දකුණු පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව
தென் மாகாணக் கல்வித் திணைக்களம்
Southern Provincial Department of Education

අධ්‍යාපන පොදු සහතික පත්‍ර (උසස් පෙළ), 12 ශ්‍රේණිය, පළමු වාර පරීක්ෂණය, 2019 නොවැම්බර්
General Certificate of Education (Adv. Level), Grade 12 First Term Test, November 2019

භෞතික විද්‍යාව I **Physics I**	01 E I	පැය එකයි. **One hour**

Instructions :

- This question paper consists of **25** question in **06** pages.
- Answer **all** the questions.
- Write your Name or Index Number in the space provided in the answer sheet.
- Instructions are given on the back of the answer sheet, Follow those carefully.
- In each of the questions **1** to **50** pick one of the alternatives form (1), (2), (3), (4), (5) which is **correct** or **most appropriate** and **mark your response on the answer sheet with a cross** (x) in accordance with the instructions given in the back of the answer sheet.

Use of calculation is not allowed.

($g = 10\ N\ kg^{-1}$)

1. The pair of quantities which have the equal dimensions is

   (1) Linear momentum and potential energy (2) Work and torque

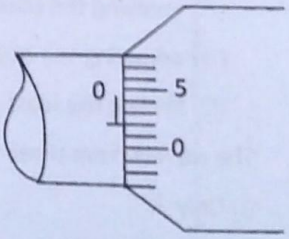
   (3) Linear momentum and work (4) Relative velocity and kinetic energy

   (5) Torque and Impulse

2. A meter ruler reading of a coin is 2.5 cm. The percentage error of it is

   (1) 0.2% (2) 0.4% (3) 2% (4) 4% (5) 40%

3. The figure shows scale position of a micrometer screw gauge when the anvil and spindle is touched. The circular scale of it has 50 divisions and least count of it is 0.5 mm. The reading of this instrument, when a diameter of ball having a diameter of 5 mm is measured, is



   (1) 4.98 mm (2) 5.00 mm (3) 5.02 mm (4) 5.20 mm (5) 5.48 mm

4. The magnitude of the ratio of prefix units in the following, **unequal** to 1000, is

   (1) $\frac{Gm}{Tm}$ (2) $\frac{mm}{\mu m}$ (3) $\frac{Mm}{Km}$ (4) $\frac{\mu m}{nm}$ (5) $\frac{nm}{pm}$

(see page 2)

5. In the experiment of simple pendulum, the period of one oscillation was measured as 2 s. If the maximum error of the stop watch used to measure the time is 0.2 s, the minimum number of oscillations that should be chosen in order to keep the percentage error of the time measurement of one oscillation below 1% is

(1) 5 (2) 10 (3) 15 (4) 20 (5) 25

6. Two vector quantities $\vec{P}$ and $\vec{Q}$ are introduced as $\vec{P} = \vec{A} + \vec{B}$ and $\vec{Q} = \vec{A} - \vec{B}$. If the magnitudes of $\vec{P}$ and $\vec{Q}$ are equal, the angle between $\vec{A}$ and $\vec{B}$ is

(1) 0 (2) $\frac{\pi}{4}$ (3) $\frac{\pi}{3}$ (4) $\frac{\pi}{2}$ (5) π

7. A ball having a mass of 150 g is coming towards a fielder with a speed of 20 $m\,s^{-1}$. If it takes 0.1 s to stop of it completely in the fielder's hand as he catches the ball, the magnitude of the force exerted by the fielder's hand on the ball is

(1) 0.3 N (2) 20 N (3) 30 N (4) 32 N (5) 300 N

8. In the laboratory, the instruments that can be used to measure more accurately the length, width, thickness and mass of a A4 (21 cm x 30 cm) photocopy paper, are respectively given by

