# 08-08-15_Sr.IPLCO_JEE-Main_RPTM-2_ Syllabus

## Mathematics:

**PARABOLA AND CIRCLES**

## Physics:

**N L M and Friction(Circular motion excluded)**

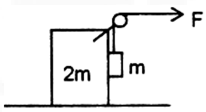
## Chemistry:

**ALKANES, ALKENES and ALKYNES**

Preparation, properties and reactions of Alkanes, Alkenes, Alkynes and Dienes

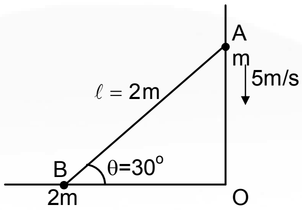
# PHYSICS

1. Two cars of unequal masses use similar tyres. If they are moving at the same initial speed, the minimum stopping distance (neglect air resistant)
   1) is smaller for the heavier car
   2) is smaller for lighter car
   3) is same for both cars
   4) depends on the volume of the car
2. A person says that he measured the acceleration of a particle to be nonzero while no force was acting on the particle.
   1) He is a liar
   2) His clock might have run slow.
   3) His meter scale might have been longer than the standard
   4) He might have used non inertial frame
3. A reference frame attached to the earth
   1) is an inertial frame by definition
   2) can be an inertial frame because the earth is revolving around the sun
   3) is an inertial frame because Newton's laws are applicable in this frame
   4) cannot be an inertial frame because the earth is rotating about its axis.
4. Two blocks of mass 2m and m are arranged as shown in the figure. The pulley is massless and a force F is applied horizontally. If $a_1$ is the upward acceleration of m & a is acceleration of 2m horizontally, then $\frac{a_1}{a}$ is (Assume all surfaces to be frictionless)




   1) $\frac{F}{mg}$
   2) $\frac{3(F-mg)}{F}$
   3) $\frac{3mg}{F}$
   4) $\frac{F}{(F-mg)}$

5. Two particles A and B of mass m and 2m are connected by a light rigid rod of length $\ell$. The particles are free to slide on frictionless L–shaped horizontal frame as shown in the figure. A moves with a constant velocity of 5 m/s. Then at the instant shown.




1) velocity of B is $5\sqrt{3}$ m/s

2) the magnitude of rate of change of θ with time will be $\frac{5}{\sqrt{3}}$ rad/sec

3) velocity of B is $\frac{10}{\sqrt{3}}$ m/s

4) the magnitude of rate of change of θ with time will be $\frac{10}{\sqrt{3}}$ rad/sec

6. A: When you are standing on a stationary floor, $\vec{R}+\vec{W}=0$, where R = reaction of the floor and W = your weight.

R: It is in accordance with Newton's 3rd law which states that the vector sum of action and its reaction is zero

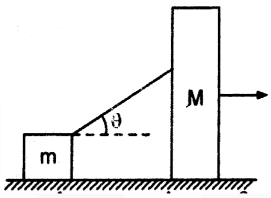
1) both assertion and reason are true and reason is the correct explanation of assertion.

2) both assertion and reason are true but reason is not the correct explanation of assertion.

3) assertion is true and reason is false.

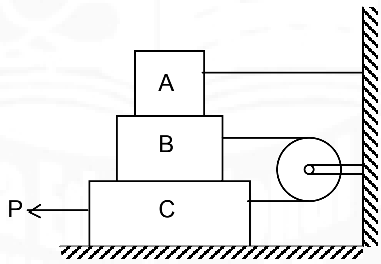
4) assertion is false but reason is true.

**7.** Two blocks of masses m (2 kg) and M (3 kg) are connected by an inextensible light string. When a constant horizontal force F (5N) acts on the block of mass M, normal reaction on the block m (2 kg) and ground is $\beta - \alpha \tan\theta$. Where $\beta$ and $\alpha$ has some numerical values. Neglect friction between the contacting surfaces and assume that m does not lose contact with the ground. Find the value of $\alpha$?



