Presidency University, Bengaluru
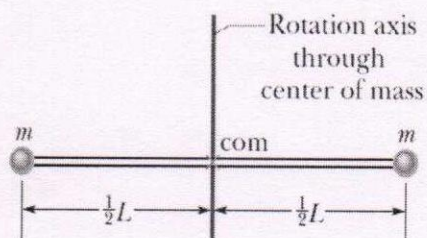
School of Engineering

Instructions to Candidates
1. Write legibly.
2. Attempt all questions.
3. Use of scientific calculators is permitted
4. Assume any missing data suitably and clearly state and justify the same


Part A (10 x 3 = 30 Marks)

1. Define instantaneous velocity and instantaneous acceleration for a particle undergoing linear motion.

2. Define uniform circular motion and the time period

3. Define average and instantaneous angular acceleration.

4. A 5-kg rock swings in a circle of radius 5 m. If its constant speed is 10 m/s, what is the centripetal acceleration and centripetal force

5. Explain Coulombs law in electrostatics.

6. Define electric field and electric flux.

7. Define Ohm's law and electromotive force.

8. Differentiate covalent and ionic bonds with one example each.

9. Suppose the position of a particle as a function of time is s= $2t^2$ m, where t is in sec. what is the particles velocity at t=2 seconds?

10. What is the final linear momentum of the target in Figure if the initial linear momentum of the projectile is 6 kg m/s and the final linear momentum of the projectile is (a) 2 kg m/s and (b) -2 kg m/s? (c) What is the final kinetic energy of the target if the initial and final kinetic energies of the projectile are, respectively, 5 J and 2 J?

Part B (4 x 5 = 20 Marks)

11. Derive work kinetic energy theorem for a variable force.

12. Derive the energy and power of a wave travelling along a stretched string.

13. Starting with Gauss's law, calculate the electric field due to an isolated point charge q.

14. Figure shows a rigid body consisting of two particles of mass m connected by a rod of length L and negligible mass.

a)What is the rotational inertia I_{com} about an axis through the center of mass, perpendicular to the rod as shown?
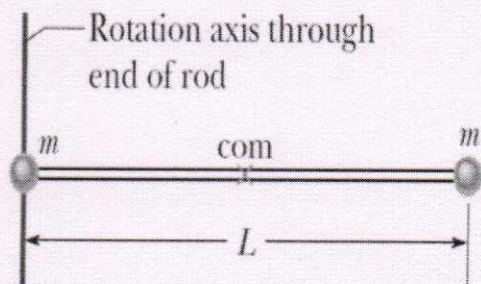
b)What is the rotational inertia I of the body about an axis through the left end of the rod and parallel to the first axis

Part C (1 x 10 = 10 Marks)
15. Explain Young's double slit experiment with necessary diagrams.

Presidency University, Bengaluru

School of Engineering

Instructions to Candidates

1. Write legibly.
2. Attempt all questions.
3. Use of scientific calculator and text book are permitted
4. Assume any missing data suitably and clearly state and justify the same

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2 X 10 = 20 Marks

1. What is the electric potential at point P, located at the center of the square of point charges? The distance d is 1.3 m, and the charges are $q_1=+20nC$, $q_2=-24nC$, $q_3=+41nC$, $q_4=+19nC$

2. A block of mass 50kg is at rest on a ramp. The coefficient of static friction between the block and the ramp is not known. Find the magnitude of net force exerted by the ramp on the block. Sketch the free body diagram and explain the concept.

I Semester 2015-2016	COMPREHENSIVE EXAMINATION	Course: PHY A 101 Engineering Physics (Closed Book)	
Max Marks:60	Max Time: 2 hours	Weightage: 30 % 5th Jan' 2016	SET B

Instructions to Candidates
1. Write legibly.
2. Attempt all questions.
3. Use of scientific calculators is permitted
4. Assume any missing data suitably and clearly state and justify the same

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Part A (10 x 3 = 30 Marks)

1. Define average angular velocity and instantaneous angular velocity.

2. Derive the kinematic equation $x - x_0 = v_0 t + \frac{1}{2}at^2$

3. Derive the expression for acceleration for SHM.

4. Explain the types of waves with one example each.

5. Explain quantization of electric charge.

6. Define electric potential and equipotential surfaces.

7. Define Lenz's law.

8. Differentiate intrinsic and extrinsic semiconductors.

9. In a particle accelerator, the position vector of a particle is initially estimated as $\vec{r}$ = 6i – 7j + 3k and after 2 seconds it is estimated to be $\vec{r}$ = -3i+9j-3k, all in meters. In unit vector rotation, what is the average velocity of the particle?