(1) meter ruler, vernier caliper, screw gauge, spring balance
(2) meter ruler, travelling microscope, screw gauge, triple beam balance
(3) meter ruler, meter ruler, travelling microscope, four beam balance
(4) meter ruler, meter ruler, screw gauge, electronic balance
(5) meter ruler, meter ruler, spherometer, four beam balance

9. The first thing that should be done before taking a measurement is

(A) levelling the base of it by rotating the screws
(B) adjusting the objective to focus a clear image on the cross wires
(C) finding the least count of the scale and the zero error

The correct from these is

(1) Only A (2) Only A and B (3) Only A and C
(4) Only B and C (5) All A, B and C

10. ,It took 6 s for a projectile launched vertically upward to reach to maximum height. The ratio of the distance it traveled in 1 s to the distance it travelled in 6 s, is

(1) 1:1 (2) 1:2 (3) 2:1 (4) 1:11 (5) 11:1

(see page 3)

11. A body is in equilibrium under three coplanar forces. Consider the following statements.

(A) Three forces should be met in one point

(B) Three forces should be parallel each other

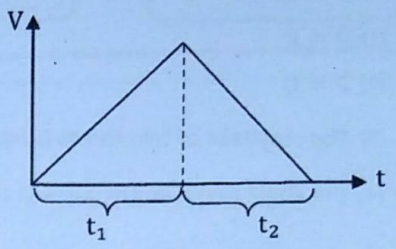
(C) The sum of the torque of the force about any point should be zero

From the above statement, the correct at all the time is

(1) Only (A) (2) Only (B) (3) Only (C)

(4) Only (A) and (B) (5) All (A), (B), and (C)

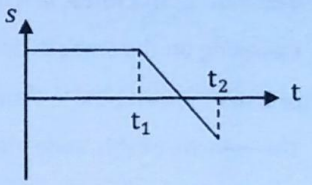
12. As shown in the figure, a vehicle starts at rest and travels a distance s_1 in time t_1 with an acceleration a_1. It comes to a stop in time t_2 travelling a distance s_2 with a deceleration a_2. The correct relationship regarding this motion is

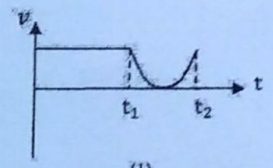


(1) $\frac{a_1}{a_2} = \frac{s_1}{s_2} = \frac{t_1}{t_2}$ (2) $\frac{a_1}{a_2} = \frac{s_2}{s_1} = \frac{t_1}{t_2}$

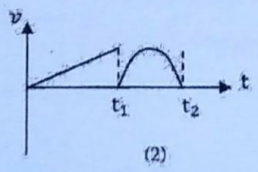
(3) $\frac{a_1}{a_2} = \frac{s_1}{s_2} = \frac{t_2}{t_1}$ (4) $\frac{a_1}{a_2} = \frac{s_2}{s_1} = \frac{t_2}{t_1}$ (5) $\frac{a_2}{a_1} = \frac{s_2}{s_1} = \frac{t_1}{t_2}$

13. Corresponding velocity - time (v - t) graph to the given displacement - time (s - t) graph is correctly shown by

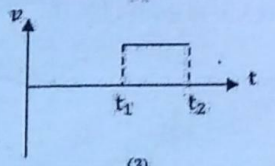




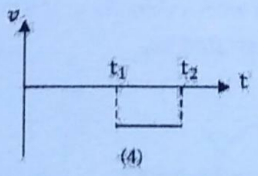
(1)



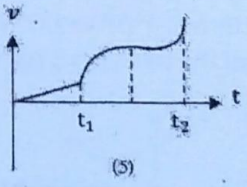
(2)



(3)



(4)



(5)

14. If a body is suddenly exploded into two equal mass bodies, these two parts

(1) travel in same direction with equal speeds

(2) travel in same direction with different speeds

(3) travel any direction with different speeds

(4) travel opposite directions with equal speeds

(5) do not travel

(see page 4)

15. If the respective dimensions of A, B, and C are MLT^{-3}, ML^2T^{-3} and T and the time t, velocity t and acceleration a, the correct relation for the force F is

