PHYSICS

BOOKS - CHETANA PHYSICS (MARATHI ENGLISH)

LAWS OF MOTION

Exercise

1. State which physical quantities decides the trajectory of any motion.

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2. How can trajectory of different motion be explained on the basis of acceleration and initial velocity?

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3. Was Aristotle correct in stating that external force is required to keep a body in uniform motion?

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4. State Newton's Laws of motion

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5. What is special about Newton's first law if it is derivable from Newton's second law?

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6. State the importance of Newton's first law of motion.

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7. State the importance of Newton's Second law of motion.

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8. State the importance of Newton's third law of motion.

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9. What is frame of reference? Explained the terms:

(i) inertial frame of reference

(ii) non-inertial frame of reference

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10. Explain the concept of pseudo force in non-inertial frame of reference.

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11. State the limitations of Newton's Laws of motion

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12. In real life, objects never travel with uniform velocity even on a horizontal surface, unless something is done? Why is it so? What is to be done?

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13. For the study of any kind of motion, we never use Newton's first law of motion directle? Why should it be studied?

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14. Are there any situations in which we cannot apply Newtons laws of motion? Is there any alternative for it?

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15. You are inside a closed capsule from where you are not able to see anything about the outside world. Suddenly you feel that you are pushed towards your right. Can you explain the possible cause (s)? Is it a feeling or a

reality? Give at least one more situation like this.

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16. Distinguish between

(i) Inertial and Non-inertial frames of reference

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17. Name the real forces in nature?

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18. Explain various fundamental forces in nature.

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19. Write a short note on weak interaction force.

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20. Among the four fundamental forces, only one force governs your daily life almost entirely. Justify the statement by stating that force.

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21. Find the odd man out:

(i) Force responsible for a string to become tout on stretching

Weight of an object

The force due to which we can hold an object in hand.

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22. You are siting to your friend on ground. Is there any gravitional force of attraction between you two? If so, why are you not coming together naturally? Is any force other than the gravitationall force of the earth coming in picture?

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23. Distinguish between:

(1) Real and Pseudo Forces

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24. As I was standing on a weighing machine inside a lift it recorded 50 kg wt. Suddenly for few seconds it recorded 45 kg wt. What must have happened during that time Explain with complete numerical analysis.

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25. Two galaxies of masses 9 billion solar ,ass and 4 billion solar mass are 5 million light years apart. If, the sun has to cross the line joining them, without being attracted by either of them, through what piont it should pass?

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26. State the formula for calculating work done by a force. Are there any conditions or limitations in using it directly? If so, state those clearly. Is there any mathematical way out for it? Explain.

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27. Justify the statement, 'work and energy are the two sides of a coin'.

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28. From the terrace of building of height H, you dropped a ball of mass m. It reached the ground with speed v. Is the relation $mgH = \frac{1}{2}mv^2$ applicable exactly ? If not, how can you account for the difference ? Will the ball bounce to the same height from where it was dropped?

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29. State the law of conservation of linear momentum. It is a consequence of which law? Give an example form our daily life for conservation of momentum. Does it hold good during burst of a cracker?

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30. Two bodies of masses 2 kg and 4 kg are connected at the two ends of a string of negligible mass that passes over an ideal

pulley (i. e., of negligible mass and friction). Calculate (i) the acceleration of the system (ii) the tension in the string.

[Given: $g = 10m/s^2$]

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31. Ten identical masses (m each) are connected one below the other wih 10 strings. Holding the topmost string, the system is accelerated upwards with acceleration $g/2$.

What is the tension in the 6th string from the top (topmost string being the first string)?

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32. A person of mass 60 kg stands on a weighing scale in a lift (elevator). What would the scale read if the elevator moves

(i) up with a uniform speed of $5m/s$

(ii) down with a uniform acceleration of $4m/s^2$

(iii) up with a uniform acceleration of $4m/s^2$?

[Given :$g = 10m/s^2$]

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33. A liquid drop of mass 1 g falls from a cliff 1 km high. It hits the ground at the bottom of the cliff with a speed of $50m/s$. What is the work done by the unknown resistive force?