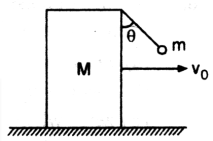

1) 2 2) 4 3) 6 4) 9

8. In figure, the masses of blocks A, B and C are 3kg, 4kg and 8kg respectively. The coefficient of sliding friction between any two surfaces is 0.25. A is held at rest by a massless rigid rod fixed to the wall, while B and C are connected by a light flexible cord passing around a fixed frictionless pulley. The force $P = \alpha \times 10$ N necessary to drag C along the horizontal surface to the left at a constant speed. Assume that the arrangement shown in the diagram, B and C and A on B is maintained all the throughout. Find the value of $\alpha$? (assume g = 10 m/sec$^2$)



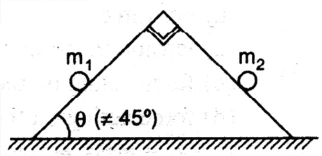

1)4 2)8 3)3 4) 5

9. A wedge of mass M is pushed with a speed $v_0$ on a rough horizontal plane. The angle of friction between the wedge and horizontal plane is $\phi$. The angle of inclination $\theta$ of the pendulum is:



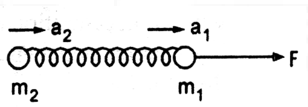

1) $\phi$ 2) $90^\circ - \phi$ 3) $\frac{m}{M}\phi$ 4) $\tan^{-1}\left(\frac{m}{M}\tan\phi\right)$

10. Two particles of masses $m_1$ and $m_2$ are released from rest on a smooth wedge of mass M. Then:




1) reaction force on the wedge due to ground is equal to $(m_1 + m_2 + M)g$
2) the wedge remains at rest if $m_1 = m_2$
3) the wedge remain stationary if $\frac{m_1}{m_2} = \tan\theta$
4) if $m_1 > m_2$, the wedge will accelerate toward right

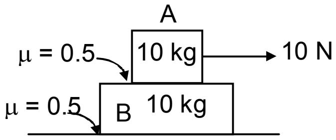
11. A spring connects by two particles of masses $m_1$ and $m_2$. A horizontal force F acts on $m_1$. Ignoring friction, when the elongation of the spring is x then incorrect statement among the following




1) $a_2 = \frac{kx}{m_2}$ 2) $a_1 = \frac{F - kx}{m_1}$

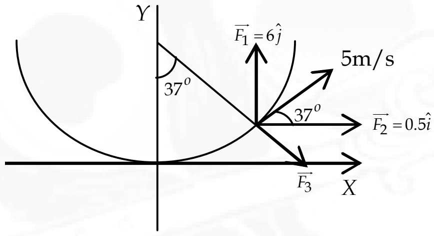
3) $F = m_1a_1 + m_2a_2$ 4) $a_1 = a_2 = \frac{F}{m_1 + m_2}$ at any time

12. F = 10 N $m_A = m_B = 10$ kg



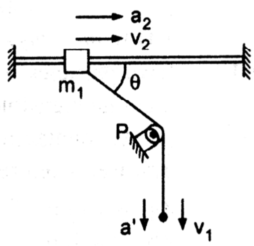

1) the force of friction acting on the block B by ground is 10 N
2) the force of friction acting on the block A by block B is 10 N
3) the entire system is at rest
4) the block B will never move whatever the magnitude of F

13. A particle of mass 1 kg is moving along a circular path as shown in the figure. The speed at the instant shown is 5 m/s and $\vec{F_1}$, $\vec{F_2}$, $\vec{F_3}$ are acting on the particle as shown. The magnitude of rate of change of speed at this instant is _______________ m/s$^2$.