10. Body 1 and body 2 are in a completely inelastic one-dimensional collision. What is their final momentum if their initial momenta are, respectively, (a) 10 kg. m/s and 0; (b) 10 kg m/s and 4 kg m/s; (c) 10 kg m/s and -4 kg m/s?

Part B (4 X 5 = 20 Marks)

11. Derive the expression for Energy for Simple Harmonic Oscillator.

12. Derive the expression for intensity of sound wave travelling in air.

13. Prove that energy stored in a capacitor is $U = \frac{q^2}{2C}$.

14. Explain Kirchhoff's current law and voltage law with the help of diagrams.

Part C (1 x 10 = 10 Marks)

15. An insulating sphere of radius 'a' has a uniform charge density ρ and a total positive charge Q. Calculate the electric field outside the sphere. Also calculate the electric field at a point r inside the sphere.

| I Semester
2015-2016
Max Marks: 20 | COMPREHENSIVE EXAMINATION

Max Time: 1 hour | Course: PHY A 101 Engineering Physics
(Open Book)
Weightage:10 %   5th Jan' 2016   **SET B** |

Instructions to Candidates
1. Write legibly.
2. Attempt all questions.
3. Use of scientific calculator and text book are permitted
4. Assume any missing data suitably and clearly state and justify the same

Sef B

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2 X 10 = 20 Marks

1. If a car's wheels are "locked" (kept from rolling) during emergency braking, the car slides along the road. Ripped-off bits of tire and small melted sections of road form the "skid marks" that reveal that cold-welding occurred during the slide. The record for the longest skid marks on a public road was reportedly set in 1960 by a Jaguar on the M1 highway in England, the marks were 290 m long. Assuming that $\mu_k = 0.60$ and the car's acceleration was constant during the braking, how fast was the car going when the wheels became locked?
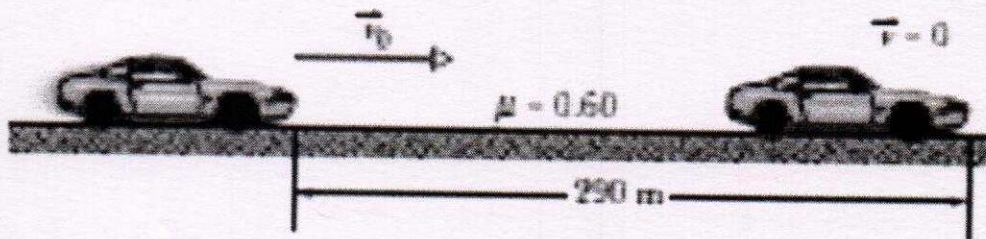
2. A spherical metal shell of inner radius R. A point charge of -5.0 mC is located at a distance R/2 from the center of the shell. If the shell is electrically neutral;

a) what are the (induced) charges on its inner and outer surfaces?

b) are those charges uniformly distributed?

c) what is the field pattern inside and outside the shell? Explain with diagrams

ID No.:

Section No.:   Signature of Invigilator:

Presidency University, Bengaluru
School of Engineering

I Semester 2015-2016   Quiz   Course: **PHY A 101 Engineering Physics**
(Closed Book)

Max Marks: 20   Max Time: 30 Min   Weightage: 10%   15th Dec' 2015   **Set A**

Instructions to Candidates
1. Write legibly using pen only.
2. Do not overwrite.
3. Answer in the question paper itself, there will be no separate answer book provided.
4. Enter your ID No. and Section No. in the designated place

20 x 1 = 20 Marks

Fill up the blanks

1. Speed in a given direction is called _____. It is a vector quantity.

2. The magnitude of free fall acceleration is _____.

3. The tendency of an object to resist a change in its state of motion is called the objects _____.

4. _____ is also produced with friction.

