

H Chem Summer Project Part I

Multiple Choice (1 point each)

Identify the choice that best completes the statement or answers the question.

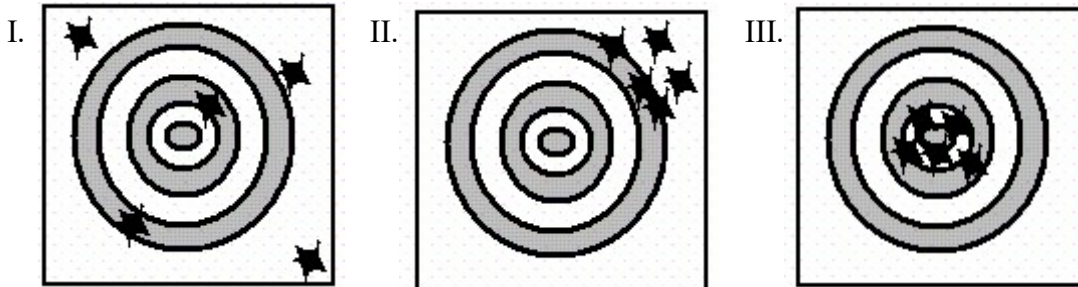
- _____ 1. Which of the following is an example of a qualitative observation?
- The piece of metal is 10. cm longer than the piece of wood.
 - Solution 1 has a volume of 450 mL
 - The temperature of the liquid is 60°C.
 - The liquid in beaker A is blue.
 - At least two of the above (A-D) are quantitative observations.
- _____ 2. A quantitative observation
- contains a number
 - does not contain a number
 - always makes a comparison
 - contains a number and a unit
 - is a written description
- _____ 3. The degree of agreement among several measurements of the same quantity is called _____. It reflects the reproducibility of a given type of measurement.
- accuracy
 - error
 - precision
 - significance
 - certainty
- _____ 4. As part of the calibration of a new laboratory balance, a 1.000-g mass is weighed with the following results:

Trial	Mass
1	1.201 ± 0.001
2	1.202 ± 0.001
3	1.200 ± 0.001

The balance is:

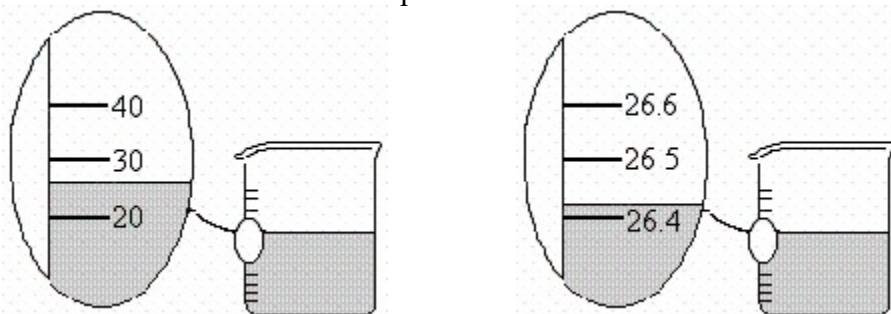
- Both accurate and precise.
- Accurate but imprecise.
- Precise but inaccurate.
- Both inaccurate and imprecise.
- Accuracy and precision are impossible to determine with the available information.

Consider the following three archery targets:



- _____ 5. Which of the following figure(s) represent a result having high precision?
- Figure I only
 - Figure II only
 - Figure III only
 - Figure I and Figure II
 - Figure II and Figure III
- _____ 6. Which of the following statements concerning these figures is correct?
- Figure I represents systematic error and Figure II represents random error.
 - Figure I represents random error and Figure II represents systematic error.
 - Figure I and Figure II represent random error.
 - Figure I and Figure II represent systematic error.
 - Figure III represents no errors.
- _____ 7. The agreement of a particular value with the true value is called
- accuracy
 - error
 - precision
 - significance
 - certainty
- _____ 8. You measure water in two containers: a 10-mL graduated cylinder with marks at every mL, and a 1-mL pipet marked at every 0.1 mL. If you have some water in each of the containers and add the water in the pipet to the water in the graduated cylinder, to what decimal place could you report the total volume of water?
- 0.01 mL
 - 0.1 mL
 - 1 mL
 - 10 mL
 - none of these

9. The beakers shown below have different precisions as shown.



Suppose you pour the water from these two beakers into a third unmarked container. What would be the volume in the new container reported to the correct number of significant figures?

