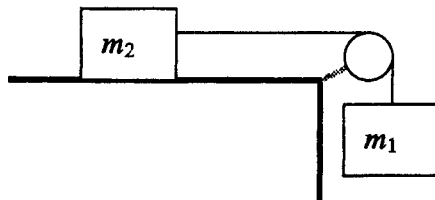


本試題是否可以使用計算機： 可使用， 不可使用（請命題老師勾選）

考試日期：0302，節次：3

1. Please describe and explain (a) Mean free Path, (b) Quantum number, (c) Superconductor, (d) Semiconductor, (e) Strain. (20%)
2. A solid sphere of radius R has a density that varies as $\rho = \rho_0(1-r/2R)$ where r is the distance from the center. Determine the variation of the field strength with r within the sphere ($r < R$) (10%)
3. Two blocks with mass $m_1 = 0.41$ kg and $m_2 = 0.7$ kg are connected by a string as in Figure. If $\mu_k = 0.2$ for the horizontal surface, find the acceleration. (10%)



4. An object is dropped from a high tower. Make a sketch of how the speed varies with the distance fallen when air resistance is (a) ignored, or (b) taken into account. (c) Can an object speed up if its acceleration is decreasing? (10%)
5. A javelin thrown from height of 2 m at 30° above the horizontal lands on the ground 42 m away horizontally. Find : (a) the initial speed; (b) the time of flight; (c) the maximum height. (10%)
6. The expression $U_g = mgh$ for gravitational potential energy is valid only near the surface earth, and $U(r) = -GmM/r$ is the gravitational potential energy of two point particles. What is the connection between $U(r) = -GmM/r$ and $U_g = mgh$? (10%)
7. An ideal monatomic gas undergoes a quasistatic expansion to one-third of its initial pressures. Find the ratio of the final volume to the initial volume if the process is (a) isothermal; (b) adiabatic. (10%)
8. A parallel-plate capacitor has plates with dimension 4 cm x 5 cm, separated by 2.3 mm. The plates are connected across a 100-V battery. Find: (a) the capacitance; (b) the magnitude of the charge on each plate. (10%)
9. An electron with a kinetic energy of 10^4 eV moves perpendicular to the lines of a uniform field $B = 3$ G (a) What is the period of its orbit? (b) What is the radius of the orbit? (10%)