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PHYSICS PAPER 1
2HOURS

ALLIANCE HIGH SCHOOL
MOCK EXAM

INSTRUCTIONS

Answer all the questions in the spaces provide.
Electronic calculators may be used
All working must be clearly shown.
Where necessary take:-

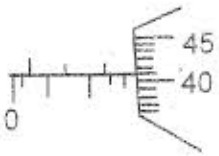
- Density of water = 1000kg/m^3.
- Specific heat capacity of water = 4200J kg^{-1} K^{-1}
- Specific latent heat of fusion of ice = 3.36 x 10^5 Jkg^{-1}
- Acceleration due to gravity, g, = 10m/s^2
- Melting point of ice = 0^{0}C
- Boiling point of water=100^{0}C
- Specific heat capacity of copper

For examiners use

Section	Question	Max Score	Candidates score
A	1 – 13	25	
	14	14	
	15	09	
	16	13	
	17	11	
	18	09	
		80	

SECTION A 25 MARKS

1. The figure below represents a scale of a measuring instrument.



(a) Name the instrument whose scale is given above. (1mark)
(b) State the readings shown by the scale. (1mark)

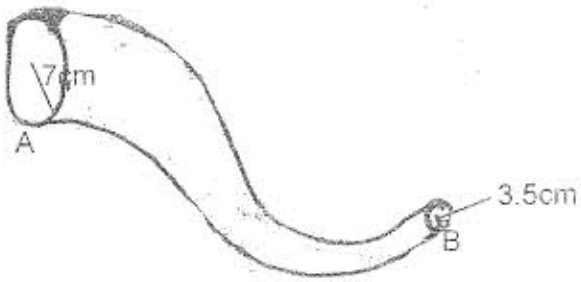
2. A piece of glass has a mass of 52g. It weighs O.32N and 0.18N in water and oil respectively. Determine
(a) the density of the oil (density of water = 1g/cm^3) (2 marks)

3. Sweating is an important activity of the body. Explain how it helps regulate the body temperature. (2 marks)

4. Materials can be described as being tough or brittle. Briefly explain what the terms brittle and tough mean. (2 marks)

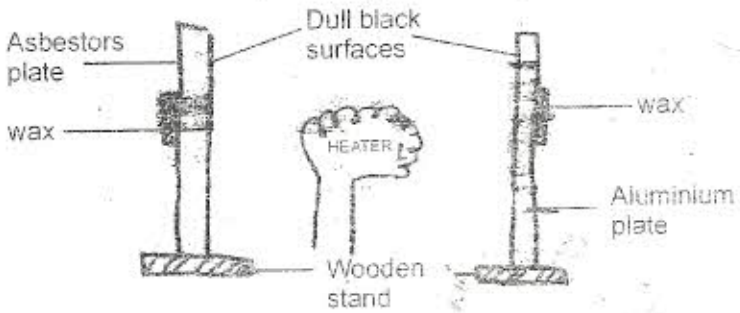
5. A bullet of mass 40g is fired at a velocity of 400m/s from a gun of mass 8kg. Determine the corresponding velocity of the gun. (2 marks)

6. The diagram shown below shows motion of an incompressible liquid in a tube of varying cross-section area.



The rate of flow of the liquid through the tube is 15.4 litres per second. Determine the speed of the liquid at point A and B of the tube. (3mks)

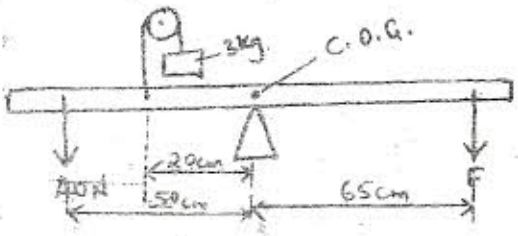
7. The diagram below shows a simple arrangement of apparatus used to study properties of different materials.



State with reasons what happens when the heater has been switched on for sometime. (2 marks)

8. When a thermometer is immersed in ice cold water, the mercury thread is observed to rise before dropping steadily in the capillary tube. Explain. (2 marks)

9. The diagram below represents a system in equilibrium.



Determine the force F needed to maintain the equilibrium. (2 marks)

