國立嘉義大學九十六學年度
轉學生招生考試試題

科目：普通物理學

第一部分：選擇題（每小題 4 分，共 40 分）

1. A soap film, 4×10^{-5}cm thick, is illuminated by white light normal to its surface. The index of refraction of the soap film is 1.50. Which wavelengths will be intensified in the reflected beam？ (A) 400 and 600 nm (B) 480 and 800 nm (C) 360 and 533 nm (D) 400 and 800 nm (E) 510 and 720 nm.
2. The work function for a certain sample is 2.3eV. The stopping potential for electrons ejected from the sample by 7.0×10^{14} Hz electromagnetic radiation is : (A) 0.6 eV (B) 2.3 eV (C) 2.9 eV (D) 5.2 eV (E) 7.0eV
3. A wave is described by $y(x, t)=0.1\sin(3x+10t)$, where x is in meter, y is in centimeter, and t is in seconds. The wavelength is: (A) 6π m (B) 3π m (C) 2π/3 m (D) π/3 m (E) 0.1cm
4. Use $R=8.2\times10^{-5}$ m^3·atm/mol·K and $N_A=6.02\times10^{23}$ mol^{-1}. The approximate number of air molecules in a *1.0* m^3 volume at room temperature and atmospheric pressure is : (A) 41 (B) 450 (C) 2.5×10^{25} (D) 2.7×10^{26} (E) 5.4×10^{26}
5. An astronaut on a strange planet finds that she can jump a maximum horizontal distance of R = 20.0 m if her initial speed is v_0 = 3.33 m/s. What is the free-fall acceleration g on that planet ? (Hint: The horizontal range R has its maximum value for $\theta_0 = 45^o$) (A) g = 0.17 m/s^2 (B) g = 0.39 m/s^2 (C) g = 0.55 m/s^2 (D) g = 1.80 m/s^2 (E) g = 6.00 m/s^2
6. A pendulum comprising a string of length L and a sphere swings in the vertical plane as shown in Fig. 1. The string hits a peg located a distance d below the point of suspension. Show that if the pendulum is released from the horizontal position and is to swing in a complete circle centered on the peg, then the minimum value of d must be (A) 1/2L (B) 3/5L (C) 5/7L (D) 3/4L (E) 4/5L

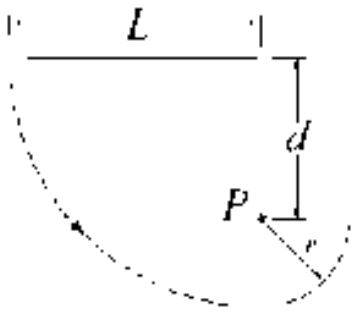


Fig. 1

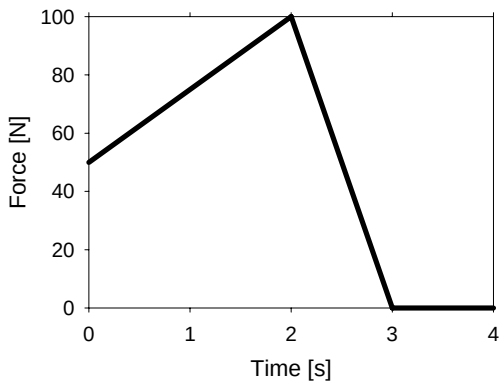


Fig. 2

7. A force F varies with time t as shown in Fig. 2. What is the linear impulse J of this force during the time interval 0 s < t < 4 s ? (A) 66.7N (B) 100N (C) 200N (D) 300N (E) 600N
8. A uniform thin rod of mass m = 2.0 kg and length L = 0.70 m is pivoted at one end in such a way that it can move in a vertical plane as shown in Fig. 3. The free end is held so that the rod is horizontal when it is released. What is the angular acceleration of the rod the instant it is released? (A) 12 rad/s^2 (B) 21 rad/s^2 (C) 32 rad/s^2 (D) 40 rad/s^2 (E) 46 rad/s^2
9. In the circuit(Fig. 4) ξ = 120 V, R_1 = 30 Ω, R_2 = 20 Ω, and R_3 = 10 Ω. What is the current i_1 a long time after the switch has been closed ? (A) 0.0 A (B) 2.4A (C) 3.3 A (D) 8.0 A (E) 18

