PHYSICS

BOOKS - FULL MARKS PHYSICS (TAMIL ENGLISH)

LAWS OF MOTION

Textual Solved Problems

1. Calculate the velocity of a moving body of mass 5 kg whose linear momentum is 2.5 $kgms^{-1}$.

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2. A door is pusehd, at a point whose distance from the hinges is 90 cm, with a force of 40 N. calculate the moment of the force about the hinges.

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3. At what height from the center of the Earth the acceleration due to gravity will be 1/4th of its value as at the earth.

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1. Inertia of the body depends on

A. weight of the object

B. acceleration due to gravity of the planet

C. mass of the object

D. Both a & b

Answer: C

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2. Impulse is equals to _____

A. rate of change of momentum

B. rate of force and time

C. change of momentum

D. rate of change of mass

Answer: C

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3. Newton's III law is applicable _____.

A. for a body is at rest

B. for a body in motion

C. both a & b

D. only for bodies with equal masses

Answer: C

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4. Plotting a graph for momentum on the X-axis and time on Y-axis. Slope

of momentum-time graph gives ....

    A. Impulsive force

    B. Acceleration

    C. Force

    D. Rate of force

Answer: C

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5. In which of the following sport the turning effect of force used ?

A. swimming

B. tennis

C. cycling

D. hockey

Answer: C

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6. The unit of 'g' is ms^{-2} . It can be expressed as _____.

A. cms^{-1}

B. Nkg^{-1}

C. Nm^2kg^{-1}

D. cm^2s^{-2}

Answer: B

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7. One kilogram force equals to _____

A. 9.8 dyne

B. $9.8 \times 10^4 N$

C. $98 \times 10^4 \text{dyne}$

D. 980 dyne

Answer: C

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8. The mass of a body is measured on planet Earth as M kg. When it is taken to a planet of radius half that of the Earth then its value will be _____ kg.

A. 4 M

B. 2M

C. $M/4$

D. M

Answer: C

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9. If the Earth shrinks to 50% of its real redius its mass remaining the same , the weight of a body on the Earth will _____

    A. decrease by $50\ \%$

    B. increase by $50\ \%$

    C. decrease by $25\ \%$

    D. increase by $300\ \%$

Answer: C

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10. To project the rockets which of the following principle(s) is /(are) required ?

    A. Newton's third law of motion

    B. Newton's law of gravitation

    C. law of conservation of linear momentum

    D. both a and c

Answer: D

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Textual Evaluation Ii Fill In The Blanks

1. To produce a displacement _____ is required .

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2. Passengers lean forward when sudden brake is applied in a moving vehicle. This can be explained by _____.

3. By convention, the clockwise moments are taken as .... and the anticlockwise moments are taken as ....

4. .... is used to change the speed of car.

5. A man of mass 100 kg has a weight of _____ at the surface of the Earth .

1. The linear momentum of a system of particles is always conserved.

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2. Apparent weight of a person is always equal to his actual weight

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3. Weight of a body is greater at the equator and less at the polar region .

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4. Turning a nut with a spanner having a short handle is so easy than one with a long handle .

5. There is no gravity in the orbiting space station around the Earth . So the astronauts feel weightlessness .

Textual Evaluation Iv Match The Following

1. Match the following :

Column I		Column II
1. Newton's I law	—	(a) Propulsion of a rocket
2. Newton's II law	—	(b) Stable equilibrium of a body
3. Newton's III law	—	(c) Law of force
4. Law of conservation of momentum	—	(d) Flying nature of bird

Textual Evaluation V Assertion Reasoning

1. Assertion : The sum of the clockwise moments is equal to the sum of the anticlockwise moments.

Reason : The principle of conservation of momentum is valid if the external force on the system is zero .

    A. If both the assertion and the reason are true and the reason is the

       correct explanation of assertion.

    B. If both the assertion and the reason are true, but the reason is not

       the correct explanation of the assertion.

    C. Assertion is true, but the reason is false.

    D. Assertion is false, but the reason is true.

Answer: b

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2. Assertion : The value of 'g' decreases os height and depth increases from the surface of the Earth .

Reason : 'g' depends on the mass of the object and the Earth .

A. If both the assertion and the reason are true and the reason is the

correct explanation of assertion.

B. If both the assertion and the reason are true, but the reason is not

the correct explanation of the assertion.