(1) $F = At + B(V^2 + ac)$ (2) $F = At + \frac{Ba}{a+c}$ (3) $F = At + \frac{B}{V+aC}$

(4) $F = \frac{At}{a} + B(V + c)$ (5) $F = At + \frac{B}{(aV+C)}$

16. If the resultant of two forces of magnitudes P and Q are perpendicular to the force P, the correct from the following is

(1) $Q < P$

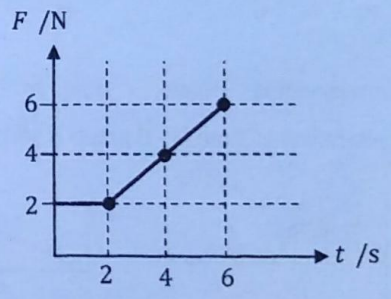
(2) $P = Q$

(3) The resultant of two forces is equal to $\sqrt{P^2 + Q^2}$

(4) the angle between the force Q and the resultant of two forces is $\sin^{-1}\left(\frac{P}{Q}\right)$

(5) the angle between the two forces is $90^0 + \sin^{-1}\left(\frac{Q}{P}\right)$

17. Variation of the force, acted on the body of mass 2 kg travelling on the smooth horizontal plane with a velocity of 2 ms^{-1}, with time is shown in the graph.

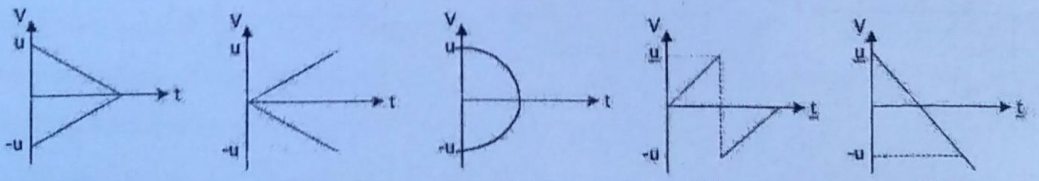


The velocity of this body after 6 s is

(1) 8 m s^{-1} (2) 10 m s^{-1} (3) 12 m s^{-1}

(4) 16 m s^{-1} (5) 20 m s^{-1}

18. If a sportsman throws a ball vertically upward with a velocity u, the velocity - time graph for the whole motion of the ball is most correctly illustrated by,



(1) (2) (3) (4) (5)

19. The incorrect statement regarding the couple of force is

(1) The resultant of a couple of force is zero

(2) The torque of a couple of force is independent of the point it takes

(3) A couple of force is created from two opposite forces of same magnitude

(4) The algebraic sum of the parts of a couple of force along any direction is zero

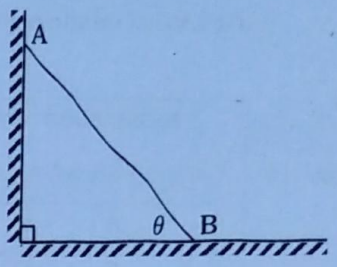
(5) The torque of a couple of force is obtained by multiplying the magnitude of any one force by the perpendicular distance between the two forces.

(see page 5)

20. In a vernier caliper, n divisions of vernier scale is coincide with N divisions of main scale. The least count of this instrument is in terms of n and N is

(1) $\frac{N}{n}$ (2) $\frac{n}{N}$ (3) $\frac{1}{n}$ (4) $1-\frac{N}{n}$ (5) $1-\frac{n}{N}$

21. The uniform rod AB of length 2a and weight W is kept in equilibrium by touching the end A to a smooth wall and the end B to a rough surface as shown in the figure. The magnitude of the resultant reaction acted on the end A of the rod is