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34. A truck of mass 5 tons is travelling on a horizontal road with 36 km hr^{-1} stops on travelling 1 km after its engine fails suddenly. What fraction of its weight is the frictional force exerted by the car of mass 1 ton i.e., car moving with same speed stops in similar distance, how much will the fraction be?

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35. A lighter object A and a heavier object B are initially at rest. Both are imparted the same linear momentum. Which will start with the greater kinetic energy?

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36. Power is rate of doing work or the rate at which energy is supplied to the system. A constant force F is applied to a body of mass m. Power delivered by the force at time t from

the start is proportional to_____

(a) t

(b) t^2

(c)$\sqrt{t}$

(d) t^0

Derive the expression for power in terms of F, m and t.

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37. Variation of a force in certain region is given by $F = 6x^2 - 4x - 8$. It displaces an

object from x = 1m to x= 2 m in this region. Calculate the amount of work done.

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38. While decreasing linearly from 5 N to 3 N, a force displaces an object from 3 m to 5 m. Calculate the work done by this force during this displacement.

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39. 40000 liters of oil of density 0.9 gram per cc is pumped from an oil tanker ship into a storage tank at 10 m higher level than the ship in half an hour. What should be the power of the pump?

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40. Define and explain.

(i) Elastic collision.

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41. Define coefficient of restitution and obtain its value for an elastic collision and a perferctly inelastic collision.

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42. Derive an expression for the velocities of the colliding bodies after elestic collision

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43. Discus the folwing as special cases of elastic collision and obtain their exact or approximate final velocities in terms of their initial velocities.

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44. A bullet of mass m_1 travelling with a velocity u strikes a stationary wooden block of mass m_2 and gets embeded into it. Determine the expression for loss in the kinetic energy of the system. Is this violating the principle of

conversation of energy? If not, how can you account for this loss?

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45. Explain non head on collision i.e. collision in two dimensions?

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46. A marble of mass 2m travelling at 6 cm/s is directly followed by anoother marble of

mass m with double speed. After collision, the heavier one travels with the average initial speed of the two. Calculate the coeficient of restitution.

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47. Two bodies of masses m and 2m, moving with initial velocities 50 m/s in the + x direction and 40 m/s in the -x direction respectively, undergo a head -on elastic collision.

(i) Calculate their final velocities

(ii) What is the ratio of the final to initial kinetic energies for the body of mass m?

(iii) Calculate the change in momentum of each body if m= 1kg

(iv) What is the change in the momentum of the system?

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48. A bodyof mass 2 kg moves at speed of $4m/s$ and makes head on collision with body

of mass 1 kg moving with speed $2m/s$ in opposite direction. What is velocity of two bodies after collision?

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49. A body of mass 0.5 kg moving with a velocity of $6m/s$ collides with another body of mass 2 kg moving at $2m/s$ and travelling in opposite direction. If the two bodies travel together after the collision, find the velocity of combined mass and the loss of kinetic energy.

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50. A ball is dropped on a plane horizontal surface from height H. The ball bounces and reaches height h. Show that cofficient of restitution is $e = \sqrt{\frac{h}{H}}$

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51. A spring ball of mass 0.5 kg is dropped from some height. On falling freely for 10 s, it explodes into two fragments of mass ratio $1:2$

. The lighter fragment continues to travel downwards with speed of $60m/s$. Calculate the kinetic energy supplied during explosion.

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52. A ball orf mass 100 g dropped on the ground from 5 m bounces repeatedly. During every bounce 64% of the potential energy is converted into kinetic energy. Calculate the following:

(a) Coefficient of restitution

(b) Speed with which the ball comes up from the ground after third bounce.

(c) Impulse given by the ball to the ground during this bounce.

(d) Average force exerted by the ground if the impact lasts for 250ms.

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53. One of the effects of a force is to change the momentum. Define the quantity related to this and explain it for a variable force. Usually

when do we define it instead of using the force?

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54. A bullet of mass 0.1 kg moving horizontally with a velocity of 20 m/s strike a stationary target and is brought to rest in 0.1 s. Find the impulse and average force of impact.