C. Assertion is true, but the reason is false.

D. Assertion is false, but the reason is true.

Answer: c

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Textual Evaluation Vi Answer Briefly

1. Define inertia. Give its classification.

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2. Classify the types of force based on their application .

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3. If a 5N and a 15 N forces are acting opposite to one another . Find the resultant force and the direction of action of the resultant force

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4. Differentiate mass and weight.

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5. Define moment of a couple.

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6. State the principle of moments .

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7. State Newton's first law.

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8. Why a spanner with a long handle is preferred to tighten screws in heavy vehicles ?

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9. While catching a cricket ball the fielder lowers his hands backwards. Why?

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10. How does an astronaut float in a space shuttle ?

Textual Evaluation Vii Solve The Given Problems

1. Two bodies have a mass ratio of 3:4. The force applied on the bigger mass produces an acceleration of 12 ms^{-2}. What could be the acceleration of the other body , if the same force acts on it .

2. A ball of mass 1 kg moving with a speed of $10ms^{-1}$ rebounds after a pefect elastic collision with the floor. Calculate the change in linear momentum of the ball.

3. A mechanc unsrew a nut by applying a force of 140 N with a spanner of length 40 cm . What should be the length of the spanner if a force of 40 N is applied to unsrew the same nut ?

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4. The ratio of masses of two planets is 2:3 and the ratio of their radii is 4:7 . Find the ratio of their acceleration due to gravity .

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Textual Evaluation Viii Answer In Detail

1. What are the types of inertia ? Give an example for each type.

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2. State Newton's II law of motion.

3. Deduce the equation of a force using Newton's second law of motion .

4. State and prove the law of conservation of linear momentum.

5. Describe rocket propulsion.

6. State the universal law of gravitation and derive its mathematical expression .

7. Give the examples of universal law of gravitation

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Textual Evaluation Ix Hot Questions

1. Two blocks of masses 8 kg and 2 kg respectively, lie on a smooth horizontal surface in constant with one other. They are pushed by a horizontally applied force of 15 N. Calculate the force exterted on the 2 kg mass.

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2. A heavy truck and bike are moving with the same kinetic energy . If the mass of the truck is four times that of the bike , then calculate the ratio of their momenta . (Ratio of momenta = 1:2)

3. "Wearing helmet and fastening the seat belt is higly recommended for safe journey" justify your answer using Newton's law of motion.

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Additional Questions I Choose The Correct Answer

1. A cricketer catches a ball of mass 150 gm in 0.1s and which is moving with a speed of $20ms^{-1}$, then he experiences force of.........................

   A. 300 N

   B. 30 N

   C. 3N

   D. 0.3N

Answer: B

2. When train stops, the passenger move forward, It is due to ....

A. Inertia of passenger

B. Inertia of train

C. gravitational pull by earth

D. None of the above

Answer: A

3. A coin is dropped in a lift . It takes time t_1 second to reach the floor when lift is stationary . It takes t_2 second when the lift is moving up with constant acceleration . Then ,

A. $t_1 > t_2$

B. $t_1 < t_2$

C. $t_1 = t_2$

D. None

Answer: A

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4. The force of gravitation is:

A. repulsive

B. conservative

C. electrostatic

D. non-conservative

Answer: B

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5. A sattelite in its orbit around earth is weightess on account of its.....

    A. velocity

    B. momentum

    C. angular momentum

    D. acceleration

Answer: C

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6. A body weight 700N on earth. What will be its weight on a planet having $1/7$ of earth's mass and half of earth's radius?

    A. 400 N

    B. 300 N

    C. 200 N

    D. 100N

Answer: A

7. What would be the acceleration due to gravity at another planet, whose mass and radius core twice that of earth ?

A. g

B. $\dfrac{g}{2}$

C. $\dfrac{g}{4}$

D. 2g

Answer: B

8. At sea level, the value of "g" is maximum at ....

A. the poles

B. the equator

C. $45°$ south latitude

D. $45°$ north longitude

Answer: A

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9. Mechanics is divided into .... types.

A. One

B. two

C. three

D. four

Answer: B

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10. Ability of a body to maintain its state of rest or motion is called

....

    A. mechanics

    B. kinematics

    C. kinetics

    D. Inertia

Answer: D

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11. _____ deals with the bodies which are at rest under the action of forces .

    A. Statics

    B. Dynamics

C. Kinematics

D. Kinetics

Answer: A

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12. _____ deals with the motion of bodies without considering the cause of motion .

