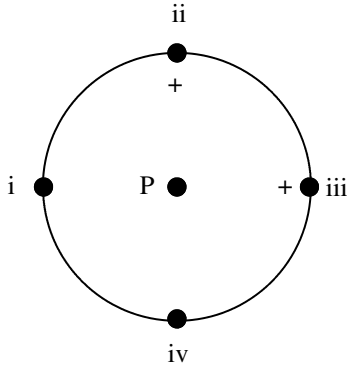
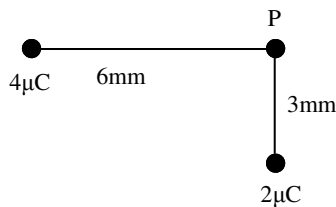


## 2010 PreAP Electrostatics 8



1. Two equal positive charges are placed at points ii and iii on a circle as shown.
  - A. On the diagram, use arrows to show the electric fields due to both charges AND the net electric field. (*Start the arrows at point P.*)
  - B. Since the electric fields are the same magnitude, what is the direction of the net electric field?  $\theta =$
  - C. If a positive charge was placed at P, which way would the electric force on it act?  $\theta =$
  - D. If a negative charge was placed at P, the direction of F would be?  $\theta =$
  - E. If the voltage from one of the charges =  $k_e q/r$ , what is  $V_{\text{total}}$  at P?
  - F. What would be the total voltage at P if the charges are moved to points ii and iv?
  - G. Where would you move the charges for the electric field to be a minimum?
  - H. Where would you move the charges for the electric field to be a maximum?
  - I. What would be the total voltage if one of the charges was negative?



2. A. Calculate the four electrostatic quantities at point P. Some may or may not be zero. (*If you need to, follow the steps from the previous homework.*)
  - B. If a  $-0.5 \mu\text{C}$  charge was placed at point P, give the four electrostatic quantities at point P.

*Remember that the units for electric field can be either N/C or V/m.*

3. A parallel plate capacitor is fully charged by a battery. It then has a constant electric field between the plates of  $24 \text{ N/C}$  and a plate separation of  $25 \text{ cm}$ .
  - A. What is the voltage of the battery that charged the capacitor?

The capacitor is then disconnected from the battery so that the charges on the plates cannot escape. This means the electric field remains the same. The plates are then separated to  $0.75 \text{ m}$ .

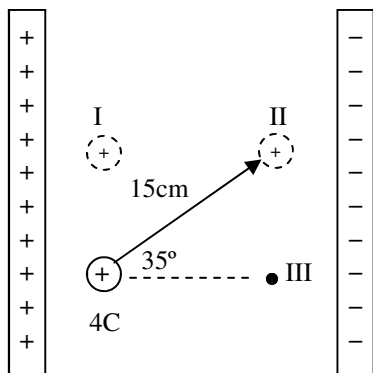
- B. What is the new voltage between the plates?

- C. Challenge: What would happen if the capacitor is reconnected to the same battery that originally charged it?

4. A parallel plate capacitor has a capacitance of 3F.
- What is the charge on one plate if connected to a 2V battery?
  - What is the potential energy held by the capacitor?
- The voltage across the capacitor is then doubled.*
- What is the capacitance of the capacitor?
  - What is the charge held by the capacitor?
  - What is the new potential energy held by the capacitor?
  - So, if the voltage across a capacitor is doubled, by what factor does the potential energy change?

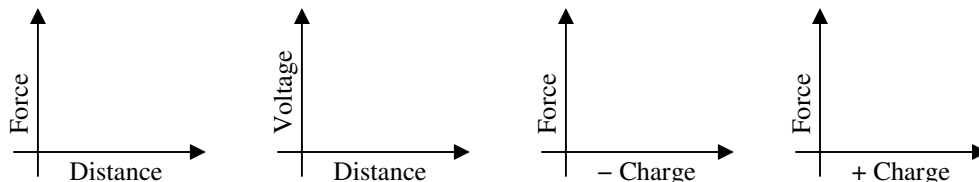
*Proportionality questions:*

5. The distance between two charges is doubled while one of the charges is halved.
- How does the electric force between them change?
  - How does the potential energy between them change?



