

NAME.....ADM.....CLASS.....

NOVEMBER 2021 EXAMINATION

232/1

PHYSICS

PAPER 1

TIME: 2 HRS

INSTRUCTION TO CANDIDATES:

1. Write your name and Admission number in the spaces provided.
2. Answer all the questions in the spaces provided.
3. Mathematical tables and electronic calculators may be used.
4. All workings must be clearly shown where necessary.

FOR EXAMINERS USE ONLY:

SECTION	QUESTIONS	MAXIMUM SCORE	CANDIDATES SCORE
A	1 – 13	25	
	14	13	
B	15	11	
	16	9	
	17	13	
	18	10	
TOTAL		80	

SECTION A (25 marks)

Answer *ALL* the questions in this section in the spaces provided.

1. A micrometer screw gauge has a zero error of $+0.12\text{mm}$. Sketch the reading of the micrometer screw gauge when used to measure the size of a ball of diameter 3.44mm . (1 mark)
2. Figure 1 (a) and 1(b) shows capillary tubes inserted in water and mercury respectively.

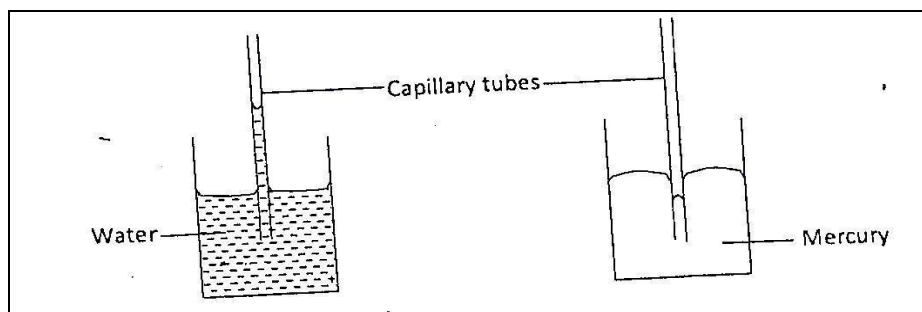


Figure 1(a)

Figure 1(b)

It is observed that in water the meniscus in the capillary tube is higher than the meniscus in the beaker, while in mercury the meniscus in the capillary tube is lower than the meniscus in the beaker. Explain these observations. (2 marks)

3. A block of mass 500g and measuring 30cm by 25cm by 15cm rests on a flat floor. Determine maximum pressure exerted on the floor. (3 marks)

4. In figure 2 ammonia gas and an acid gas diffuse and react to form a white deposit on the walls of the glass tube. Explain why the white deposit forms nearer end B than A. (1 mark)

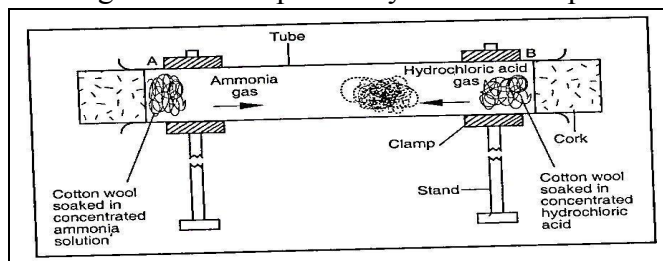


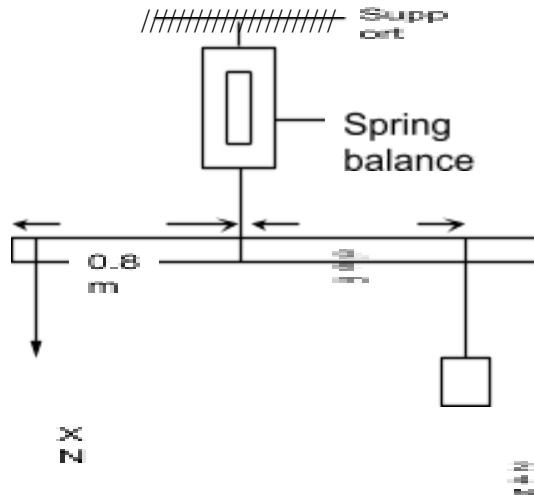
Figure 2

5. A man wants to fit a brass ring tightly onto a steel rod of equal diameter to the inner diameter of the ring. Explain how this can be achieved. (2 marks)

6. State how conduction and radiation is minimized in a thermos flask. (2 marks)

7. A body moving around a circle is accelerating and yet the speed is constant. Explain. (1 mark)

8. **Figure 3** shows a uniform bar of mass 0.8kg supported by a spring balance at its Centre and the bar is at equilibrium.



