所別：水文科學研究所碩士班 一般生 科目：普通物理

1. A piece of rubber originally 12 *cm* long is stretched to a new length of 18 *cm*. Calculate the tensile strain. (6%)

2. Calculate acceleration of a particle moving at a velocity of $u=16.4t^2+2sin(t)-21.8$. (6%)

3. The wavelength and period of a deep ocean wave is 450 *m* and 12 *s*, respectively. Calculate its wave velocity. (6%)

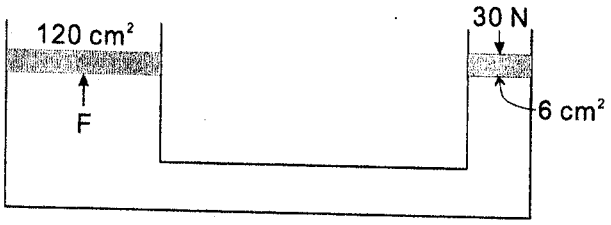
4. At what depth in the ocean is the absolute pressure 2050×10^3 *Pa*? (Density of seawater is 1.025 g/cm^3; g=10 m/s^2) (6%)

5. A ray of light traveling in air falls on a crown glass surface with a 49.47° angle of incidence. Calculate the angle of reflection. [*tan*(49.47°)=1.17; *cos*(49.47°)=0.65; *sin*(49.47°)=0.76] (6%)

   Table of reflection index:

Material	Reflection index
Air	1.00
Flint glass	1.66
Crown glass	1.52
Ice	1.31
Water	1.33

6. A hydraulic press consists of two vertical cylinders of circular cross-sectional area 6 cm^2 and 120 cm^2 that are joined at the base as shown. The press contains oil of relative density 0.9, and the friction between the pistons and the cylinder walls is negligible. Initially the pistons are at the same level.



   a. Calculate the upward force on the larger piston due to a downward force of 30 *N* on the smaller one. The smaller piston is pushed down through a distance of 60 *cm*. (10%)

   b. Through what distance does the larger piston rise? (10%)

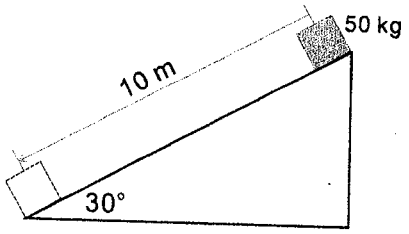
注意：背面有試題

c. What is now the upward force on the larger piston due to a downward force of 30 *N* on the smaller one? (10%)

(The masses of the two pistons are negligible; g=10 m/s^2)

7. An automobile of mass 2000 *kg* is moving at 36 *km/h*. What average net forward force is required to accelerate the automobile to 72 *km/h* over a distance of 75 *m*? (10%)

8. A block of mass 50 *kg* slides down a frictionless plane inclined at 30° with the horizontal through a distance of 10 *m* (measured parallel to the slope of the plane). How much work is done by the force of the weight during this slide? (g=10 m/s^2) (10%)



9. A vertical Hooke's law spring extends 10 *cm* when a 3 *kg* mass is attached to it. What is the period of vibration of the mass? (g=10 m/s^2, π=3.14) (10%)

10. A composite body built using a uniform thin rod and a uniform solid sphere is rotated about an axis perpendicular to the rod, as shown in the figure. If M=3 kg, L=0.4 *m*, m=0.5 *kg*, and r=0.1 *m*, calculate the moment of inertia of the body about the given axis. (10%)