- 53.817 mL
 - 53.82 mL
 - 53.8 mL
 - 53 mL
 - 50 mL
10. We generally report a measurement by recording all of the certain digits plus _____ uncertain digit(s).
- no
 - one
 - two
 - three
 - four
11. The estimated uncertainty of a measuring device is +/- _____ of the _____ scale division.
- 0.1; minor
 - 0.2; minor
 - 0.1; major
 - 0.2; major
 - none of the above
12. Consider the numbers 23.68 and 4.12. The sum of these numbers has _____ significant figures, and the product of these numbers has _____ significant figures.
- 3, 3
 - 4, 4
 - 3, 4
 - 4, 3
 - none of these
13. Express 165,000 mm in exponential notation to the correct number of significant figures.
- 1.65000×10^5 mm
 - 1.65×10^5 mm
 - 1.65000×10^{-5} mm
 - 1.65×10^{-5} mm
 - 165×10^3 mm

- ___ 14. How many significant figures are there in the number 0.04560700?
a. 4
b. 5
c. 7
d. 8
e. 9
- ___ 15. How many significant figures are there in the number 0.0006428?
a. 7
b. 3
c. 8
d. 4
e. 0
- ___ 16. How many significant figures are there in the number 3.1400?
a. 1
b. 2
c. 3
d. 4
e. 5
- ___ 17. A scientist obtains the number 0.045006700 on a calculator. If this number actually has four (4) significant figures, how should it be written?
a. 0.4567
b. 0.4501
c. 0.0450
d. 0.04500
e. 0.04501
- ___ 18. You are asked to determine the perimeter of the cover of your textbook. You measure the length as 39.36 cm and the width as 24.83 cm. How many significant figures should you report for the perimeter?
a. 1
b. 2
c. 3
d. 4
e. 5
- ___ 19. Using the rules of significant figures, calculate the following:
$$\begin{array}{r} 6.167 + 68 \\ \hline 5.10 \end{array}$$

a. 14.5
b. 16
c. 15
d. 82
e. 14.54

- ___ 20. Using the rules of significant figures, calculate the following: $4.0021 - 0.179$
- 3.823
 - 4
 - 3.8231
 - 3.82
 - 3.8
- ___ 21. The density of gasoline is 0.7025 g/mL at 20°C . When gasoline is added to water:
- It will float on top.
 - It will sink to the bottom.
 - It will mix so, you can't see it.
 - The mixture will improve the running of the motor.
 - None of these things will happen.
- ___ 22. A piece of zinc with a mass of 12.14 g is submerged in 46.3 cm^3 of water in a graduated cylinder. The water level increases to 48.0 cm^3 . The correct value for the density of zinc from these data is:
- 7.141 g/cm^3
 - 7.1 g/cm^3
 - 0.14 g/cm^3
 - 0.253 g/cm^3
 - 3.95 g/cm^3

The density of a liquid is determined by successively weighing 25, 50, 75, 100, and 125 mL of the liquid in a 250-mL beaker.

- ___ 23. If volume of liquid is plotted along the horizontal axis, and total mass of beaker plus liquid is plotted on the vertical axis:
- The x , or horizontal, intercept is the negative value of the weight of the beaker.
 - The y , or vertical, intercept is the weight of the empty beaker.
 - The slope of the line is 1.0.
 - The line will pass through the origin.
 - The slope of the line is independent of the identity of the liquid.
- ___ 24. Considering the plot of total mass (y -axis) versus volume (x -axis), which of the following is true?
- The plot should be rather linear because the slope measures the density of a liquid.
 - The plot should be curved upward because the slope measures the density of a liquid.
 - The plot should be curved upward because the mass of the liquid is higher in successive trials.
 - The plot should be linear because the mass of the beaker stays constant.
 - None of the above.

