**Name:** _____ **Date:** _____

# Answer Key: Standardized or Sus: 9th Grade Measurement Mayhem

Can you spot the difference between precision and accuracy in the lab? Analyze experimental data, apply SI prefixes, and solve complex dimensional analysis problems.

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**1. A chemist synthesized a new compound and determined its density to be 4.54 g/cm³, 4.55 g/cm³, and 4.56 g/cm³ in three trials. The actual density is 5.80 g/cm³. How would you describe this data set?**

**Answer:** C) Low accuracy but high precision

The measurements are very close to each other (high precision) but far from the actual value (low accuracy), suggesting a systematic error in the procedure.

**2. An oceanographer measures the pressure at the bottom of the Mariana Trench as 1.10 x 10^8 pascals. If they wanted to express this value in megapascals (MPa), the numerical value would be _____.**

**Answer:** C) 110

Since 'mega' represents 10^6, you divide the total pascals (1.10 x 10^8) by 10^6, resulting in 1.10 x 10^2, which is 110 MPa.

**3. Unlike the Celsius scale, the Kelvin scale is an absolute thermodynamic scale where 0 K represents the point at which all molecular motion ceases.**

**Answer:** A) True

True. Kelvin is the SI base unit for temperature and starts at absolute zero, whereas Celsius is based on the freezing and boiling points of water.

**4. If an astrophysicist is calculating the distance between two galaxies, which derived SI unit would be most appropriate for measuring the 'luminosity' or total power output?**

**Answer:** A) Watts ($kg \cdot m^2/s^3$)

Luminosity is a measure of power (energy per unit time). The Watt is the SI derived unit for power, defined as Joules per second.

**5. A biotechnologist needs to dilute a 5.0 mL sample of DNA. To communicate this volume in SI base units without prefixes, the value should be written as _____ meters cubed ($m^3$).**

**Answer:** D) 5.0 x 10^-6

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One milliliter (mL) is equal to one cubic centimeter ($cm^3$). Since there are 1,000,000 $cm^3$ in 1 $m^3$, 5.0 mL is 5.0 / 1,000,000, which is 5.0 x 10^-6 $m^3$.

**6. In the SI system, the 'mole' is used specifically to measure the volume of a gas at Standard Temperature and Pressure (STP).**

**Answer:** B) False

False. The mole is the SI base unit for the 'amount of substance' (count of particles), not a unit of volume.

**7. Which of the following scenarios best demonstrates a failure of 'calibration' rather than human observational error?**

**Answer:** B) An electronic balance consistently displays 0.05g even when the pan is empty.

A balance showing a non-zero value when empty requires 'zeroing' or calibration to ensure the start point (zero) is accurate.

**8. A fiber optic cable transmits data using light pulses. The intensity of the light source is 500 millicandela (mcd). In standard SI base units, this value is equal to _____ candela (cd).**

**Answer:** B) 0.5

The prefix 'milli' means one-thousandth (10^-3). Therefore, 500 mcd divided by 1,000 equals 0.5 cd.

**9. When converting 15 meters per second (m/s) to kilometers per hour (km/h), which conversion factor setup is correct?**

**Answer:** C) (15 m/s) * (1 km / 1000 m) * (3600 s / 1 hr)

To cancel 'meters', it must be in the denominator of the first factor (1km/1000m). To cancel 'seconds' in the denominator, it must be in the numerator of the second factor (3600s/1hr).

**10. The ampere (A) is considered an SI base unit, even though it describes the flow of electric charge over time.**

**Answer:** A) True

True. Under the International System of Units, the Ampere is one of the seven fundamental base units, from which the Coulomb (charge) is actually derived.