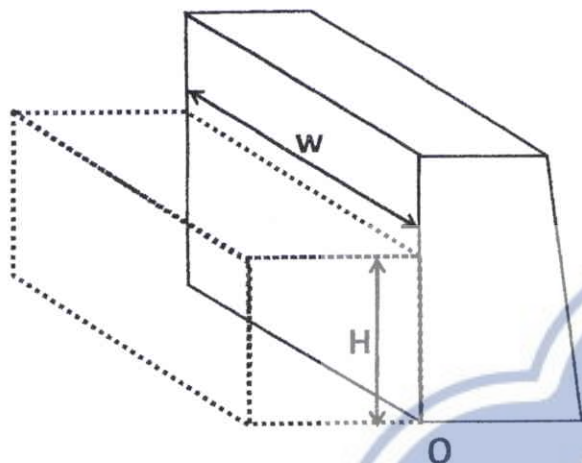
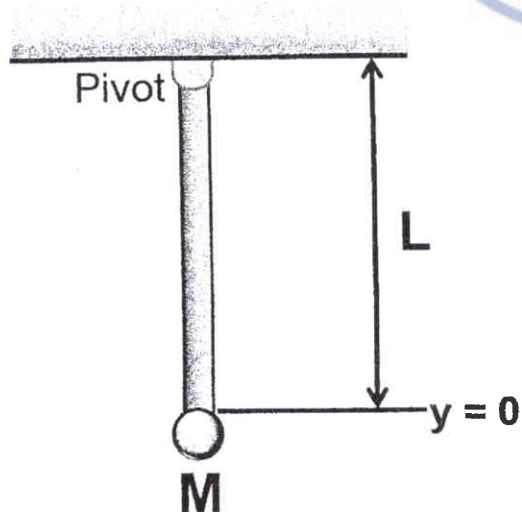


考試科目	普通物理	系所別	應用物理研究所	考試時間	2月8日(六)第2節
------	------	-----	---------	------	------------

1. (16%) Water is filled to a height H behind a dam of width w . (a) Determine the resultant force exerted by the water on the dam. (b) Determine the total torque exerted by the water behind the dam about a horizontal axis through O .

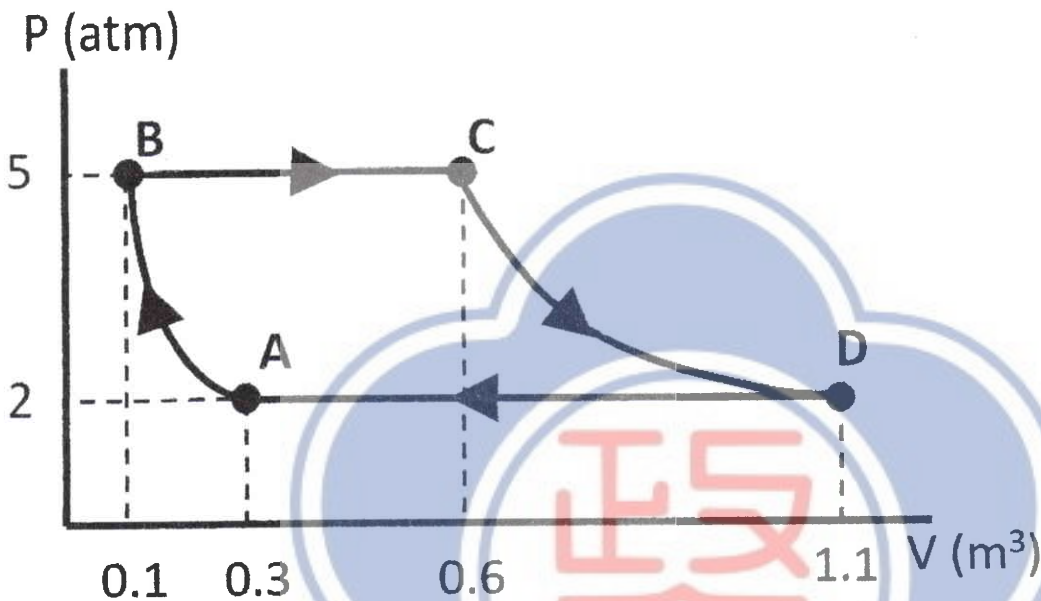


2. (16%) A small ball of mass $2M$ is attached to the end of a uniform rod of mass M and length L that is pivoted at the top. When the ball and rod starts to oscillate for small displacements from equilibrium about the pivot, (a) determine the moment of inertia of the ball and rod system about the pivot. (b) Calculate the distance between pivot and center of mass for the ball and rod system. (c) Show that oscillation of the ball and rod system is simple harmonic motion. (d) Calculate the frequency of oscillation. (Note, the moment of inertia of rod at center is $I_{CM} = ML^2/12$. You can use $\tau = I\alpha$ to deduce the equation of simple harmonic motion in physical pendulum $d^2x/dt^2 = -\omega^2 x$)



