

# 國立嘉義大學九十四學年度轉學生招生考試試題

科目：普通物理

請將答案寫在答案卷上

## 一、right (O) and wrong (X): (40 points)

1. Momentum within a system of freely moving particles is always conserved unless the system is acted upon by an outside force.
2. The velocity of an object exhibiting SHM is at a maximum when its displacement from equilibrium is at its maximum.
3. Centripetal force is a force (whether a normal force, gravity, tension and so on) that keeps a body moving in a circular path.
4. The heat capacity of a substance determines how much heat is necessary to raise it by a given amount of temperature. Its amplitude is dependent on the temperature.
5. The second law of thermodynamics states that naturally occurring process will move in the direction that ends with the great entropy, or disorder, in a system.
6. A dielectric is a material that has a permittivity ( $\epsilon$ ) greater than that of a vacuum ( $\epsilon_0$ ). The dielectric constant (K) is a multiplier of  $\epsilon_0$ , and therefore, when placed within a capacitor, it can increase its capacitance.
7. The equivalent inductance of a group of inductors in parallel is found by adding them linearly.  $L = L_1 + L_2 + L_3 + \dots + L_n$ .
8. The critical angle is defined as that the incident angle at which a light ray traveling from a medium with a low index of refraction into a high index of refraction is refracted at  $90^\circ$ .
9. The eye uses a lens to focus light onto the retina. If an eye is too long, the image will focus in front of the retina(視網膜), which results in nearsightedness. If an eye is too short, the image will focus behind the retina, resulting in farsightedness(遠視).
10. Particles exhibit both wave and particle characteristics, although in most cases the particle nature predominates. The wave nature can be considered by calculating the associated *de Broglie* wavelength, which is dependent on an object's velocity.

## 二、Calculation: (60 points)

1. System shown as given figure with  $A=8\text{kg}$ ,  $\mu_s=0.3$ ,  $\mu_k=0.15$ ,  $\theta=30^\circ$ . Find that
  - 1) Argue that the system is going to move or to stand still while  $B=2\text{kg}$  (5 points)
  - 2) The tension of the string as 1) (5 points)
  - 3) Determine the maximum and minimum masses for B to keep the system standing still. (5 points)

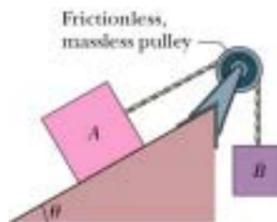


Figure 1

2. Find out the following answers.  $\mathcal{E}_1 = 5\text{V}$ ,  $\mathcal{E}_2 = 8\text{V}$ ,  $R_1 = 4\Omega$ ,  $R_2 = 6\Omega$ ,  $R_3 = 2\Omega$ .
  - 1) Write down the equation of voltage for the right circuit in given circuit. (5 points)
  - 2) As 1), calculate the current of  $R_3$ . (5 points)
  - 3) Draw the Thevenin's equivalent circuit of  $R_3$ . (5 points)

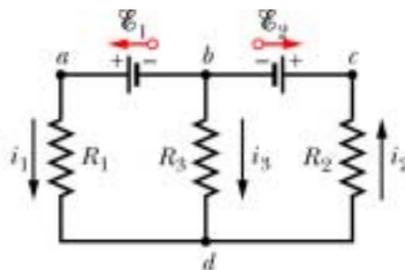


Figure 2

3. Find the following answers:
  - 1) A linear polarized light beam traveling through two polarizers with polarizing direction  $\theta$  and  $90^\circ$  to the initial polarization. It keeps 37.5% of its original intensity. Find  $\theta=?$  (5 points)
  - 2) Find the Brewster's angle for a ray beam passing through a glass ( $n=3/2$ ) in water ( $n=4/3$ ). (5 points)
  - 3) Find the capacitance of an isolated conducting sphere with radius R and net charge Q. (5 points)

4. Find the following answers:

- 1) The electric field  $E_x$  at  $P_1$  in given figure with uniform linear charge density  $\lambda=Q/L$  by integration. (5 points)
- 2) The electric potential V at  $P_1$  as 1) by integration. (5 points)
- 3) Verify that  $\vec{E}_x = -\frac{\partial V}{\partial x}$  at  $P_1$  by 1) and 2). (5 points)

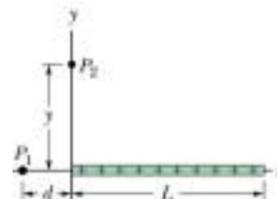


Figure 4