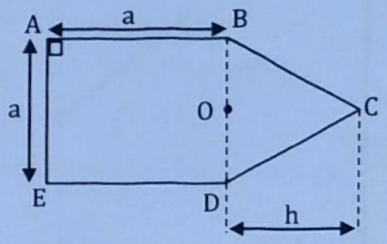
(1) $W\cos\theta$ (2) $\frac{W}{2}\cos\theta$ (3) $\frac{W\cos\theta}{2\sin\theta}$

(4) $\frac{W\cos\theta}{\sin\theta}$ (5) $\frac{W}{\cos\theta}$

22. When a body is projected with a velocity of 40 m s^{-1} in a direction of an angle of 60^0 to the horizontal, it takes landed in a horizontal displacement of $80\sqrt{3}$ m . When a another body is projected with the same velocity in a direction of an angle of 30^0 to the horizontal, the horizontal displacement it takes is (neglect the air resistance)

(1) 20 m (2) 40 m (3) $40\sqrt{3}$ m (4) 80 m (5) $80\sqrt{3}$ m

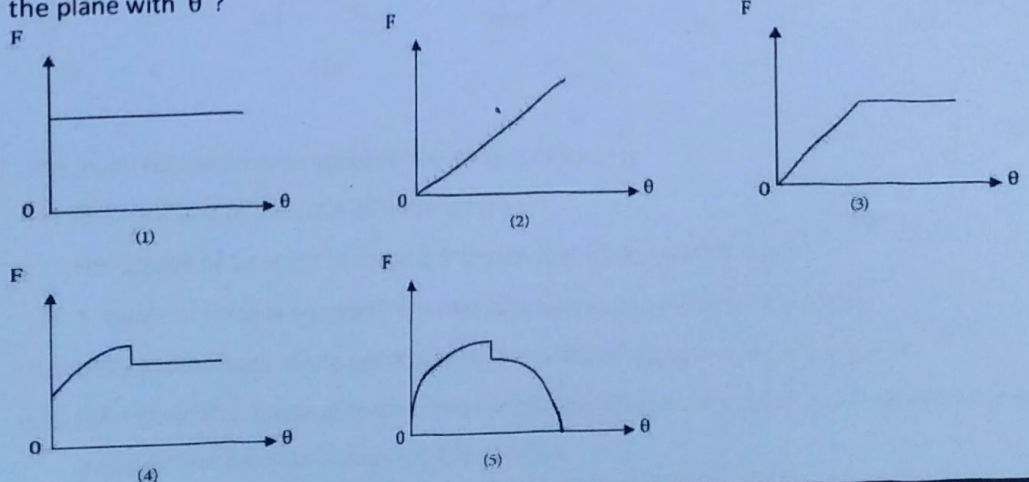
23. As shown in the figure, the ABCDE is a lamina cut from a plate of same thickness. If the center of gravity of it is situated at O, the value of h is given by



(1) $\sqrt{3}\,a$ (2) $\frac{a}{\sqrt{3}}$ (3) $\sqrt{2}\,a$

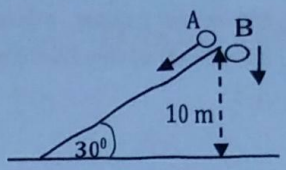
(4) $\frac{a}{\sqrt{2}}$ (5) $\sqrt{\frac{3}{2}}\,a$

24. A body is kept in equilibrium on an inclined plane of variable angle θ to the horizontal. Which graph of the followings correctly shows the variation of Frictional force F between the body and the plane with θ ?



(see page 6)

25. As shown in the figure, two bodies A and B are released at the same moment. The body B is falling down freely while the body B is sliding down on the inclined plane. The correct relation of the motion of A and B is



	acceleration (ms^{-2})		Time taken it to reach to the earth surface (s)		The velocity it reaches to the earth surface (ms^{-1})	
	A	B	A	B	A	B
(1)	5	10	$2\sqrt{2}$	$\sqrt{2}$	$10\sqrt{2}$	$10\sqrt{2}$
(2)	10	10	4	2	10	10
(3)	5	10	2	$\sqrt{2}$	10	$10\sqrt{2}$
(4)	5	10	$2\sqrt{2}$	$\sqrt{2}$	10	$10\sqrt{2}$
(5)	5	10	$2\sqrt{2}$	$2\sqrt{2}$	10	10

