Physics 10164 - Exam 1C

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work even if you get the right answer. Clearly indicate your answer with a circle or a box and remember to include correct units and significant figures.

1. (30 pts) A 65 gram particle with a charge of 43 μC is initially at rest in a uniform 7500 V/m electric field that points straight up. For this problem, you may assume that both gravity and the electric force are relevant.

a) After the particle has moved 28 cm in response to the forces, what is the magnitude and direction of its velocity?

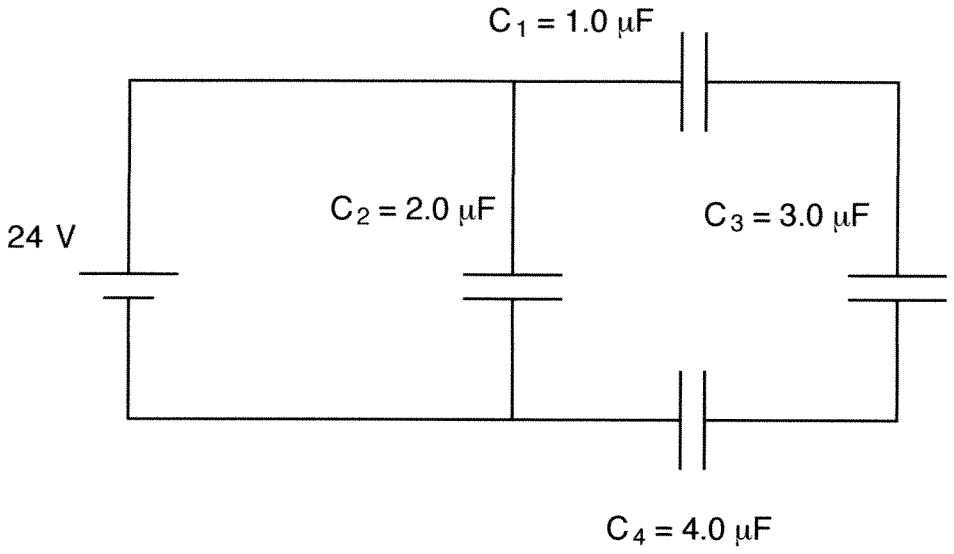
b) If the particle starts at a potential (due to the uniform field) of 1200 Volts, what is the potential after the particle has moved 28 cm?

(see exam 1A)

2. (40 pts) A 3.0 μC particle is fixed at the origin, and a -2.2 μC particle is fixed at the coordinate x = 1.4 meters. At what x-coordinate does a -6.0 μC feel no net electric force from these two particles?

(see exam 1A)

3. (30 pts) Determine the charge on each capacitor in the circuit shown below. Show/explain all work.



C_1, C_3, C_4 are in series

$$\frac{1}{C_{134}} = \frac{1}{1} + \frac{1}{3} + \frac{1}{4} \Rightarrow C_{134} = 0.63\ \mu F$$

C_2 + C_{134} are in parallel $\Rightarrow C_{TOT} = 2.63\ \mu F$

$C_{TOT} = 2.63\ \mu F$
$\Delta V_{TOT} = 24\ V$
$\Rightarrow Q_{TOT} = 63\ \mu C$

$C_2 = 2.0\ \mu F$ $C_{134} = 0.63\ \mu F$
$\Rightarrow$ $\Delta V_2 = 24\ V$ $\Delta V_{134} = 24\ V$
$Q_2 = 48\ \mu F$ $Q_{134} = 15\ \mu F$

$$Q_1 = Q_3 = Q_4 = 15\ \mu F$$
$$Q_2 = 48\ \mu F$$