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55. While rotating an object or while openning a door or a water tap we apply a force or forces. Under which conditions is this process easy for us? Why? Define the vector quantity concerned. How does it differ for a single force and for two opposite forces with different lines of action?

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56. Why is the moment of a couple independent of the axis of rotation even if axis is fixed?

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57. A force $\vec{F} = \left(3\vec{i} + 2\vec{j} - 4\vec{k}\right)$ N acts on a particle. The position of particel with respect to origin O is $\vec{r} = \left(\vec{i} + 2\vec{j}\right)$m. Find the torque acting on the particel and calculate its magnitude.

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58. Linear velocity of a rotating fan as a whole generally zero. Is it in mechanical equilibrium? Justify your.

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59. Define centre of mass.

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60. Define and explain rotational equilibrium:

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61. How can the centre of mass be mathematically determined or understood?

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62. State any 6 characteristics of centre of mass:

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63. Define Centre of gravity:

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64. Why do we need to know the centre of mass of an object? For which objeects, its position may differ from that of the centre of gravity?

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65. The mass of the Moon is 0.0123 times that of the Earth and the separation between their centers is 3.83×10^8 m. Determine the location of their center of mass relative to the center of the Earth:

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66. Locate the centre of mass of the syste,m of three particles of masses $m_1 = 1$ kg, $m_2 = 2$

kg and $m_3 = 3$ kg which are placed at the corners of an equilateral triangle of side 1 m.

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67. Two brass sphere of radii 5 cm and 10 cm are brought in contact with each other. Find the centre of gravity of the combination.

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68. A uniform beam 1 m long is supported on knife-edge at 60 cm from left end. A mass of 100 g is suspended at a distance of 50 cm and a mass of 50 g is suspended at 20 cm from same end. From where should the mass of 200 g be suspended so that beam will remain horizontal. Also find normal reaction at the support.

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69. A uniform wooden plank, 5 m long and mass of 40 kg, is resting horizontally on two supports 0.5 m from each end. A boy weighing 45 kg stands on the plank, 1.5 m from one end. Find the reaction at the supports.

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70. A 2 m long wooden plank of mass 20 kg is pivoted (supported from below) at 0.5 m from either end. A person of mass 40 kg starts

walking from one of these pivots to the farther end. How far can the person walk before the plank topples?

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71. State and explain Mechanical equilibrium:

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72. A 2 m long ladder of mass 10 kg is kept against a wall such that is 1.2 m. away from the

wall. The wall is smooth but the ground is rough. Roughness of the ground is such that it offers a maximum horizontal resistive force (for sliding motion) half that of normal reaction at the point of contact. A monkey of mass 20 kg starts climbing the ladder. How far can it climb along the ladder? How much is the horizontal reaction at the wall?

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73. Four uniform solid cubes of edges 10 cm, 20 cm, 30 cm and 40 cm are kept on the ground, touching each other in order. Locate centre of mass of their system.

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74. A uniform solid sphere of radius R has a hole of radius $R/2$ drilled inside it. One end of the hole is at the centre of the sphere while

the other is at the boundary. Locate centre of mass of the remaining sphere..

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75. A uniform solid sphere of radius R has a hole of radius $R/2$ drilled inside it. One end of the hole is at the centre of the sphere while the other is at the boundary. Locate centre of mass of the remaining sphere..

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76. Find the expression for velocity of centre of mass.

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77. Find the expression for the acceleration of centre of mass.

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78. A man of mass 80 kg stands in an elevator.

Calculate his apparent weight when,

(i) elevator is at rest

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79. A man of mass 80 kg stands in an elevator.

Calculate his apparent weight when,

(ii) elevator is uniformly accelerated upwards at $2m/s^2$

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80. A man of mass 80 kg stands in an elevator.

Calculate his apparent weight when,

(iii) downwards with $2m/s^2$ acceleration

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81. A man of mass 80 kg stands in an elevator.

Calculate his apparent weight when,

(iv) the elevator cable breaks $\left(g = 10m/s^2\right)$

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82. Two masses of 20 kg and 10 kg are connected to the ends of a string, hanging on a smooth and frictionless pulley. Find the acceleration of the two masses and tension in the string.

