

# 國立中央大學八十五學年度碩士班研究生入學試題卷

所別：地球物理研究所 不分組 科目：普通物理學 共 1 頁 第 1 頁

所別：應用地質研究所 不分組

40% 1. State the following physical laws in words :

- (1) Newton's laws of motion.
- (2) Newton's law of gravitation.
- (3) Kepler's laws of planetary motion.
- (4) Hooke's law of elasticity.
- (5) Archimede's principle.
- (6) Coulomb's law of electricity.
- (7) First law of thermodynamics.
- (8) Snell's law.

10% 2. A block of mass  $m_1 = 2 \text{ kg}$  and initial velocity  $v_1 = 4 \text{ m/s}$  makes a one-dimensional elastic collision with a block of mass  $m_2 = 3 \text{ kg}$  moving at  $v_2 = 2 \text{ m/s}$ . Find their final velocities.

10% 3. A  $60 \text{ kg}$  person floats vertically in a pool with just his head, of volume  $2.5 \text{ liter}$ , exposed. What is his (average) density?

10% 4. For an ideal gas undergoing an adiabatic process, show that the relation between the pressure ( $p$ ) and volume ( $v$ ) of the gas is

$$pv^\gamma = \text{constant}$$

where  $\gamma$  is the ratio of heat capacity at constant pressure ( $C_p$ ) and heat capacity at constant volume ( $C_v$ ).

10% 5. Given the equation of a wave as

$$y(x, t) = 0.05 \sin \left[ \frac{\pi}{2} (10x - 40t) - \frac{\pi}{4} \right]$$

Find (a) the wavelength, the frequency, and the velocity.

(b) the particle velocity and acceleration at  $x = 0.5 \text{ meters}$  and  $t = 0.05 \text{ seconds}$ .

10% 6. An object is located  $15 \text{ cm}$  from a spherical mirror whose focal length has a magnitude of  $10 \text{ cm}$ . Determine the position and transverse magnification of the image given that mirror is (a) concave, and (b) convex.

10% 7. The circuit in Figure 1 has two loops and three sources of emf.

(a) Determine the currents given that  $r_1 = r_2 = 2\Omega$ ,  $r_3 = 1\Omega$ ,  $R_1 = 4\Omega$ ,  $R_2 = 3\Omega$ ,  $\mathcal{E}_1 = 15\text{V}$ ,  $\mathcal{E}_2 = 6\text{V}$  and  $\mathcal{E}_3 = 4\text{V}$ .

(b) what is the potential difference between points A and B?

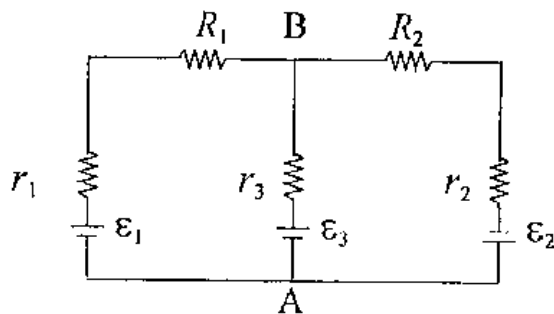


Figure 1.

參考用