

系所組別： □ 腔醫學研究所丙組

考試科目： 普通物理學

考試日期： 0307，節次： 3

※ 考生請注意：本試題 可 不可 使用計算機

1. Please describe and explain (a) Heat engine, (b) Fermi energy, (c) Doppler effect, (d) Bohr's theory, (e) Laminar flow. (20%)
2. Describe and sketch Carnot cycle. (10%)
3. We have a point of $+10.0 \mu\text{C}$. (a) What is the electric field 20 cm from the point charge? (b) If a charge of $+5 \mu\text{C}$ is placed at this point (20 cm away), what force will act on this charge? What direction will this force act in? (c) If the $+5 \mu\text{C}$ charge is on the object of mass 0.1 kg, what will be the acceleration of the object? (15%)
4. 5 kg of ice, starting at an initial temperature of -20°C is melted completely. (a) How much heat is required to heat the ice to 0°C ? (b) How much heat is required to melt the ice once after it has reached 0°C ? (10%)
5. A car travelling at 60 km/hr must make an emergency stop to avoid hitting another (stationary) car 10 m ahead. The brakes can slow the car down at a rate of 10 m/s^2 . (a) What distance does the car need to stop? Does the car stop before running into the stationary car? (b) How fast is the car moving when it reaches the stationary car? (10%)
6. You want to use a magnifying glass (converging lens) with a focal length of 10 cm to form a virtual image of an object. You want to obtain a magnification of 3x. How far away from the object will you place the lens? Where will the image be? (10%)
7. A helium-neon laser produces light with a wavelength of 633 nm. (a) What is the frequency of the light? (b) What is the energy of each photon? (c) What properties of waves could be used to show that the laser light is a wave? (15%)
8. Describe and sketch the temperature-dependence of the electric resistivity for insulator, semiconductors and metals. (10%)