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83. A body P of mass 3 kg and moving with velocity of $2m/s$ makes a head-on elastic collision wi9th other body 'Q' of mass 5 kg,

which is at rest.

What is velocity of Q after collision?

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84. A body P of mass 3 kg and moving with velocity of $2m/s$ makes a head-on elastic collision wi9th other body 'Q' of mass 5 kg, which is at rest.

(ii) What is momentum of body P after collision?

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85. A body of mass 2 kg travels with a velocity of 8 m/s makes a head on collision with another body having mass 4 kg, which is travelling in the same direction with a velocity of 1 m/s. Calculate the velocities of the two bodies after collision. Find the loss in kinetic energy of the system. (Given e = 0.5)

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86. A body of mass 1 kg moving with velocity $10m/s$ collides with another body moving in opposite direction of mass 3 kg and velocity $3m/s$. After collision both the bodies move together. What is their common velocity?

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87. Two men are carrying a uniform beam of mass 200 kg of length 10 m on their shoulders. If one man is at 1 m from one end and other is

2 m from other end, find the load supported by each.

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88. A steel rod of 1 m is supported at its ends so that it remains horizontal. Three spheres of masses 4 kg, 6 kg, 8 kg, are suspended from 15 cm, 40 cm and 80 cm marks respectively . If weight of rod is 2 kg wt, calculate the reaction at each support.$\left(g = 9.8m / s^2\right)$

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89. A flexible chain of length L and mass M is slowly pulled at constant at speed up over the edge of a table by a force f parallel to the edge of the table. Assume that there is no friction between the table and the chain, calculate the work done.

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90. Find the position vector of the centre of mass 1 kg, 2 kg and 3 kg at points

$\left(3\hat{i}+2\hat{j}\right).\left(5\hat{j}+\hat{k}\right)$ and $\left(2\hat{i}+\hat{k}\right)$

respectively.

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91. A force $\vec{F}=\left(2\hat{i}+3\hat{j}\right)$ N acts on particle, whose position with respect to the 'O' of an inertial frame of reference is given by $\vec{r}=\left(3\hat{i}+2\hat{j}\right)$ m determine the torque acting on the particel.

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92. A bomb of 12 kg expledes into 2 pieces of masses 4 kg and 8 kg mass is $6ms^{-1}$. What is K.E of the other mass?

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93. Three equal masses each of 1 kg are placed at vertices of an equilateral triangle of side 10m. Find the position of centre of mass.

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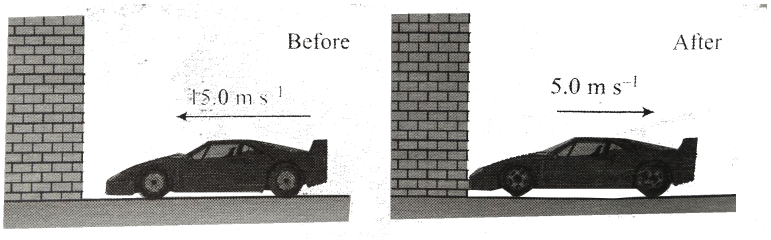
94. In a particular crash test, a car of mass 1500 kg collies with a wall as shown in fig. The initial and final velocities on the car are $\rightarrow$ vi=-15.0^ims-1 and $\rightarrow$ vf=5.00^ims-1, respectively. If the collision lasts 0.150s, find the impulse caused by the collision and the average force exerted on the car.



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95. A force F = (2 + x) acts on a particle in x-direction, where F is in newton and x is in metre. Find the work done by this force during a displacement from x = 1m to x = 2m

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96. The potential energy of a conservative is given by $u = ax^2 - bx$, where a and b are positive constants. Discuss whether the equilibrium is stable, Unstable or neutral.

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97. An object of mass 5kg falls from rest through a verticle distance of 20m and reaches a velocity of $10ms^{-1}$. How much work is done by the push of the air on the object? $(g = 10ms^2)$

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98. Choose the correct options

Consider following pair of forces of equal

magnitude and opposite directions:

(p) Gravitational forces exerted on each other by two point masses separted by a distance.

