(1) A force P acts horizontally on a block
18% of weight W resting on an incline plane as shown in Fig. 1. If the tangent of the incline angle θ is larger than the static coefficient of friction μ_s between the plane and the block, find the range of P to keep the block at rest in terms of W, θ, and μ_s.

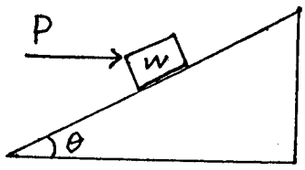

Fig. 1

(2) A uniform disk of mass M and radius R
18% has a string wrapped around the periphery of the disk and attached to a ceiling as shown in Fig. 2. Find the tension in the string and the acceleration of the center of mass of the disk.

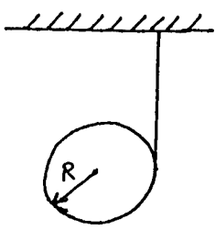

Fig. 2

(3) If the pressure of 2.5 mole of an ideal gas for which
18% $C_v = 7.5$ cal/K, is increased from 1.0 atm to 3.0 atm by an isochoric ($V = 0.040\ m^3$) process, calculate the
(a) heat Q for this process. {1 atm = 10^5 N/m²)
(b) change ΔS in the entropy of the gas. R = 8.3 J/mol·K)

(4) A sphere of radius R is filled with a continuous charge
18% described by the volume density $\rho(r) = \alpha r^3$ for $0 < r < R$, where α is a positive constant and r measures distance from the center of the sphere. Find
(a) the electric field as a function of r.
(b) the potential difference $V_A - V_B$, where A and B are $\frac{R}{2}$ and 2R from the center of the sphere, respectively.

(5) At $t = 0$ when the switch S is
18% closed (see Fig. 3), the capacitors are uncharged. Calculate (in terms of ℰ, C, and R)
(a) the initial current through ℰ.
(b) the steady-state current through ℰ.

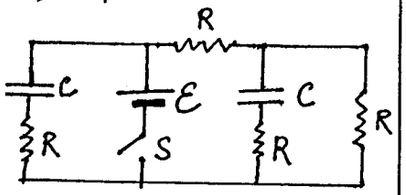

Fig. 3

(6) Find the de Broglie wavelength of an electron ($m_e = 9.1 \times 10^{-31}$ kg)
10% moving with a speed of 10^4 m/s.

(題目將用本張複印製版請以黑色正楷書寫或打字並請勿超出此線)

命題人簽章	周楊勳