

BA / BSc / BCOM DEGREE END SEMESTER EXAMINATION - NOVEMBER 2024**UGP (HONS.) SEMESTER - 1: DISCIPLINE SPECIFIC COURSE (PHYSICS)****COURSE: 24UPHYDSC101: FOUNDATIONS OF PHYSICS***(For Regular 2024 Admission)*

Time: 1.5 Hours

Max. Marks: 50

PART A (Short Answers)**Answer any 10 (2 marks each)**

1. Differentiate between average velocity and instantaneous velocity with examples
2. We can multiply a vector quantity by a scalar. Is it possible to add a vector quantity to a scalar? If so, provide an example. If not, explain why.
3. Justify the statement that displacement is not necessarily equal to or directly related to the total distance traveled. Include an explanation and supporting examples.
4. When two objects are dropped simultaneously from the same height, but one is given an initial horizontal velocity. Assuming no air resistance, explain why they hit the ground at the same time.
5. Newton's first law: "An object at rest remains at rest, and an object in motion remains in motion at constant speed along a straight line unless acted on by an unbalanced force." Explain the term unbalanced force
6. Explain why a vehicle does not move when you push it from inside, but moves when you push it from outside.
7. Using Newton's Third Law, explain why a vehicle remains stationary when you pull it from inside, but moves when you pull it from outside
8. Two objects of different masses are placed at the same height. Which one has more gravitational potential energy? Why?
9. How does the kinetic energy relate to the momentum of an object?
10. An iron sphere with a radius of 20 cm rolls down from a height and experiences energy loss due to friction. How does this loss of energy affect its kinetic energy?
- 11.

 $x=50$ $y=7$ $p=x/y$ $q=x//y$ $r=x\%y$

What are the values of p, q, and r for the above python code?

12. Write a Python program to determine whether the given number is even or odd.

(2 x 10 = 20)

PART B

(Short Essays or Problems)

Answer any 6 (5 marks each)

13. The position of a particle is given by $s(t)=4t^3-2t^2+3t$. Find the instantaneous velocity of the particle at $t=2$ seconds.
14. A cross-country skier skis (Someone who participates in cross-country skiing) 1.00 km north and then 2.00 km east on a horizontal snowfield. How far and in what direction is she from the starting point?
15. A police car traveling at 90 km/h is chasing a thief's car moving at 120 km/h. If the thief's car is initially 1 km ahead, determine the time required for the police car to catch the thief, assuming the police can accelerate at 2 m/s².
16. Two teams are pulling a rope with a total force of 2000 N. If the rope moves 10 meters in 5 seconds, calculate the average power exerted by the teams.
17. A rock is thrown vertically upwards with an initial velocity of 20 m/s. Calculate the maximum height reached by the rock using the concept of conservative forces and potential energy.
18. Derive the concept of kinetic energy using the work-energy theorem and obtain the equation $T=1/2 mv^2$ from this.
19. A pendulum bob of mass 0.5 kg swings between two points, reaching a height of 1 meter above its lowest point. Calculate the potential energy at the highest point and the kinetic energy at the lowest point.
20. Write a Python program to check whether a given value of x satisfies the quadratic equation $2x^2+3x-5=0$.

(5 x 6 = 30)