Grade Level	Content Area	Course Title *(9-12 Samples Only)*	Unit Title
Eighth	**Science**		**Fundamental Measurement**
Length of Unit	**Time of Year Taught**	**Expected Prior Knowledge**	
1 week	**First Quarter**	- Inquiry process	
Unit Description			
Student will be instructed on how to measure with scientific tools. This lesson will be at the beginning of the year for the student to master for further learning in science throughout the year.			

Strand(s), Concept(s), and PO(s) *List and define the required Strand(s), Concept(s), and PO(s) for each lesson included in this sample.*	Strand 1: Inquiry Process Concept 2: Scientific Testing (Investigating and Modeling) Performance Objective 4: Perform measurements using appropriate scientific tools (e.g., balances, microscopes, probes, micrometers).
Summative Assessment *Describe a cumulative and comprehensive activity that allows students to demonstrate mastery of stated POs. A copy of the summative assessment must be included in the application package.*	The assessment will be for the students to accurately measure a variety of objects/specimens using the appropriate scientific tools at different lab stations. A copy of the summative assessment/answer key (scoring rubric) is attached.
Assessment Scoring *Explain how each assessment is scored, to include points per question, total points possible, criteria, and grading scale. Describe rubric, if applicable, to include components being evaluated and the scoring criteria for each. A copy of the answer key and/or scoring*	A copy of the answer key/scoring rubric is attached. Remediation students given more time. There are 10 questions. A correct answer for each question is worth one point for a total of 10 points. Mastery = 8/10 (80%) or higher.

rubric must be included in the application package.	
Materials/Resources Needed *(Include all items for the entire unit.)*	Micrometers 4 different thicknesses of metal Graph paper compound microscope, clear plastic metric ruler, paper pencil scale gram weights objects to measure weights (balls, marbles, markers)

	Lesson 1	**Lesson 2**	**Lesson 3**	**Lesson 4**
Lesson Instruction	Teacher will begin lesson by asking How do we know that the measurements we make are accurate? The teacher will allow time for students to create thoughts thn perform a KWL chart about what they know about measurement and the tools of science. The teacher will ask students to take out their journals and take notes based on the teacher's lesson on using appropriate tools and	Teacher will begin lab on a balance scale by demonstrating how to use balance scale and explaining why scientist use such tools. Then the teacher will hand out lab procedures reminding students on proper lab behavior. Teacher will place students in groups of three and will have 5 different stations that contain different scales to balance different items. Teacher will ask for each student to predict the mass of the	Teacher will begin lab on a Microscope by demonstrating the power of a microscope and how it works and what scientist learn from them and the parts of a microscope. The teacher will pass out procedure sheets and remind each student about proper lab safety. Teacher will be using these questions to guide the lesson; What is the function of each part of the microscope? What do you notice when you look at something with a	Teacher will begin lab on a micrometer by demonstrating how it works and explaining how scientist and why scientist use the devise. The teacher will go over the lab plan, pass out the procedure sheets, and remind all students about proper lab safety. The teacher will have new key words and definitions on the board for students to place in their interactive student notebook. The teacher will have labeled and known sizes of all metals being

	units of measure. The teacher will demonstrate how to use each measuring tool and the units of measures they are associated with. Students will be called up to the front to assist in the demonstration. The teacher will prompt the students to write a reflective summary based on the opening question. The teacher will review the summaries to track student understanding and look for areas of remediation and re-teaching.	object and then measure using the scale. When finished teacher will discuss with students their findings.	microscope? How can you measure the size of an object under the microscope? When all students are finished measuring teacher will discuss the questions as whole group. Teacher will have 4 objects for students to look under the microscope and each student must draw what they see and calculate and collect the size of each object.	used for the demonstration. When lab is finished: discuss real world application of learning from lab, opportunity for students to share/present learning, Students will have learned to properly measure metal thickness using a micrometer and a metal gauge. They will share their information gathered on their data sheets and with the class on the board and orally.

