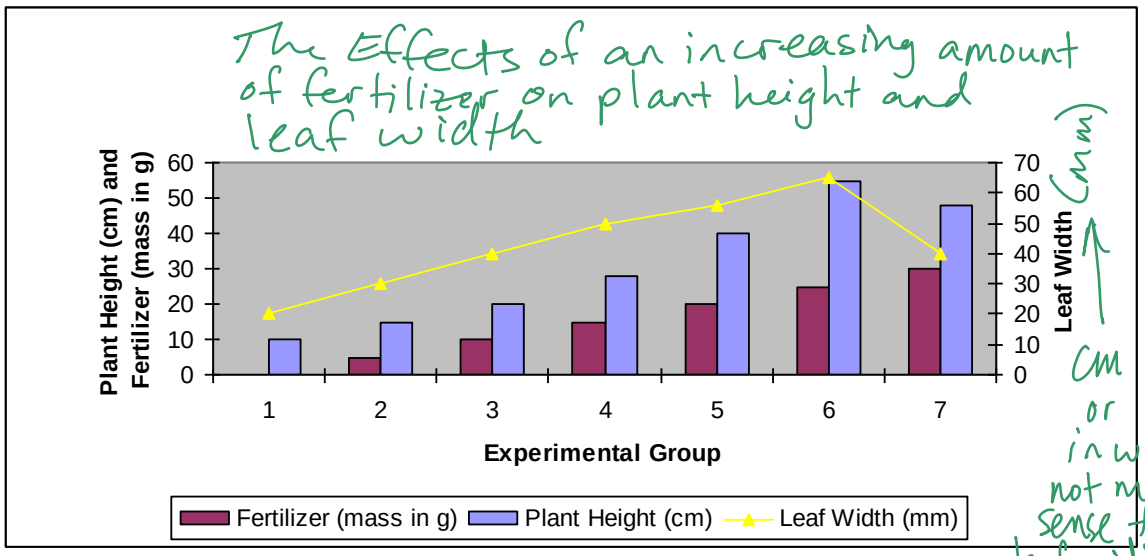
Biology 138 Name _____

Graphing, Metrics, Scientific Notation, Microscope Review

1. Answer the questions below about the following graph:



a. What is the independent variable in this experiment? Be careful! How do you know?

Fertilizer - it is the only variable listed that the scientist controls

b. Which group (1-7) is the control group? How can you tell that it is?

1 - No fertilizer added - used as a comparison to see effects of adding

c. What is the relationship between the amount of fertilizer applied and the height of the plant?

Height of plant increases as fertilizer added increases, up until a mass of 5.8 g, after which height declines

d. What is the relationship between plant height and leaf width?

As plant height increases, so does leaf width

e. Identify two problems with this graph, and then fix them.

No title, no units for leaf width

2. Complete the following problems involving scientific notation:

   a. $4.246 \times 10^{12} \div 1.123 \times 10^{20}$

   3.781×10^{-8}

   b. $3.5 \times 10^{5} \times 5.6 \times 10^{-3}$

   1.96×10^{3}

3. Convert the following metric problems:

   a. 425.5 hm = 4255 dam

   b. .000222 Mm = 222 m

   c. 315 mm = 3.15 dm

   d. 125,554 μm = .125554 m

   e. 112.4 cm = .001124 km

4. Complete the following problems:

   a. 133.4 km + 111 cm = 133,401.11 m

   133,400 m
   + 1.11 m
   133,401.11

   b. .0255 Mm - 50 m = 2,545,000 cm

   2,550,000
   − 5,000
   2,545,000

5. Complete the following problems – answer all questions in scientific notation:

   a. 4.33×10^{2} m = 4.33×10^{-1} km

   $4.33 \times 10^{2-3} = 4.33 \times 10^{-1}$

   b. 1.04×10^{-4} hm = 1.04×10^{0} cm

   $1.04 \times 10^{-4+4} = 1.04 \times 10^{0}$

6. Answer the following questions about the microscope:

   a. Explain why the same organism viewed under low power, then under high power, would appear to move faster under high power.

   The field of view is smaller under high power, so the organism covers the area faster.

   b. When do you want to open up the diaphragm to allow more light in – when viewing objects under scanning power or under high power?

   High

   c. Which of the objective lenses shows the greatest resolution?

   High (or oil immersion if the microscope has an oil immersion lens)

   d. Which of the objective lenses shows the greatest depth of field?

   Scanning

   e. Which of the objective lenses has the largest field of view?

