招 生 學 年 度	106	招 生 類 別	碩士班
系 所 班 別	物理學系 應用物理碩士班（一般組）、材料科學與工程學系碩士班		
科 目 名 稱	普通物理		
注 意 事 項			

1. (5%) (a) What are the basic postulates of the Bohr model of hydrogen atom?
   (5%) (b) What are the failures of the Bohr model?

2. (20%) Please write down the Maxwell's equations and explain their physical meanings.

3. (10%) A parallel-plate capacitor is half-filed with a dielectric slab of constant κ_1, while the other half contains a slab of constant κ_2, as in Fig. 1. What is the resulting capacitance? Please express your answer in terms of C_0, the capacitance with no dielectric.
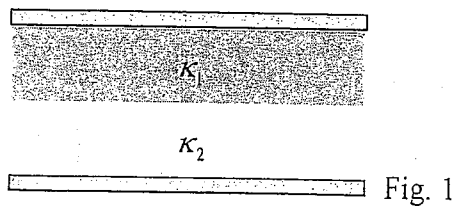

Fig. 1

4. (10%) A circular plate has a radius of 12 cm. The plane of the plate is set at a 30° angle to a uniform field $\mathbf{E} = 450\mathbf{i}$ N/C (Fig. 2). What is the flux through the plate?
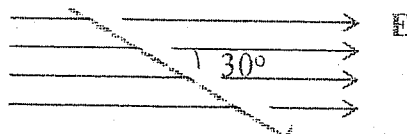

Fig. 2

5. (10%) A sphere of radius R has a charge Q uniformly distributed throughout its volume. For $r < R$, the potential function is $V(r) = kQ(3R^2-r^2)/2R^3$. Find the radial component of the electric field from $V(r)$.

6. (10%) The three capacitors in Fig. 3 have an equivalent capacitance of 12.4 μF. Find C_1.

Fig. 3
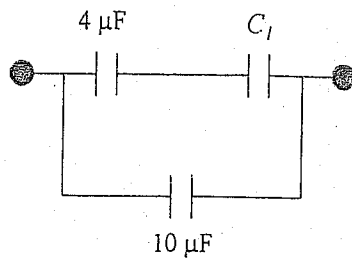
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7. (10%) A cylindrical tube of length L has inner radius a and outer radius b (see Fig. 4). The material has resistivity ρ. Current flows radially from the inner to the outer surface. Show that the resistance is $R = \rho[\ln(b/a)]/2\pi L$.
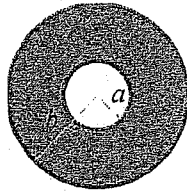

Fig. 4

8. The wavefunctions for two waves on a string are:

   $y_1 = 0.03\sin[\pi(2x+10t)]$ m

   $y_2 = 0.03\sin[\pi(2x-10t)]$ m

   (5%) (a) Please derive the equation for the standing wave.

   (5%) (b) Locate the 2 nodes that are closest to $x=0$ (for $x>0$).

   (5%) (c) Locate the 2 antinodes that are closest to $x=0$ (for $x>0$).

   (5%) (d) Find the amplitude of oscillation at $x=\lambda/8$.