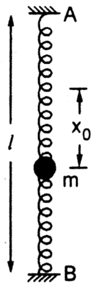

1) 1 2) 4 3) 3 4) 5

14. A bob of mass $m_1$ hangs by a light inextensible string which passes over a fixed smooth pulley P and connects a ring of mass $m_2$. The ring is constrained to move along a smooth rigid horizontal rod. The instantaneous velocities and accelerations of the bodies are $v_1$, $a_1$ and $v_2$, $a_2$ respectively then:




1) $v_2 = v_1 \cos\theta$, $a_2 = a_1 \cos\theta$
2) $v_1 = v_2 \sin\theta$, $a_1 = a_2 \sin\theta$
3) $v_1 = v_2 \cos\theta$, $a_1 = a_2 \cos\theta$
4) $m_2v_2 = m_1v_1 \sin\theta$, $m_2a_2 = m_1a_1 \sin\theta$

15. A particle P of mass m is welded at the mid-point of a relaxed spring of length $\ell$ and stiffness k. The spring is fixed vertically between two rigid supports A and B. At equilibrium of the particle:



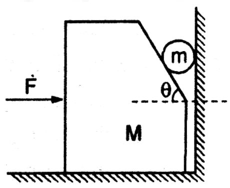

1) $x_0 = \frac{mg}{k}$; $x_0$ = displacement of the particle from undeformed state of the spring

2) $\frac{F_A}{F_B} = 1$; $F_A$ and $F_B$ are the spring forces acting at A and B respectively

3) The net spring force acting on m is zero

4) $\frac{R_A}{R_B} = 1$; $R_A$ and $R_B$ are reaction forces at A and B

16. A wedge of mass M is loaded with a sphere of mass m. If a horizontal force F is applied on the wedge, it remains in equilibrium. Then:



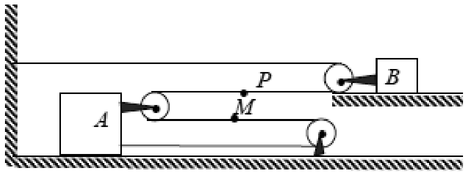

1) $N_1 = mg \sec\theta$; $N_1$ = reaction force between wedge and sphere

2) $F = mg \tan\theta$;

3) $N_2 = mg \cot\theta$; $N_2$ = reaction force between sphere and vertical wall

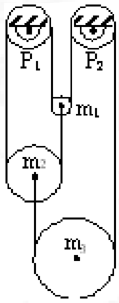
4) $N_3 = Mg + mg$; $N_3$ = = reaction force between ground and wedge

17. Block B shown in the figure moves to the right with a constant velocity of 30 $cm/s$ towards right, then




1) the speed of block A is 30 cm/s.
2) the speed of the point P of the string is 60 cm/s
3) the speed of the point P of the string is 40 cm/s
4) the speed of the block A is 10 cm/s.

18. Three smooth pulleys of masses $m_1$, $m_2$ and $m_3$ are interconnected by an inextensible light string that passes over two fixed smooth pulleys $P_1$ and $P_2$ as shown in figure. The tension in the string is $\frac{4m_1m_2m_3}{\alpha\, m_1m_2 + m_2m_3 + m_1m_3}g$. Find the value of $\alpha$?

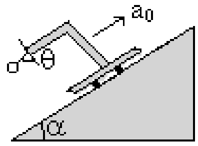



1) 2 2) 4 3) 1 4) 3

19. A body is moving down a long inclined plane of angle of inclination θ. The coefficient of friction between the body and the plane varies as $\mu = 0.5x$, where x is the distance moved down the plane. The body will have the maximum velocity when it has travelled a distance x given by :

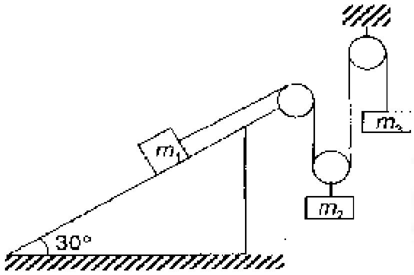
1) $x = 2\tan\theta$ 2) $x = \frac{2}{\tan\theta}$ 3) $x = \sqrt{2}\cot\theta$ 4) $x = \frac{\sqrt{2}}{\cot\theta}$

