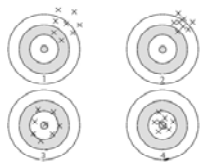


Test- Measurements & Calculations

$D = \frac{m}{V}$ $P.E. = \frac{|Actual - Measured|}{Measured} \times 100$

- 1. (2 points) Which piece of safety equipment would be best to use in the following scenario: Howard used a leaky Bunsen burner that is shooting out flames.
 - a. Fire Extinguisher
 - b. Main Gas Shut-Off Valve
 - c. Broken Glass Container
 - d. Eye Wash Station
 - e. Shower
 - f. Acid Spill Bucket
 - g. Fire Blanket
- 2. (2 points) The symbols for units of length in order from smallest to largest are
 - a. m, cm, mm, km.
 - b. mm, m, cm, km.
 - c. km, mm, cm, m.
 - d. mm, cm, m, km.
- 3. (2 points) Which of the following is the greatest mass?
 - a. 2.3×10^9 pg
 - b. 1.5×10^8 ng
 - c. 6.6×10^5 μ g
 - d. 8.4×10^2 mg
 - e. 3.0×10^{-1} g
- 4. (2 points) The measurement 6.8×10^{-1} g also could be written as
 - a. 6.8 g
 - b. 6.8 mg
 - c. 6.8 pg
 - d. 6.8 kg
 - e. 6.8 dg
- 5. (2 points) Which of the following is not a fundamental unit?
 - a. Molarity
 - b. Mass
 - c. Length
 - d. Time
 - e. Temperature
- 6. (2 points) Which picture below best represents data that is accurate but not precise.
 - a. 1
 - b. 2
 - c. 3
 - d. 4



1

2

- 7. (2 points) A titration was performed to find the concentration of hydrochloric acid with the following results:

Trial	Molarity
1	1.54 ± 0.01
2	1.21 ± 0.01
3	1.28 ± 0.01

 The actual concentration of HCl was determined to be 1.000 M; the results of the titration are:
 - a. both accurate and precise.
 - b. accurate but imprecise.
 - c. precise but inaccurate.
 - d. both inaccurate and imprecise.
 - e. accuracy and precision are impossible to determine with the available information.
- 8. (2 points) What is the implied error on the following measurement: 4.803mm?
 - a. ± 0.01 mm
 - b. ± 0.03 mm
 - c. ± 0.001 mm
 - d. ± 0.003 mm
- 9. (2 points) What is the purpose of significant figures?
 - a. to show the percent error of a measurement
 - b. to show the accuracy of a measurement
 - c. to show the error associated with the measurement
 - d. to show how "off" a measurement is
- 10. (2 points) In division and multiplication, the answer must not have more significant figures than the
 - a. number in the calculation with fewest significant figures.
 - b. number in the calculation with most significant figures.
 - c. average number of significant figures in the calculation.
 - d. total number of significant figures in the calculation.
- 11. (2 points) The number of significant figures that should be reported for the mass of a sample obtained by taking the difference between the mass of sample plus beaker (66.316 g) and the mass of the beaker (65.597 g) is
 - a. 1
 - b. 2
 - c. 3
 - d. 4
 - e. 5
- 12. (2 points) What is the correct recording of the following measurement if the ruler is in centimeters?
 - a. 6.5cm
 - b. 6.6cm
 - c. 6.53cm
 - d. 6.56cm
- 13. (2 points) If an object has a volume of 7.64mL and a mass of 11.7g then its density is _____.
 - a. 1.53g/cm^3
 - b. 0.653g/cm^3
 - c. 89.4g/cm^3
 - d. 19.3g/cm^3

- 14. (2 points) Water has a density of 1.0 g/mL. Which of the objects will float in water?
 - Object I: mass = 74.3 g; volume = 73.6 mL
 - Object II: mass = 84.2 g; volume = 124 mL
 - Object III: mass = 212 g; volume = 36.5 mL
 - a. I
 - b. I, III
 - c. II
 - d. II, III
 - e. III
- 15. (2 points) The quantity of matter per unit volume is
 - a. mass.
 - b. weight.
 - c. inertia.
 - d. density.
- 16. (2 points) If the true value of an object is 30.14cm and the measured value is 30.62cm, then what is the percent error associated with this measurement?
 - a. 1.568%
 - b. 0.01593%
 - c. 0.4800%
 - d. 1.593%

Short Answer

- 17. (3 points) What are the numerical values for the following SI prefixes?
 - a) milli = _____
 - b) centi = _____
 - c) kilo = _____
 - d) micro = _____
 - e) deci = _____
 - f) deca = _____

