# 國立臺灣師範大學 103 學年度碩士班招生考試試題

科目：**天文學**　　適用系所：**地球科學系**

注意：1.本試題共 2 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則不予計分。

**1. (25 分)** If we find a new planet that looks 0.01 arcsec in diameter in sky (i.e. it's apparent diameter), but somehow we know it should be twice as large as Pluto in reality (i.e. its real physical diameter). Calculate the distance to this planet from the Sun. Assume Pluto's real diameter is 2000km. Recall one arcsec is 1/3600 th of one degree. (Show your work and answer)

**2. (25 分)** A new Kuiper Belt Object is discovered and photographed by a space probe, but it took about 6 hour and 32 min for the picture to reach to Earth. How long will this Kuiper Belt Object (new planet?) take to rotate around the Sun? Use one of the Kepler's law, and calculate the time to take in Earth year. Recall also the Sun is about 8 light-minute away from us. (Show your work and answer)

**3. (12 分)** Calculate the absolute magnitude of Jupiter from its apparent magnitude at opposition, -2.6, and the absolute magnitude of M31, from its apparent magnitude, +3.5 (assuming it to be a point source). Their distances are respectively 4.2 AU and 670 kpc.

**4. (12 分)** Show, by drawing celestial spheres, that at the summer solstice (June 21), the Sun is directly overhead at midday for an observer at the Tropic of Cancer (latitudes +23°27′).

**5. (14 分)** The spectral distribution of the radiation of a blackbody in thermodynamic equilibrium is given by the Planck Law: $B_\nu(T) = (2h\nu^3/c^2)\,[\exp(h\nu/kT)-1]^{-1}$.

**(a)** Show that $B_\nu(T)$ can be converted to wavelength scale $B_\lambda(T)$ in the form

$$B_\lambda(T) = (2hc^2/\lambda^5)\,[\exp(hc/\lambda kT)-1]^{-1}$$

**(b)** Please show that when $h\nu \ll kT$, the brightness $B_\nu(T)$ is strictly proportional to the thermodynamic temperature, $T$. (The Rayleigh-Jeans Law)

**選擇題：(12 分；單選，每題 3 分)**

**6.** At longitude 170° E, it is 11 pm, October 2, then at 160° W, it is

**(A)** 9 pm, Oct 1.

**(B)** 1 am, Oct 2.

**(C)** 9 pm, Oct 2.

**(D)** 1 am, Oct 3.

7. Which one of the following physical parameters, more than any other, most probably controlled the early evolution of the planetary system and dictated the characteristics of the planets that eventually formed?

**(A)** The mix of chemical constituents.

**(B)** The overall rotation of the Solar Nebula.

**(C)** The temperature distribution within the Solar Nebula.

**(D)** The density of hydrogen gas in the Solar Nebula.

8. Which statement about the solar day is **FALSE**?

**(A)** The solar day is defined with respect to the Sun.

**(B)** The length of the solar day is not constant.

**(C)** The Sun's apparently eastward daily progress varies because of the obliquity of the ecliptic.

**(D)** A solar day is slightly shorter than a sidereal day.

9. The reason for stellar parallax to happen is

**(A)** because the Earth orbits the Sun in space.

**(B)** because stars have size and they are not really just points of light.

**(C)** because the Earth rotates about its own axis.

**(D)** because stars move in space.