

Physics, 4e (Walker/Gatch)

Chapter 1 Introduction to Physics

1.1 Conceptual Questions

1) What does the prefix giga- stand for?

Answer: 10^9

Diff: 1 Var: 1 Page Ref: Sec. 1-2

2) What does the prefix pico- stand for?

Answer: 10^{-12}

Diff: 1 Var: 1 Page Ref: Sec. 1-2

3) Why is MASS considered a more basic property than WEIGHT?

Answer: A mass may have weight but the weight is a property which changes as the mass is moved around the universe. Mass is not a property which depends upon location.

Diff: 2 Var: 1 Page Ref: Sec. 1-2

4) When referring to the "mks" system what does the "m", the "k", and the "s" stand for ?

Answer: meter, kilogram, and second

Diff: 2 Var: 1 Page Ref: Sec. 1-2

5) When referring to the "cgs" system, what does the "c", the "g", and the "s" stand for?

Answer: centimeter, gram, and second

Diff: 2 Var: 1 Page Ref: Sec. 1-2

6) What are the dimensions of area?

Answer: $[L^2]$

Diff: 1 Var: 1 Page Ref: Sec. 1-3

7) What are the dimensions of volume?

Answer: $[L^3]$

Diff: 1 Var: 1 Page Ref: Sec. 1-3

8) What are the dimensions of velocity?

Answer: $[L]/[T]$

Diff: 1 Var: 1 Page Ref: Sec. 1-3

9) What are the dimensions of acceleration?

Answer: $[L]/[T]^2$

Diff: 1 Var: 1 Page Ref: Sec. 1-3

10) What are the dimensions of energy?

Answer: $[M] [L]^2/[T]^2$

Diff: 2 Var: 1 Page Ref: Sec. 1-3

11) State the general rule for significant figures when adding or subtracting numbers.

Answer: The final result of an addition or subtraction problem should be no more precise than the least precise number used in the calculation.

Diff: 1 Var: 1 Page Ref: Sec. 1-4

12) State the general rule for significant figures when multiplying or dividing numbers.

Answer: The final result of a multiplication or division problem should have only as many digits as the number with the least number of significant figures used in the calculation.

Diff: 1 Var: 1 Page Ref: Sec. 1-4

13) Describe an order-of-magnitude estimate.

Answer: A rough estimate made by rounding off all numbers to one significant figure and its power of ten, and after the calculation is made, again only one significant figure is kept.

Diff: 1 Var: 1 Page Ref: Sec. 1-6

14) Give examples of four quantities which are scalars.

Answer: distance, temperature, speed, age

Diff: 1 Var: 1 Page Ref: Sec. 1-7

15) Give examples of four quantities which are vectors.

Answer: displacement, velocity, acceleration, force

Diff: 1 Var: 1 Page Ref: Sec. 1-7

16) Dimensional analysis can tell you whether an equation is physically correct.

Answer: FALSE

Diff: 1 Var: 1 Page Ref: Sec. 1-3

17) The meter is currently defined as

- A) the distance between two etched lines in a platinum-iridium bar kept in Sèvres, France.
- B) the distance between two etched lines in a platinum-iridium bar kept in Washington, D.C.
- C) one ten-millionth of the distance between the North pole and the equator.
- D) the distance traveled by light in $1/299,792,458$ of a second.
- E) 1,553,164.1 wavelengths of red cadmium light in dry air at 25°C.

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-2

18) The kilogram is currently defined as

- A) the mass of a platinum-iridium cylinder kept in Sèvres, France.
- B) the weight of a platinum-iridium cylinder as measured on the Earth's moon.
- C) the mass of 5.9786332×10^{26} protons.
- D) the mass of one liter of pure water, free of air, at standard temperature and pressure.
- E) the mass of a cube of pure water, free of air, 10 cm on each side, at standard temperature and pressure.

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-2

19) The second is currently defined as

A) 1/86,400 of a mean solar day.

B) 1/86,164 of a sidereal day.

C) 1/31,557,600 of the period of the Earth's rotation around the Sun.

D) the time required for light to travel 1/299,792,458 of a meter.

E) the time that it takes the radiation from a Cesium-133 atom to complete 9,192,631,770 cycles of oscillation.

Answer: E

Diff: 1 Var: 1 Page Ref: Sec. 1-2

20) The metric prefix for one one-thousandth is

A) milli.

B) centi.

C) kilo.

D) mega.

E) giga.

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-2

21) The metric prefix for one one-hundredth is

A) milli.

B) centi.

C) kilo.

D) mega.

E) giga.

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-2

22) The metric prefix for one thousand is

A) milli.

B) centi.

C) kilo.

D) mega.

E) giga.

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 1-2

23) The national debt is measured in trillions of dollars. Which of the following is a representation of a trillion?

A) 1×10^{15}

B) 1×10^{12}

C) 1×10^9

D) 1×10^6

E) 1×10^3

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-2

24) A typical *E. coli* bacterium is measured in microns. Which of the following is a representation of a micron?