20. A pendulum of mass m hangs from a support fixed to a trolley. The direction of the string when the trolley rolls up a plane of inclination $\alpha$ with acceleration a is :



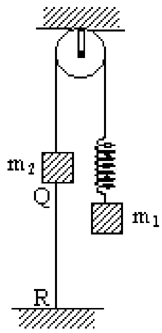

1) 0 2) $\tan^{-1}\alpha$ 3) $\tan^{-1}\frac{a+g\sin\alpha}{g\cos\alpha}$ 4) $\tan^{-1}\frac{a}{g}$

21. All surfaces shown in fig are smooth. For what ratio $m_1 : m_2 : m_3$, system is in equilibrium. All pulleys and strings are massless,



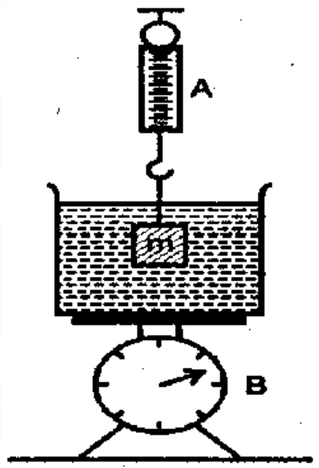

1) 1 : 2 : 1 2) 2 : 2 : 1 3) 2 : 1 : 2 4) 1 : 2 : 2

22. In the shown system, $m_1 > m_2$. Thread QR is holding the system. If this thread is cut, then just after cutting.




1) Acceleration of mass $m_1$ is zero and that of $m_2$ is directed upward.
2) Acceleration of mass $m_2$ is zero and that of $m_1$ is directed downward
3) Acceleration of both the blocks will be same.
4) Acceleration of system is given by $\left(\frac{m_1 - m_2}{m_1 + m_2}\right)$ kg, where k is a spring factor.

23. The spring balance A reads 2 kg with a block m suspended from it. A balance B reads 5 kg when a beaker filled with liquid is put on the pan of the balance. The two balances are now so arranged that the hanging mass is inside the liquid as shown in figure. In this situation



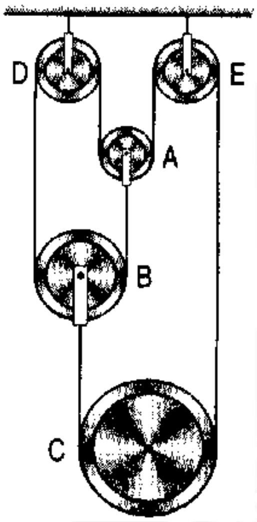

1) the balance A will read more than 2 kg

2) the balance A will read less than 2 kg and B will read more than 5 kg but the Sum of the readings is less than 7kg

3) the balance A will read less than 2 kg and B will read more than 5 kg but the Sum of the readings is equal to 7kg

4) balance A and B will read 2 kg and 5 kg respectively

24. In the pulley system shown the movable pulleys A, B and C have mass m each, D and E are fixed pulleys. The strings are vertical, light and inextensible. Then,




1) The tension through out the string is the same and equals $T = \frac{mg}{3}$

2) pulleys A and B have acceleration $\frac{g}{3}$ each in downward direction and pulley C has acceleration $\frac{g}{3}$ in upward direction

3) pulleys A, B and C all have acceleration $\frac{g}{3}$ in downward direction

4) pulley A has acceleration $\frac{g}{3}$ in downward direction and pulleys B and C have acceleration $\frac{g}{3}$ each in upward direction

25. Two men of unequal masses hold on to the two sections of a light rope passing over a smooth light pulley. All accelerations are in ground frame

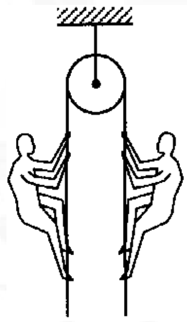
I) The lighter man is stationary while the heavier man slides with some acceleration

II) The heavier man is stationary while the lighter man climbs with some acceleration

III) The two men climb up with the same acceleration in the same direction

IV) The two men slide down with accelerations of the same magnitude.

