

參考用

- I. Briefly describe Brookhaven solar neutrino experiment.
- II. If a planet is surrounded by plasma. How will the temperature of the plasma affect the behavior of the plasma escaping from the planet. (10%)
- III. What are the relative variations of solar electromagnetic radiation during quiet and active times. (10%)
- IV. (a) What is the physical meaning of "adiabatic invariant"? (5%)
- (b) if one gradually shortens (or lengthens) the length of a single pendulum (單擺), such that $|\Delta t/T| \ll |\Delta L/L|$, where T is the pendulum period and L is the length. The adiabatic invariant is found to be T/\sqrt{L} . Why? (10%)
- V. (a) What is Vis-visa equation? (5%)
- (b) What are its unique features different from those of electrical and magnetic forces. (5%)

1. Please explain the following terminology (20%)

- (1) quasi-equilibrium distribution
- (2) conjugate point
- (3) the magneto ionic theory
- (4) true height analysis
- (5) seasonal anomaly
- (6) sporadic-E layer
- (7) polar cap absorption
- (8) traveling ionospheric disturbance (TID)
- (9) equatorial electrojet
- (10) the second law

2. State the relationship between the solar and earth's ionosphere in both quiet sun and solar disturbance. (10%)

3. In a collisionless ionosphere, the geomagnetic field is 0.3 gauss and the electron density profile is expressed as

$$\begin{aligned} N(z) &= 0 && \text{for } z \leq b \\ N(z) &= a(z-b)/H && \text{for } z \geq b \end{aligned}$$

where $a = 10^4 \text{ #/cm}^3$, $H = 10 \text{ km}$ and $b = 80 \text{ km}$. (1) For a probing frequency, $f = 3.6 \text{ MHz}$, (i) derive the reflection heights for O-, X-, and Z-wave of vertical incidence; and (ii) evaluate the refractive index and height at the reflection point of the O-wave of oblique sounding (elevation angle, $\text{el} = 60^\circ$). (2) For vertical sweeping probing frequencies, please calculate the reflection frequencies of O-, X-, and Z-wave at $N_{\text{min}} = 10^6 \text{ #/cm}^3$. (20%)