NAME	**INDEX NUMBER**
SCHOOL	**DATE**

UNIFORM CIRCULAR MOTION

1. 1995 Q4 P2

(c) (i) Explain why a pail of water can be swung in vertical circle without the water pouring out (3 marks)

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(ii) A car of mass 1200kg is moving with a velocity of $25ms^{-1}$ around a flat bend of radius 150m. Determine the minimum frictional force between the tyres and the road that will prevent the car from sliding off. (4 marks)

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2. 1996 Q6 P2

(a) The **fig. 4** shows the diagram of set up to investigate the variation of centripetal with the radius r, of the circle in which a body rotated

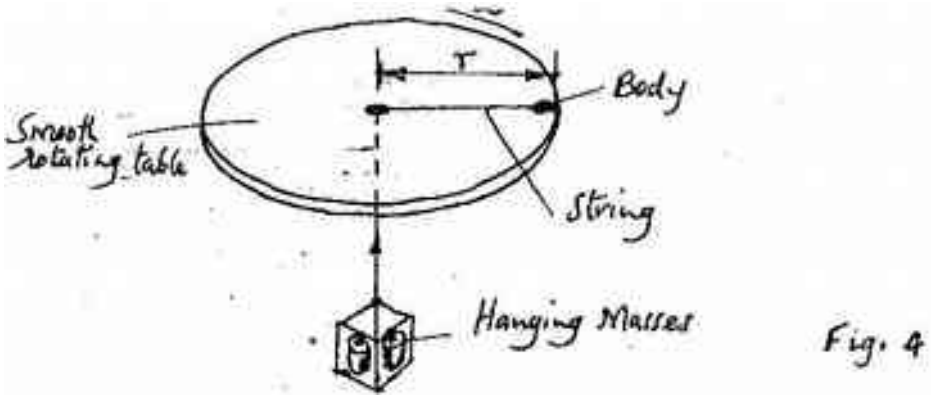

Fig. 4

Describe how the set up can be used to carry out the investigation (5 marks)

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(b) **Table 1**

Mass, m (g)	60	50	40	30	20
Radius, r (cm)	50	41	33	24	16

Table 1 shows results obtained from an investigation similar to the one in part (a)

(i) Plot a graph of force, F (y- axis) on the body against the radius , r, (in meters) (5marks)

(ii) Given that the mass of the body is 100g, use the graph to determine the angular velocity, (5 marks)

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3. 1998 Q18 P1

State the reason why the amplitude of a simple pendulum decreases with time.

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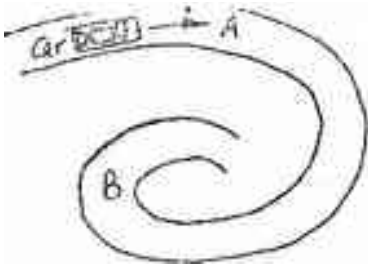
4. 1998 Q29 P1

Fig. 8 shows a car of mass M moving along a curved part of the road with a constant speed.



Explain the fact that the car is more likely to slide at B than at A if the speed is not changed.

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5. 1999 Q31 P1

Figure 15 shows two masses 0.1kg and 0.2kg connected by a string through a hole on a smooth horizontal surface.

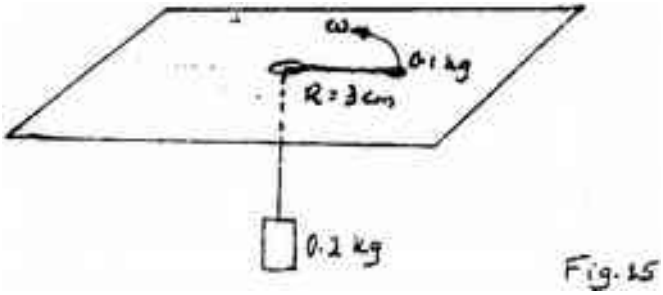

Fig. 15

The 0.1kg mass rotates in a horizontal circle of radius 3cm. Calculate the angular velocity of the mass when the system is in equilibrium.Use acceleration due to gravity g= 10ms^{-2}

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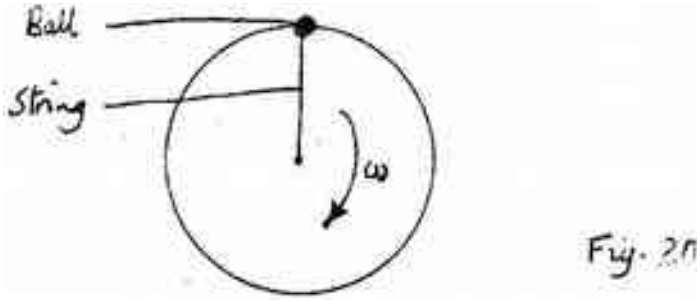
6. 2001 Q29 P1

Fig. 20 shows a ball being whirled in a vertical plane.



