

**FIRST SEMESTER B.Sc. FYUGP EXAMINATION NOVEMBER 2025****(Regular/Improvement/Supplementary)****PHYSICS****MAJOR****PHY1CJ101: FUNDAMENTALS OF PHYSICS****Time: 2 Hrs.****Maximum Marks: 70**

M: Mark

BL: Bloom's Taxonomy Level (1 to 6)

CO: Course Outcome

**Section A: Answer all questions. Each carries 3 marks.****Ceiling: 24 Marks**

No.	Question	M	BL	CO
1.	A helium balloon hovers in midair, neither ascending nor descending. Is it in equilibrium? Give reasons. What are the forces acting on it?	3	5	CO2
2.	When a car is hit from behind, the occupants may experience whiplash. Use Newton's laws of motion to explain what causes the result.	3	5	CO2
3.	Newton's laws are not universal. Validate the statement with example.	3	3	CO1
4.	What are the fundamental forces in nature? Give its order of magnitude.	3	2	CO1
5.	Draw the free body diagram of a swimmer, swimming in water.	3	3	CO2
6.	Give examples for positive, negative and zero work.	3	2	CO3
7.	A climber of mass 100 kg (including the equipment she is carrying) ascends from sea level to the top of a mountain 5500 m high. Calculate the change in her gravitational potential energy.	3	4	CO3 CO5
8.	Define one watt power.	3	2	CO3
9.	Define work done by a varying force. Give its mathematical expression.	3	2	CO3
10.	Derive the expression for potential energy of a spring.	3	3	CO4

**Section B: Answer all questions. Each carries 6 marks.****Ceiling: 36 Marks**

No.	Question	M	BL	CO
11.	A man sitting in a train throws a ball upward. Where will the ball fall relative to the man when: a) the train moves uniformly. b) the train is accelerated forward. c) train moves along a circular track.	6	4	

**(PTO)**

12.	Show that $\mu = \tan\theta$ (the coefficient of static friction is equal to the tangent of angle of inclination) when a body just begins to slide on an inclined surface. What is the an angle of inclination?	6	3	CO5
13.	A block slides down at an angle of $30^\circ$ with an acceleration $g/4$ . Find the coefficient of kinetic friction.	6	4	CO3
14.	Define viscosity and give its unit. Derive an expression for terminal velocity of a ball falling through a liquid of density 'p'.	6	2	CO1
15.	If a force $F=Ax+ B$ acts parallel to X-axis on an object and moves it from $x=1$ to $x=2$ , calculate the work done.	6	3	CO3
16.	An air-track glider of mass 0.100 kg is attached to the end of a horizontal air track by a spring with force constant 20.0 N/m. Initially the spring is unstretched and the glider is moving at 1.50 m/s to the right. Find the maximum distance d that the glider moves to the right (a) if the air track is turned on, so that there is no friction, and (b) if the air is turned off, so that there is kinetic friction with coefficient $\mu_k = 0.47$ .	6	5	CO3
17.	What is simple harmonic motion. Draw and explain the energy diagram for simple harmonic oscillator.	6	3	CO4
18.	A particle moves in a potential energy field $Ax-Bx^2$ . Find the expression for the force. At what point does the force vanish.	6	3	CO4

**Section C: Answer any one question. Each carries 10 marks. (1 x 10 = 10 marks)**

No.	Question	M	BL	CO
19.	What are the steps to be followed to draw a free body diagram? Draw the free body diagram of the body sliding down on a frictional inclined surface.	10	3	CO2
20.	Establish the relation between work and potential energy for gravitational and elastic force field. Derive the law of conservation of energy for conservative and non-conservative force field. Compare the features of these two-force fields.	10	2	CO4