

Name _____
 Period _____

Date _____
 Living Environment

Micropipette and the Metric System
 Student Worksheet

1. **Metric conversions:** complete the following

a. 1 ml = _____ microliters	d. 1 μ l = _____ ml
b. 10 microliters = _____ ml	e. 20 μ l = _____ ml
c. 100 microliters = _____ ml	f. 2 ml = _____ μ l

2. Put the following volumes in order from largest to smallest.

a. 2.5 ml, 250 μ l, 0.025 ml, 2.5 μ l , _____ , _____ , _____

b. 100 μ l, 0.01 ml, 250 μ l, 0.015 ml, _____ , _____ , _____

3. Explain the reason for each of the following rules:

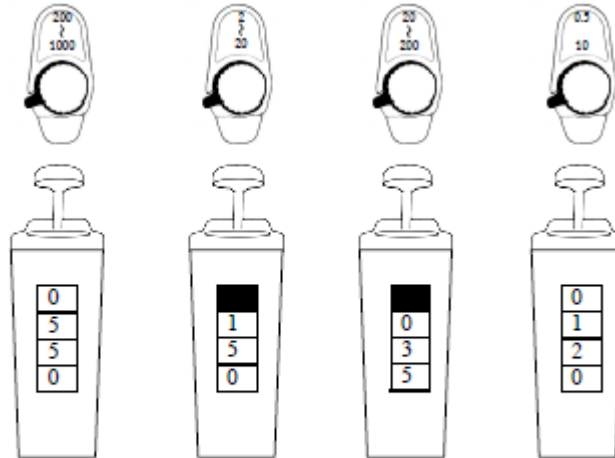
a. Always use the micropipette within its designated range:

b. Always use a disposable tip on a micropipette:

c. Always hold a loaded micropipette in a vertical position:

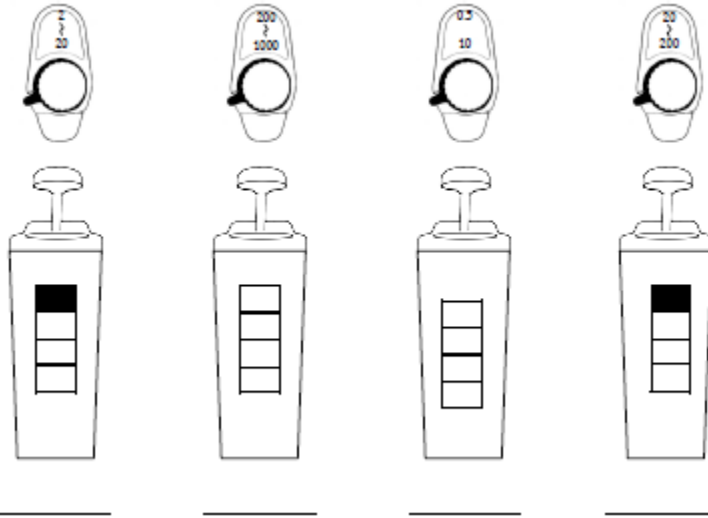
d. Always release the micropipette plunger slowly:

4. Under each micropipette, indicate the size of the micropipette, the set volume and the range for that micropipette (*the first one is filled out as an example*).



Size (P-?)	P-1000			
Volume:	550 μ l			
Range:	200 – 1000 μ l			

5. Select the appropriate micropipette and show what the dial should read to measure each of the following volumes: 150 μl , 1.5 μl , 300 μl , and 17.3 μl . Also write the amount on the line beneath each drawing.



6. Volume comparisons

Practice measuring 1, 5, 10, 20, 100, and 500 μl . On a piece of waxed paper or Parafilm release the drops and visually compare the sizes. Draw the actual size of each droplet on the chart below. (If you wet the lab table before setting the waxed paper down, the paper will not curl up as much.)

Work on your technique. Be smooth. Try to pick up and dispense the same drop several times

1.0 μl	5.0 μl	10.0 μl
20.0 μl	100 μl	500 μl

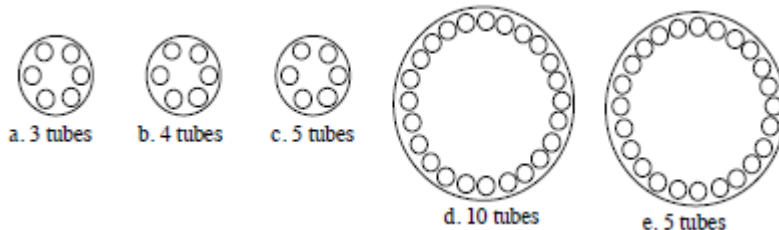
7. Put one drop from an eyedropper or plastic transfer pipette on the piece of wax paper away from your other drops. **Estimate** its size in μl . _____

8. Microcentrifuge instructions

- Close the caps on the tubes.
- The rotor must always be balanced—you cannot, for example, insert only one tube into a microcentrifuge (microfuge). Spinning in an unbalanced arrangement like this would damage the motor of the instrument. Use an extra balance tube if necessary.
- After you have closed the lid of the centrifuge, give the tubes a 1-3 second spin. This will mix and pool all the reagents into a droplet in the bottom of each tube.
- Wait for the rotor to stop before opening the centrifuge lid.

9. Why is it important to balance a centrifuge before turning it on?

10. Show how you would arrange the given number of tubes in each centrifuge to balance the load. If you decide that you must add or remove tubes, explain.



11. Measurement Matrix

Label three empty microtubes A, B, and C, with a permanent marker pen. Add solutions I, II, III, and IV to tubes A-C as shown in the matrix. To help you stay organized and prevents cross contamination, after pipetting each liquid place a check mark next to that space on your chart. *Always use a new tip for each new liquid being added to the tubes or when adding a new liquid to a tube already containing some.*

Micropipette Matrix

Tube	Micropipet	Solution I	Solution II	Solution III	Solution IV	Total
A	P-10	1.8 μ l	4.1 μ l	3.7 μ l	–	
B	P-20	3.4 μ l	–	2.6 μ l	12 μ l	
C	P-200	105 μ l	42 μ l	–	50 μ l	

Spin the tubes in the microcentrifuge (microfuge) for a few seconds to pool the solutions. **See centrifuge instructions in 8 above.**

As a check of your pipetting accuracy, do the following exercise. Set the P-10 to 9.6 μ l. Slowly attempt to suck in all of the fluid in tube A. The contents should just fill the tip--no air space at the bottom of the tip, no leftover fluid in the tube. Repeat with tube B and the P-20 (total 18 μ l) and with tube C and the P-200 (total 197 μ l).

OBSERVATION

12. What is the approximate volume of a microcentrifuge tube? _____ μ l

13. If **practice agarose gels** are available:

Load 15 μ l from tubes B and C and all of tube A into separate wells. How much fluid do the gel wells hold? _____ Use an empty well to find out. You may flush out the wells and load them again for practice.