- ___ 25. A 20.0 mL sample of glycerol has a mass of 25.2 grams. What is the mass of a 57-mL sample of glycerol?
- 8.8 g
 - 45 g
 - 2.9×10^4 g
 - 72 g
 - 71.8 g
- ___ 26. 409 Kelvin equals
- 0 °C
 - 273 °C
 - 462 °C
 - 136 °C
 - 682 °C
- ___ 27. For which pair is the SI prefix not matched correctly with its meaning?
- mega = 10^6
 - kilo = 1000
 - deci = 10
 - nano = 10^{-9}
 - centi = 0.01
- ___ 28. A metric unit for length is
- gram
 - milliliter
 - yard
 - kilometer
 - pound
- ___ 29. The SI unit for mass is
- gram
 - kilogram
 - pound
 - milligram
 - Newton
- ___ 30. Which of the following is *not* a unit in the SI system?
- ampere
 - candela
 - Kelvin
 - meter
 - calorie

- ___ 31. Convert 0.3980 m to mm.
- 398.0 mm
 - 3.980×10^{-3} mm
 - 3.980×10^{-4} mm
 - 0.03980 mm
 - none of these
- ___ 32. Convert 2751.4 kg to mg.
- 2.7514 mg
 - 275.14 mg
 - 2.7514×10^3 mg
 - 2.7514×10^6 mg
 - 2.7514×10^9 mg
- ___ 33. Express the volume 781.2 cm^3 in liters. ($1 \text{ cm}^3 = 1 \text{ mL}$)
- 781.2 L
 - 78.12 L
 - 7.812 L
 - 0.7812 L
 - 0.07812 L
- ___ 34. Convert 44.7 m^3 to mm^3 .
- $4.47 \times 10^7 \text{ mm}^3$
 - $4.47 \times 10^{10} \text{ mm}^3$
 - $4.47 \times 10^4 \text{ mm}^3$
 - $4.47 \times 10^{-5} \text{ mm}^3$
 - $4.47 \times 10^{-8} \text{ mm}^3$

Short Answer (4 points each)

Be sure to report any mathematical answers to the proper number of significant figures. Show all work to receive full credit.

35. Contrast the terms precision and accuracy.
36. Explain how Archimedes might have used the concept of density to determine whether the king's crown was pure gold. (density of gold = 19.32 g/cm^3)
37. Bob determines the density of a substance to be 7.31 g/mL . The true density of the substance is 8.15 g/mL . Determine Bob's percent error. Show all work to receive full credit.
38. Ron wanted to expand the inventory of Muggle "magic" tricks at Weasley's Wizarding Wheezes. He found something called the "flaming book" which retailed for $\$15.99$ on Amazon.com. After buying them from a wholesaler, he wants to charge his customers the same price listed on Amazon, but most wizards don't carry Muggle money. How many Knuts should he list as the price?
($\$10.17 = 1 \text{ galleon}$, $1 \text{ galleon} = 17 \text{ sickles}$, $1 \text{ sickle} = 29 \text{ knuts}$)

H Chem Summer Project Part I Answer Section

MULTIPLE CHOICE

1. ANS: D PTS: 1 DIF: Easy REF: 1.2
KEY: Chemistry | general chemistry | general concepts | scientific method
MSC: Conceptual
2. ANS: D PTS: 1 DIF: Easy REF: 1.2
KEY: Chemistry | general chemistry | general concepts | scientific method
MSC: Conceptual
3. ANS: C PTS: 1 DIF: Easy REF: 1.4
KEY: Chemistry | general chemistry | general concepts | measurement
MSC: Conceptual
4. ANS: C PTS: 1 DIF: Easy REF: 1.4
KEY: Chemistry | general chemistry | general concepts | measurement
MSC: Conceptual
5. ANS: E PTS: 1 DIF: Easy REF: 1.4
KEY: Chemistry | general chemistry | general concepts | measurement
MSC: Conceptual
6. ANS: B PTS: 1 DIF: Easy REF: 1.4
KEY: Chemistry | general chemistry | general concepts | measurement
MSC: Conceptual
7. ANS: A PTS: 1 DIF: Easy REF: 1.4
KEY: Chemistry | general chemistry | general concepts | measurement
MSC: Conceptual
8. ANS: B PTS: 1 DIF: Moderate REF: 1.4
KEY: Chemistry | general chemistry | general concepts | measurement | significant figures
MSC: Conceptual
9. ANS: D PTS: 1 DIF: Moderate REF: 1.5
KEY: Chemistry | general chemistry | general concepts | measurement | significant figures
MSC: Conceptual
10. ANS: B PTS: 1 DIF: Easy REF: 1.5
KEY: Chemistry | general chemistry | general concepts | measurement | significant figures
MSC: Conceptual
11. ANS: B PTS: 1
12. ANS: D PTS: 1 DIF: Easy REF: 1.5
KEY: Chemistry | general chemistry | general concepts | measurement | significant figures
MSC: Conceptual
13. ANS: B PTS: 1 DIF: Easy REF: 1.5
KEY: Chemistry | general chemistry | general concepts | measurement | significant figures | scientific notation
MSC: Conceptual
14. ANS: C PTS: 1 DIF: Easy REF: 1.5
KEY: Chemistry | general chemistry | general concepts | measurement | significant figures
MSC: Conceptual
15. ANS: D PTS: 1 DIF: Easy REF: 1.5
KEY: Chemistry | general chemistry | general concepts | measurement | significant figures