A. Inertia

B. Force

C. Kinematics

D. kinetics

Answer: C

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13. _____ deals with the motion of bodies without considering the cause of motion .

   A. Force

   B. Dynamics

   C. Statics

   D. Kinetics

Answer: D

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14. Linear momentum is p=_____

   A. $mass \times$ velocity

   B. $mass \times$ distance

   C. $distance \times$ time

   D. $\dfrac{mass}{velocity}$

Answer: A

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15. The unit of momentum in SI system is _____.

A. ms^{-1}

B. $Kgms^{-2}$

C. $Kgms^{-1}$

D. ms^{-2}

Answer: C

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16. Two or more forces of equal or unequal magnitude acting along the same direction parallel to each other are called................

A. like parallel forces

B. unlike parallel forces

C. resultant force

D. balanced force

Answer: A

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17. The axis of a fixed edge about which the door is rotated is called
_____.

A. axis of rotation

B. fixed axis rotation

C. point of rotation

D. Fixed point

Answer: A

18. The rotating or turning effect of a force about a fixed point or fixed axis is called ....

    A. Force

    B. momentum

    C. torque

    D. couples

Answer: C

19. Rotating effect of a couple is known as ....

    A. product of forces

    B. momentum of a couple

C. mass

D. momentum

Answer: B

20. The amount of force required to produce an acceleration of $1ms^{-2}$ in a body of mass................. is called unit force.

   A. 10 kg

   B. 100 kg

   C. 1 kg

   D. 0 kg

Answer: C

21. The velocity which is sufficient to just escape from the gravitational pull of the earth is

A. drift velocity

B. escape velocity

C. gradual velocity

D. final velocity

Answer: B

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22. Universal gravitational constant (a) $G = 6.684 \times 10^{-10} Nm^2 kg^{-1}$

A. $G = 7.4 \times 10^{-10} Nm^2$

B. $G = 6.623 \times 10^{-11} Nm^2 kg^{-1}$

C. $G = 6.674 \times 10^{-11} Nm^2 kg^{-2}$

D. $G = 6.674 \times 10^{-11} Nm^2 kg^{-2}$

Answer: D

23. Mean value of the acceleration due to gravity is ....

A. $10.1ms^{-2}$

B. $8.8ms^{-2}$

C. $9.8ms^{-2}$

D. $9.8ms$

Answer: C

24. The value of variation of accelaration due to gravity (g) is ....
at the centre of the earth.

A. one

B. zero

C. ∞

D. $\dfrac{1}{\infty}$

Answer: B

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25. The value of accelaration due to gravity on the surface of the moon is........................

A. $1.75ms^{-1}$

B. $3.8ms^{-2}$

C. $1.625ms^{-2}$

D. $1.625ms^{-1}$

Answer: C

26. The unit of weight is _____.

A. kg m

B. kg

C. newton

D. kgm^{-1}

Answer: C

27. The weight of a body is .... at the poles than at the equatorial region.

A. More

B. less

C. zero

D. one

Answer: A

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28. .... of a body is defined as the quantity of matter contained in the object.

A. weight

B. mass

C. force

D. momentum

Answer: B

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1. Turning a tap is an example for ....

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2. Torque is a _____ quantity .

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3. 1 gf is equal to .... dyne.

▶ Watch Video Solution

4. The resultant force acting on a body is equal to zero then the body will be in ....

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5. The force which is equal to resultant but opposite in direction is called as _____.

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6. The product of force and time is ....

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7. Force between the masses is always ....

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8. The quantity of matter contained in the object is known as ....

▶ Watch Video Solution

9. Magnitude of universal gravitational constant is ....

▶ Watch Video Solution

10. Propulsion of rockets is based on the .... and ....

▶ Watch Video Solution

11. Parallel unequal forces are acting in .... directions.

▶ Watch Video Solution

12. Torque and force are the .... quantities.

▶ Watch Video Solution

13. The unit of moment of a couple is ....

14. A .... enables you to manoeuore a car easily by transferring a .... to the wheels with less effort.

15. .... is required to produce the acceleration of a body.

16. The acceleration is produced along the radius is called as ....

17. .... is equal to the magnitude of change in momentum.

18. A large force acting for a very short interval of time is called as ....

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19. Mass of the earth ....

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20. Relation between acceleration due to gravity (g) and the universal gravitational constant (G) is ....