- A) 1×10^{-15}
- B) 1×10^{-12}
- C) 1×10^{-9}
- D) 1×10^{-6}
- E) 1×10^{-3}

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-2

25) If you are measuring the length of a room, the most appropriate SI unit is the

- A) kilometer.
- B) meter.
- C) centimeter.
- D) millimeter.
- E) micrometer.

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-2

26) If you are measuring the thickness of a strand of human hair, the most appropriate SI unit is the

- A) kilometer.
- B) meter.
- C) centimeter.
- D) millimeter.
- E) micrometer.

Answer: E

Diff: 1 Var: 1 Page Ref: Sec. 1-2

27) If you are measuring the mass of an elephant, the most appropriate SI unit is the

- A) teragram.
- B) kilogram
- C) gram.
- D) milligram.
- E) microgram.

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-2

- 28) If you are measuring the mass of a small glass of milk, the most appropriate SI unit is the
- A) teragram.
 - B) kilogram.
 - C) gram.
 - D) milligram.
 - E) microgram.

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 1-2

- 29) How many cm^2 equal a m^2 ?

- A) 10^{-4}
- B) 10^{-2}
- C) 10^2
- D) 10^4
- E) 10^6

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 1-3

- 30) When multiplying several quantities, the number of significant digits in the result must always be

- A) larger than the number of significant digits in the most accurate of the quantities.
- B) equal to the number of significant digits in the most accurate of the quantities.
- C) equal to the average number of significant digits in the most and least accurate of the quantities.
- D) equal to the number of significant digits in the least accurate of the quantities.
- E) smaller than the number of significant digits in the least accurate of the quantities.

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-4

- 31) When dividing several quantities, the number of significant digits in the result must always be

- A) larger than the number of significant digits in the most accurate of the quantities.
- B) equal to the number of significant digits in the most accurate of the quantities.
- C) equal to the average number of significant digits in the most and least accurate of the quantities.
- D) equal to the number of significant digits in the least accurate of the quantities.
- E) smaller than the number of significant digits in the least accurate of the quantities.

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-4

- 32) When adding several quantities, the number of decimal places in the result must always be
- A) larger than the number of decimal places in the most accurate of the quantities.
 - B) equal to the number of decimal places in the most accurate of the quantities.
 - C) equal to the average number of significant digits in the most and least accurate of the quantities.
 - D) equal to the number of decimal places in the least accurate of the quantities.
 - E) smaller than the number of decimal places in the least accurate of the quantities.

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-4

- 33) When subtracting several quantities, the number of decimal places in the result must always be
- A) larger than the number of decimal places in the most accurate of the quantities.
 - B) equal to the number of decimal places in the most accurate of the quantities.
 - C) equal to the average number of significant digits in the most and least accurate of the quantities.
 - D) equal to the number of decimal places in the least accurate of the quantities.
 - E) smaller than the number of decimal places in the least accurate of the quantities.

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-4

34) Four students measure the mass of an object, each using a different scale. They record their results as follows:

Student	A	B	C	D	E
Mass (g)	49.06	49	50	49.1	49.061

Which student used the least precise scale?

- A) A
- B) B
- C) C
- D) D
- E) E

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 1-4

35) Four students measure the mass of an object, each using a different scale. They record their results as follows:

Student	A	B	C	D	E
Mass (g)	49.06	49	50	49.1	49.061

Which student used the most precise scale?

- A) A
- B) B
- C) C
- D) D
- E) E

Answer: E

Diff: 1 Var: 1 Page Ref: Sec. 1-4

36) A useful method of expressing very small or very large numbers is

- A) scientific notation.
- B) arabic numerals.
- C) roman numerals.
- D) significant figures.
- E) greek letters.

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-4

37) What is the conversion factor between km/h and m/s?

- A) 7.72×10^{-5} m/s
- B) 2.78×10^{-1} m/s
- C) 1.30×10^4 m/s
- D) 3.60 m/s
- E) 16.7 m/s

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-5

38) What is the conversion factor between km/h² and m/s²?

- A) 7.72×10^{-5} m/s²
- B) 2.78×10^{-1} m/s²
- C) 1.30×10^4 m/s²
- D) 3.60 m/s²
- E) 16.7 m/s²

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-5

39) What is the conversion factor between cm^2 and m^2 ?

- A) $0.01 \text{ m}^2/\text{cm}^2$
- B) $0.0001 \text{ m}^2/\text{cm}^2$
- C) $10 \text{ m}^2/\text{cm}^2$
- D) $100 \text{ m}^2/\text{cm}^2$
- E) $10000 \text{ m}^2/\text{cm}^2$

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-5

40) A scalar quantity is defined as

- A) a quantity that is specified by a numerical value only.
- B) a quantity that is specified by using both a numerical value and a direction.

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-7

41) A vector quantity is defined as

- A) a quantity that is specified by a numerical value only.
- B) a quantity that is specified by using both a numerical value and a direction.

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-7

1.2 Quantitative Problems

1) The prefix yotta (Y) signifies a multiple of 10^{24} . How many yottameters are there in a gigameter?