Sketch on the same figure the path followed by the ball if the string cuts when the ball is at the position shown in the figure.

7. 2002 Q26 P1

A small object moving in a horizontal circle of radius 0.2m makes 8 revolutions per second. Determine its centripetal acceleration.

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8. 2004 Q29 P1

A body mass 0.50kg is attached to the end of a string of length 50cm and whirled in a horizontal circle. If the tension in the string is 81N, determine the velocity of the body.

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9. 2005 Q29 P1

A car of mass 800kg moves on a circular track of radius 20m. The force of friction between the tyres and the tarmac is 4800N. Determine the maximum speed at which the car can be driven on the track without skidding.

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10. 2005 Q6 P2

(a) Define the term angular velocity (1 mark)

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(b) A body moving with uniform angular velocity is found to have covered an angular distance of 170 radians in t seconds. Thirteen seconds later it is found to have covered a total angular distance of 300 radians. Determine t. (3 marks)

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(c) **Fig 8** shows a body of mass m attached to the centre of a rotating table with a string whose tension can be measured. (The device for measuring the tension is not shown in the figure)

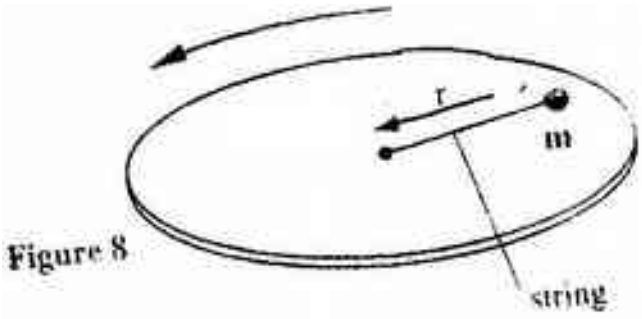

Figure 8

The tension, T on the string was measured for various values of angular velocity, w. The distance r of the body from the centre was maintained at 30cm. **Table 1** shows the results obtained.

Table 1

W^2	4.0	9.0	16.0	25.0	36.0
Angular velocity w ($radi^{-1}$)	2.0	3.0	4.0	5.0	6.0
Tension T (N)	0.04	0.34	0.76	1.30	1.96

(i) Plot the graph of T (y- axis against w^2) (5 marks)

(ii) From the graph, determine the mass, m of the body given that $T = mw^2 - C$
Where C is a constant (4 marks)

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(iii) Determine the constant C and suggest what it represents in the set up.
(2 marks)

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11. 2007 Q18 P1

(a) State what is meant by centripetal acceleration

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(b) **Figure 12** shows masses, A, B and C placed at different points on a rotating table. The angular velocity, ω, of the table can be varied.

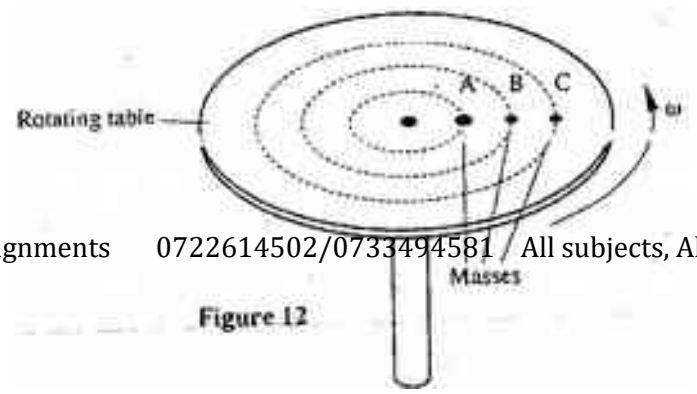

Figure 12

(i) State two factors that determine whether a particular mass slides off the table or not (2 marks)

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(ii) It is found that the masses slide off at angular velocities ω_A, ω_B, and ω_C respectively. Arrange the values of ω_A, ω_B, ω_C in decreasing order.