Determine the:

(a) Value of X (3 marks)

(b) Reading of the spring balance (1mark)

9. **Figure 4** shows a load-extension graph for various loads hung from a single spring.

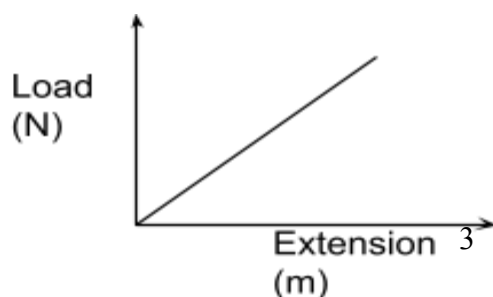


Figure 4

On the same axes, sketch a graph for a spring double the diameter of the first one (1mark)

10. An aeroplane is moving horizontally through still air at uniform speed. State with reason what is observed when the speed of the plane is increased. (2marks)

11. A crane lifts a load of 2000kg through a vertical distance of 4.0 m in 5 seconds. Determine the power developed by the crane. (3 marks)

12. Sketch a displacement time graph for a freely falling body and describe the motion. (2marks)

13. State Newton's first law of motion. (1mark)

SECTION B (55 marks)

Answer ALL the questions in this section in the spaces provided.

14. **Figure 5** shows a crate of mass 70kg being pushed by a man with a force of 150 N along the plane AB.

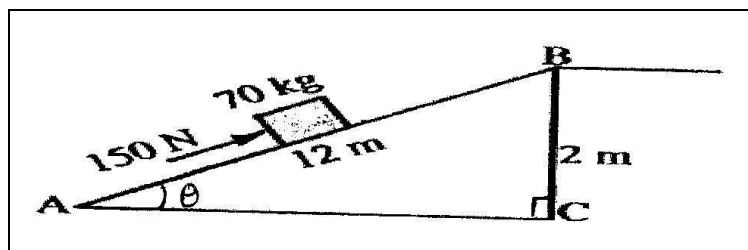


Figure 5

(a) Show that V.R of the inclined plane is given by $\frac{1}{\sin\theta}$ (3 marks)

(b) Determine the work done:
(i) By the force of the man. (2marks)

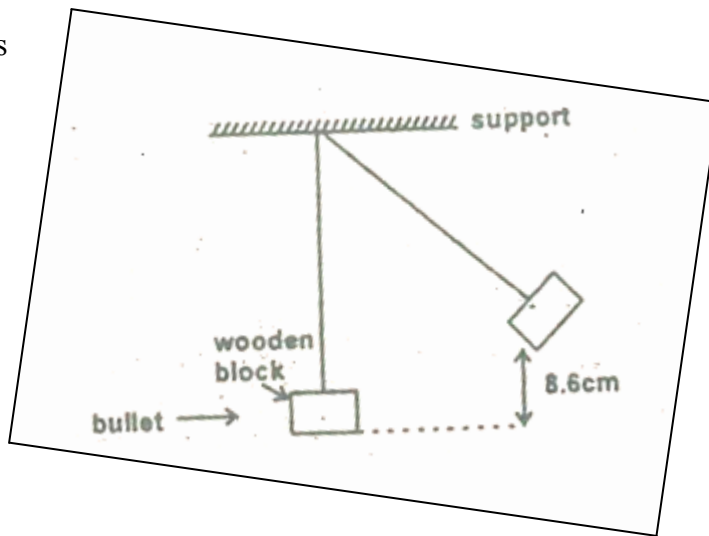
(ii) On the mass. (2marks)

(iii) To overcome friction. (1mark)

(c) Determine the efficiency of the inclined plane. (2marks)

(d) Suggest two method of improving the efficiency of an inclined plane. (1mark)