- 18. (8 points) Fill out the following table keeping in mind the SI measurement system:

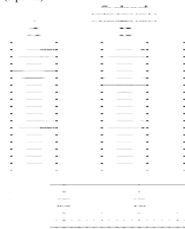
Fundamental Measurement	SI Base Unit	Abbreviation
		m
Temperature		
Time		
Mass		

- 19. (4 points) Convert the following measurements into proper scientific notation:
 - a) _____ = 7920000
 - b) _____ = 220.
 - e) _____ = 0.00004700
 - f) _____ = 0.87892×10^3
- 20. (9 points) Determine the number of significant figures in the following measurements:
 - a) _____ = 273 000 cm
 - b) _____ = 0.00000569 km
 - c) _____ = 0.0089000 L
 - d) _____ = 60630. mL
 - e) _____ = 0.5840024 s
 - f) _____ = 9810880 mm
 - g) _____ = 8.7×10^{-23} s
 - h) _____ = 1012×10^{10} km
 - i) _____ = 81 Pencils

3

- 21. (4 points) a) 4.52×10^9 b) 7.53×10^{-6} c) 9.67×10^{14} d) 6×10^{-14}
 + 4.55×10^9 - 2.13×10^{-6} + 8.62×10^{11} - 4.63×10^{-16}
- 22. (4 points) a) 7.9×10^3 b) 8.4×10^8 c) 6.60×10^{-4} d) 6.4×10^{-6}
 $\times 4.0 \times 10^4$ + 2.0×10^3 $\times 9.3 \times 10^{-3}$ + 8×10^2

- 23. (5 points)



Using the pictures of these graduated cylinders and ruler give the appropriate measurements with the correct units and significant figures.

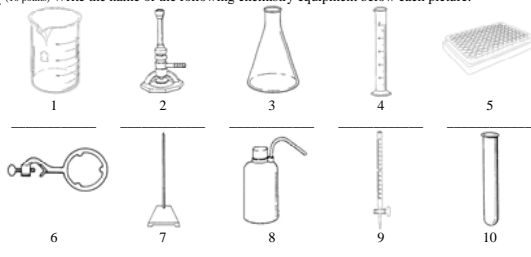
- A. _____
- B. _____
- C. _____
- D. _____
- E. _____

Give the measurement for "A."

- 24. (4 points) What is the density of a piece of cork that has a mass of 0.718 g and a volume of 2.66 cm³?
- 25. (4 points) When a 95.7 g piece of chromium metal was placed into a graduated cylinder containing 25.0 mL of water, the water level rose to 36.6 mL. Calculate the density of the chromium.
- 26. (4 points) An empty graduated cylinder has a mass of 42.817 g. When filled with 50.0 mL of an unknown liquid it has a mass of 113.325 g. What is the density of the liquid?

4

27. (4 points) A chemist needs 28.8 g of bromine for an experiment. What volume should she use? (Density of bromine = 3.12 g/cm³.)
28. (4 points) The density of lead is 11.35 g/cm³. What is the mass of a 60.0 cm³ piece of lead?
29. (4 points) An experiment performed to determine the density of lead yields a value of 10.55 g/cm³. The literature value for the density of lead is 11.342 g/cm³. Find the percent error.
30. (4 points) Find the percent error in a measurement of the boiling point of bromine if the laboratory figure is 57.12°C and the literature value is 59.35°C.
31. (10 points) Write the name of the following chemistry equipment below each picture.



5

Test- Measurements & Calculations Answer Section

MULTIPLE CHOICE

- ANS: B PTS: 2
OBJ: Explain the proper use of the following safety equipment: Fire extinguisher, fire blanket, acid spill bucket, main gas shut-off valve, shower, broken glass container, eye wash station
- ANS: D PTS: 2
OBJ: Memorize the numerical values for the following metric prefixes: micro-, milli-, centi-, deci-, [base: m, kg, C, s], kilo-.
- ANS: D PTS: 2 OBJ: Convert between metric units using prefixes.
- ANS: E PTS: 2 OBJ: Convert between metric units using prefixes.
- ANS: A PTS: 2
OBJ: Memorize the fundamental measurements (length, time, mass, and temperature).
- ANS: C PTS: 2
OBJ: Compare and contrast accuracy and precision using an example (i.e. archery, target shooting)
- ANS: D PTS: 2
OBJ: Identify whether a set of measurements is accurate, precise or a combination thereof.
- ANS: C PTS: 2
OBJ: Explain the error on a given measurement (i.e. 5cm, 5.0cm, 5.00cm)
- ANS: C PTS: 2 OBJ: Explain the purpose of significant figures.
- ANS: A PTS: 2
OBJ: Use significant figures in calculations (multiplication and division).
- ANS: C PTS: 2
OBJ: Use significant figures in calculations (addition and subtraction).
- ANS: C PTS: 2
OBJ: Read an instrument and record the proper number of digits (significant figures).
- ANS: A PTS: 2
OBJ: Use density to determine the identity of an unknown substance.
- ANS: C PTS: 2
OBJ: Use density to determine the identity of an unknown substance.
- ANS: D PTS: 2
OBJ: Use density to determine the identity of an unknown substance.
- ANS: D PTS: 2
OBJ: Use density to determine the identity of an unknown substance.

