國　立　清　華　大　學　命　題　紙

九十三學年度 原子科學學系 所(所) 甲 組碩士班入學考試

科目 普通物理學 科號 5702 共 1 頁第 1 頁 *請在試卷【答案卷】內作答

1. (8%) Design an experiment to find the focal length of convex lenses.

2. (8%) Explain why the lights lining the taxiways are blue?

3. (8%) Design an experiment to find the gravitational acceleration g.

4. (8%) Describe the Michelson-Morly experiment.

5. (8%) A-bian, our president, was shot and then treated at Chi-Mei Hospital on March 19th. What kind(s) of medical imaging was (were) made? Explain why they chose it (them).

6. (12%) A spaceship in lunar orbit (the Earth-Moon distance is ~380 Mm) transmits plane waves with an antenna operating at 1 GHz and radiating a total power of 1 MW isotropically. Find
   a) the time-average power density on the earth's surface,
   b) the time it takes for these waves to travel from the spaceship to the earth.

7. (12%) A Nissan X-TRAIL has a 2500 cc engine. It is running on the no.1 super highway at a constant speed of 100 km/hr and using constant power of 200 hp. What is the forward thrust exerted by the engine? Why doesn't the car accelerate? Hint: 1 hp = 746 (J/s) and 1 J = 1 N-m.

8. (12%) The Young's modulus, Y, is defined as the value of the force per unit area that produces a stretching or compression of a rod of the material divided by the fractional change. A 1-m-long wire of 1 mm diameter is observed to stretch 0.5 mm when a 2 kg weight is hung on it. Find its Young's modulus.

9. (12%) A diver underwater lifts a stone with a volume of 0.1 m^3 and finds that he must exert a force of 760 N to lift it. Find the density of the stone.

10. (12%) Determine the electric field intensity of an infinitely long, straight, line charge of a uniform density ρ_l in air.