## **CHAPTER 2: MEASUREMENTS IN CHEMISTRY**

# **MULTIPLE CHOICE**

1)	The "mathematical meaning" associated we <i>micro</i> is, respectively, a) $10^{-2}$ , $10^{-4}$ , and $10^{-6}$ b) $10^{-2}$ , $10^{-3}$ , and $10^{-6}$	<ul> <li>ith the metric system p</li> <li>c) 10<sup>-3</sup>, 10<sup>-6</sup>, and 10</li> <li>d) 10<sup>-3</sup>, 10<sup>-9</sup>, and 10</li> </ul>	-9
	ANS:BPTS:1KEY:Chemistry   general chemistry   met	DIF: Easy ric system	NOT: Section 2.2
2)	<ul><li>In which of the following sequences are the <i>decreasing</i> size?</li><li>a) kilo giga mega</li><li>b) milli nano micro</li></ul>	e metric system prefixe c) mega kilo micro d) pico kilo deci	es listed in order of
	ANS: C PTS: 1 KEY: Chemistry   general chemistry   met	DIF: Easy ric system	NOT: Section 2.2
3)	<ul> <li>Which of the following is an incorrect pair.</li> <li>a) kilogram - metric unit of mass</li> <li>b) milliliter - metric unit of volume</li> <li>c) meter - metric unit of length</li> <li>d) cubic centimeter - metric unit of length</li> </ul>		
	ANS: C PTS: 1 KEY: Chemistry   general chemistry   met	DIF: Easy ric system	NOT: Section 2.2
4)	To what decimal position should a measure measurement scale are tenths of a centimet a) to the closest centimeter b) to the tenths of a centimeter ANS: C PTS: 1		of a centimeter
	KEY: Chemistry   general chemistry   mea		NOT: Section 2.4
5)	In which one of the following measure num a) 0.0705 b) 3,300,000 ANS: D PTS: 1	nbers are <i>all</i> of the zero c) 0.000440 d) 3.945900 DIF: Moderate	os significant?
	KEY: Chemistry   general chemistry   sign	nificant figures	NOT: Section 2.4

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<ul> <li>6) In which of the following pairs of measured numbers does each member of the the same number of significant figures?</li> <li>a) 10.3 and 10.30</li> <li>b) 800.0 and 80</li> <li>c) 0.03330 and 0.0333</li> <li>d) 0.000096 and 960,000</li> </ul>				
	ANS: D PTS: 1 KEY: Chemistry   general chemistry   sign	DIF: Moderate		
7)	In which of the following cases is the given significant figures? a) 479,000 becomes 479 b) 0.02235 becomes 0.0223 ANS: C PTS: 1	<ul> <li>n measurement correctly rounded to three</li> <li>c) 37.98 becomes 38.0</li> <li>d) 49.400 becomes 49,400</li> <li>DIF: Moderate</li> </ul>		
	KEY: Chemistry   general chemistry   sign			
8)	<ul><li>Which of the following would involve an <i>a</i></li><li>a) the length of a table</li><li>b) the mass of a bag of carrots</li></ul>	<i>exact</i> number? c) the number of inches in a yard d) the surface area of a quilt		
	ANS: C PTS: 1 KEY: Chemistry   general chemistry   exa	DIF: Easy ct/inexact numbers NOT: Section 2.3		
9)	The measurement 8310.90 expressed in sci a) 0.83109×10 <sup>3</sup> b) 8.3109×10 <sup>2</sup>	ientific notation becomes c) $8.3109 \times 10^4$ d) $8.3109 \times 10^3$		
	ANS: D PTS: 1 KEY: Chemistry   general chemistry   scie	DIF: Moderate entific notation NOT: Section 2.6		
10)	<ul><li>What is the uncertainty associated with the</li><li>a) 100</li><li>b) 10</li></ul>	<ul> <li>measurement of 6.02 x 10<sup>4</sup>?</li> <li>c) 0.1</li> <li>d) 0.01</li> </ul>		
	ANS: A PTS: 1 KEY: Chemistry   general chemistry   scie	DIF: Moderate entific notation NOT: Section 2.6		
11)	<ul><li>The calculator answer obtained from multi 423.70. Given the operational rules govern</li><li>a) is correct as written</li><li>b) should be rounded to 423.7</li></ul>			
	ANS:CPTS:1KEY:Chemistry   general chemistry   signNOT:Section 2.5	DIF: Moderate nificant figures   mathematical operations		