* * *

දකුණු පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව
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අධ්‍යාපන පොදු සහතික පත්‍ර (උසස් පෙළ), 12 ශ්‍රේණිය, පළමු වාර පරීක්ෂණය, 2019 නොවැම්බර්
General Certificate of Education (Adv. Level), Grade 12, First Term Test, November 2019

භෞතික විද්‍යාව II **Physics II**	**01 E II**	පැය එකයි මිනිත්තු 30 යි **One hour and 30 minutes**

Name: ..... **Grade :** .....

Important :

* This question paper consists of **09** pages.
* This question paper comprises of two parts, Part **A** and Part **B**. This time allocated for **both parts in One hour and 39 minutes**.
* Use of calculators is **not** allowed.

Part A - Structured Essay (2 – 6)

* Answer **all** the question on this paper itself. Write your answers in the space provided for each question. Note that the space provided is sufficient for your answer and that extensive answers are not expected.

Part B - Essay (7 - 9)

* This paper contains **six** question, of which, **four** are to be answered. Use the papers supplied for this purpose. At the end of the time allotted for this paper, tie the **two parts together** so that **Part A** is **on top** of **Part B** before handing them over to the supervisor.
* You are permitted to remove **only Part B** of the question paper from the Examination Hall.

For Examiner's Use Only

For the second paper		
Part	**Question Nos.**	**Marks Awarded**
A	01	
	02	
B	03	
	04	
	05	
Total:		

Final Marks.

In Number	
In words	

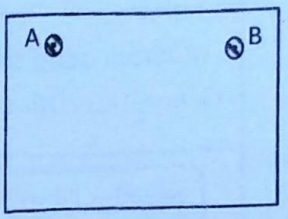
Signature

Marks Checked by	
Supervised by	

Do not write any think this column

Part A Structured Essay

01. Figure shows a board, fixed vertically on a laboratory wall to use to verify the parallelogram law of forces. Here A and B are two pulleys coupled to the board. Known weights w_1, w_2 and w_3 and strings are given two you. Weights w_1 and w_2 almost equal and w_3 is sufficiently large.



(a) (i) Draw the arrangements of the strings after applying weights and indicate w_1, w_2 and w_3 on the same diagram clearly.

(ii) Write down two other items which would be needed for the experiment.

.....

.....

(iii) Write down an experiment to test the smoothness of the setup.

.....

.....

(iv) Why is it needed to use light strings in this experiment?

.....

.....

(v) What is the resultant of two forces w_1 and w_2 and indicate the direction of it on the diagram.

.....

(vi) Write down the main experimental step/s which have to be followed in constructing parallelogram on the paper.

.....

.....

.....

.....

(vii) If diagonal you obtained from the constructed parallelogram is not vertical, what would be the reason?

.....

.....

(see page 3)

Do not write any think this column

(viii) How you prove the parallelogram law using the construction in part (vi)?

.....

.....

(b) (i) Same experimental set up is used to find the unknown mass of a small glass block. In such the diagonal length obtained under the scale of 5 g per 1 cm is 9.9 cm. Find the mass of the glass block.

.....

(ii) If 50 g object is measured by an electronic balance with minimum reading of 0. 1 g what is the fractional error of the measurement?

.....

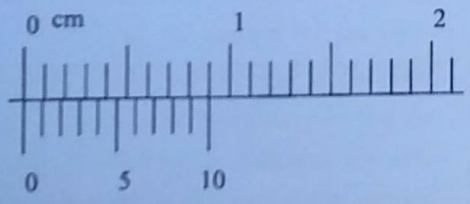
(iii) If the correct weight of the glass block is 50.5 g calculate the percentage error of the measurement done by the parallelogram law.

.....

