

Name: _____ Class: _____ Date: _____

Chapter 01 - Measurements in Science and Medicine

1. An appropriate unit to measure the length of a football field would be the meter.

- a. True
- b. False

ANSWER:

True

2. Using a unit of mg to measure the mass of a premature infant would not be appropriate because the mass of the infant would be a very large number.

- a. True
- b. False

ANSWER:

True

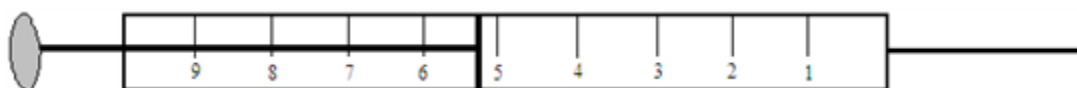
3. The memory capacity of a flash drive is measured in **gigabytes** so that the capacity can be expressed using simple integers.

- a. True
- b. False

ANSWER:

True

4. If the following represents a syringe that measures in cc's (cm^3), the volume indicated by the end of the plunger would be correctly recorded as 5.2 cc.



- a. True
- b. False

ANSWER:

True

5. The average of the following volume measurements is 15.5 mL.

Volume Measurements
15.7 mL
15.2 mL
15.9 mL
15.6 mL
15.3 mL

- a. True
- b. False

ANSWER:

True

6. To convert feet to inches, you should multiply by the factor shown below.

$$\frac{12 \text{ in}}{1 \text{ ft}}$$

- a. True
- b. False

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ANSWER: True

7. To convert micrograms to grams, you should multiply by 1,000,000 g/μg.

- a. True
- b. False

ANSWER: False

8. A patient weights 220 lbs. A medication for this patient is supposed to be taken using a dosage of 3 mg per kg per day. The correct dose for this patient is 3000 mg per day.

- a. True
- b. False

ANSWER: False

9. A pharmaceutical solution of penicillin contains 125 mg of penicillin in 3 mL. The two conversion factors that express this relationship are:

$$\frac{125 \text{ mg penicillin}}{3 \text{ mL}} \quad \text{and} \quad \frac{3 \text{ mg penicillin}}{125 \text{ mL}}$$

- a. True
- b. False

ANSWER: False

10. A 20.00 mL urine sample of a patient has a mass of 20.70 g. This patient is most likely drinking very large amounts of water.

- a. True
- b. False

ANSWER: False

11. A Celsius degree is the same size as a Kelvin degree.

- a. True
- b. False

ANSWER: True

12. One advantage of the Kelvin system is that it is impossible to have temperatures below zero.

- a. True
- b. False

ANSWER: True

13. The lowest temperature ever recorded on earth was −128.6°F. The temperature is equivalent to − 89.2 K.

- a. True
- b. False

ANSWER: False

14. The normal range (adult) for specific gravity of urine is 1.020 - 1.028 g/mL

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- a. True
- b. False

ANSWER: True

15. If a patient stands 6 feet tall, their height can also be expressed as 1828.8 cm.

- a. True
- b. False

ANSWER: False

16. If an order read: NS (normal saline solution) 1000 mL to be given intravenously over 8 hrs. 125 mL of NS should be administered every hour.

- a. True
- b. False

ANSWER: True

17. The normal range (adult) for specific gravity of urine is 1.010 - 1.048 g/mL.

- a. True
- b. False

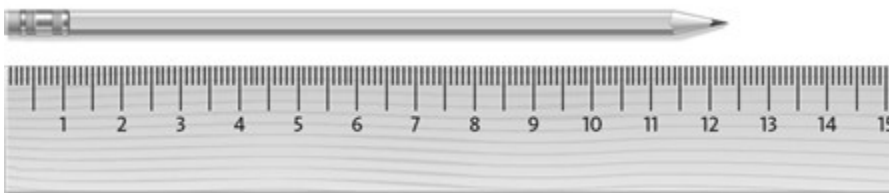
ANSWER: False

18. If the specific gravity of a sample of urine tested higher than normal, this would indicate dilution.

- a. True
- b. False

ANSWER: False

19. Consider the image below.



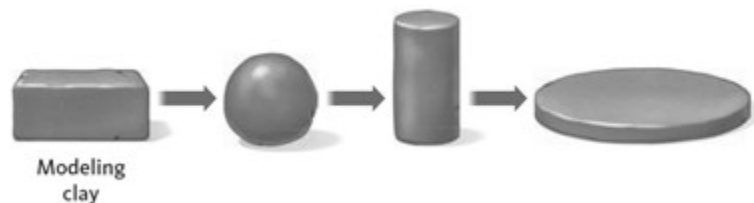
The smallest division on the ruler is a cm.