- MSC: Conceptual
16. ANS: E PTS: 1 DIF: Easy REF: 1.5
KEY: Chemistry | general chemistry | general concepts | measurement | significant figures
MSC: Conceptual
17. ANS: E PTS: 1 DIF: Easy REF: 1.5
KEY: Chemistry | general chemistry | general concepts | measurement | significant figures | rounding
MSC: Conceptual
18. ANS: E PTS: 1 DIF: Moderate REF: 1.5
KEY: Chemistry | general chemistry | general concepts | measurement | significant figures
MSC: Quantitative
19. ANS: C PTS: 1 DIF: Easy REF: 1.5
KEY: Chemistry | general chemistry | general concepts | measurement | significant figures
MSC: Quantitative
20. ANS: A PTS: 1 DIF: Easy REF: 1.5
KEY: Chemistry | general chemistry | general concepts | measurement | significant figures
MSC: Quantitative
21. ANS: A PTS: 1 DIF: Easy REF: 1.8
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | density
MSC: Conceptual
22. ANS: B PTS: 1 DIF: Moderate REF: 1.8
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | density
MSC: Quantitative
23. ANS: B PTS: 1 DIF: Moderate REF: 1.8
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | density
MSC: Conceptual
24. ANS: A PTS: 1 DIF: Difficult REF: 1.8
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | density
MSC: Conceptual
25. ANS: D PTS: 1 DIF: Easy REF: 1.8
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | density
MSC: Quantitative
26. ANS: D PTS: 1 DIF: Easy REF: 1.7
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | temperature
MSC: Quantitative
27. ANS: C PTS: 1 DIF: Easy REF: 1.3
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | prefixes
MSC: Conceptual
28. ANS: D PTS: 1 DIF: Easy REF: 1.3
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | base unit
MSC: Conceptual
29. ANS: B PTS: 1
30. ANS: E PTS: 1 DIF: Easy REF: 1.3
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | base unit
MSC: Conceptual
31. ANS: A PTS: 1 DIF: Easy REF: 1.3
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | prefixes
MSC: Conceptual
32. ANS: E PTS: 1 DIF: Easy REF: 1.6
KEY: Chemistry | general chemistry | general concepts | measurement | factor label method

MSC: Quantitative

33. ANS: D PTS: 1 DIF: Easy REF: 1.6
KEY: Chemistry | general chemistry | general concepts | measurement | factor label method
MSC: Quantitative
34. ANS: B PTS: 1 DIF: Moderate REF: 1.6
KEY: Chemistry | general chemistry | general concepts | measurement | factor label method
MSC: Quantitative

SHORT ANSWER

35. ANS:
Precision refers to the agreement among several measurements of the same quantity.
Accuracy refers to the agreement of a measurement with the true value.
Measurements may often be precise without being accurate.
See Sec. 1.4 of Zumdahl, *Chemistry*.
- PTS: 1 DIF: Easy REF: 1.4
KEY: Chemistry | general chemistry | general concepts | measurement
MSC: Conceptual
36. ANS:
If the density of gold was known to Archimedes, he could weigh the crown to determine its mass and then submerge the crown in water to measure the volume by displacement. By comparing the density of the crown calculated from this data to the known density of gold, he could find out if the crown was made of gold.
Archimedes' Principle is slightly different, and not specifically addressed in this text.
See Sec. 1.8 of Zumdahl, *Chemistry*.
- PTS: 1 DIF: Moderate REF: 1.8
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | density
MSC: Conceptual
37. ANS:
Hooray!
- PTS: 1
38. ANS:
yes.
- PTS: 1