   Scanning (wide-angle)

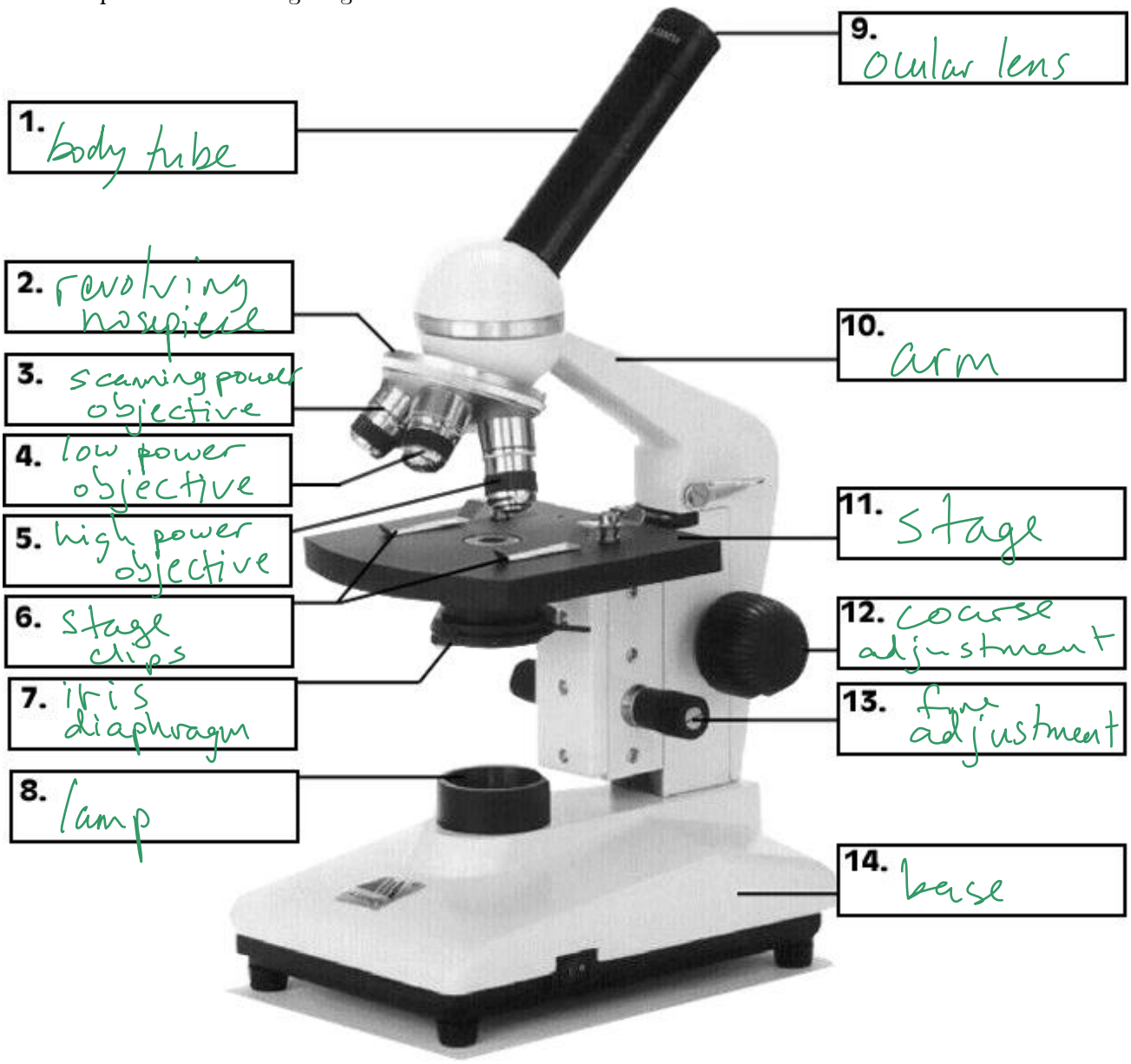
   f. Which of the focusing knobs must not be used under high power and oil immersion?

   Coarse

   g. Draw what the letter "F" would look like if viewed under the microscope.

7. Complete the following diagram:

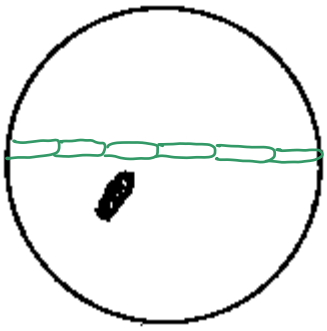


8. Answer the following questions regarding measurements made under the microscope:

   a. How big is the field of view in the picture below?

3.5 mm

   b. Given your answer from part "a", then how big is the microorganism (in µm) seen below under the same microscope as in part a?



$\frac{3.5\text{mm}}{6} = .583\text{mm} =$

583µm

9. Read about the different types of microscopes on pages 21 and 22 of your textbook. Then answer the following questions:

   a. What is one disadvantage to using the light microscope?

The object must be very small and transparent

   b. What do electron microscopes use to magnify the image of a specimen?

electrons

   c. What are the two types of electron microscopes? What is the difference between them? Scanning electron microscope - 3D images

Transmission electron microscope - 2D images

   d. What is one disadvantage of the electron microscope as compared to the compound light microscope? Living organisms cannot be viewed under the electron microscope, but can under the compound light microscope.

10. Calculate the high power field diameter for a microscope with a low power field diameter of 2.3 mm. Assume the magnification of all lenses is the same as our class scopes. Give your answer in μm.

$$\frac{2.3\text{mm} \times 100}{400} = \frac{230\text{mm}}{400} = .575\text{mm}$$

$$.575\text{mm} \times 1000 = 575\mu\text{m}$$