Kuwait University Physics Department

جامعة الكويت
KUWAIT UNIVERSITY

Physics 101

Summer Semester

Second Midterm Exam

Saturday, July 17, 2025

10:00 PM – 11:30 PM

Student's Name: ……. Serial Number: ….……

Student's Number: ……Section: ……

Choose your Instructor's Name:

Instructors: Drs. Al Dosari, Al Jassar, Al Qattan, Al Smadi, Salameh, Zaman

For Instructors use only

Grades:

#	SP1	SP2	SP3	SP4	SP5	LP1	LP2	Q1	Q2	Q3	Q4	Total
Pts	2	2	2	2	2	3	3	1	1	1	1	20

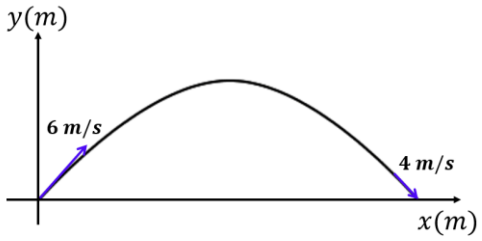
Important:

1. Answer all questions and problems (No solution = no points).
2. Full mark = 20 points as arranged in the above table.
3. **Give your final answer in the correct units.**
4. Assume g = 10 m/s^2.
5. Mobiles are **strictly prohibited** during the exam.
6. Programmable calculators, which can store equations, are not allowed.
7. **Cheating incidents will be processed according to the university rules.**

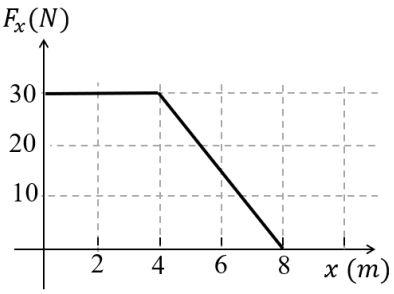
GOOD LUCK

Part I: Short Problems (2 points each)

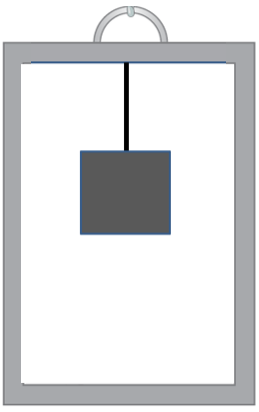
SP1. A 0.4 kg stone is projected from ground level with an initial speed of 6 m/s and strikes the ground with a speed of 4 m/s. **Calculate the work done by air resistance on the stone**.



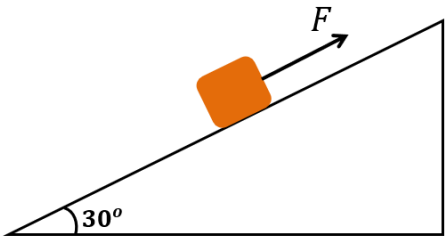
SP2. A 6 kg box moves along the x-axis from the origin under the influence of a variable net force, the net force as a function of position is plotted in the graph. **If the box has a speed of 2 m/s at $x = 0$, find its speed at $x = 8\,m$.**



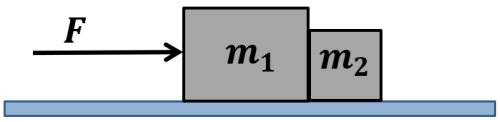
SP3. A 50 kg block is suspended from the lower end of a rope of negligible mass, with the upper end attached to the ceiling of an elevator. The elevator is **moving downward and slowing down** at a rate of 3 m/s^2. **Find the tension in the rope**.



SP4. A block of mass $m = 8\ kg$ is pulled by a constant force $F = 60\ N$ on **a rough** incline , as shown. If the block **moves up** the incline at **constant speed**, **find the coefficient of kinetic friction (μ_k) between the block and the surface**.

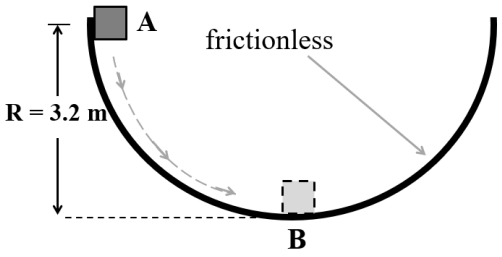


SP5. Two blocks ($m_1 = 15\ kg, m_2 = 5\ kg$) are in contact on a horizontal, **frictionless** surface, as shown. A horizontal force of $F = 40\ N$ is applied to block 1. **Find the magnitude of the force that block 1 exerts on block 2**.