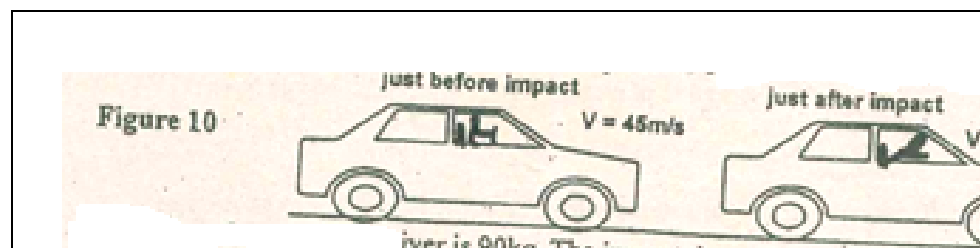
15. a) A bullet of mass 2.0g is fired horizontally into a block of wood of mass 600g . the block is suspended from a string so that it is free to move in a vertical plane. The bullet and block rise together through a vertical distance of 8.6cm as in figure 9 below.



before the impact with the block.

(5mks)

Calculate the speed of the bullet



b) Figure below 10 shows a car with a dummy driver before and after collision test.

The mass of the dummy driver is 90kg. The impact time reduces the dummy's speed from 45m/s to 0m/s in 1.2 seconds.

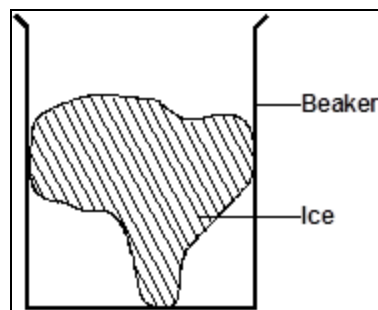
i) State the energy transformation during the collision. (1mk)

ii) Calculate the average force on the dummy during impact. (3mks)

iii) Calculate how much of the dummy's energy is transformed during the collision. 2mks)

16. a) i) State two conditions necessary for equilibrium of a body acted upon by a number of forces. (2 marks)

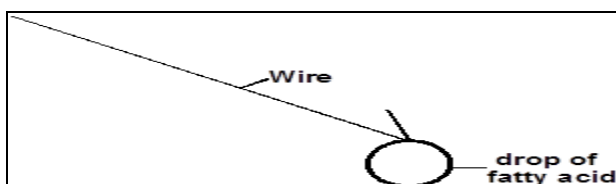
ii) Figure below shows beaker containing a block of ice.



State and explain the change in stability when the ice melts.

(3 marks)

b) Figure below shows a drop of fatty acid on a wire of diameter 1.4mm



When the drop of the fatty acid was placed on clean water surface it formed a circular patch of diameter 91cm.

i) Estimate the length of the molecule of the fatty acid. (3 marks)

ii) State two assumption made in part (i) above. (2 mark)

17 (a) State the principle of conservation of linear momentum. (1 mark)

(b) Distinguish between elastic and inelastic collision. (1 mark)

(c) A striker kicks a ball of mass 200g initially at rest with a force of 78N. Given that the foot was in contact with the ball for 0.30s; determine the takeoff velocity of the ball. (3 marks)

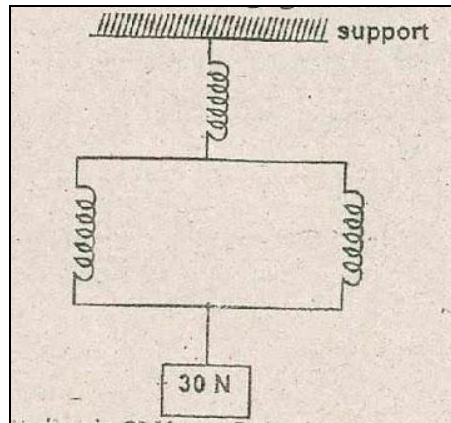
(d) A high jumper usually lands on thick soft mattress. Explain how the mattress helps in reducing the force of impact. (2 marks)

- (e) A ball is thrown horizontally from the top of a vertical tower of height 75m and strikes the ground at a point 80m from the bottom of the tower. Determine the:
- (i) Time taken by the ball to hit the ground. (*Acceleration due to gravity*= 10m/s^2) (3 marks)

(ii) Initial horizontal velocity of the ball. (2 marks)

18. a) State Hooke's law. (1mk)

- b) Three springs which are identical and have negligible mass are arranged as shown in the diagram below.



The spring constant of each spring is 2N/cm . calculate the total extension due to the 30N weight. (4mks)

a) A student was provided with a wire, assortment of masses, a test-tube a mounted retort stand a metre rule. Describe how she could use the provided materials to verify Hook's law for a spring. (5mks)