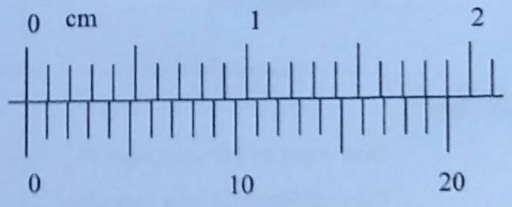
Is it less or higher than 1%? .....

20

02. (a). Find the minimum readings of following two vernier scales.



(P)



(Q)

Minimum reading of (P) .....

Minimum reading of (Q) .....

(see page 4)

Do not write any think this column

(b).

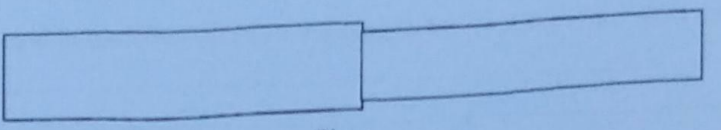


Fig. 1

The object shown in figure 1 is formed by jointing two cylinders of different diameters. The vernier caliper with scale Q is used for measuring the diameter of the object. Figure 2 and 3 shows the relevant scales of measurments.

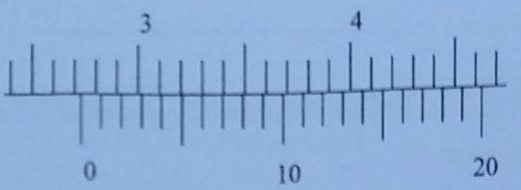


Fig. 2

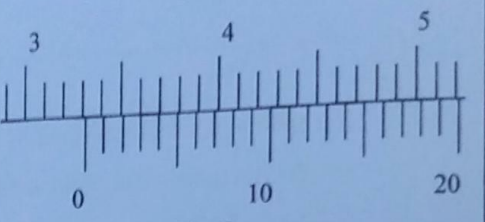


Fig. 3

(i). What is the reading relevant to the larger diameter cylinder?.....

(ii). What is the reading relevant to the smaller diameter cylinder?.....

(c) A student says it is very much essential to know the zero error of the vernier caliper in finding the correct diameter of a cylinder and the difference between two diameters of cylinders. Is his idea is true?

.....

Give reasons for your answer.

Correct diameter of a cylinder : .....

.....

Difference of diameters of cylinders : .....

.....

(see page 5)

Do not write any think this column

(d) Following figures show the use of spherometer for finding the linear expansion of a metal rod. The pitch of the spherometr is 1 mm and the circular scale id divided to 100 equal parts.

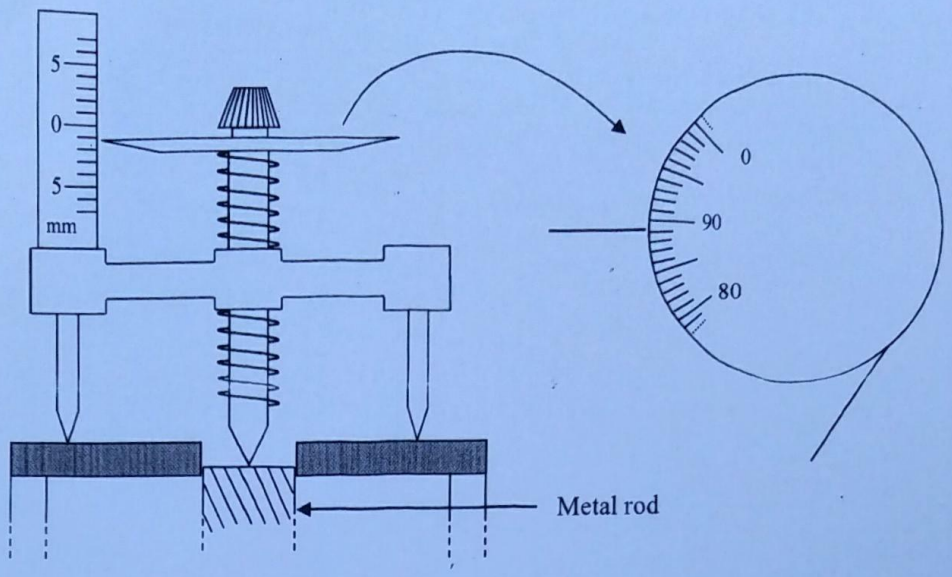


Fig. 4 The measurement relevant to the room temperature.

