Pre-Lab for Counting Experiment

Read the Guide, and Melissinos sections 8.3.1 and 8.3.4. Answer the following questions:

1. A Geiger-Muller tube is coupled to a capacitance of 0.1 nano Farad. You have adjusted the high voltage so that the G-M tube is operating in the so-called Geiger plateau region. A gamma ray induces an avalanche resulting in the immediate deposition of 10 billion electrons on the capacitor. The capacitor discharges through a load resistance across which you measure a voltage with your oscilloscope. The pulse decays with a time constant = RC sec. What is the peak voltage in the pulse?

2. How would you set up the oscilloscope to view this pulse vs time (out to several decay times)? Assume a 50 ohm load resistance. [Vert scale in volts per division, trigger level, horizontal scale in time per division].

3. The output of your G-M tube triggers a counter. You do a series of counting runs to measure background radiation (and study Poisson statistics). You are getting about 2 counts per 20 sec run interval. The counts per interval fluctuate randomly. How many such intervals do you have to measure counts in order to achieve 10% precision in your mean count rate? How many for 1% precision? How long would that take?