

國立臺北教育大學 98 學年度博士班招生入學考試

自然科學教育學系博士班 基礎自然科學 科試題

一、單選題(每題 5 分, 共 25 分)

1. One atmosphere is the same as 1.013×10^5 Pa. What force in N does the atmosphere exert on the top of a sealed can of radius 1.000×10^{-1} m?
 - A. 6.365×10^4
 - B. 1.591×10^3
 - C. 2.823×10^3
 - D. 103×10^3

2. What happens to the magnetic field inside a solenoid if the current is doubled?
 - A. It is doubled.
 - B. It is cut in half.
 - C. It stays the same.
 - D. There is no magnetic field inside.
 - E. It reverses.

3. One should argue that a large ship floats because
 - A. the density of the ship is less than that of the water it displaces.
 - B. the density of the ship is the same as that of the water it displaces.
 - C. the surface area of the ship contacting the water is the same as the surface area of the water contacting the ship.
 - D. the gravitational force on the ship is less than the buoyant force on the ship.
 - E. the mass of the ship is greater than the mass of the water it displaces.

4. A meter stick is moving along its long axis near the speed of light. A stationary observer will observe that the meter stick is
- A. longer than one meter.
 - B. shorter than one meter.
 - C. one meter in length.
 - D. moving faster than the speed of light.
 - E. moving into the future.
5. A skydiver jumps out of a plane. Before reaching terminal velocity, her
- A. displacement remains constant.
 - B. velocity decreases.
 - C. acceleration remains constant.
 - D. acceleration increases.
 - E. velocity increases.

二、問答題(共 75 分)

1. 請探討「板塊循環」與「岩石循環」的關聯？(10 分)
2. 請說明大氣層垂直分布的構造與特徵？(10 分)
3. 請說明礦物非金屬光澤的種類，每一種類並各舉出一例？(5 分)
4. Why desert rabbits can adapt to the hot climate?(5 分)
5. What maintains the secondary structure of a protein?(5 分)
6. Give statements of natural selection concept.(5 分)
7. Explain hypothesis that life's taxonomic domains originated from a community of gene-swapping prokaryotes.(5 分)
8. Compare homozygous allele with heterozygous allele.(5 分)
9. Why is it incorrect to consider benzene an alkene (e.g. 1,3,5-cyclohexatriene)? (5 分)
10. Briefly describe the principle for the formation of laser. (5 分)
11. Briefly describe the definition of acid and base by the Lewis's concept. (5 分)
12. The reaction $A \rightarrow \text{products}$ is first order in A. If the concentration of A is cut in half, how the half life changes?(5 分)
13. Briefly describe the second law of thermodynamics.(5 分)