- a. True
- b. False

ANSWER: False

20. Consider the image showing a sample of modeling clay.

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The density of the clay remains constant through the changes shown.

- a. True
- b. False

ANSWER:

True

21. The following statement is correct based on the size of the measurement.

“My cup of coffee contains 500 L.”

- a. True
- b. False

ANSWER:

False

22. The base unit of length in the metric system is the

- a. mil.
- b. millimeter.
- c. foot.
- d. meter.

ANSWER:

d

23. Which of the following is **not** a base unit of the metric system?

- a. g
- b. g/L
- c. L
- d. All are base units.

ANSWER:

b

24. The prefix centi- denotes what fraction of a base unit?

- a. 1/10
- b. 1/100
- c. 1/1000
- d. 100

ANSWER:

b

25. The mass of an object is

- a. the force between the object and the earth.
- b. a measure of the amount of matter in the object.
- c. the amount of space the object occupies.

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- d. depends on the location of the object on Earth.

ANSWER:

b

26. In which of the following are the masses given in the correct order?

- a. $\text{cg} > \text{mg} > \text{g} > \text{kg}$
- b. $\text{cg} > \text{g} > \text{kg} > \text{mg}$
- c. $\text{kg} > \text{g} > \text{cg} > \text{mg}$
- d. $\text{mg} > \text{cg} > \text{g} > \text{kg}$

ANSWER:

c

27. Which of the following is the smallest number?

- a. 5×10^3
- b. 3×10^4
- c. 2×10^{-5}
- d. 7×10^{-6}

ANSWER:

d

28. The land surface area of the earth is approximately $1.49 \times 10^8 \text{ km}^2$. Which of the following is the correct way to write this in conventional notation?

- a. 0.00000000149 km^2
- b. 149,000,000 km^2
- c. 14,900,000,000 km^2
- d. none of these

ANSWER:

b

29. Which of the following set-ups will allow you to calculate the cost of fruit in dollars per gram, if the price is given as 0.79 dollars per pound?

- a. $\frac{0.79 \text{ dollars}}{\text{lb}} \times \frac{2.20 \text{ lb}}{1000 \text{ g}}$
- b. $\frac{0.79 \text{ dollars}}{\text{lb}} \times \frac{457 \text{ g}}{1 \text{ dollar}}$
- c. $\frac{\text{lb}}{0.79 \text{ dollars}} \times \frac{1 \text{ lb}}{457 \text{ g}}$
- d. $\frac{\text{lb}}{0.79 \text{ dollars}} \times \frac{1 \text{ kg}}{2.20 \text{ lb}}$

ANSWER:

a

30. How many minutes are in a 30 day month? [Assume exactly 24 hours in a day]

- a. 7.20×10^2 minutes

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- b. 4.32×10^4 minutes
- c. 2.59×10^6 minutes
- d. 3.11×10^7 minutes

ANSWER:

b

31. A common piece of laboratory glassware is a 125 mL beaker. What is the volume of this piece of glassware in the English system of units? [1 quart = 0.946 L = 32 fl oz]

- a. 0.423 fl oz
- b. 0.423 quarts
- c. 4.23 fl oz
- d. 4.23 quarts

ANSWER:

c

32. A particular model of hybrid car can travel 53.0 miles/gallon of gas. What is this fuel efficiency expressed in the metric system? [1 quart = 0.946 L; 1 mile = 1.609 km]

- a. 8.71 km/L
- b. 20.2 km/L
- c. 22.5 km/L
- d. 90 km/L

ANSWER:

c

33. A tablet contains 250 mg of penicillin while the solution form of the same antibiotic contains 250 mg of penicillin/5 mL. If a doctor was to prescribe that one-half of a scored tablet be taken four times a day, how many mL of the solution would be equivalent to this daily dosage?

- a. 5.0 mL
- b. 20. mL
- c. 2.5 mL
- d. 10. mL

ANSWER:

d

34. An intern made an error and gave a patient a dose of 500 μg rather than 500 mg of a drug. Which of the following is true?

- a. The patient received an overdose by a factor of 1000.
- b. The patient received an overdose by a factor of 100.
- c. The patient received an underdose by a factor of 1000.
- d. The patient received an underdose by a factor of 100.

ANSWER:

c

35. A penicillin derivative is used to treat infections with an adult 24-hour dosage of 35 mg/kg of body mass. This is to be given in three injections daily. This antibiotic is prepared by the pharmacy in solution form with a concentration of 130 mg/5mL. What volume in milliliters should be given in each injection to an adult with a mass of 12.5kg?

