科目 普通物理 類組別 A3 A5 A7 共 / 頁 第 / 頁

＊請在答案卷內作答

填充題，共6題。請將答案依題號順序寫在答案卷上，不必寫演算過程。

1. A ladder of length L and weight W rests on a rough floor and against a frictionless wall, as shown in figure 1. The maximum angle θ between ladder and wall is 45°. (a) Find the minimum coefficient of static friction at the floor. (b) the force exerted by the wall at this angle θ = 45°. (a)10% _____ (b) 5% _____

2. A uniform rod of length L and mass M is pivoted freely at one third of the rod as shown in figure 2. (a) What is the angular acceleration of the rod when it is at angle θ to the vertical. (b) What is the tangential linear acceleration of the end A of the rod when the rod is horizontal? The moment of inertia of a rod about one end is $ML^2/3$.
(a)10% _____ (b)5% _____

3. What is the heat input needed to raise the temperature of 2 moles of di-atomic gas, like hydrogen, from 0°C to 100°C (a) at constant volume; (b) at constant pressure? (c) What is the work done by the gas in part (b)?
(a)5% _____(b) 5% _____ (c) 5% _____

4. A radio station transmits a 100-kW signal at a frequency of 150 MHz. For simplicity, assume that it radiates as a point source. At a distance of 10 km from the antenna, find: (a) the amplitudes of the electric and magnetic field strengths, and (b) the energy incident normally on a square plate of side 10 cm in 5 min.
(a) 10% _____ (b)10%_____

5. (a)What is the de Broglie wavelength of an electron accelerated from rest by a potential difference of 150 V? (b) The 150 eV electron beam are directed at a spacing D = 0.2 nm crystal. Find the angular position of the first diffraction maxima angle θ.
(a)7% _____ (b) 8% _____

6. The wave function of a particle of mass m in a 1-D box in x-direction , one end at x = 0 and the other end at L, is $\psi(x) = A\sin(n\pi x/L)$. Where n is integer and L = 0.1 nm. (a) Find the ground state energy in eV by using de Broglie's hypothesis. (b) If the particle in the 2nd excited state. What is the possibility to find the particle in region in between x = 0 and x = L/3. (a)10% _____ (b)10%_____

Gravitational acceleration g = 9.8 m/s²
Electron mass $m_e = 9.1*10^{-31}$kg
Electron charge e = $1.6*10^{-19}$ C
Permeability constant $\mu_0 = 4\pi*10^{-7}$ H/m
Permittivity constant $\varepsilon_0 = 8.9*10^{-12}$ F/m

Gas constant R = 8.3 J/K.mole
Boltzmann's constant k = $1.38*10^{-23}$ J/K
Planck's constant h = $6.6*10^{-34}$ J*s

參考用

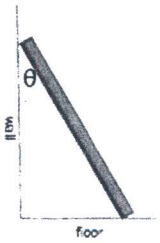

Figure 1

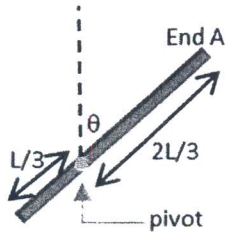

Figure 2