	Lesson 1	Lesson 2	Lesson 3	Lesson 4
Student Activities	Student will think about the question How do we know that the measurements we make are accurate? Students will perform a KWL chart about what they know about measurement and the tools of science. Student will take out their journals and take notes based on the teacher's lesson on using appropriate tools and units of measure. The student will watch the teacher demonstrate how to use each measuring tool and the units of measures they are associated with. Students will be called up to the front to assist in the demonstration. Student will write a reflective summary based on the opening question.	Students will watch demonstration on how to use a scale and then be given procedure for the lab. Students will be in a group of three and be going to five different stations that will weigh five objects taking an educated guess on how much mass the object is then comparing it to the real amount. Students will then discuss how close the came and the difficulties of using a scale to measure mass.	Student will watch the demonstration of how to measure with a microscope then look at the procedure list of the lab, they will perform each procedure and when finished will write their personal answer to these questions What is the function of each part of the microscope? What do you notice when you look at something with a microscope? How can you measure the size of an object under the microscope? Place the plastic millimeter ruler provided across the midline of the microscopic field by aligning it properly on the stage of your microscope where the light comes through. Record the low power and high diameter diameters of the microscopic field in the space provided	Student will watch demonstration of a micrometer and be given a lab procedure sheet to collect data on different metals. Procedures are as follows statement of problem addressed by lab given a micrometer and a metal thickness gauge, create a data chart that shows accurate measurement of the thicknesses of three pieces of metal identifying the gauge measurement and the decimal measurement in inches to the nearest thousandth; then analyze the data and determine whether the data fits within the tolerance allowed. Each person in each group will measure one piece of metal with a micrometer to the nearest thousandth and measure one piece of metal with the metal

			on your data table using the technique provided in step # 1 of this procedure. The diameter of the high power field may be obtained quickly once the diameter of the low power field is known. Remove the plastic ruler from the stage and replace with the slide of a prepared specimen obtained from your instructor. Record the type of cell that you will be observing in the appropriate place on your data sheet. Estimate the diameter of your cell, first under low power, and then under high power in microns.	thickness gauge, and record the data from a third piece of metal on the data chart. Once the data sheets are completed share the information with your group and discuss if the results appear accurate. When the group has agreed that the data is as accurate as the tools allow record your data on the chart on the board in front of the room. If any data seems inaccurate remeasure using the appropriate tool. Next analyze your group data in a written statement verifying your assessment as to whether your group results have met the tolerance criteria and explain the accuracy and precision of your group results. Complete written analysis of group data using numbers in the explanation of data expectations. Work area is clean.

Summative Assessment

Each question is worth 1 point. **Score ____/10**

At the microscope station, record the measurement for cell.

1. Cheek cell = _____ micrometers
2. Width of human hair = _____ micrometers
3. Lichen spore = _____ micrometers
4. Human cheek cell nucleus = _____ micrometers
5. Onionskin cell = _____ micrometers

At the balance station, weigh and record the weight of each specimen.

6. 3 pennies = _____grams
7. 1 cup of sand is about _____ grams

At the micrometer station, measure the length of each object.

8. Thickness of a pencil = _____ mm
9. Thickness of a paper clip = _____mm

10. A student wants to use a microscope to measure the size of a cell. What is the most important part of the microscope that will ensure accuracy in the measurements?

Summative Assessment – Answer Key

Each question is worth 1 point. **Score ____/10**

At the microscope station, record the measurement for cell.

1. Cheek cell = _____60_____ micrometers
2. Width of human hair = _____70_____ micrometers
3. Lichen spore = _____35_____ micrometers
4. Human cheek cell nucleus = _____5_____ micrometers
5. Onionskin cell = _____400_____ micrometers

At the balance station, weigh and record the weight of each specimen.

6. 3 pennies = _____9.33_____grams
7. 1 cup of sand is about _____354.3_____ grams

At the micrometer station, measure the length of each object.

8. Thickness of a pencil = _____7_____ mm
9. Thickness of a paper clip = ____1_____mm

10. A student wants to use a microscope to measure the size of a cell. What is the most important part of the microscope that will ensure accuracy in the measurements?

    Objectives

Scoring: A correct answer for each question is worth one point for a total of 10 points.
Mastery = 8/10 (80%) or higher.