5. You are a passenger being lowered down in an elevator. Here tension does _____work, gravity does _____work.

6. Torque is the product of _____ and _____.

7. _____waves can exist only within a material medium.

8. The study of the behaviour of charges when they are at rest is called _____.

9. A material through which electrons move freely is classified as a _____.

10. The insulating material between two plates of capacitor is called _____.

State true or false (write T or F)

11. An object with mass will have momentum.

12. A collision in which there is absolutely no loss of kinetic energy is called elastic collision.

13. Torque is a vector quantity.

14. A particle executing SHM velocity is maximum at the mean position

15. Sound wave is a mechanical wave.

16. Electric lines of force do not cross each other.

17. Newton's first law is also known as the law of Inertia.

Choose the best option (put a tick mark)

18. A dielectric material must be

a)   Insulator   b) conductor   c)semiconductor   d) None of these

19. Which one of the following statements concerning the acceleration of an object moving with simple harmonic motion is correct?

a) It is constant.

b) It is zero when the object moves through the center of the oscillation.

c) It is zero when the object is at the extremity of the oscillation.

d) None of these

20. A projectile in fight explodes into several fragments. The total momentum of the fragments immediately after this explosion:

a) is the same as the momentum of the projectile immediately before the explosion

b) has been changed into kinetic energy of the fragments

c) is less than the momentum of the projectile immediately before the explosion

d) is more than the momentum of the projectile immediately before the explosion

For official use (students shall not write beyond this line)

_____

Marks scored out of 20

Name and Signature of Examiner with Date

ID No.:									

Section No.:		Signature of Invigilator:	

Presidency University, Bengaluru
School of Engineering

I Semester 2015-2016   Quiz   Course: **PHY A 101 Engineering Physics**
(Closed Book)

Max Marks: 20   Max Time: 30 Min   Weightage: 10%   15th Dec' 2015   **Set B**

Instructions to Candidates
1. Write legibly using pen only.
2. Do not overwrite.
3. Answer in the question paper itself, there will be no separate answer book provided.
4. Enter your ID No. and Section No. in the designated place

20 x 1 = 20 Marks

Fill up the blanks

1. The rate at which velocity changes is called _____.

2. A projectile is any object that once projected or dropped continues in motion by its own _____ and is influenced only by the downward force of _____.

3. Using Newton's second law, when you double the force, the acceleration_____ if mass remains the same.

4. _____ provides the centripetal force needed to allow a car to turn a corner.

5. Any _____ force can have a potential energy function associated with it

6. The angular momentum of a rotating system is conserved if no external _____ acts on it.

7. _____ is produced when vibrations travel in a medium.

8. The value of ε_r is _____ in free space.

9. The _____ is the capacity of capacitor to store the charge.

10. When a positive charge, q+ , is moved toward a negative plate, work is done by the charge, and the potential energy of the charge _____

State true or false (write T or F)

11. If a particle is at rest, its displacement-time graph will be a line parallel to time axis.

12. A projectile is an object launched into space under the influence of gravity only.

13. Force is a push or a pull that acts on an object.

14. Work done by a force in displacing a body is equal to the change in kinetic energy.

15. Impulse is equal to rate of change of momentum.

16. Rotational inertia depends on the mass of an object.

17. A cat dropped upside down will twist and land on its feet while maintaining a state of zero angular momentum.

Choose the best option (put a tick mark)

18. A projectile in fight explodes into several fragments. The total momentum of the fragments immediately after this explosion:

a) is the same as the momentum of the projectile immediately before the explosion

a)   has been changed into kinetic energy of the fragments

b)   is less than the momentum of the projectile immediately before the explosion

c)   is more than the momentum of the projectile immediately before the explosion

19. Action-reaction forces

a) sometimes act on the same object.   b) always act on the same object.