Part II: Long Problems (3 points each)

LP1. A block of mass $m = 2\ kg$ is released from **rest at point A** and slides inside a **frictionless** circular path of radius R, as shown.

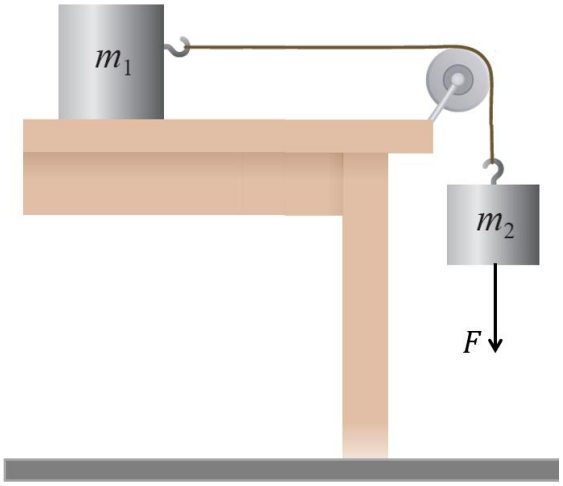


a) Find the speed of the block at point B.

b) Find the magnitude of the normal force on the block at point B.

c) Find the magnitude of the block's acceleration at point B.

LP2. Two blocks ($m_1 = 8\ kg,\ m_2 = 2\ kg$) are connected by a light rope that passes over a massless, frictionless pulley. The horizontal surface is **frictionless,** and a constant force $F = 16\ N$ is applied to m_2, as shown.



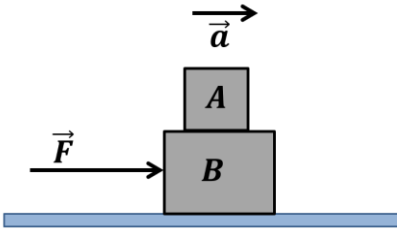
a) **Find the acceleration of the blocks.**

b) Find the tension in the rope.

c) Calculate the power delivered by the tension force on block 2 when it is moving downward at a speed of 2 m/s.

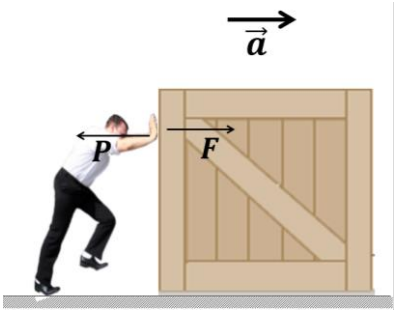
Part III: Questions (Choose the correct answer, one point each)

Q1. Block A is placed on top of block B. A force $\vec{F}$ is applied to block B, causing both blocks to accelerate to the right, as shown. **Block A does not slip relative to block B**. What is the direction of the **static friction force between the two blocks**?



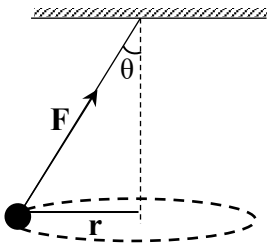
* It acts to the right on both blocks A and B.
* It acts to the left on both blocks A and B.
* It acts to the right on block A and to the left on block B.
* It acts to the left on block A and to the right on block B.

Q2. A man pushes a box of mass M on **a rough** horizontal surface with a force of magnitude F. The box pushes back on the man's hand with a force of magnitude P. **If the man and the box accelerate to the right with a constant acceleration of magnitude** a, then



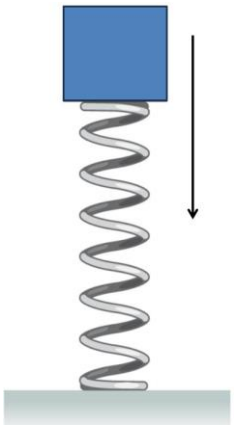
* $F = P$
* $F = P + Ma$
* $F = P + Ma + f_k$
* $F = P + Ma - f_k$

Q3. The ball of a conical pendulum rotates in a horizontal circle at **constant speed,** as shown**.** The work done on the ball by the **tension $\vec{F}$ during one complete revolution equals**



* $F(2\pi r\, sin\theta)$
* $F(2\pi r\, cos\theta)$
* $F(2\pi r\, tan\theta)$
* zero

Q4. A block is placed on the top of a vertical relaxed spring, as shown. As the block moves downward and compresses the spring, **the work done on the block by the spring is:**



* Positive
* Negative
* Zero