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(c) A block of mass 200g is placed on a frictionless rotating table while fixed to the centre of the table by a thin thread. The distance from the centre of the table to the block is 15 cm. If the maximum tension the thread can withstand is 5.6N. Determine the maximum angular velocity the table can attain before the thread cuts. (4 marks)

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12. 2009 Q14 P1

A turntable of radius 8cm is rotaing at 33 revolutions per second. Determine the linear speed of a point on the circumference of the turntable. (3 marks)

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13. 2009 Q19 P1

(a) Define angular velocity. (1 Mark)

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(b) Three masses are placed on a rotating table at distances 6cm, 9cm and 12cm respectively from the centre of rotation. When the frequency of rotation is varied, it is noted that each mass slides off at a different frequency of rotation of the table. **Table 1** shows the frequency at which each mass slides off.

Table 1

Radius r (cm)	12	9	6
Sliding off Frequency, f, (rev/s)	0.68	0.78	1.0

(i) State two factors that determine the frequency at which each mass slides off (2 marks)

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(ii)Oil is now poured on the table before placing the masses .Explain the Effect of this on the frequency at which each mass slides off.. (2 marks)

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(c) **Figure 12** shows a flywheel of a radius 14cm suspended about a horizontal axis through its centre so that it can rotate freely about the axis. A thread is wrapped round the wheel and a mass attached to its loose end so as to hang at a point 1.26m above the ground.

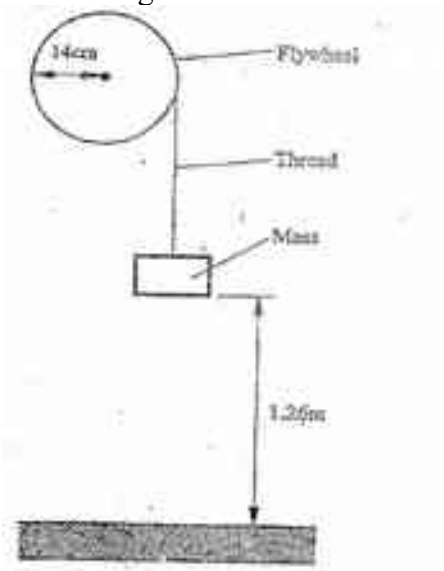

Figure 12.

When the mass is released, it accelerates at $0.28ms^{-2}$. Determine the angular velocity of the wheel just before the mass strikes the ground. (4 marks).

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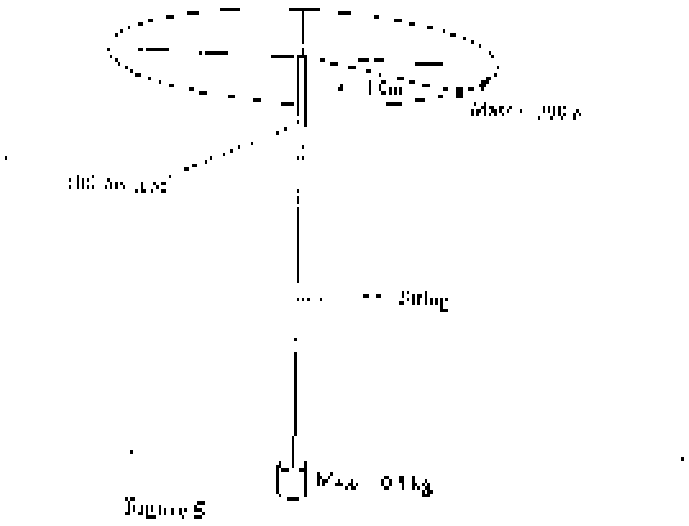
14. 2010 Q12 P1

Figure 5 shows a mass of 200g connected by a string through a hollow tube to a mass of 0.5kg. Teh 0.5kg mass is kept stationary in the air by whirling the 200g mass round in a horizontal circle of radius 1.0 metre.



Determine the angular velocity of the 200g mass. (3 marks)

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11. 2012 Q16c P1

Figure 10 shows the path of an object of mass m attached to a string of length r when whirled in a vertical circle at a constant speed V, a is the highest point on its path

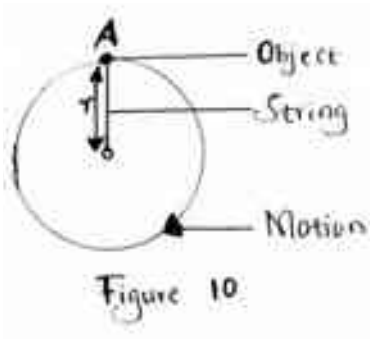

Figure 10

(i) State the forces that provide the centripetal force on the object when it is at point A. (2marks)

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(ii) Indicate with an arrow on the diagram the direction of the net force F acting on the object when it is at A. (1mark)