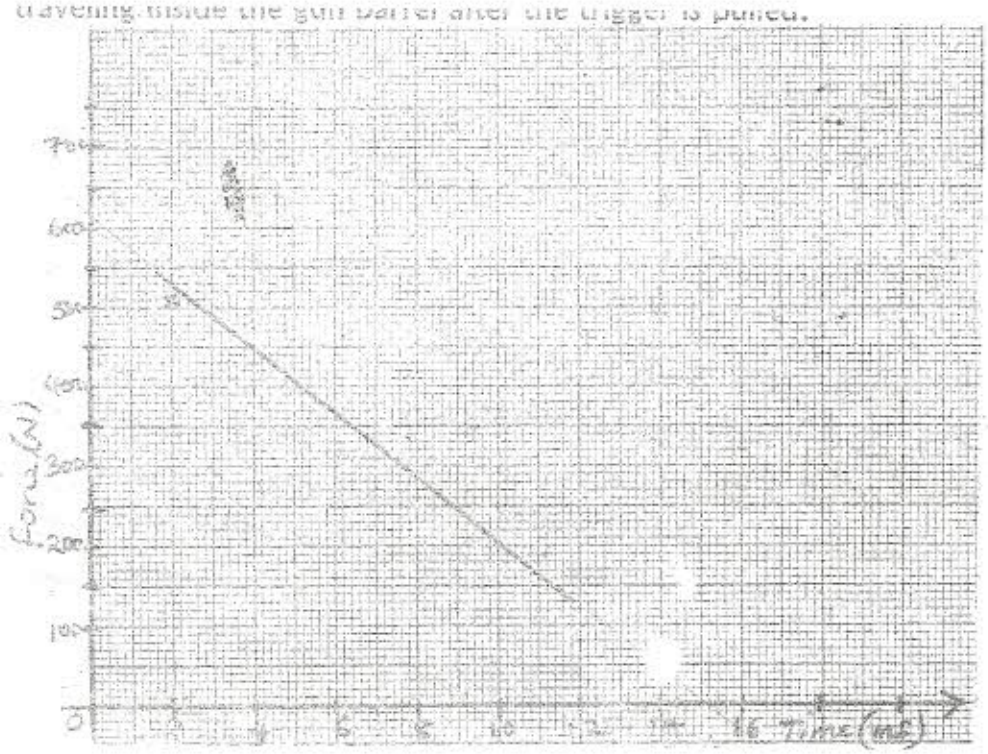
10. A player catches a cricket ball of mass 0.14kg which is traveling at 20m/s. If the ball is to be stopped in 0.5 seconds, determine the force required to stop the ball. (2 marks)

11. A stone of mass 50g is rotated in a vertical circle of radius 5m with the help of a string. If the string breaks when the tension is 81.5N, determine the likely position and speed at which the string breaks. (3 marks)

12. State Hooke's law. (1mk)

SECTION B (55MARKS)

13. The graph below shows the variation of the resultant force F and time t, for a bullet travelling inside the gun barrel after the trigger is pulled.



(a) Determine from the graph the time taken by the bullet to travel the length of the barrel. State any assumptions made. (2 marks)

(b) Work out the area of the graph and state its significance. (3 marks)

(c) Given that the mass of the bullet is 20g, calculate the velocity with which the bullet leaves the barrel. (3 marks)

(d) The bullet while travelling at its maximum speed horizontally at the top of a cliff takes 3 seconds to get to the target where it is brought to rest in 0.02 seconds.
Determine
(i) the height of the cliff. (2 marks)

(ii) the distance of penetration into the target. (2 marks)

(iii) the average retarding force exerted on the bullet. (2 marks)

14. A man pulls a box of mass 30kg up an inclined plane 5m long at a constant speed.
If the angle of incline is 30^0 and the frictional force between the plane and the block is 100N, find:
(a) The effort that must be exerted on the box for it to move up the incline at a constant speed.
(3 marks)

(b) The gain in potential energy of the box while at the top of the incline. (2 marks)

(c) The work done by the man in moving the box. (2 marks)

(d) The power developed by the man in moving the box up the incline at 2m/s. (2 marks)

15. The table below shows the results obtained in an experiment to investigate the variation of the volume of a gas with pressure using a U-tube whose one end is closed. The excess pressure was obtained by getting the length of mercury column in the open end above the one in the closed end which traps the volume of air being used in the experiment.

Volume of gas/cm^3	5.1	5.5	6.2	6.8	8.2	9.7
Excess pressure/mmHg	291	224	142	77	-55	-139
1/ Volume (cm^{-3})						

(a) What does the negative excess pressure mean? (1 mark)

(b) Complete the table and plot a graph of 1/volume against pressure on the graph paper provided.
(6 marks)

(c) From the graph

(i) Write an expression relating pressure and the volume of air. (1 mark)

(ii) Determine the slope S of the graph.

(2 marks)

(iii) Find the value X of 1/volume when h=0 and hence evaluate x/s. Comment on your answer.

(3 marks)

16. (a) An insulated metal block of mass 0.5kg is heated electrically. The Voltmeter shows reading of 15.0V while the ammeter reads 3.2A. The temperature of the block rose from 20°C to 85°C in 10 minutes.

(i) Draw a well labelled diagram of the arrangement of the apparatus that can be used to carry out the experiment to obtain the above results. (3 marks)

(ii) Using the data provided, calculate the specific heat capacity of the metal block. (4 marks)

(b) Steam is passed into a lagged copper calorimeter of mass 0.25kg containing 0.5kg of water and 0.02 kg of ice at 0°C. The mixture is well stirred and the steam supply stopped when the temperature of the water reaches 25°C. If 25g of steam was converted to water determine the specific latent heat of vaporization of water.

17. A metallic rod of length 20cm and uniform cross-section area of $8cm^2$ is suspended from a spring balance with 15cm of its length immersed in water. If the density of the material of the block is $1.5g/cm^3$, determine

(a) the mass of the block. (2 marks)

(b) the upthrust acting on the block. (2 marks)

(c) the reading of the spring balance. (2 marks)

(d) the reading of the balance when the rod is wholly immersed in water. (3 marks)