02-05-2023 12 පන්තිය Physics

Part B (I)

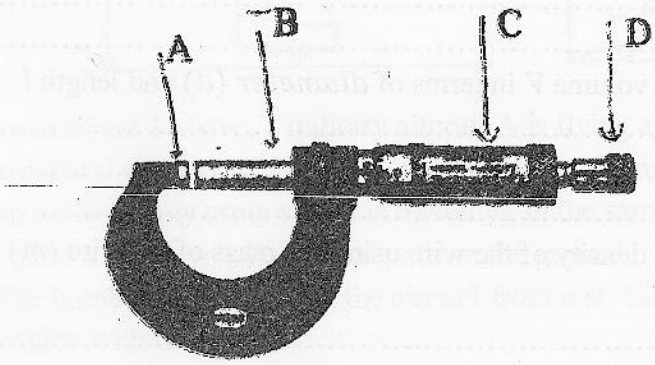
Answer all the questions.

(01) A student is provided with a micrometer screw gauge and a meter ruler to find the density of the material of a straight wire which is about 20 cm long.

a) Name a suitable laboratory instrument to measure the mass (m) of the wire accurately.

.....

b) Below is a diagram of a micrometer screw gauge used to measure the cross section area of the wire.



i) Name the parts A,B,C and D

A..... B.....

C..... D.....

ii) If the screw gauge has 100 circular divisions and the pitch is 1mm, what is the least measurement of the instrument?

.....

.....

iii) Explain why part D is used to move part B in the instrument.

.....

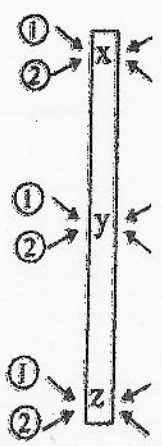
.....

c) As shown in the figure, student uses the screw gauge to take six readings at three points x, y and z along two perpendicular directions.

i) What is the reason of taking two readings along two perpendicular directions in the same place?

.....

.....



ii) State the reason why the readings are taken at three different places x, y and z ?

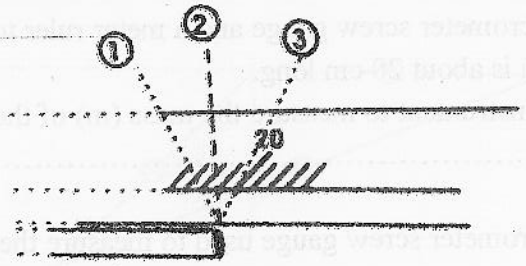
.....

.....

iii) The following table shows the readings obtained by the student at three positions x, y and z for two positions 1 and 2

	x	y	z
1st position	2.02 mm	2.03 mm	2.01 mm
2nd position	2.01 mm	2.02 mm	2.02 mm

d) The student uses the meter ruler to find the length of the wire. The figure below shows three ways of aligning one end of the wire while other end keeping on zero on the meter ruler.



i) What is the correct length (l) of the wire.

.....

.....

ii) Write down an expression for the volume V in terms of *diameter* (d) and length l

.....

.....

.....

iii) Write down an expression for the density of the wire using the mass of the wire (m) , d and l

.....

.....

Part B (II)

Answer all the questions.

(01)

Figure 1

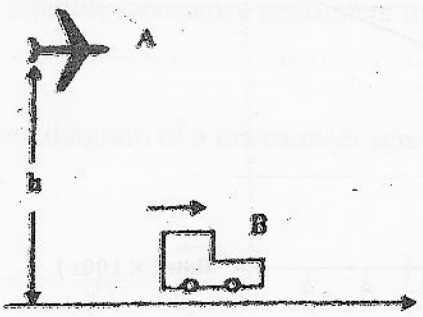
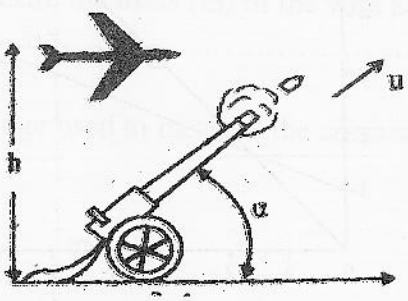