c) may be at right angles.   d) always act on different objects

20. 1 microfarad is equal to

a) 10^{-6}F   b) 10_{-9}F   c) 10^{-12}F   d) 10^6F

For official use (students shall not write beyond this line)
_____

Marks scored out of 20

Name and Signature of Examiner with Date

Presidency University, Bengaluru
School of Engineering

I Semester 2015-2016   Quiz   Course: **PHY A 101 Engineering Physics**
(Closed Book)

Max Marks: 20   Max Time: 30 Min   Weightage: 10%   15th Dec' 2015   **Set C**

Instructions to Candidates
1. Write legibly using pen only.
2. Do not overwrite.
3. Answer in the question paper itself, there will be no separate answer book provided.
4. Enter your ID No. and Section No. in the designated place

20 x 1 = 20 Marks

Fill up the blanks

1. The value of the acceleration of an object moving at constant velocity is ___.

2. The centripetal force is always directed towards the ………………

3. When a body moves forward, the frictional force acts _____

4. Energy is the ability to do ___.

5. _____ is a characteristic of a moving body determined by the product of the body's mass and velocity.

6. In simple harmonic motion acceleration is …………… when displacement is maximum.

7. Average rate per unit area at which sound energy is transferred by the wave is called ………..

8. The value of $\frac{1}{4\pi\varepsilon_0}$ is ………………..

9. …………….. is the unit of capacitance.

10. 1eV is equal to …………..J

State true or false (write T or F)

11. An object in free fall experiences an acceleration which is independent of the mass of the object.

12. An object in uniform circular motion has a constant velocity.

13. The total energy of an oscillating spring mass system is $\frac{1}{2}m\omega^2 r^2$

14. All periodic motions are SHM.

15. Time period of a simple pendulum does not depend on the mass of the bob.

16. Two sinusoidal waves on the same string exhibit interference.

17. The amount of work involved when a charge moves between two points is the potential difference between the points.

Choose the best option (put a tick mark)

18. The direction of electric field due to a positive charge is

a) away from the charge   b)towards the charge   c) Both a)and b)   d) None of these

19. The relation between wave velocity 'v', frequency 'f ', and wavelength 'λ is.

a)$v = \frac{f}{\lambda}$ b)$v = f\lambda$ c)$v = \frac{\lambda}{f}$ d)$v = \frac{1}{f\lambda}$

20. The amount of work required to stop a moving object is equal to:

a) the velocity of the object   b) the kinetic energy of the object

c) the mass of the object times its acceleration   d) the mass of the object times its velocity

For official use (students shall not write beyond this line)

Marks scored out of 20

Name and Signature of Examiner with Date

Presidency University, Bengaluru
School of Engineering

I Semester 2015-2016   Test 1(MU)   Course: **CHE A 101 Engineering Chemistry**
<div align="right">(Closed Book)</div>

Max Marks: 30   Max Time: 50 Min   Weightage: 15 %   26 Nov 2015

Instructions to Candidates
1. Write legibly, briefly and summarize. Highlight main points
2. Assume suitable data wherever necessary and justify the same.

Ques 1: Answer the following in short   (3Q x 2M = 6M)

1. Define Polymerization With examples
2. Write the functionalities of the following monomers. Phenol, styrene, glycerol, Adipic acid
3. Mention the trade name of polychloroprene rubber and its applications

Ques 2: Answer the following   (3Q x 3M = 9M)

1. What does PET stand for? What are its properties? Where is it used?
2. List the naturally occurring polymers
3. Explain any three classes of polymers based on different criteria

Ques 3: Answer the following   (3Q x 5M = 15M)

1. Describe the steps involved in addition polymerization proceeding by free-radical mechanism
2. Discuss with examples addition and condensation polymerization
3. Explain the synthesis, properties and uses of Nylon 6,6

I Semester 2015-2016   Test 1   Course: **PHY A101 Engineering Physics** (Closed Book)

Max Marks: 30   Max Time 50 Min   Weightage: 15 %.   28 September 2015   Set A

Instructions to Candidates:
1. Write legibly, briefly and summarize/highlight the main points
2. Attempt all the questions serially, in the order of question paper
3. Assume data wherever needed and justify the same

Ques 1: Answer the following   [3Q x 2M= 6M]