(Q) Couple of forces used to rotate a water tap.

(R) Gravitional force and normal force experienced by an object kept on a table.

For which of these $pair/pairs$ the two forces do NOT cancel each others's translational effect?

A. Only P

B. Only P and Q

C. Only R

D. Only R

Answer: Only Q and R

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99. Choose the correct options

Consider following forces: (w) Force due to tension along a string, (x) Normal force given by a surface, (y) Force due to air resistance and (z) Buoyant force or upthrust given by a

fluid.

Which of these are electromagnetic forces?

A. Only w, y, and z

B. Only w, x and y

C. Only x, y and z

D. All four

Answer:

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100. Choose the correct options

At a given instant three point masses m, 2m and 3m are equidistant forces each other. Consider only the gravitational forces between them. Select correct $statement/s$ for this instance only:

A. Mass m exoeriences maximum force.

B. Mass 2m experiences maximum force.

C. Mass 3m experiences maximum force.

D. All masses experience force of same magnitude.

Answer:

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101. Choose the correct options

The rough surface of a horizontal table offers a definite maximum opposing force to initiate the notion of a block along the table, which is the motion of a block along the table, which is

proportional to the resultant normal force given by the table. Forces F_1 and F_2 act at the same angle θ with the horizontal and both are just initiating the slide motion of the block along the table. Force F_1 is a pulling force while the force F_2 is a pushing force. $F_2 > F_1$, because

A. Components of F_2 adds up to weight to increase the normal reaction

B. Components of f_1 adds up to weight to increase the normal reaction.

C. Component of F_2 adds up to the opposing force.

D. Component of F_1 adds up to the opposing force.

Answer:

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102. Choose the correct options

A mass 2 m moving with some speed is directly approaching another mass m moving with

double speed. After some time, they collide with coefficient of restitution 0.5. Ratio of their respective speeds after collision is__

A. 2 / 3

B. 3 / 2

C. 2

D. 1 / 2

A. A. $2/3$

B. B. $3/2$

C. C. 2

D. D. $1/2$

Answer:

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103. Choose the correct options

A uniform rod of mass 2 m is held horizontal by two sturdy, practically inextensible vertical strings tied at its ends. A boy of mass 3 m hangs himself at one third length of the rod. Ratio of the tension in the string close to the boy to that in the other string is

A. 2

B. 1.5

C. $4/3$

D. $5/3$

Answer:

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104. Choose the correct options

Select WRONG statement about centre of mass:

A. Centre of mass of a 'C' shaped uniform rod can never be a point on that rod.

B. If the line of action of a force passes through the centre of mass, the moment of that force is zero.

C. Centre of mass of our Earth is not at its geometrical centre.

D. While balancing an object on pivot, the line of action of the gravitational force of the earth passes through the centre of mass of the object.

A. A. Centre of mass of a 'C' shaped uniform rod can never be a point on that rod.

B. B. If the line of action of a force passes through the centre of mass, the moment of that force is zero.

C. C. Centre of mass of our Earth is not at its geometrical centre.

D. D. While balancing an object on pivot, the line of action of the gravitional force

of the earth passes through the centre of mass of the object.

Answer:

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105. Choose the correct options

For which of the following objects will centre of mass NOT be at their geometrical centre?

(i) An egg

(ii) a cylindrical box full of rice

(iii) a cubical box containing assorted sweets

A. Only (I)

B. Only (I) and (II)

C. Only (III)

D. All, (I) and (III)

Answer:

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106. Choose the correct options

Action and reaction forces do not cancel each other because

A. they have different magnitude

B. they are acting in different direction .

C. they are equal in magnitude and opposite in direction acting on two differents bodies.

D. they are equal in direction and have different magnitude acting on two

different magnitude acting on two different bodies.

Answer:

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107. Choose the correct options

A force vector applied on a mass is represented as $\overrightarrow{F} = \left(6\hat{i} - 8\hat{j} + 10\hat{k}\right)$ N and accelerates with 1 ms^{-2} What will be the mass of the body?