12)	<ul><li>The correct answer obtained from adding th</li><li>a) two significant figures</li><li>b) three significant figures</li></ul>	<ul><li>ne measurements 9.6, 4.79, and 5.352 contains</li><li>c) four significant figures</li><li>d) five significant figures</li></ul>
	ANS: B PTS: 1 KEY: Chemistry   general chemistry   sign NOT: Section 2.5	DIF: Moderate afficant figures   mathematical operations
13)	The correct answer obtained by dividing th a) $0.30 \times 10^{-6}$ b) $3.00 \times 10^{-6}$	e measurement 8.63×10 <sup>-3</sup> by the measurement is c) 3.00×10 <sup>-7</sup> d) 3.00×10 <sup>-5</sup>
	ANS: B PTS: 1 KEY: Chemistry   general chemistry   scie NOT: Section 2.5	DIF: Moderate ntific notation   mathematical operations
14)	According to dimensional analysis, which of problem "How many milligrams are there is a) $85 \text{ kg} \times \left(\frac{1 \text{ g}}{10^3 \text{ kg}}\right) \times \left(\frac{1 \text{ mg}}{10^{-3} \text{ mg}}\right)$ b) $85 \text{ kg} \times \left(\frac{10^3 \text{ g}}{1 \text{ kg}}\right) \times \left(\frac{1 \text{ mg}}{10^{-3} \text{ mg}}\right)$ ANS: B PTS: 1 KEY: Chemistry   general chemistry   dim	n 85 kilograms?" c) 85 kg × $\left(\frac{10^3 \text{ mg}}{1 \text{ kg}}\right)$ × $\left(\frac{10^{-3} \text{ mg}}{1 \text{ mg}}\right)$ d) 85 kg × $\left(\frac{1 \text{ g}}{10^3 \text{ kg}}\right)$ × $\left(\frac{10^{-3} \text{ kg}}{1 \text{ mg}}\right)$ DIF: Moderate
15)	How many conversion factors can be derive a) two b) three	<ul><li>ed from the equality 60 seconds = 1 minute?</li><li>c) four</li><li>d) an unlimited number</li></ul>

ANS: APTS: 1DIF: EasyKEY: Chemistry | general chemistry | conversion factorsNOT: Section 2.7

- 16) The density of an object is the ratio of its

  a) length to volume
  b) mass to height
  c) mass to volume
  d) length to mass

  ANS: C PTS: 1 DIF: Easy

  KEY: Chemistry | general chemistry | density
  NOT: Section 2.9
- 17) If object A weighs 6.0 grams and has a volume of 3.0 mL and object B weighs 9.0 grams and has a volume of 2.25 mL
  - a) B is less dense than A. c) B is twice as dense as A.
  - b) A and B have equal densities. d) B is four times as dense as A.

