

國立臺北教育大學 98 學年度碩士班招生入學考試
自然科學教育學系碩士班 物理學 科試題

一、選擇題：(每題 5 分，共 20 分)

1. The direction of the net force on an object is
 - (A) the same as the direction of the object's velocity.
 - (B) opposite to the direction of the object's velocity.
 - (C) at right angles to the direction of the object's velocity.
 - (D) in the same direction as the object's acceleration.
 - (E) opposite to the direction of the object's acceleration.

2. The longest wavelength that a standing wave can have on a stretched string of length L is
 - (A) $2L$.
 - (B) $3L$.
 - (C) $5L$.
 - (D) $7L$.
 - (E) $9L$.

3. "The emf induced in a circuit is directly proportional to the time rate of change of magnetic flux through a circuit." This is a statement of
 - (A) Coulomb's law.
 - (B) the Biot-savart law.
 - (C) Faraday's law of induction.
 - (D) Lenz's law of back emf .
 - (E) Gauss's law of magnetic flux.

4. The glue that holds nuclei together is the
 - (A) weak force.
 - (B) electromagnetic force.
 - (C) gravitational force.
 - (D) strong force.
 - (E) coulomb force.

二、計算題：(每題 10 分，共 80 分)

1. The power output of the Sun is 3.85×10^{26} W. How much mass is converted to energy in the Sun each second?
2. Try to prove that $PV^\gamma = \text{constant}$ in the adiabatic process for an ideal gas.
3. The image of the Sun is formed by a thin converging lens of focus length 150 mm. Calculate the radius of the Sun's image on the focus plane of this lens. (The Sun-Earth distance is 1.5×10^8 km, while the radius of the Sun is 7×10^5 km.)
4. 用積分求半徑為 a 之均勻薄球殼之轉動慣量。(設薄球殼的質量為 m)
5. 若一質點做一直線運動，其速度與位移 x 的關係為 $dx/dt = bx^{-3}$ ，其中 b 是一正值常數，求作用在質點上的力函數為何？(令質點的質量為 m)
6. 證明兩質量相同的質點做斜向彈性碰撞時，若其一原為靜止，則碰撞後兩質量夾角為 90 度。
7. 有一長為 $2L$ 且帶有一均勻線電荷密度 的直線段，求距此線段中點上方 z 處之電場。
8. 一唱片半徑為 R ，攜有一均勻面電荷 ，且以等角速度 轉動。請問它的磁偶極矩大小為何？