Midterm Examination

Date: *May*, 2010

Duration: 90 minutes

SUBJECT: PHYSICS 3	
Head/Chair of Department of Physics Signature Full name *Phan Bao Ngoc*	Lecturer Signature Full name: Assoc. Prof. Dương Hoài Nghĩa

INTRODUCTIONS:

1. Open book exam.
2. Each problem carried 20 marks (total 100 marks).

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1. In Fig. 1, two tiny conducting balls of identical mass m and identical charge q hang from nonconducting threads of length L. Assume that θ is so small that $\tan(\theta) \approx \sin(\theta)$.
   a) Find the equilibrium separation x of the balls.
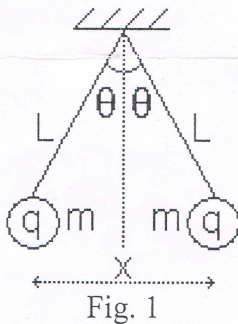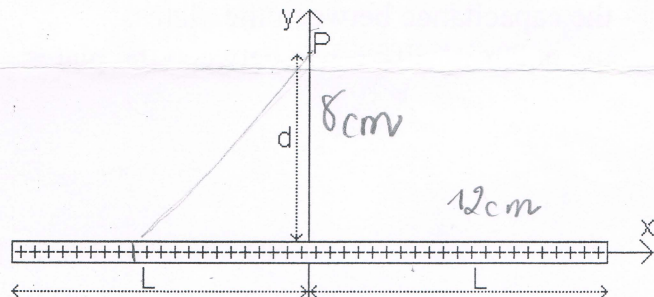   b) Explain what happens to the balls if one of them is discharged.

Fig. 1

Fig. 2

2. The thin plastic rod in Fig. 2 has length 2L and a uniform linear charge density λ. Find the electric field at point P. Where L = 12cm, d = 8cm, λ = 50pC/m.

3. The circuit in Fig. 3 has e_1 = 24V, e_2 = e_3 = 12V, r_1 = r_2 = r_3 = 2Ω. Find the currents i_1, i_2, i_3.
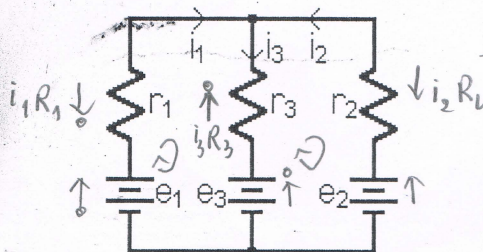

Fig. 3

4. Consider the circuit in Fig. 4 where e = 24V, r = 1kΩ, R = 2kΩ, C = 500μF. At t < 0 the switch K is closed, the capacitor C is fully charged. At t = 0 the switch K is open. Determine and sketch the potential difference V and the current i of the circuit.
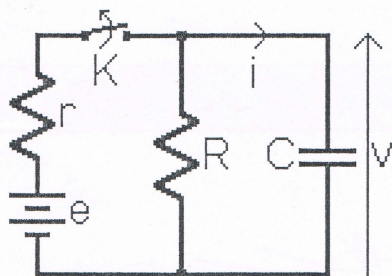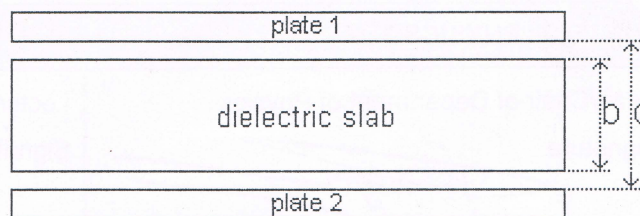

Fig. 4

Fig. 5

5. The parallel plate capacitor in Fig. 5 has plate area A = 100 cm^2 and plate separation d = 1 cm. A potential difference V_o = 50 V is applied between the plates. The battery is then disconnected. A dielectric slab of thickness b = 0.8 cm and dielectric constant k = 2 is placed between the plates after the battery was removed

a) Before the dielectric slab is inserted, find the capacitance and the charge on the plate.

b) After the slab has been introduced, find
- the electric field in the gaps between the plates and the dielectric slab.
- the electric field in the dielectric slab.
- the capacitance between the plates.
- the potential difference between the plates.

END OF QUESTION PAPER