

# 國立屏東教育大學 101 學年度研究所碩士班入學考試

## 普通物理學 試題

(應用物理系光電暨材料碩士班)

※請注意：答案須寫在答案卷上，否則不予計分。

### 問答題 (共 100 分)

1. 一質量  $M$ ，半徑為  $R$  之均勻轉盤，繞其中心軸以  $\omega$  之角速率自由轉動。(a)求此轉盤對轉軸之轉動慣量  $I_c$ 。(b)若有一質量  $m$  之昆蟲，垂直跌落於轉盤之邊緣，則轉盤之角速率變成多少?(10 分)
2. 在一均勻磁場  $B$  中，一長度  $L$  的金屬棒，繞其一端的樞紐  $O$  點，以固定的角速率  $\omega$  旋轉，假定磁場方向與棒身垂直，求棒兩端的電位差?(10 分)
3. 請解釋何謂(a)光電效應 (b)康普敦(Compton)效應(c)雷射(d)石墨烯(graphene)。(20 分)
4. 當頻率分別為 475Hz 與 480Hz 的兩個音叉一起震動時，人耳聽到的混合聲音，其強弱變化的頻率為何?(10 分)
5. The potential energy of a diatomic molecule (a two-atom system like  $H_2$  or  $O_2$ ) is given by 
$$U = \frac{A}{r^{12}} - \frac{B}{r^6}$$
, where  $r$  is the separation of the two atoms of the molecule and  $A$  and  $B$  are positive constants. This potential energy is associated with the force that binds the two atoms together. (a) Find the equilibrium separation—that is, the distance between the atoms at which the force on each atom is zero. Is the force repulsive (the atoms are pushed apart) or attractive (they are pulled together) if their separation is (b) smaller and (c) larger than the equilibrium separation?(15 分)
6. A Carnot engine whose low-temperature reservoir is at  $17^\circ C$  has an efficiency of 40%. By how much should the temperature of the high-temperature reservoir be increased to increase the efficiency to 50%?(15 分)
7. 請解釋何謂自由膨脹(free expansion)? (10 分)
8. (1)請問可見光波長範圍為何?(2)請計算 60 Hz 電磁波的波長?(10 分)