A. $2\sqrt{10}$

B. 10 kg

C. $10\sqrt{2}kg$

D. 20 kg

Answer:

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108. Choose the correct options

A ball of mass 250 g moving with 20 m/s strikes a vertical wall and rebounds along the

same line with a velocity of 15 m/s. If the time of contact is 0.1 s, the force exerted by the wall on the ball is

A. 87.5 N

B. 12. N

C. -12.5 N

D. -87.5 N

Answer:

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109. Choose the correct options

.....force is defined in order to apply Newton's laws of motion in non-internal frame.

A. Pseudo

B. Gravitational

C. Real

D. Magnetic

Answer:

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110. Choose the correct options

Which of the following is NOT an example of real force?

A. The earth revolves around the sun.

B. Bus is moving with acceleration in straight line, the passenger experience backward force.

C. Motion between two surfaces in contact.

D. Motion of the moon around the earth

Answer:

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111. Choose the correct options

The electrostatic and gravitional foces are similar because

A. both are conservatives

B. both are central forces

C. both follow inverse square law.

D. all of these

Answer:

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112. Choose the correct options

The range of nuclear force is nearly

A. 10^{14}m

B. 10^{8}m

C. 10^{-8}m

D. 10^{-14} m

Answer:

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113. Choose the correct options

A light and heavy body have equal K.E Which body possesses greater momentum?

A. Light body

B. Both have equal momentum

C. The heavy body

D. Momentum cannot be predicted

Answer:

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114. Choose the correct options

Choose the WRONG statement.

A. The law of conservation of linear momentum holds good for microscopic objects.

B. The law of conservation of linear momentum holds good for macroscopic objects.

C. The law of conservation of linear momentum is true for two objects.

D. The law of conservation of linear momentum is not applicable for two colliding bodies at any angle.

Answer:

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115. Choose the correct options

A block of wood moves a distance 5 cm along a straight line under the action of force of 2.5 dyne. If the work done is 6.25 erge, the angle which the force makes with the direction of motion of the body is.

A. 90°

B. 60°

C. 45°

D. 30°

Answer:

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116. Choose the correct options

A force applied to a packet resting on smooth horizontal plane making an angle of 45°, displaces it through 4 m. If the work done in moving the packets is 16 J, the force applied is

A. $\frac{4}{\sqrt{2}}N$

B. $\frac{20}{\sqrt{2}}N$

C. $12\sqrt{2}$ N

D. $4\sqrt{2}$ N

Answer:

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117. Choose the correct options

A ball of mass 5 kg travelling with velocity of $15cm/s$ makes a head on collision with another ball of mass 1 kg which is at rest. After

the collision, the speed of the lighter ball is____

A. zero

B. less than 15 c m / s

C. equal to 15 c m / s

D. greater than 15 c m / s

A. A. zero

B. B. less than $15cm/s$

C. C. equal to $15cm/s$

D. D. greater than $15cm/s$

Answer:

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118. Choose the correct options

When the bodies stick together after collision, the collision is said to be

A. perfectly elastic

B. perfectively inelastic

C. partly elastic

D. partly inelastic

Answer:

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119. Choose the correct options

A force $F = (0.5x + 12)$ N acts on a particle. If x is in metres, calculate the work done by the force during the displcement of the particle from x= 0 to x = 4 m

A. 128 J

B. 80 J

C. 64 J

D. 52 J

Answer:

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120. Choose the correct options

A block of mass m moving at a speed of u collides with another block of mass 2 m at rest. The lighter block comes to rest after the collision. The coefficient of restitution is

A. 0.8

B. 0.6

C. 0.5

D. 0.4

Answer:

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121. Choose the correct options

If the relative displacement between any two particles of a body does not change under the application of force of any magnitude, the body is said to be a

A. stationary body

B. elastic body

C. plastic body

D. rigid body

Answer:

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122. Choose the correct options

A bomb of mass 9 kg explodes into two pieces of mass 3 kg and 6 kg. The velocity of mass 3

kg is 16 m/s. The kinetic energy of mass 6 kg is

A. 96 J

B. 192 J

C. 384 J

D. 768 J

Answer:

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123. Choose the correct options

The cofficient of restitution will NOT have

A. $e = 0$

B. $e = 1$

C. $0 < e < 1$

D. $e > 1$

Answer:

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124. Choose the correct options

A frame of reference which moves with constant velocity with reference to a stationary frame of reference is called

A. inertial frame of reference

B. non-inertial frame of reference

C. rotating frame of reference

D. absolute frame of reference

Answer:

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125. Choose the correct options

Non-inertial frame of reference has

A. zero acceleration

B. some acceleration with respect to inertial frame of reference

C. zero velocity

D. constant velocity with respect to inertial frame of reference

Answer:

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126. Choose the correct options

When a body is at rest, then

A. force is acting on the body

B. the body is in vacuum

C. the net resultant force acting on it has some magnitude

D. the net resultant force acting on it is zero

Answer:

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127. Choose the correct options

The turning effect of the applied force does NOT depend upon

A. magnitude of the force

B. direction of the force

C. moment arm of the force

D. material and its distance from the axis

Answer: material and its distance from axis of rotation

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128. Choose the correct options

What is the torque of force f=(2i-3j+4k) acting at a point $\vec{r} = \left(3\hat{i} + 2\hat{j} + 3\hat{k}\right)$ m about origin?

A. $\left(17\hat{i} - 6\hat{j} - 13\hat{k}\right)$ N m

B. $\left(\hat{i} + 18\hat{j} + 13\hat{k}\right)$ N m

C. $\left(-\hat{i} - 18\hat{j} - 13\hat{k} \right)$ N m

D. $\left(\hat{i} - 18\hat{j} - 13\hat{k} \right)$ N m

Answer:

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129. Choose the correct options

A mass of 10 kg is suspended from a rope wound on a wheel of diameter 40 cm. The torque about the axis of rotation is

A. 39.2 N m

B. 19.6 N m

C. 4 N m

D. 2 N m

Answer:

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130. Choose the correct options

Centre of mass of body lies

A. always inside the body

B. always outside the body

C. on the surface of the body

D. may be inside or outside the body

Answer:

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131. Choose the correct options

The centre of mass of a system of two uniform

spherical masses of 5 kg and 35 kg with centres of them 0.7 m apart is

A. 0.6125 m from 35 kg

B. 0.6125 m from 5 kg

C. 0.35 m from 35 kg

D. 0.35 m from 5 kg

Answer:

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132. Choose the correct options

For a circular ring centre of gravity lies

A. awaya from the ring

B. at the geometrical centre

C. on the edge of the ring

D. none of the above

Answer:

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133. Choose the correct options

A uniform bar RS weighs 100 g and is 80 cm long. From the end R two masses 50 g and 100 g hung from the bar at a distance of 10 cm and 60 cm respectively. If the bar is to remain horizontal when balanced on a knife-edge, its position is___

A. 42 cm from S

B. 38 cm from R

C. 38 cm from G

D. 42 cm from R

A. A. 42 cm from S

B. B. 38 cm from R

C. C. 38 cm from G

D. D. 42 cm from R

Answer:

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134. Choose the correct options

A steel bar AB of mass 10 kg and length 1 m is kept horizontal by supporting it at the two ends. Two weights of 4 kg and 6 kg are

suspended from points of the bar at distances 30 cm and 80 cm respectively from the end A. The reaction at A is

A. 107.8 N

B. 97.8 N

C. 88.2 N

D. 78.2 N

Answer:

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135. Choose the correct options

A body of mass 2 kg, travelling at 4 m/s makes a head-on collision with a body of mass 1 kg travelling in the opposite direction with a velocity of 2 m/s, the velocities of the two bodies after collision are____

A. v 1 = 6 m / s , v 2 = 6 m / s

B. v 1 = 0 , v 2 = 0

C. v 1 = 0 m / s , v 2 = 6 m / s

D. v 1 = 6 m / s ,v 2 =0`

A. A. $v_1 = 6m/s, v_2 = 6m/s$

B. B. $v_1 = 0, v_2 = 0$

C. C. $v_1 = 0m/s, v_2 = 6m/s$

D. D. $v_1 = 6m/s$,v_2 =0`

Answer:

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136. Choose the correct options

A particle of mass moving eastward with a speed v collides with another particle of same mass moving north wards with same speed v.