SHORT ANSWER

17. ANS:
a) milli = 0.001 b) centi = 0.01 c) kilo = 1000
d) micro = 0.000001 e) deci = 0.1 f) deca = 10
- PTS: 3
OBJ: Memorize the numerical values for the following metric prefixes: micro-, milli-, centi-, deci-, [base: m, kg, C, s], kilo-.

1

18. ANS:

Fundamental Measurement	SI Base Unit	Abbreviation
Length	Meter	m
Temperature	Celsius	K or °C
Time	Second	s
Mass	Kilogram	kg

- PTS: 8
19. ANS:
a) $7.92 \times 10^6 = 7920000$ e) $4.7 \times 10^{-5} = 0.00004700$
b) $6.652 \times 10^6 = 220.$ f) $2.20 \times 10^2 = 0.87892 \times 10^3$
- PTS: 4
20. ANS:
a) $\underline{3} = 273\,000$ cm b) $\underline{3} = 0.000000569$ km c) $\underline{5} = 0.0089000$ L
d) $\underline{5} = 60630.$ mL e) $\underline{7} = 0.5840024$ s f) $\underline{6} = 9810880$ mm
g) $\underline{2} = 8.7 \times 10^{-23}$ s h) $\underline{4} = 1012 \times 10^{10}$ km i) $\underline{3} = 30$ Pencils
- PTS: 9
21. ANS:
a) 9.07×10^9 b) 5.4×10^{-6} c) 9.67862×10^{14} d) 5.9537×10^{-14} e
 9.68×10^{14} 6×10^{-14}
- PTS: 4 OBJ: Use significant figures in calculations (addition and subtraction).
22. ANS:
a) $3.16e+008$ b) 4.2×10^5 c) $6.118e-006$ d) 8×10^{-9}
 3.2×10^8 6.1×10^{-6}
- PTS: 4 OBJ: Use significant figures in calculations (multiplication and division).
23. ANS:
A) 528 mL or 529 mL or 530. mL
B) 1.55 mL or 1.56 mL or 1.57 mL
C) 34.2 mL or 34.4 mL or 34.6 mL
D) 0.914 cm or 0.915 cm or 0.916 cm
E) 1.000 cm or 1.001 cm
- PTS: 5

2

24. ANS:

$$D = \frac{m}{V} = \frac{0.718g}{2.66cm^3} = 0.270g/cm^3$$

- PTS: 4 OBJ: Use density to determine the identity of an unknown substance.
25. ANS:
8.3 g/mL
PTS: 4 OBJ: Use density to determine the identity of an unknown substance.
26. ANS:
1.41 g/mL
PTS: 4 OBJ: Use density to determine the identity of an unknown substance.
27. ANS:
89.9
89.9 mL
PTS: 4 OBJ: Use density to determine the identity of an unknown substance.
28. ANS:
681 g
PTS: 4 OBJ: Use density to determine the identity of an unknown substance.
29. ANS:
 $\% \text{ Error} = \frac{11.342g - 10.55g}{11.342g} (100) = 7.0\%$
PTS: 4 OBJ: Calculate the percent error on a measurement.
30. ANS:
 $\% \text{ Error} = \frac{59.35^\circ C - 57.12^\circ C}{59.35^\circ C} (100) = 3.76\%$
- PTS: 4 OBJ: Calculate the percent error on a measurement.
31. ANS:
1) Beaker; 2) Bunsen Burner; 3) Erlenmeyer Flask; 4) Graduated Cylinder; 5) 96-Well Reaction Plate; 6) Ring Clamp; 7) Stand; 8) Plastic Wash Bottle; 9) Buret; 10) Test Tube
PTS: 10 OBJ: Know the names of common lab equipment.

3