

國立中央大學八十九學年度碩士班研究生入學試題卷

150 所別: 太空科學研究所 不分組 科目: 普通物理 共 / 頁 第 / 頁

(15%) 1. Two blocks with masses $m_A = 0.2\text{kg}$ and $m_B = 0.3\text{kg}$ hang one under the other, as shown in Fig.1. Find the tensions in the (massless) ropes in the following situations: (a) The blocks are at rest; (b) they move upward at 10m/s ; (c) they accelerate upward at 2m/s^2 . ($g = 9.8\text{m/s}^2$)

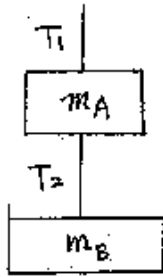


Fig. 1

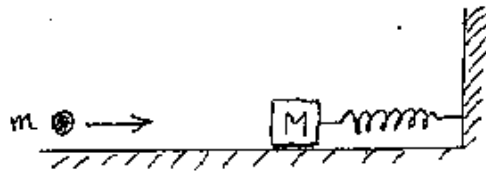


Fig. 2

(15%) 3. A cylinder with a piston contains 0.2kg of water at 100°C . What is the change in internal energy of the water when it is converted to steam at 100°C at a constant pressure of 1 atm ? The density of water is $\rho_w = 10^3\text{ kg/m}^3$ and that of steam is $\rho_s = 0.6\text{ kg/m}^3$. The latent heat of vaporization of water is $L_v = 2.26 \times 10^6\text{ J/kg}$. $1\text{ atm} = 1.01 \times 10^5\text{ N/m}^2$.

(10%) 4. A metal sphere of radius R_1 has a charge Q_1 . It is enclosed by a conducting spherical shell of radius R_2 that has a charge $-Q_2$; see Fig.4. Determine: (a) the potential V_1 of the inner sphere; (b) the potential V_2 of the outer sphere.

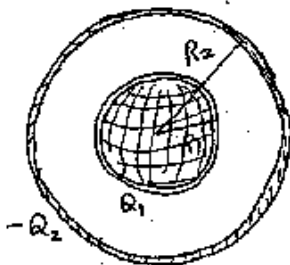


Fig. 4

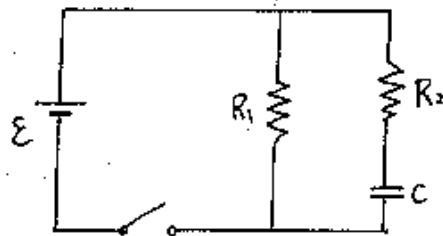


Fig. 5

(10%) 6. An ideal infinite solenoid has n turns per unit length and carries a current I . Find its magnetic field. (Hint: apply Ampere's law).

(20%) 7. Explain: (a) Heisenberg uncertainty principle; (b) The de Broglie wavelength of a particle; (c) Maxwell's theorem of the equipartition of energy. (d) The postulates of the Bohr model of hydrogen atom.

參考用