- a. 5.6 mL
- b. 17 mL

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- c. 50 mL
- d. 0.32 mL

ANSWER:

a

36. Which of the following is true of the relationship between density and specific gravity?

- a. They have different numerical values and different units.
- b. They have nearly the same numerical value and the same units.
- c. They have nearly the same numerical value but specific gravity is dimensionless.
- d. They have the nearly same units but different numerical values.

ANSWER:

c

37. The densities of the coinage metals (copper, silver and gold) are as follows:

copper = 8.95 g/mL

silver = 12.59 g/mL

gold = 19.32 g/mL

A sample of material is found to have a mass of 33.03 grams, and have a volume of 2.624 mL. This is a sample of which of the coinage metals?

- a. copper
- b. silver
- c. gold
- d. It is not one of the coinage metals.

ANSWER:

b

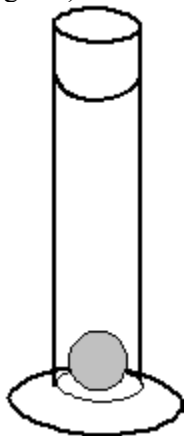
38. Aluminum has a density of 2.70 g/mL. What volume is occupied by a block of aluminum that weighs 4.32 kg?

- a. 0.000625 mL
- b. 0.625 mL
- c. 1.60 mL
- d. 1.60 L

ANSWER:

d

39. In an experiment a solid sphere is placed in a cylinder containing the organic solvent cyclohexane (density = 0.778 g/mL).



Based on this picture, the sphere has a density:

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- a. greater than 0.778 g/mL b. less than 0.778 g/mL
 c. about the same as 0.778 g/mL d. The image does not provide enough information to answer.

ANSWER:

a

40. If urine has a density of 1.08 g/mL, what would be the mass of a 143 mL urine sample?

- a. 154 g
 b. 132 g
 c. 143 g
 d. 0.00699 g

ANSWER:

a

41. What temperature on the Celsius is the same as normal body temperature 98.6°F?

- a. 34.3°C b. 37.0°C
 c. 119.9°C d. none of these

ANSWER:

b

42. At what temperature do the temperatures on the Celsius and Kelvin scales have the same numerical value?

- a. -40 b. 0
 c. 32 d. There is no value where the two scales are the same.

ANSWER:

d

43. The boiling point of liquid nitrogen is 77 K. What is this temperature on the Celsius scale?

- a. 350°C b. 171°C
 c. 25°C d. -196°C

ANSWER:

d

44. If a patient weighs 203 pounds (lbs), how many kilograms (kg) does the patient weigh?

- a. 203 kg
 b. 92.1 kg
 c. 448 kg
 d. **4.48 x 10⁵** kg

ANSWER:

c

45. In the health sciences, learning and understanding how to accurately convert chemical quantities is of utmost importance, as it keeps your patients and your practice safe. At home medicines are sometimes dispensed by the teaspoon (tsp) or tablespoon (tbsp). If there are 3 tsp in 1 tbsp and 1 tbsp is equal to 15 mL, how many milliliters are 2.0 tsp?

- a. 45 mL
 b. 45 mL
 c. 20 mL
 d. 3.0 mL

ANSWER:

c

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46. Consider the image shown below.



Which of the following is an appropriate unit to place on this measurement?

- a. g
- b. mL
- c. mm
- d. cm^3

ANSWER:

a

47. Consider the two images below.



A B

Which balance shows the more accurate measurement?

- a. A
- b. B
- c. The accuracy cannot be determined.

ANSWER:

c

48. Consider the two images below showing the readout on two balances.



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A B

Which balance should be able to produce more precise measurements?

- a. A
- b. B
- c. The accuracy cannot be determined.

ANSWER:

a

49. If the density of ethanol is 0.787 g/mL, what is the mass of 37.4 mL of this substance?

- a. 47.5 g
- b. 29.4 g
- c. 37.4 g
- d. 0.0210 g

ANSWER:

b

50. The thermostat on an incubator reads 65°C. What is this temperature on the Kelvin scale?

- a. 338 K
- b. 149 K
- c. -208 K
- d. 65 K

ANSWER:

a

51. How many significant figures are in the the measurement given below?

220.10 mm

- a. 2
- b. 3
- c. 4
- d. 5

ANSWER:

d

52. How many millimeters are equivalent to 40.5 km?

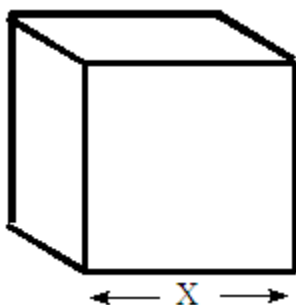
- a. 4.05×10^{-5} mm
- b. 4.05×10^4 mm
- c. 4.05×10^{-2} mm
- d. 4.05×10^7 mm

ANSWER:

d

The following questions refer to the plastic box shown below.