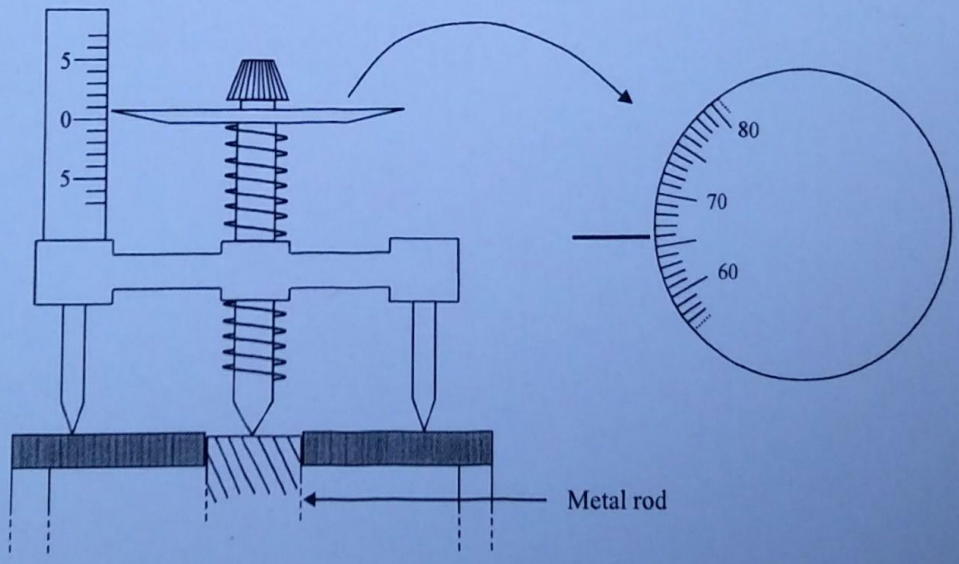


Fig. 5 The measurement relevant to the heated rod.

(i). What is the speedometer reading relevant to figure 4?

.....

(ii). What is the speedometer reading relevant to figure 5?

.....

(iii) What is the expansion of the metal rod?

.....

(see page 6)

Do not write any think this column

(e) The instruments like Vernier caliper, Spherometer and Micrometer screw gauge have to be stored properly after use. In relevant to the storing complete the blanks of following table.

Process	Requirement
1. Wipping by a dry clean cloth	
2.Wipping by an oily cloth	
3.Packing in the box by covering with a polythene bag.	

* * *

20

Part B – Essay

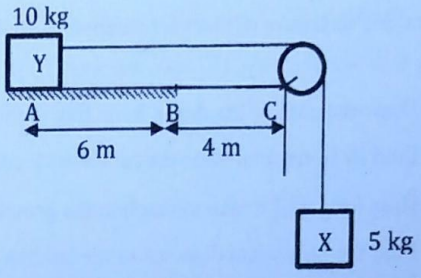
Answer only two questions

03. (a) State the Newton's law relevant to the motion.

(b) (i) Define newton, the SI unit for force.

(ii) Mass m is accelerating with acceleration a under the unbalanced force F. Derive a relation among F, m and a using above law and definition.

(c) As illustrated in the figure masses X and Y of 5 kg and 10 kg are connected to the both ends of a light string which is passes over a smooth pulley, fixed to a corner of the table. AB part of the horizontal table is rough with the coefficient of kinetic friction 0.3 and BC part is smooth. As shown in figure mass X is released from rest by keeping mass Y at A initially.