	ANS: C PTS: 1 KEY: Chemistry   general chemistry   der	DIF: Moderate nsity	NOT: Section 2.9
18)	<ul><li>What is the mass, in grams, of 30.7 mL of</li><li>a) 3.8</li><li>b) 25</li></ul>	a liquid if its density is c) 4 d) 249	s 0.81 g/mL?
	ANS: B PTS: 1 KEY: Chemistry   general chemistry   der	DIF: Moderate nsity	NOT: Section 2.9
19)	<ul> <li>Which of the following comparisons of the is <i>correct</i>?</li> <li>a) A Kelvin degree is larger than a Celsiu</li> <li>b) A Fahrenheit degree and a Celsius deg</li> <li>c) A Fahrenheit degree is larger than a K</li> <li>d) A Celsius degree and a Kelvin degree</li> </ul>	us degree. gree are equal in size. elvin degree.	e major temperature scales
	ANS: D PTS: 1 KEY: Chemistry   general chemistry   ten	DIF: Moderate nperature scales	NOT: Section 2.10
20)	If the temperature of an object is 435 oC, v a) 162 K b) 608 K	what is the temperature c) 672 K d) 708 K	on a Kelvin scale?
	ANS:DPTS:1KEY:Chemistry   general chemistry   ten	DIF: Easy perature scales	NOT: Section 2.10
21)	<ul> <li>In which of the following pairings of metrincorrect?</li> <li>a) kilo- and 10<sup>-3</sup></li> <li>b) micro- and 10<sup>-6</sup></li> <li>c) deci- and 10<sup>1</sup></li> <li>d) more than one correct response</li> <li>e) no correct response</li> </ul>	ic system prefix and po	ower of ten is the pairing
	ANS: D PTS: 1 KEY: Chemistry   general chemistry   me	DIF: Easy tric system	NOT: Section 2.1
22)	In which of the following pairs of units is second? a) milligram and nanogram b) liter and centiliter c) kilometer and megameter d) more than one correct response e) no correct response ANS: E PTS: 1 KEY: Chemistry   general chemistry   me	DIF: Moderate	0 times <i>larger</i> than the NOT: Section 2.2

- 23) In which of the following sequences of measured numbers do all members of the sequence contain three significant figures?
  - a) 3.03 and 3.30 and 0.033
  - b) 78,000 and 0.00780 and 780
  - c) 30.0 and 0.300 and 30,100
  - d) more than one correct response
  - e) no correct response

ANS: C PTS: 1 DIF: Moderate

KEY: Chemistry | general chemistry | significant figures NOT: Section 2.4

- 24) Which of the following digits in the measurement 654,300 seconds is an estimated digit?
  - a) the last digit
  - b) the next to last zero
  - c) the three
  - d) more than one correct response
  - e) no correct response

ANS: C PTS: 1 DIF: Moderate KEY: Chemistry | general chemistry | significant figures NOT: Section 2.4

- 25) Which of the following statements concerning the measured number 0.3030 is correct?
  - a) Only one of the zeros in the number is significant.
  - b) Rounded off to two significant figures the number becomes 0.30.
  - c) Expressed in scientific notation the number becomes  $3.03 \times 10^{-1}$ .
  - d) More than one correct response.
  - e) No correct response.

ANS: B PTS: 1 DIF: Moderate

- KEY: Chemistry | general chemistry | scientific notation; significant figures NOT: Section 2.5
- 26) Which of the following mathematical expressions is correctly evaluated?

a) 
$$\frac{10^3}{10^{-4}} = 10^7$$

b) 
$$10^3 \times 10^4 = 10^{12}$$

c) 
$$\frac{10^3}{10^4} = 10^{-7}$$

- d) more than one correct response
- e) no correct response

ANS:	A PTS:	1	DIF: Mod	lerate	
KEY:	Chemistry   general of	hemistry   scier	tific notation	n NOT:	Section 2.6

27) Which of the following measured numbers contains three significant figures and has a magnitude of less than one? a)  $3.30 \times 10^5$ b)  $3.00 \times 10^{-3}$ c)  $3.20 \times 10^{-4}$ d) more than one correct response e) no correct response PTS: 1 ANS: D DIF: Moderate KEY: Chemistry | general chemistry | scientific notation NOT: Section 2.4 28) When expressed in scientific notation, the measured numbers 3200 and 3200.0 become, respectively, a)  $3.2 \times 10^3$  and  $3.200 \times 10^3$ b)  $3.2 \times 10^3$  and  $3.2000 \times 10^3$ c)  $3.200 \times 10^3$  and  $3.2000 \times 10^3$ d) more than one correct response e) no correct response ANS: B **PTS:** 1 DIF: Moderate KEY: Chemistry | general chemistry | scientific notation NOT: Section 2.6 29) Which of the following measured numbers has an uncertainty of 0.01 associated with it? a) 32.930 b)  $3.02 \times 10^{6}$ c)  $3.0 \times 10^{-1}$ d) more than one correct response e) no correct response ANS: C PTS: 1 DIF: Easy KEY: Chemistry | general chemistry | significant figures NOT: Section 2.4 30) Which of the following statements concerning conversion factors is incorrect? a) English-to-English conversion factors come from defined relationships b) Metric-to-metric conversions come from measured relationships c) English-to-English conversion factors always contain exact numbers d) more than one correct response e) no correct response ANS: C PTS: 1 DIF: Moderate KEY: Chemistry | general chemistry | conversion factors NOT: Section 2.4