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Fill in the blanks in the questions from the following list. All units in the list will not be used and a unit may be used more than once.

dm
L
 μL
g/mL
kg
 μm
km

53. If a measurement were made of the quantity represented by X in the figure, an appropriate unit to use would be _____ if X = 18 in.

ANSWER: _____ dm

54. If the box were placed on a balance, a unit that might appear on the balance read-out would be _____.

ANSWER: _____ kg

55. The box is filled with water to the very top from a graduated cylinder. A unit that could be used to measure this quantity would be _____.

ANSWER: _____ L

56. Fill in the first blank with the appropriate number (1, 2, 3 etc.) and the second blank with the direction (right or left).

In order to convert from milliliters to liters, the decimal is moved _____ places to the _____.

ANSWER: _____ 3, left
three, left

57. Fill in the first blank with the appropriate number (1, 2, 3, etc.) and the second blank with the direction (right or left).

In order to convert from kilogram to milligrams, the decimal is moved _____ places to the _____.

ANSWER: _____ 6, right
six, right

58. Fill in the blanks with top or bottom as appropriate.

In order to convert from kilograms to grams, the conversion factor should have 1 kg on the _____ and

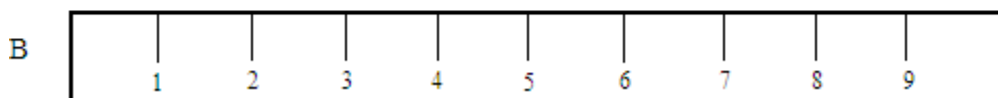
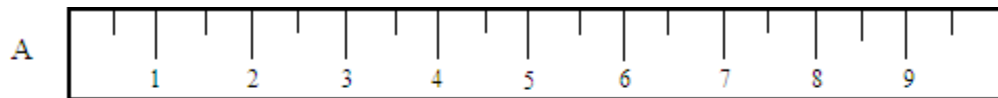
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1000 g on the _____.

ANSWER: _____ bottom, top

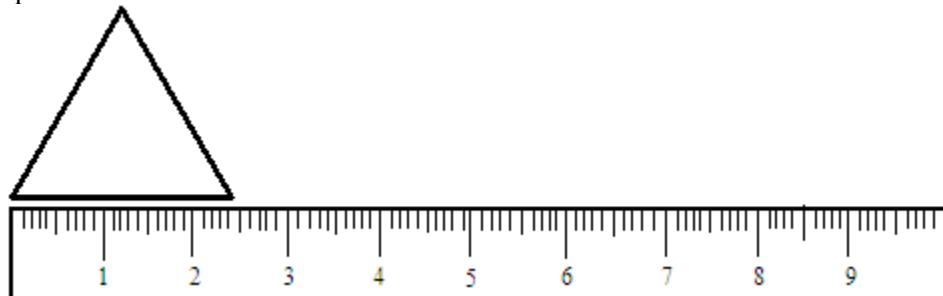
59. Compare the following two metric rulers. Fill in the blanks, respectively, with the identity of the ruler (A or B) and the terms more or less as appropriate.



A measurement made with ruler _____ would be _____ accurate.

ANSWER: _____
A, more
B, less

60. Based on the ruler represented in the picture. Use the appropriate integer (0, 1, 2, 3, etc.) in the blank to answer the question.



The length of the side of the triangle should be recorded to _____ decimal places.

ANSWER: _____
2
two

61. Fill in the blanks, respectively, with a letter (A or B) to represent the balance and more or less to describe the precision.

The density of a metal block was determined based on mass measurements using two different balances. The results are shown below.

Density (g/mL) Balance A	Density (g/mL) Balance B
9.76	9.89
9.59	9.78
9.89	9.99

The density determined using balance _____ is _____ precise.

ANSWER: _____
A, less
B, more

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62. Fill in the blanks, respectively, with a letter (A or B) to represent the balance and more or less to describe the precision.

Two students measured the density of a metal block was determined based on mass measurements using the same balance. The results are shown below.

Density (g/mL) Student A	Density (g/mL) Student B
21.7	21.0
21.6	21.3
21.9	21.5
22.0	21.8

If the metal block is gold (density = 21.45 g/mL), student _____'s data is _____ accurate.