(i) Draw free body diagrams separately to indicate all forces acted on X and Y just before releasing them. Name all forces.

(ii) Calculate the frictional forces acted on Y.

(iii) Calculate the acceleration of the mass system when they start the motion.

(iv) What is the tension of the string?

(v) What is the velocity of Y when it passesB?

(vi) When Y passes the B, the string is broken. Explain the motion of masses after that.

(vii) Then Y collide with pulley and return it with the velocity 2 m s^{-1} within 0.1 sec. Calculate the force acted on Y by the pulley.

(viii) Calculate the kinetic energy of Y at B in its return motion.

(ix) Before stops how long will Y travel from B?

(see page 8)

04. A drone camera is used to photographing the school sport meet. Total mass of the drone with camera is 500 g. The camera is to be operated in horizontal plane of 7.5 m elevation from the ground. In taking the drone to this elevation initially it accelerated with uniform acceleration of 1×10^{-2} m s^{-2} for 30 s and allowed it to decelerate until reaching the required elevation. of 7.5 m. All this motion is vertical and finally at 7.5 m the drone become rest of its vertical motion.

(a) (i) Find its velocity and elevation after first 30 s.

(ii) How height is it travelled under deceleration?

(iii) Find the time of motion under deceleration.

(iv) Draw Displacement-Time and Velocity-Time curves for above motion.

(b) When landing the drone, it obtains the velocity of $5\sqrt{2}$ ms^{-1} to 45^0 downward direction. At that instant due to failure of electricity supply it start move freely without the power of it motors.

(i) Draw the path of the drone in its free motion, when it is observed by a student on the playground.

(ii) Find its horizontal and vertical velocity components at the moment of its failure.

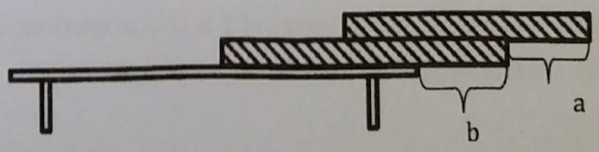
(iii) How long will it take to reach to the ground(take $\sqrt{7} = 2.64$)?

(iv) Find the horizontal distance to the landing point from the location where its free motion starts.

(v) Find the magnitude of the resultant velocity when it reach to the ground.

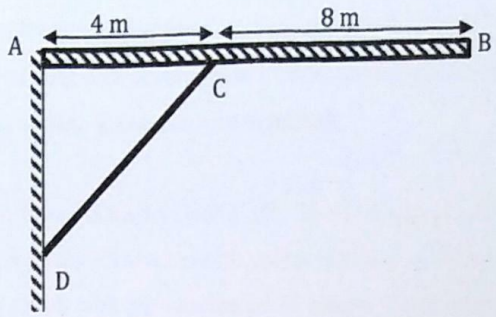
05. (a) What are the necessary conditions have to be satisfied to balance an object in equilibrium under coplanar forces?

(b) Two equal rods of length 12 m and weight 400 N are balanced on a table one on the other. Each of rods are pulling away from the table by maintaining its balance as shown in the figure. Find the maximum values that can be obtained by a and b.



(see page 9)

(c) A swimming player is planning to jump to a swimming pool from a jumping board which is above the water surface. A sketch of a jumping board constructed by using a rod AB is shown in the following figure. The end A of the rod is hinged to the horizontal wall and CD is a supporting rod.



(i) When a jumper of mass 200 N is at B, the rod AB is in horizontal. The horizontal and vertical components of reactions by the hinge at A are X & Y and horizontal and vertical force components at C are P & Q . Draw free body diagram to the rod AB by indicating all force components.

(ii) Calculate Y.

(iii) If X is 1200 N find the magnitude of the force acted on the rod at A.

($\sqrt{5} = 2.24$')

(iv) Find the magnitude of the compressional force acted at C ($\sqrt{2} = 1.41$).

(v) If the compressional force on CD rod at C is along the rod, find the length of the rod.

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