31)	Which of the following conversion factors would limit a calculation to two significant
	figures?

	figures?
	a) <u>453.6 g</u>
	1 lb
	b) $\frac{1 \text{ in.}}{2.54 \text{ cm}}$
	c) 24 hr
	1 day
	d) more than one correct response
	e) no correct response
	ANS: E PTS: 1 DIF: Moderate
	KEY: Chemistry   general chemistry   conversion factorsNOT: Section 2.7
32)	Density can be used as a conversion factor to convert from a) mass to volume
	b) volume to mass
	c) metric unit mass to English unit mass
	d) more than one correct response
	e) no correct response
	ANS:DPTS:1DIF:ModerateKEY:Chemistry   general chemistry   densityNOT:Section 2.9
	KEY: Chemistry   general chemistry   densityNOT: Section 2.9
33)	The density of table sugar is $1.59 \text{ g/mL}$ . It is true that
/	a) 2.00 g of table sugar occupies a volume of 1.17 mL.
	b) 3.00 g of table sugar occupies a volume of 1.97 mL.
	<ul><li>c) 5.00 g of table sugar occupies a volume of 3.14 mL.</li><li>d) More than one correct response</li></ul>
	e) No correct response
	ANS: C PTS: 1 DIF: Difficult
	KEY:   Chemistry   general chemistry   density   NOT:   Section 2.9
34)	Which of the following statements concerning the three major temperature scales is <i>correct</i> ?
	<ul><li>a) Kelvin temperatures are always positive.</li><li>b) The equation for converting from Celsius to Kelvin involves the number 273.</li></ul>
	<ul><li>c) The freezing point of water has a lower numerical value on the Kelvin scale than</li></ul>

- c) The freezing point of water has a lower numerical value on the Kelvin scale than on the Fahrenheit scale.
- d) More than one correct response.
- e) No correct response.

ANS:	D	PTS: 1	DIF:	Moderate		
KEY:	Chemistry   g	general chemistry	'   temperature	e scales	NOT:	Section 2.10

- 35) In which of the following pairs of temperature readings are the two members of the pair equivalent to each other?
  - a) 32°F and 273 K
  - b) 0°C and 373 K
  - c)  $0^{\circ}$ C and  $40^{\circ}$ F
  - d) more than one correct response
  - e) no correct response

ANS: A PTS: 1 DIF: Moderate

KEY: Chemistry | general chemistry | temperature scales NOT: Section 2.10

#### 36) Statements:

(1) The meaning of a metric system prefix is independent of the base unit it modifies.

(2) "Trailing zeros" at the end of a measured number are never significant.

- (3) The answer to the problem  $10^{5}/10^{-3}$  is  $10^{2}$ .
- a) All three statements are true.
- b) Two of the three statements are true.
- c) Only one of the statements is true.
- d) None of the statements is true.

ANS:CPTS:1DIF:ModerateKEY:Chemistry | general chemistry | metric system; scientific notation; significant figuresNOT:Section 2.2| Section 2.4| Section 2.6

## 37) Statements:

(1) In outer space, an astronaut may be weightless but never massless.

(2) The metric system prefixes *milli* and *micro* differ in mathematical meaning by a factor of 1000.

(3) The addition of 273 to a Fahrenheit temperature reading will convert it to a Kelvin temperature reading.

- a) All three statements are true.
- b) Two of the three statements are true.
- c) Only one of the statements is true.
- d) None of the statements is true.