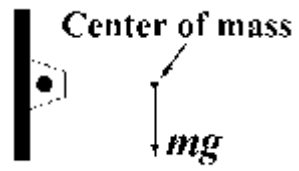


Fig. 3

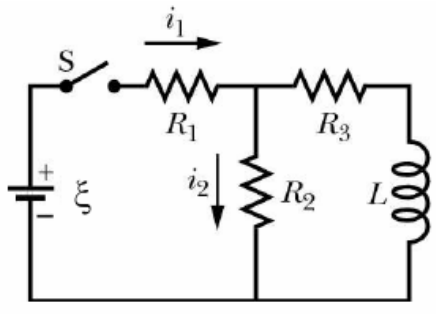


Fig. 4

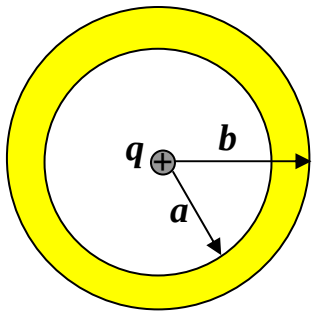


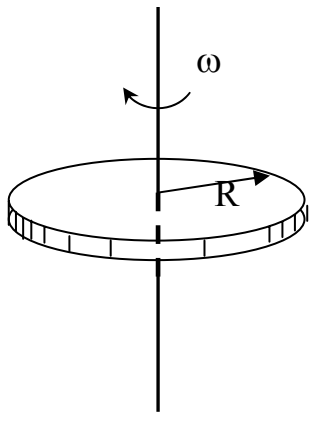
Fig. 5

10. A point charge $q_p = +q$ is placed inside a spherical conducting shell with inner radius a and outer radius b as shown in Fig. 5. The total charge of the conductor is $Q = -4q$. What are the surface charges on the inner surface q_a and outer surface q_b ? (A) $q_a = -q$ and $q_b = -3q$ (B) $q_a = -3q$ and $q_b = -q$ (C) $q_a = 0$ and $q_b = +4q$ (D) $q_a = +q$ and $q_b = +4q$ (E) $q_a = -q$ and $q_b = -4q$

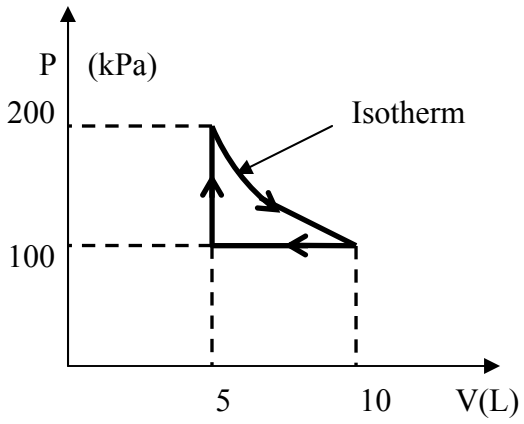
背面尚有試題

第二部分：計算題（共 60 分；請注意有效數字以三位為原則）

1. A nonconduction disk of radius R has a uniform surface charge density σ C/m^2. It rotates at angular velocity ω as depicted in figure. (a)What is the current passing through a surface perpendicular to the plane of the disk ? (8 分) (b) What is the total magnetic field at the center of the disk. (8 分)



2. Two moles of an ideal diatomic gas (γ = 7/5) are taken around the cycle as shown in figure. Find: (a) the heat absorbed or rejected in each segment(4 分); (b) the work done per cycle(4 分); (c) the efficiency. (4 分)



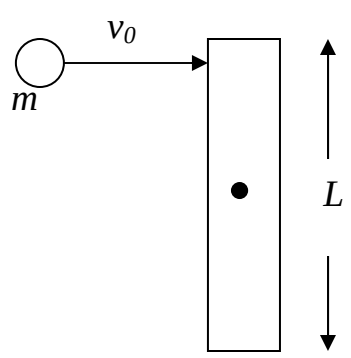
3. A bullet of mass *m* and initial speed v_0 strikes and is embedded in the end of a uniform rod of mass 2*m* and length *L* originally at rest, the rod pivots about a fixed axis at its center

(a) What is the angular momentum of the system f bullet and rod with respect to the axis through the rode pivot ? . (4 分)

(b) What is the angular speed of the rod after the collision ? (4 分)

(c) Is linear momentum of the system conserved? (4 分)

(d) Is kinetic energy conserved ? (4 分)



4. A rod of length L, mass M, and resistance R slides without friction down a pair of parallel conducting rails of negligible resistance, as shown in figure below. The rails are connected together at the bottom as shown, forming a conducting loop with the rod as the top member. The plane of the rails makes an angle θ with the horizontal and a uniform vertical magnetic field $\vec{B}$ exists throughout the region.

(a) Show that the rod acquires a steady state terminal speed whose magnitude is $V_T = \dfrac{MgR\sin\theta}{B^2L^2\cos^2\theta}$ (8 分)

(b) Show that the rate at which thermal energy is being generated in the rod is equal to the rate at which the rod is losing gravitational potential energy. (8 分)