考試科目	普通物理	系所別	應用物理研究所	考試時間	2月8日(六)第2節
------	------	-----	---------	------	------------

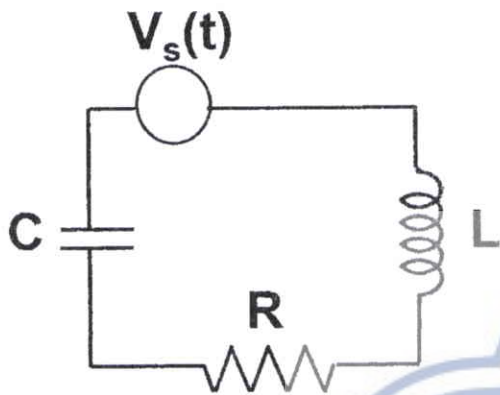
3. (16%) A sample of an ideal gas goes through the process shown in the figure. From A to B , the process is adiabatic; from B to C , it is isobaric with 82 kJ of energy entering the system by heat; from C to D , the process is isothermal; and from D to A , it is isobaric with 91 kJ of energy leaving the system by heat. Determine the difference in internal energy from A to B . (Note: $1\text{atm} = 1.013 \times 10^5 \text{ Pa}$ and $E_{int,ab} = Q_{ab} + W_{ab} = Q_{ab} - PV_{ab}$)



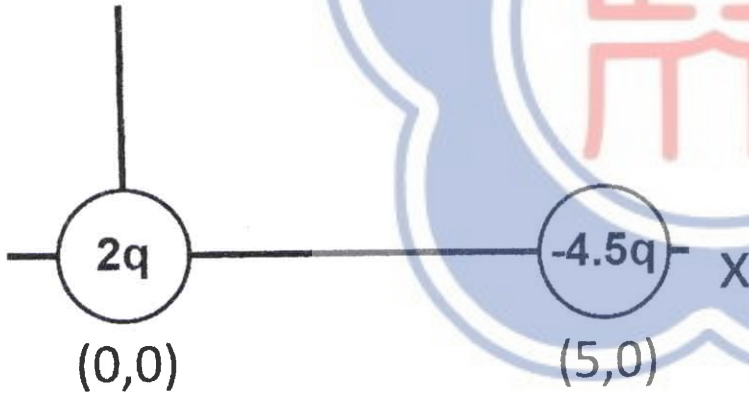
4. (16%) A plane electromagnetic sinusoidal wave propagating in the z direction. Suppose the frequency is 3×10^{14} Hz and the intensity is 1370 W/m^2 . Calculate (a) the wavelength of the wave (b) the max amplitude of electrical field in the EM wave, (c) the max amplitude of magnetic field in the EM wave. (d) Write an expression for magnetic field $B(x, t)$ with numerical values (Note the intensity of EM wave is the average of poyting vector; $\vec{S} = \vec{E} \times \vec{B}/\mu_0$; $\mu_0 = 4\pi \times 10^{-7} \text{ N/A}^2$; $c = 3 \times 10^8 \text{ m/s}$)

考試科目	普通物理	系所別	應用物理研究所	考試時間	2月8日(六)第2節
------	------	-----	---------	------	------------

5. (18%) A sinusoidal voltage $v_s(t) = 15\sin 100t$, where Δv is in volts and t is in seconds, is applied to a series RLC circuit with $L = 100 \text{ mH}$, $C = 100.0 \mu\text{F}$, and $R = 120.0 \Omega$. What is the impedance of (a) inductance, (b) capacitance, (c) resistance, (d) the circuit? (e) What is the maximum current? (f) What is the phase angle for current.



6. (18%) A particle with charge $+2q$ is at the origin. A particle with charge $-4.5q$ is at $x = 5.00 \text{ m}$ on the x axis. (a) For what finite value(s) of x is the electric field zero? (b) For what finite value(s) of x is the electric potential zero?



備

註

- 一、作答於試題上者，不予計分。
- 二、試題請隨卷繳交。