UNIVERSITAT POLITÈCNICA DE CATALUNYA
Departament de Física

Final Exam of Pysics 1: Fundamentals of Mechanics **15th January 2026 A**

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LAST NAME (uppercase): GOMEZ

FIRST NAME: ELENA

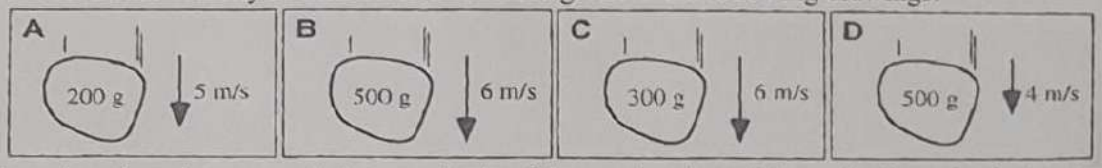
	1	2	3	4	5	6	7	8	9	10
a			X							
b							X			
c		X			X					
d										
e									X	X

MARK YOUR ANSWERS IN THE ABOVE TABLE. ONLY ANSWERS MARKED IN THE TABLE WILL BE CONSIDERED. USE $g = 9.8\ m/s^2$

MOBILE PHONES AND WATCHES ARE NOT ALLOWED

Each incorrect answer subtracts 0.25 points

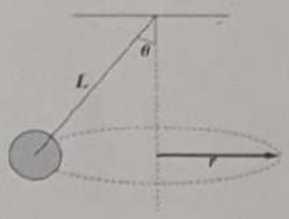
1. Four rocks, all with the same shape but different mass, are thrown downward in air. The mass of each rock and the initial velocity at which it is thrown are given in the following drawings:



Ignoring air resistance, rank the magnitude of the acceleration of the rocks, just after being thrown:

a. B = D > C > A **b.** B = C > A > D **c.** A > C > B = D **d.** B > A > C > D **e.** They are all the same

2. A particle of mass m, tied to a string of length $L = 0.50$ m and negligible mass, moves with uniform circular motion in a horizontal plane. What angular velocity should the string have, so that the angle 0 that it forms with the vertical is 60°?

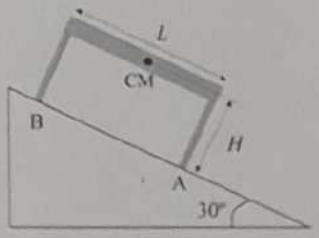


a. 4.0 rad/s **b.** 6.3 rad/s **c.** 5.3 rad/s **d.** 4.8 rad/s **e.** 6.8 rad/s

3. A constant total force is applied to a system of 3 masses, $m_1 = 1.0$ kg, $m_2 = 2.0$ kg and $m_3 = 3.0$ kg, initially at positions $\mathbf{r}_1 = (2.0\,\mathbf{i} + 0.0\,\mathbf{j})$ m, $\mathbf{r}_2 = (2.0\,\mathbf{i} + 3.0\,\mathbf{j})$ m and $\mathbf{r}_3 = (2.0\,\mathbf{i} + 2.0\,\mathbf{j})$ m and with initial velocities $\mathbf{v}_1 = (0.0\,\mathbf{i} + 6.0\,\mathbf{j})$ m/s, $\mathbf{v}_2 = (3.0\,\mathbf{i} + 3.0\,\mathbf{j})$ m/s and $\mathbf{v}_3 = (2.0\,\mathbf{i} + 0.0\,\mathbf{j})$ m/s, respectively. If the position of the centre of mass after 2.0 seconds is $\mathbf{r}_{CM} = (9.0\,\mathbf{i} + 8.0\,\mathbf{j})$ m, determine the total force acting on this system.

a. $(18\,\mathbf{i} + 12\,\mathbf{j})$ N **b.** $(8.0\,\mathbf{i} + 16\,\mathbf{j})$ N **c.** $(4.0\,\mathbf{i} + 8.0\,\mathbf{j})$ N **d.** $(27\,\mathbf{i} + 24\,\mathbf{j})$ N **e.** $(9.0\,\mathbf{i} + 6.0\,\mathbf{j})$ N

4. A uniform table weighing 178 N is in equilibrium on a ramp that forms an angle of 30.0° with the horizontal. If the length of the table is $L = 1.00$ m and the height of its centre of mass is $H = 40.0$ cm, the magnitude of the normal force exerted by the ramp on the two table legs at point A is:



a. 126 N **b.** 157 N **c.** 130 N **d.** 113 N **e.** 142 N