Which of the following are possible?

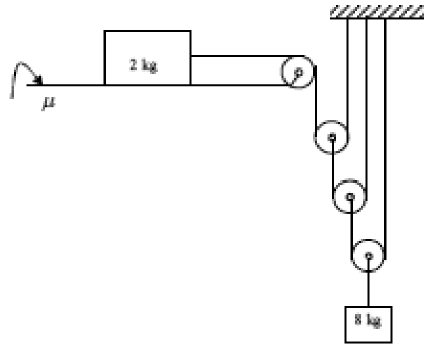


1) I & IV 2) I & II 3) I & III 4) III & IV

26. A block of mass m is placed over a block B of mass 2m. The block B can move on a smooth horizontal surface. If the coefficient of friction between the blocks A and B is $\mu$, then the minimum force R required to initiate sliding motion in block A is

1) $\mu$ mg 2) $3\mu$ mg 3) $3\mu$ mg/2 4) 3mg / $\mu$

27. Two blocks of masses 2 kg and 8 kg are connected through pulleys and strings as shown in the figure. If all pulleys and strings are ideal, then which of the following statements is not true? ($\mu = 0.6$, $g = 10ms^{-2}$)



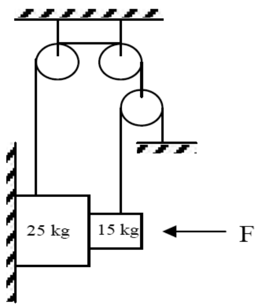

1) friction force between the 2 kg block and the surface is 12 N

2) friction force between the 2 kg block and the surface is 10 N

3) acceleration of the 2 kg block is equal to zero

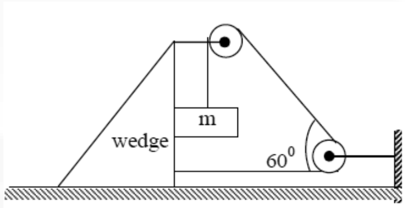
4) tension in the string connected to the 2 kg block is 10 N

28. Two blocks of masses 15kg and 25kg are connected using pulleys as shown. Find the minimum value of F to hold the system at equilibrium. Coefficient of friction between all the contact surfaces is 0.4



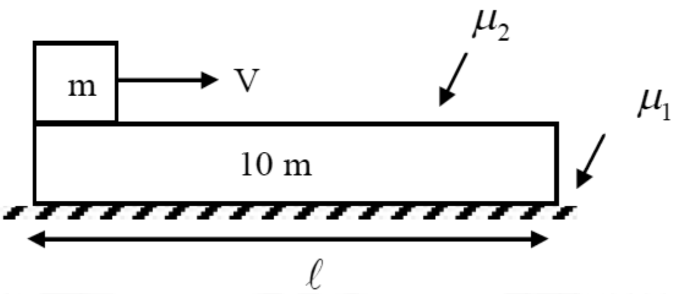

1)125 N 2) 62.5 N 3) 31.25 N 4) 250N

29. A wedge and block are connected by a mass less string passing over a frictionless pulley as shown in the figure. The ratio of speed of wedge to the speed of the block of the instant shown is (all surfaces are smooth) $\sqrt{N/13}$ where N is a positive integer. The value of N is




1) 4 2) 3 3) 2 4) 1

30. A small block 'm' is projected on a larger block of mass 10m and length l with velocity V as shown below. The coefficient of friction between two blocks is $\mu_2$. While that between the lower block and the ground is $\mu_1$ given $\mu_2 > 11\mu_1$ If V has the minimum value find the time taken by block to falls off the block of mass 10m




1) $t = \sqrt{\dfrac{20l}{11g(\mu_2 - \mu_1)}}$

2) $t = \sqrt{\dfrac{20l}{11g(\mu_2 + \mu_1)}}$

3) $t = \sqrt{\dfrac{20l}{11g(\mu_1 - \mu_2)}}$

4) None of these