1. Define instantaneous velocity for one dimension motion of a particle.
2. Give an example to show that the direction of velocity of a body can change even when its acceleration is constant.
3. Define average acceleration and represent this in vector notation.
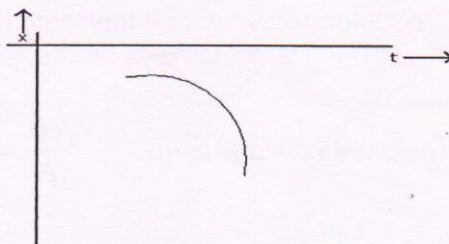
Ques 2 Answer the following   [3Q x 3M= 9M]

1. A car is moving on a straight road for 9.5 km at 60km/h at which point the car runs out of fuel and stops. Over the next 35 minutes, the person in the car walks another 2km farther along the road to a petrol station. Calculate the overall displacement to the petrol station.
2. Derive the kinematic equation

$$x - x_0 = v_0 t + \frac{1}{2}at^2$$

3. From the following graph, find the sign of (i) velocity (ii) acceleration. Give reasons for each answer.

Ques 3   Answer the following   [3Q x 5M= 15M]

1. A pigeon flies at 38 km/h to and fro between two cars moving towards each other on a straight road, starting from the first car when the car separation is 50km. The first car has a speed of 21 km/h and the second one has a speed of 30 km/h. By the time the cars meet head on, what are the (a) total distance and (b) the net displacement flown by the pigeon?

2. In a particle accelerator, an electron enters a region in which it accelerates uniformly in a straight line from a speed of 5×10^5 m/s to a speed of 8×10^7 m/s in a distance of 4cm. For what time interval does the electron accelerate?

3. What is a projectile? Derive the expressions for the maximum range for the projectile thrown upwards at an angle θ with the horizontal direction.

Presidency University, Bengaluru
School of Engineering

Instructions to Candidates:
1. Write legibly, briefly and summarize/highlight the main points
2. Attempt all the questions serially, in the order of question paper
3. Assume data wherever needed and justify the same

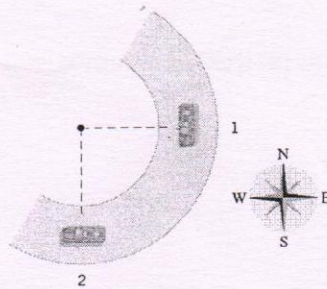**Ques 1:** Answer the following   [3Q x 2M= 6M]

1. Define uniform circular motion and the time period
2. Define Tangential and Radial acceleration
3. Define Newton's second law of motion. Give one example.

Ques 2 Answer the following   [3Q x 3M= 9M]

1. Give the kinematic equations for horizontal and vertical motion of projectile body.
2. An ion's position vector is initially $5\hat{\imath} - 6\hat{\jmath} + 2\hat{k}$, and 10 s later it is $-2\hat{\imath} + 8\hat{\jmath} - 2\hat{k}$, all in meters. In unit vector notation, what is its average velocity during the 10 s?
3. The car in the drawing is moving clockwise around a circular section of road at a constant speed. What is the direction of its velocity and acceleration at (a) position 1 and (b) position 2?

Ques 3   Answer the following   [3Q x 5M= 15M]

1. A 5kg object is driven along an x-axis by a variable force that is directed along that axis. Its position is given by $x = 4m + (6m/s)t + Kt^2 - (5m/s^2)t^3$ where x is measured in meters and t in seconds. The factor K is a constant at t=5s, the force on the particle has a magnitude of 40N and is in the negative direction of the axis. Find the value of K.
2. A rotating fan completes 900 revolutions every minute. Consider the tip of a blade, at a radius of 0.25m. (a) Through what distance does the tip move in one revolution? What are (b) the tips speed and (c) the magnitude of its acceleration?
3. Define uniform circular motion? Prove that acceleration is directed along the radius of the circles center.

Presidency University, Bengaluru
School of Engineering

I Semester 2015-2016   Test 2   Course: **PHY A 101 Engineering Physics**

(Closed Book)

Max Marks: 30   Max Time: 50 Min   Weightage: 15%   16th Nov' 2015   **Set A**

Instructions to Candidates
1. Write legibly
2. Use of scientific calculator permitted
3. Assume suitable data wherever necessary and justify the same.