PTS: 1 DIF: Moderate

KEY: Chemistry | general chemistry | metric system; temperature scales

NOT: Section 2.10| Section 2.2

## 38) Statements:

ANS: B

- (1) The measured number  $2.410 \times 10^{-3}$  contains three significant figures.
- (2) The specific heat of water is higher than that of most other substances.
- (3) The equation 1 kg =  $10^6$  mg is a correct mathematical statement.

- a) All three statements are true.
- b) Two of the three statements are true.
- c) Only one of the statements is true.
- d) None of the statements is true.

DIF: Moderate

KEY: Chemistry | general chemistry | metric system; significant figures; specific heat

NOT: Section 2.10| Section 2.11| Section 2.4

PTS: 1

39) Statements:

ANS: B

(1) The answer to the addition problem 3.21 + 32 + 3.22 should have an uncertainty of hundredths.

(2) The measurement 653,899, when rounded to five significant figures, becomes 65,390.

(3) The higher the specific heat of a substance, the more its temperature will change when it absorbs a given amount of heat.

- a) All three statements are true.
- b) Two of the three statements are true.
- c) Only one of the statements is true.
- d) None of the statements is true.

ANS:DPTS:1DIF:ModerateKEY:Chemistry | general chemistry | significant figures; specific heatNOT:Section 2.11| Section 2.5

40) Statements:

(1) The conversion factor  $10^3$  m/1 km contains an unlimited number of significant figures.

(2) Density may be used as a conversion factor to convert from mass to volume.

(3) The equation 2.33 lb = 625 g is a correct mathematical statement.

- a) All three statements are true.
- b) Two of the three statements are true.
- c) Only one of the statements is true.
- d) None of the statements is true.

ANS: B PTS: 1 DIF: Easy

- KEY: Chemistry | general chemistry | conversion factors; density
- NOT: Section 2.7 |Section 2.9

#### 41) Statements:

(1) A deciliter is equal to 100 milliliters.

(2) The Kelvin temperature scale is closely related mathematically to the Celsius temperature scale.

(3) Measurements cannot be exact because two estimated digits are always recorded as part of any measurement.

- a) All three statements are true.
- b) Two of the three statements are true.
- c) Only one of the statements is true.
- d) None of the statements is true.

ANS:BPTS:1DIF:ModerateKEY:Chemistry | general chemistry | metric system; significant figures; temperature scalesNOT:Section 2.10| Section 2.2| Section 2.4

42) Statements:

(1) The answer to the calculation  $12.00 \times (6.00 \times 10^{23})$  should contain three significant figures.

(2) A meter is slightly larger than a yard, and a liter is slightly larger than a quart.

(3) The numbers  $3.30 \times 10^{-1}$  and  $3.30 \times 10^{1}$  both have a magnitude of less than one.

- a) All three statements are true.
- b) Two of the three statements are true.
- c) Only one of the statements is true.
- d) None of the statements is true.

ANS: B PTS: 1 DIF: Moderate

KEY:Chemistry | general chemistry | metric system; scientific notation; significant figures| mathematical operationsNOT:Section 2.2|Section 2.5|Section 2.6|

## 43) Statements:

(1) The size of the degree is the same on the Fahrenheit and Celsius temperature scales.

(2) The measurement 62,300 has an uncertainty of  $\pm$  100.

(3) The answer to the calculation 8.45 + 10.40 should contain four significant figures.

- a) All three statements are true.
- b) Two of the three statements are true.
- c) Only one of the statements is true.
- d) None of the statements is true.

ANS: BPTS: 1DIF: DifficultKEY: Chemistry | general chemistry | significant figures; temperature scales | mathematicaloperationsNOT: Section 2.10| Section 2.4| Section 2.5

44) Statements:

ANS: C

(1) The measured numbers 244,000 and 0.000244 contain the same number of significant figures.

(2) One cubic centimeter is equal to ten milliliters.

(3) The conversion factor 1 in/2.54 cm, when used as written, would decrease unit size.

- a) All three statements are true.
- b) Two of the three statements are true.
- c) Only one of the statements is true.
- d) None of the statements is true.

PTS: 1 DIF: Moderate

KEY: Chemistry | general chemistry | conversion factors; metric system; significant figures

NOT: Section 2.2| Section 2.4| Section 2.7

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