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1. show that 'Rest' and 'Motion' are relative term.

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2. In C.G.S. system, the unit of linear momentum is $kgms^{-1}$.

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3. External force is required to maintain the motion of a body moving with uniform velocity.

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4. The amount of force required for a body of mass 1 gram produces an accelaretion of $1cms^2$

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5. By Newton's III - law of motion, the action force is not equal to the reaction force.

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6. The value of acceleration due to gravity (g) is not the same at all the points on the surface of the earth.

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7. The value of acceleration due to gravity on the surface of the moon is $1.625ms^{-2}$.

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8. The regularities in the motion of stars is called 'wobble'.

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9. Mechanics is divided into kinematics and kinetics.

10. Application of Newton's law of gravitation helps to predict the path of the astronamical bodies.

Additional Questions Iv Match The Following

1. Match the following.

1. Linear momentum	— (a) Mass and acceleration
2. Force	— (b) Change in momentum
3. Moment of force	— (c) GM/R^2
4. Impulse	— (d) Mass and velocity
5. Acceleration due to gravity	— (e) Force and perpendicular distance

2. Match the following.

1. Kinetics   —   (a) Causes the motion
2. Kinematics   —   (b) Inequilibrium
3. Balanced force   —   (c) Motion of bodies without cause
4. Unbalanced force   —   (d) Motion of bodies with cause

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Additional Questions V Assertion Reasoning

1. Assertion : At poles value of acceleration due to gravity (g) is greater than that of equator.

Reason : Earth rotates on its axis in addition to revolving around the sun.

    A. If both the assertion and the reason are true and the reason is the

       correct explanation of assertion.

    B. If both the assertion and the reason are true, but the reason is not

       the correct explanation of the assertion.

    C. Assertion is true, but the reason is false.

D. Assertion is false, but the reason is true.

Answer: a

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2. Assertion : The fore exerted by the earth on a apple is more than that exerted by apple on the earth.

Reason : The force on apple exerts on the earth is determined by the mass of the apple only.

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3. Assertion : A freely falling body is in the state of weightlessness

Reason : A body becomes conscious of its weight only when it is opposed

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4. Assertion : Newton's third law of motion is applicable only when bodies are in motion.

Reason : Newton's third law applies to all types of forces, e.g. gravitational, electric or magnetic forces.

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5. Assertion: The apparent weight of the person is zero, in which condition or state is known as weightless.

Reason : When the person in a lift moves down with an acceleration (a) is equal to the acceleration due to gravity (g)

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6. Assertion : A gear is a circular wheel with teeth around its rim.

Reason : It helps to change the speed of rotation of a wheel by changing the force and helps to transmit power.

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7. Assertion : Mass of a body is defined as the gravitational force exerted on it due to earth's gravity alone

Reason : $\text{Weight} = \text{mass} \times \text{acceleration due to gravity.}$

8. Assertion : Weight is a vector quantity.

Reason : Direction of weight is always towards the centre of the earth.

9. Assertion : Resultant force is equal to the vector sum of all the forces.

Reason : A system cannot be brought to equilibrium by applying another force.

1. Define - Linear momentum.

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2. What is resultant force ?

▶ **Watch Video Solution**

3. What is meant by equilibrant ?

▶ **Watch Video Solution**

4. State newton's third law

▶ **Watch Video Solution**

5. How did the change in momentum achieved ?

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6. Define impulse .

▶ Watch Video Solution

7. What is meant by free fall ?

▶ Watch Video Solution

8. Define weightlessness.

▶ Watch Video Solution

9. Explain the various cases of apparent weight of a person in a moving lift.

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10. Explain about the variation of acceleration due to gravity.

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11. Define one newton and one dyne.

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12. How can you measure the moment of couple ?

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13. Define torque and mention its unit.

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1. Explain any three application of Torque.

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2. State Newton's third law. Explain it with three examples.

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3. Derive the relation between 'g' and G. Explain how to determine the mass of earth.

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1. A cricket ball of mass 0.5 kg strikes a bat normally with a velocity of $30 \, \text{ms}^{-1}$ and rebounds with a velocity of $20 \, \text{ms}^{-1}$ in the opposite direction, calculate the impulse of the force exerted by the ball on the bat.

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2. A force exerted on abody of mass 100 g changes its speed by $0.2 \, \text{ms}^{-1}$ in each second. Calculate the magnitude of the force.

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