Kuwait University Physics Department

جامعة الكويت
KUWAIT UNIVERSITY

Physics 101

Summer Semester

Second Midterm Exam
Saturday, July 11, 2026
10:00 AM – 11:30 AM

Student's Name: ……. Serial Number: ……

Student's Number: ……Section: ……

Choose your Instructor's Name:

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

For Instructors' use only

Grades:

#	SP1	SP2	SP3	SP4	SP5	LP1	LP2	MC	Total
Pts	2	2	2	2	2	3	3	4	20

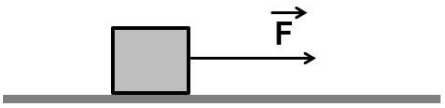
Important:

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.**

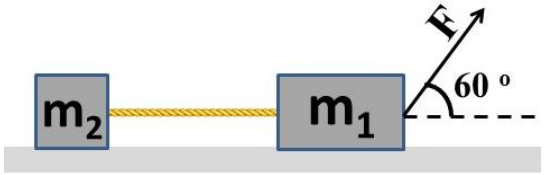
GOOD LUCK

Part I: Short Problems (2 points each)

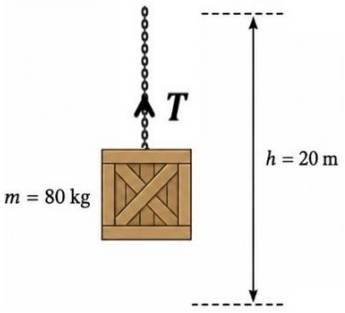
SP1. A constant horizontal force $|\vec{F}| = 120\ N$ is applied to a $20\ kg$ block moving on a **rough** horizontal surface ($\mu_k = 0.5$), as shown. **Find the magnitude of the block's acceleration.**



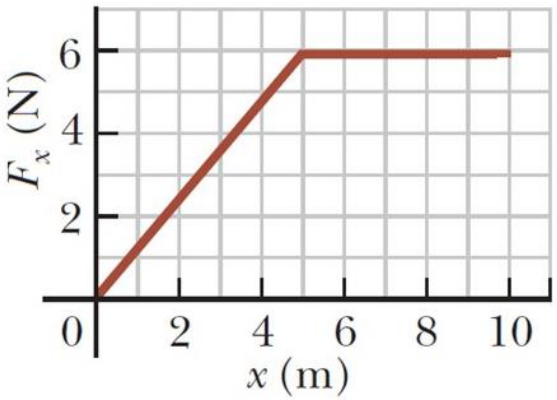
SP2. Two blocks ($m_1 = 8\ kg, m_2 = 4\ kg$), are connected by a light rope and pulled by a force $|\vec{F}| = 70\ N$, along a horizontal **frictionless** surface, as shown. **Find the magnitude of the tension (*T*) in the string**.



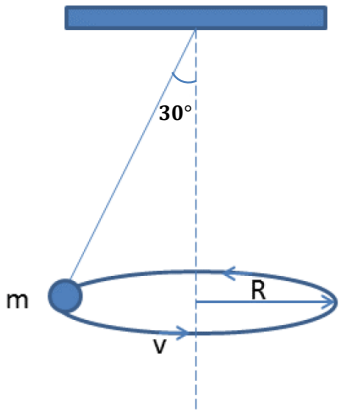
SP3. What is the **average power** required to lift a box of mass $m = 80\ kg$ **vertically** through a height of $h = 20\ m$ in $t = 40\ s$ at a **constant speed?**



SP4. A 2 kg block is subject to a single force $\boldsymbol{F_x}$ that varies with position as shown. If the speed of the block at $x = 0\ m$ is 6 m/s, **find its speed at $\boldsymbol{x = 10\ m}$.**



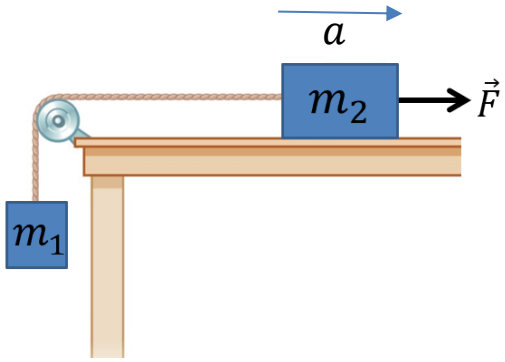
SP5. A ball of mass ($m = 4\ kg$) is attached to a string and rotates in a **horizontal** circle with **constant speed** ($v = 1.7\ m/s$). The string makes an angle ($\theta = 30°$) with the vertical, as shown. **Find the radial force acting on the ball.**



Part II: Long Problems (3 points each)

LP1. Two blocks ($m_1 = 2\ kg, m_2 = 4\ kg$) are connected by a light rope passing over a massless, frictionless pulley. The horizontal surface is **frictionless** and a constant force $\vec{F}$ is applied to m_2, causing the system to accelerate at $|\vec{a}| = 0.5\ m/s^2$, as shown.

a) Find the magnitude of the applied force $\vec{F}$.



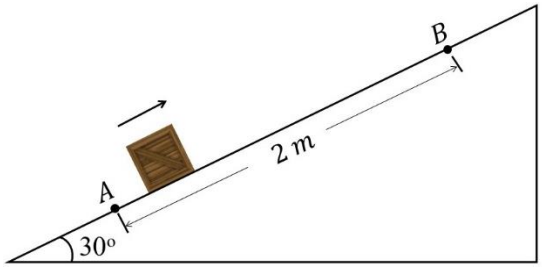
b) Find the tension (*T*) in the rope.

c) If the applied force $\vec{F}$ is **removed**, what happens to the **tension (*T*)** in the rope **immediately after removal?**

* T increases * T decreases * $T = 0$

LP2. A 4 kg block is given an initial speed of 6 m/s at point **A**. The block slides up **a rough** incline and completely stops at point B.

a) Find the total work done on the block as it moves from A to B.



b) Using the work-kinetic energy theorem, find the coefficient of kinetic friction (μ_k) between the block and the incline.

c) Find the coefficient of static friction (μ_s), required to keep the block at <u>rest</u> at point B.

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

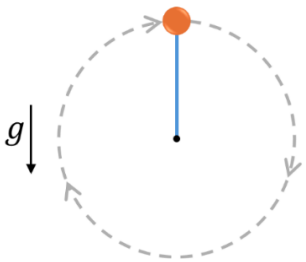
Q1. In a **uniform** circular motion, **the vectors that point toward the center** of the circular path are**:**

* acceleration and net force.
* velocity and acceleration.
* velocity and net force.
* velocity, acceleration, and net force.

Q2. A boy with mass (m) stands on a scale in an elevator. **While the elevator is moving downward but slowing down,** which one of the following is correct?

* $n < mg$
* $n = mg$
* $n > mg$
* $n = 0$

Q3. A ball of mass m, attached to a light string of length L, moves in a **vertical circle** as shown. What is the **work** done by the gravitational force **(W_g)** on the ball during **one complete revolution?**



* $W_g > 0$
* $W_g = 0$
* $W_g < 0$
* $W_g = 2mgL$

Q4. A block of mass m is moving with a speed v. Its kinetic energy is K. If the **speed** of the block is **doubled** while its mass remains unchanged, **what will be its new kinetic energy?**

* $2K$
* $4K$
* $8K$
* $K/2$