ANSWER: B, more
A, less

63. Enter the number (0, 1, 2, 3, etc.) in the blank provided.

Consider the measurement shown below.

780 mg

The first uncertain digit is the _____.

ANSWER: 8
eight

64. Enter the number (0, 1, 2, 3, etc.) in the blank provided.

Consider the measurement shown below.

23.5410 g

The first uncertain digit is the _____.

ANSWER: 0
zero

65. Fill in the blank with the appropriate number (0, 1, 2, 3 etc.).

Consider the following calculation:

143.321 g
17.89 g
+ 100.1 g
261.311 g

The answer should be round to _____ decimal places.

ANSWER: 1
one

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66. Fill in the blank with the appropriate number (0, 1, 2, 3 etc.).

The following calculation was carried out to determine the volume of a rectangular solid.

$$15.55 \text{ cm} \times 12.0 \text{ cm} \times 0.557 \text{ cm} = 105.80233350 \text{ cm}^3$$

The answer should be round to _____ significant figures..

ANSWER: 3
three

67. Fill in the blank with the appropriate number (0, 1, 2, 3 etc.).

The thermometer shown in the image is laying on a counter top and indicates room temperature.



This temperature contains _____ significant figures..

ANSWER: 3
three

68. Fill in the blanks, respectively, with higher or lower and adequate or inadequate.

A drop of a potential donor's blood is placed in water and floats on the surface. This indicates that specific gravity of the blood is _____ than water and that the iron concentration is _____.

ANSWER: lower, inadequate

69. Fill in the blank with the appropriate term from the following: distance, volume, mass.

Kilogram is a unit of _____.

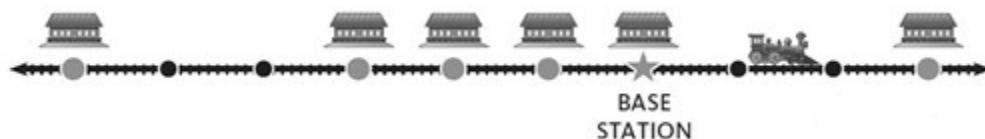
ANSWER: mass

70. Write the complete name of the metric unit below in the blank.

mm: _____

ANSWER: millimeter

71. Consider the metric railraod shown below. Fill in the blank with 10, 100, 1000, 10000, etc. as appropriate.



To move between three stops corresponds to increasing or decreasing the unit by a factor of _____.

ANSWER: 1000

72. Digoxin is a purified cardiac glycoside, which is a commonly prescribed drug given to a patient

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experiencing a cardiac disorder, such as atrial fibrillation or atrial flutter.

Digoxin 0.125 mg tablets are available. The order is for Digoxin 0.25 mg poq am (by mouth every morning).

How many tablets will you give?

ANSWER: 2 tablets (tabs)

73. In an ampule, Sublimaze 2 mL containing 50 mcg/mL is available. The order is to administer Sublimaze 0.05 mg intravenously (IV). (Note: mcg is another abbreviation for μg .)

a. How many mcg will you be giving?

b. How many mL will you be giving?

ANSWER: a: 50 mcg
b: 1 mL

74. The order reads 'haloperidol (generic name) 1 mg IV x1 now'. Haloperidol comes supplied in an ampule containing 10 mg/1 mL. How many mL's will you administer? Show your work.

ANSWER: 0.1 mL = 1 mg

75. An angiotensin converting enzyme (ACE) inhibitor, from the dicarboxylate-containing agent group, Lisinopril, is ordered as an oral anti-hypertensive (blood pressure lowering) medication. The order reads, Lisinopril 50 mg po (by mouth) qd (each day). The pharmacy supplied Lisinopril 20 mg tablets. How many tablets would be needed each day?

ANSWER: 2 ½ or 2.5 tablets

76. A patient arrives in the emergency department with a highly elevated blood pressure of 210/100 mm Hg. A calcium channel blocker and potent vasodilator is ordered. The entry of calcium into the cell causes the cell to contract, therefore a calcium channel blocker blocks the entry of calcium into the cell. This action causes decreased contraction, which in turn causes the vessels to relax and vasodilate, which in turn causes decreased blood pressure. The order reads diltiazem 15 mg IV stat. Diltiazem is supplied in 20 mg/2 mL vials. How many mL's would be administered?

ANSWER: 1.5 mL

77. A patient is experiencing pain and you want to administer pain medication. The order reads Morphine 2 mg IV q (every) 4-6 hrs (hours) PRN (as needed) for pain. The pharmacy has supplied Morphine 10 mg/mL vials. How many mL's are to be administered to your patient?

ANSWER: 0.2 mL