB = 1.5cm$, $CD = 3.2cm$ and the frequency of the ticker-timer is $100Hz$.



Determine:

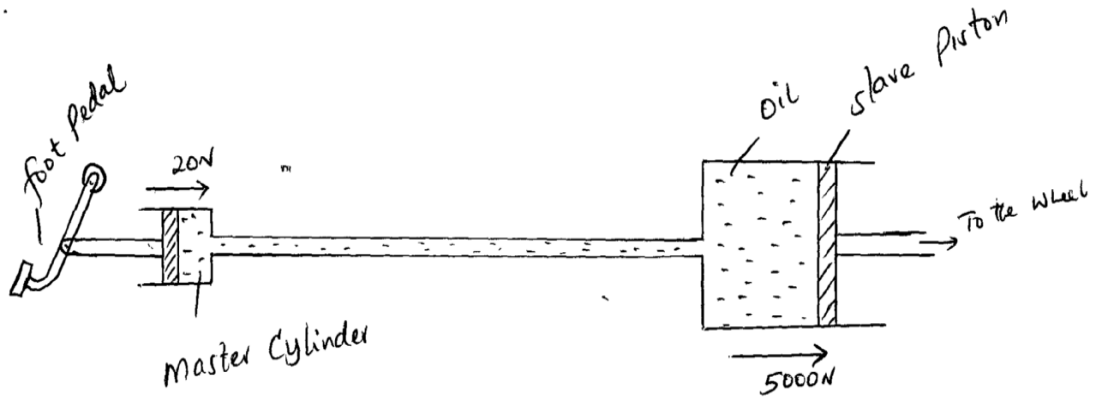
(i) The velocity at AB and CD. (4 marks)

(ii) The average acceleration of the trolley. (3 marks)

16.

(a) State the *Pascal's principle* of transmission of pressure. (1 mark)

(b) The figure below shows a hydraulic brake system.

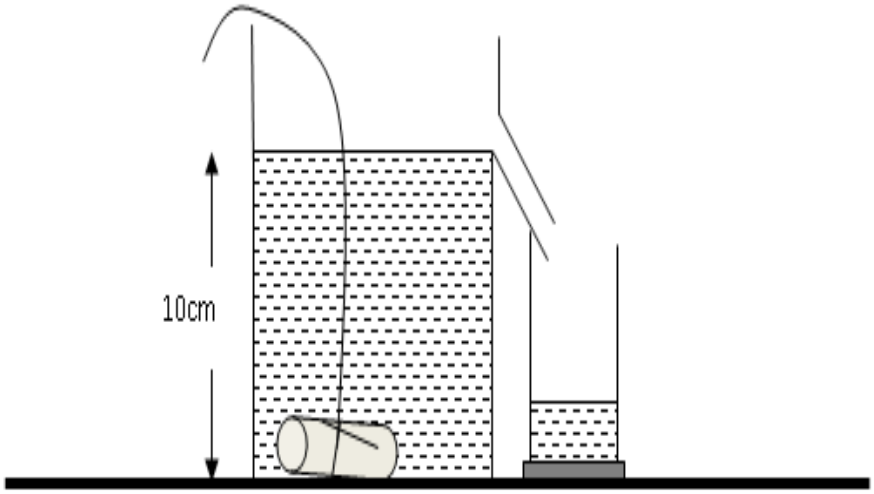


A force of $20N$ is applied on the foot pedal connected to a piston of area $0.05m^2$. This causes a stopping force of $5000N$ on one wheel. Calculate:

(i) The pressure on the master cylinder. (2 marks)

(ii) The area of the slave piston. (2 marks)

(c) A Eureka can of mass 60g and cross-sectional area of $60cm^3$ is filled with water of density $1\text{g}/cm^3$. A piece of steel of mass 20g and density $8\text{g}/cm^3$ is lowered carefully into the can as shown.



Calculate:

i) The total mass of water and the Eureka can before the metal was lowered. (2 marks)

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ii) The volume of the water that overflowed. (2 marks)

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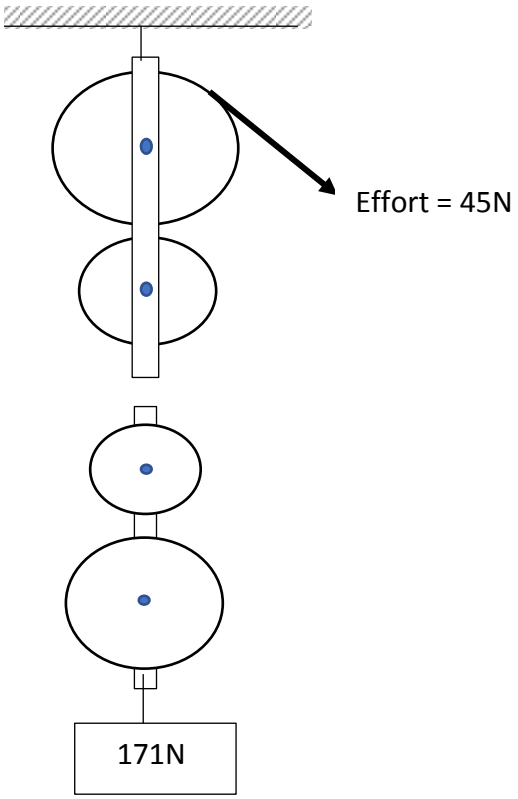
iii) The final mass of the Eureka can and its contents. (2 marks)

17.

(a) State the law of conservation of energy. (1 mark)

(b) The diagram below shows a section of block and tackle. An effort force of $45N$ is used to raise a load of $171N$.



(i) Complete the diagram by showing how the rope is connected to pass through all the pulley wheels. (1 mark)

(ii) Determine the velocity ratio (V.R) of the block and tackle. (1 mark)

(iii) Calculate the mechanical advantage (M.A) of the machine. (1 mark)

(iv) Calculate the efficiency of the machine. (2 marks)

(v) State the reason why the efficiency of the block and tackle is not 100%. (1 mark)

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