Figure 2



(a) As shown in figure 1 above, a military aircraft A is flying at a height of h= 2000 m from the ground with a horizontal velocity of 150 s^{-1} . The aircraft is planning to drop a bomb exactly on a jeep (B) belonging to the enemy army which is travelling in the same direction as the aircraft at a uniform velocity of 36 kmh^{-1} on a horizontal path on the ground.

i) The bomb is dropped from the aircraft from rest. Calculate the time that the bomb takes to collide with the target.

ii) Find the horizontal distance, the bomb has travelled during the above time period.

iii) Sketch how the motion of the bomb would appear to the pilot in the aircraft if he looked down.

iv) Calculate the angle that the line joining the airplane and the jeep makes with the vertical when the bomb is dropped from the aircraft so that the bomb hits the jeep correctly.

(b) As shown in figure 2, an enemy time gun is fixed to the army jeep and a bullet from the time gun is fired upward at an angle (α)to the horizontal when the military aircraft is moving horizontally with a velocity of 150 ms^{-1} and a height 2000 m above the position where the time gun is fixed to the enemy jeep. At the maximum height of the bullet, it is designed to hit the aircraft. Note that the time gun does not recoil and ignore the height of the time gun.

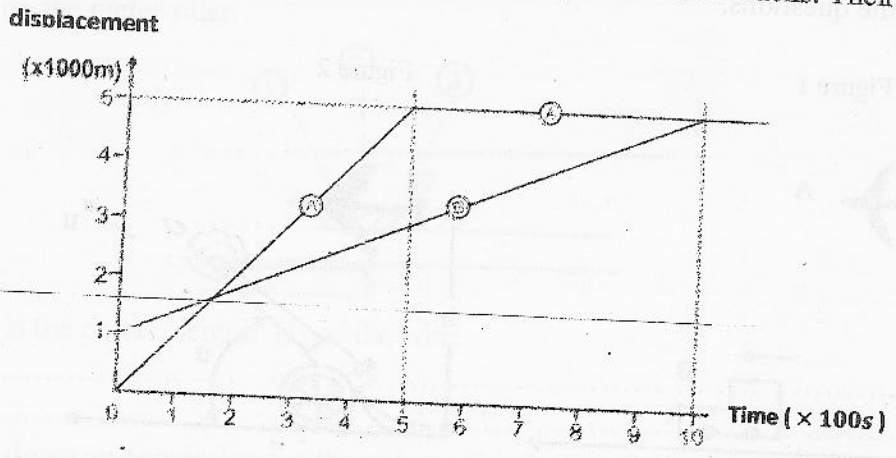
i) Find the initial velocity (u) of the bullet.

ii) Find the angle through which the time gun is inclined to the horizontal.

iii) Draw two separate velocity-time graphs for the horizontal and vertical motions of the bullet until it hits with the aircraft.

02)

(a) A and B are two short train engines moving on two straight parallel close tracks. Their displacement-time



i) Which engine gets delayed for stopping? What is the delayed time in seconds?

ii) Which one of the two engines comes to rest first? When it comes to rest, what is the distance between the engines?

iii) At what time does one engine passes the other one from time t= 0

iv) Which one has the higher velocity, when they pass each other? What is that velocity?

v) At a certain instance, the driver of the engine A sees the engine B moving at a distance of 100 m ahead. What is the time taken by the engine A to reach closer to engine B?

vi) Draw the velocity-time graphs for both A and B on the same axes.

(b) A particle at rest starts its motion along a straight line path. It travels a distance of 50 m., with a constant acceleration, next 300m with a constant velocity and last 25 m with a constant retardation to rest. The total time for the whole motion is 4.5 s

1. Draw the velocity time graph for the above motion.

Find 2. the average velocity

3. maximum velocity
4. acceleration
5. the deceleration of the particle