

1. Metrology is the science of measurement. Why do we measure? (2 pts)

To meet customer expectations for Fit (use) /form (free of defect) /function (as intended)

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Measurement is a method for evaluating characteristic and describing with number.

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2. Define accuracy and precision. What is the difference? (4 pts)

Accuracy is how close to target the measured value is

Precision is how close the measured values are to each other.

3. Environmental controls are one aspect of measurement; describe how the following may be affected by the environment, providing examples (4 pts)

a. Product (sample)

Temperature – measure sample warm/cold (i.e. plastic shrinks, liquid vs solid)

Moisture – hygroscopic (picks up moisture, changes weight)

Lighting – reacts to UV, interference with what's being measured

Air Quality - contamination

Electromagnetic field - interference (acoustics, transmission, etc)

b. Equipment

Temperature – glass/metal expand/contract is probe accurate

Moisture – protecting sensitive equipment

Lighting – can you see the tool, gages, etc?

Air Quality - protecting sensitive equipment

Electromagnetic field - cross talk between machines

Vibration - tool wear, protecting sensitive equipment

4. Match the measurement capability with its definition (5 pts)

Bias	B	A) closeness of measurements under the same conditions
Linearity	E	B) difference between observed average and master average
Repeatability	D	C) change in bias over time (example: drift)
Reproducibility	A	D) closeness of measurements from same instrument
Stability	C	E) equally increasing