- Which direction does the electric field point?
  - Where would the charge lose more energy: moved to I or II?
  - Where would the charge lose more energy: moved to II or III?
  - Where is the voltage higher: at I or II?
  - If the charge loses 15.8 J moving to point II, what is the electric field strength between the plates?
7. *I am not going to talk about the Millikan Oil Drop Experiment, but there will be questions about it on the test. Read the book or on the Internet. This is your responsibility.*
8. Compare conductors and insulators.

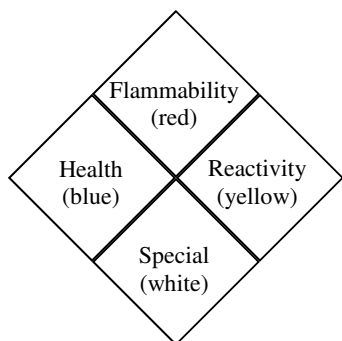
9. Draw the following graphs. The responsive quantities (y-axis) are from a + charge and what's on the x-axis.



10. A. Give five of the six lab safety rules the person is following.
- If the person had long hair what else should they do?
  - What should the person do to protect their feet?
  - If there is an emergency in the lab, who is the first person that should be told?
11. How should we smell a chemical in the lab (*use the correct word*)?
12. In the lab, where do we store very dangerous gases or substances that give off fumes?

13. You mix chemicals together in the lab. Why should you not put the extra chemicals back in the original container?
14. A. When diluting an acid, do we add acid to water or water to acid?  
B. Why?
15. Give two rules for safety when cutting with a sharp instrument.
16. Corrosive (I) (caustic), combustible (II), or carcinogen (III)?
- A. \_\_\_\_\_ Flammable.                      D. \_\_\_\_\_ Eats away what it touches.  
B. \_\_\_\_\_ Eats away at something.      E. \_\_\_\_\_ Wood or gasoline.  
C. \_\_\_\_\_ Causes cancer.                  F. \_\_\_\_\_ Strong acid on your skin

Numbers on the safety diamonds range from 0 (safe) to 5 (most dangerous).



17. Give the number and color for the following:
- A. \_\_\_\_\_ Water is safe to drink.  
B. \_\_\_\_\_ Gasoline burns very quickly.  
C. \_\_\_\_\_ Sodium will react very quickly in water.  
D. \_\_\_\_\_ Hydrochloric acid is poisonous.

18. What do we call the curved at the top of the liquid in #7 below?
19. Measure the liquid in #7 below.

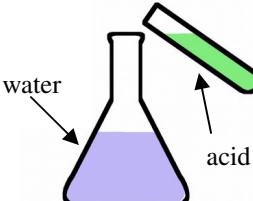
20. Use the pictures below to answer the following. (Can be more than one.)

- |  |                               |
|--|-------------------------------|
| A. _____ Used to measure mass.                       | J. _____ A burette            |
| B. _____ Used to measure temperature.                | K. _____ A graduated cylinder |
| C. _____ Used to measure volume.                     | L. _____ Electronic scale     |
| D. _____ Used to add very small amounts of a liquid. | M. _____ Beam balance         |
| E. _____ Used to carry liquids.                      | N. _____ Thermometer          |
| F. _____ Very accurate for measuring liquids         | O. _____ Scalpel              |
| G. _____ Used to make fine cuts in specimen          | P. _____ Erlenmeyer Flask     |
| H. _____ Which is more precise 6 or 7?               | Q. _____ Beaker               |
| I. _____ Used to mix liquids by swirling             |                               |

**Diluting Acids**

***Never add water to a concentrated acid!***

When acid compounds are dissolved in water, heat is produced (sometimes a lot of heat). Acids are more dense than water, so if you add water to a concentrated acid, water sits on top and can flash boil (quickly boil). The boiled water can splash up burning you with hot water and acid. If the acid is added to water it sinks thru the water and is diluted safely.



***Always add acids to water!***