Part A (3 x 4 = 12 Marks)

1. Define friction and mention its properties

2. Adam stretches a spring by some length. John stretches the same spring later by 4 times the length stretched by Adam. Find the ratio of the stored energy in the first stretch to that in the second stretch

3. Calculate work done by non conservative forces

Part B (3 x 6 = 18 Marks)

4. A student of weight 600 N rides a steadily rotating Ferris wheel (the student sits upright). At the highest point, the magnitude of the normal force on the student from the seat is 556 N. (a) Does the student feel "light" or "heavy" there? (b) What is the magnitude of at the lowest point? If the wheel's speed is doubled, what is the magnitude FN at the (c) highest and (d) lowest point?

5. Define Hooks law. Calculate the elastic potential energy of Spring – Block System.

6. Derive the expression for elastic collision in one dimension for a moving target.

Presidency University, Bengaluru
School of Engineering

I Semester 2015-2016   Test 2   Course: **PHY A 101 Engineering Physics**

(M/4)

(Closed Book)

Max Marks: 30   Max Time: 50 Min   Weightage: 15%   16th Nov' 2015   **Set B**

22/12/15

Instructions to Candidates
1. Write legibly
2. Use of scientific calculator permitted
3. Assume suitable data wherever necessary and justify the same.

Part A (3 x 4 = 12 Marks)

1. Define work. Explain the work done by gravitational force.

2. Differentiate conservative and non conservative forces with one example each.

3. Define linear momentum. Explain Newton's second law in terms of linear momentum of a particle.

Part B (3 x 6 = 18 Marks)

4. Explain the work-kinetic energy theorem with a variable force $F(x)$

5. A 10.00 g bullet moving at 120 m/s strikes a log. Assume that the bullet undergoes a uniform deceleration and stops after penetrating 6.00 cm. Find

   a) The time taken by the bullet to stop.

   b) The impulse on the log.

   c) The magnitude of the average force experienced by the log?

6. Two metal spheres, suspended by vertical cords, initially just touch. Sphere 1, with mass m_1 15 g, is pulled to the left to height h_1 10 cm, and then released from rest. After swinging down, it undergoes an elastic collision with sphere 2, whose mass m_2 50 g. What is the velocity v_{1f} of sphere 1 just after the collision?

Presidency University, Bengaluru
School of Engineering

I Semester 2015-2016   Test 2   Course: **PHY A 101 Engineering Physics**

(Closed Book)

Max Marks: 30   Max Time: 50 Min   Weightage: 15%   16th Nov' 2015   **Set C**


Instructions to Candidates
1. Write legibly
2. Use of scientific calculator permitted
3. Assume suitable data wherever necessary and justify the same.

Part A (3 x 4 = 12 Marks)

1. A 5-kg rock swings in a circle of radius 5 m. If its constant speed is 10 m/s, what is the centripetal acceleration and centripetal force

2. State and Explain the principle of conservation of mechanical energy

3. Define conservation of linear momentum. The figure shows an overhead view of a ball bouncing from a vertical wall without any change in its speed. Consider the change in the ball's linear momentum. (a) Is Δp_x positive, negative, or zero? (b) Is Δp_y positive, negative, or zero? (c) What is the direction of Δp?
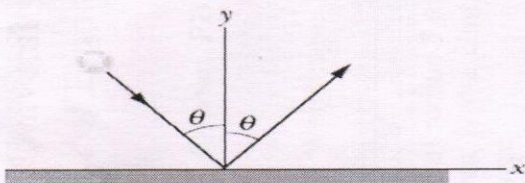
Part B (3 x 6 = 18 Marks)

4. Define average and instantaneous power. Calculate the work done by a spring force

5. Derive the expression for elastic collision in one dimension for a stationary target

6. A block of mass 10kg is at rest on a ramp. The coefficient of static friction between the block and the ramp is not known. Find the magnitude of net force exerted by the ramp on the block. Sketch the free body diagram.