The two particle coalesce on collision. The new particle of mass 2m will more in direction with the velocity

A. $\frac{v}{\sqrt{2}}$ N W

B. $\frac{v}{\sqrt{2}}$ S W

C. $\frac{v}{\sqrt{2}}$ N E

D. $\frac{v}{\sqrt{2}}$ S E

Answer:

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137. Choose the correct options

The coordinate of centre of mass of a hemispherical shell of radius R, placed in xy plane with its centre at origin is

A. $x_c = 0, y_c = 0$

B. $x_c = 0, y_c = R$

C. $x = 0, y_c = \frac{R}{2}$

D. $x_c = R/2, y_c = 0$

A. A. $x_c = 0, y_c = 0$

B. B. $x_c = 0, y_c = R$

C. C. $x = 0, y_c = \frac{R}{2}$

D. D. $x_c = R/2, y_c = 0$

Answer:

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138. Choose the correct options

A block at rest explodes into 3 parts of the same mass. The momentum of the 2 parts are $-2p\hat{i}$ and $p\hat{j}$. The momentum of the third part will have a magnitude

A. P

B. $p\sqrt{3}$

C. $p\sqrt{5}$

D. zero

Answer:

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139. Choose the correct options

The potential energy V of a system is a function of displacement 'x'. The sign of the

second derivative $\left(\frac{d^2u}{dx^2}\right)$ is negative. The state of equilibrium is

A. stable

B. unstable

C. neutral

D. can't say

Answer:

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140. Select and write the most appropriate answer from the given alternatives for each sub-question :

(1) If m is the mass of body and E its kinetic energy then its linear momentum is

A. $m\sqrt{E}$

B. $2\sqrt{mE}$

C. $\sqrt{mE}$

D. $\sqrt{2mE}$

Answer:

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141. Select and write the most appropriate answer from the given alternatives for each sub-question :

A ball falls vertically onto a floor, with momentum p and then bounces back. The coefficient of restitution is e. The change in momentum of the ball is given by__

A. - p(1 + e)

B. $\frac{p}{1+e}$

C. $p\left(\frac{1+e}{1-e}\right)$

D. $p\left(1-\frac{1}{e}\right)$

A. A. - p(1 + e)

B. B. $\frac{p}{1+e}$

C. C. $p\left(\frac{1-e}{1+e}\right)$

D. D. $p\left(1-\frac{1}{e}\right)$

Answer:

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142. Distinguish between gravitational force and nuclear force

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143. Define inertial frame of reference. State any one example of inertial frame of reference

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144. Define and explain moment of force.

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145. Find the position of a centre of mass of a system consisting of two bodies of mass 7kg and 14kg seperated by a distance of 70 cm from each other.

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146. Define coefficient of restitution. State its value in case of an inelastic collision.

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147. The potential energy of a system given by $u = \frac{K}{r^2}$. Find the state of equilibrium of the system.

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148. State the physical quantities that decide the trajectory of motion. Explain with help of two examples.

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149. Why is the moment of a couple independent of the axis of rotation even if axis is fixed?

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150. State and explain work energy theoram for conservative forces.

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151. A massless inextensible string with masses 1kg and 4kg attached to its two endsis passing over the pulley. Find the acceleration of the system using free body diagram.

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152. State the expression of final velocity of 2 bodies having a head on elastic collision.

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153. Why do we need to know the centre of mass of an object? For which objeects, its position may differ from that of the centre of gravity?

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154. A uniform beam 1 m long is supported on knife-edge at 60 cm from left end. A mass of 100 g is suspended at a distance of 50 cm and a mass of 50 g is suspended at 20 cm from same end. From where should the mass of 200

g be suspended so that beam will remain horizontal. Also find normal reaction at the support.

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