Answer: 10^{-15}

Diff: 1 Var: 1 Page Ref: Sec. 1-2

2) The speed v of an object falling with a constant acceleration g can be expressed in terms of g and the distance traveled from the point of release, h , as $v = ag^b h^c$, where a , b , and c , are dimensionless constants. What must be the values of b and c ?

Answer: $b = 1/2$, $c = 1/2$

Diff: 1 Var: 1 Page Ref: Sec. 1-3

3) The speed v of sound waves in a gas can be expressed in terms of the pressure p and the density ρ (mass per unit volume) of the gas, as $v = ap^b \rho^c$, where a , b , and c , are dimensionless constants. The dimensions of pressure are $[M]/[L][T]^2$. What must be the values of b and c ?

Answer: $b = 1/2$, $c = -1/2$

Diff: 1 Var: 1 Page Ref: Sec. 1-3

4) The time P required for a spring-mass system to complete one full oscillation can be expressed in terms of the attached mass m and the spring constant of the spring k in the form $P = km^b k^c$, where k , b , and c are dimensionless constants. What must be the values of b and c ? The dimensions of k are $[M]/[T]^2$.

Answer: $b = 1/2$, $c = -1/2$

Diff: 1 Var: 1 Page Ref: Sec. 1-3

5) The period P of oscillation of a pendulum (the time interval needed to complete one full oscillation) can be expressed in terms of the mass m of the plumb bob, the length l of the string, and the acceleration due to gravity, g , as $P = km^b l^c g^d$, where k , b , c , and d are dimensionless constants. What must be the values of b , c , and d ?

Answer: $b = 0$, $c = 1/2$, $d = -1/2$

Diff: 2 Var: 1 Page Ref: Sec. 1-3

6) Hydraulicists often express rainfall in acre-feet. This is the amount of water required to cover an area of one acre to a depth of one foot. There are 640.0 acres in a square mile, and 5280 feet in one mile. How many cubic feet are there in one acre-foot?

Answer: 43,560 cubic feet

Diff: 1 Var: 1 Page Ref: Sec. 1-5

7) There are 640 acres in a square mile, and 5280 feet in one mile. How many acres are there in a hectare, a square one hundred meters on each side?

Answer: 2.47 acres

Diff: 1 Var: 1 Page Ref: Sec. 1-5

8) Hydraulicists often express rainfall in acre-feet. This is the amount of water required to cover an area of one acre to a depth of one foot. There are 640.0 acres in a square mile, and 5280 feet in one mile. How many cubic yards are there in one acre-foot?

Answer: 1613 cubic yards

Diff: 1 Var: 1 Page Ref: Sec. 1-5

9) There are 2.00 dry pints to 1.00 dry quart, 8.00 dry quarts to 1.00 peck, 4.00 pecks to 1.00 bushel. A farmer wants to pick enough berries to fill 40,000 pint containers. How many bushels of berries does the farmer need?

Answer: 625 bushels

Diff: 1 Var: 1 Page Ref: Sec. 1-5

10) A typical ruby-throated hummingbird is 8 centimeters long. Express its length in millimeters and dekameters.

A) 80 mm; 0.8 dam

B) 80 mm; 0.008 dam

C) 800 mm; 0.008 dam

D) 800 mm; 0.8 dam

E) 0.8 mm; 80 dam

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-2

11) Jane has a mass of 50 kilograms. Express her mass in grams and hectograms.

- A) 50,000 g; 5,000 hg
- B) 500,000 g; 500 hg
- C) 500,000 g; 5,000 hg
- D) 50,000 g; 500 hg
- E) 50,000 g; 5,000 kg

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-2

12) A jar of peanut butter costs \$3.29. Express its price in dekadollars and decidollars.

- A) 0.329 dekadollars; 0.329 decidollars
- B) 32.9 dekadollars; 0.329 decidollars
- C) 329 dekadollars; 32.9 decidollars
- D) 0.329 dekadollars; 32.9 decidollars
- E) 32.9 dekadollars; 329 decidollars

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-2

13) In the year 2000, the average size of a transistor in a microprocessor was 250 nanometers. A human hair has a diameter of 70 microns (micrometers). How many transistors fit across a human hair?

- A) 280
- B) 28
- C) 2800
- D) 2.8
- E) 0.28

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 1-2

14) In solving a physics problem you end up with m in the numerator and m/s in the denominator. The units for your answer are

- A) m^2/s .
- B) m^2 .
- C) m.
- D) s.
- E) $1/s$.

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-3

15) The density of a solid object is defined as the ratio of the mass of the object to its volume. The dimension of density is

- A) $[M]/[L]$.
- B) $[L]^3/[M]$.
- C) $[M] [L]^{-3}$.
- D) $[M][L][T]$.
- E) $[M][L]$.

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 1-3

16) The position, x , of an object is given by the equation $x = A + Bt + Ct^2$, where t refers to time. What are the dimensions of A , B , and C ?

- A) distance, distance, distance
- B) distance, time, time
- C) distance, time, time^2
- D) distance, distance/time, distance/ time^2
- E) distance/time, distance/ time^2 , distance/ time^3

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 1-3

17) The period of a pendulum is the time it takes the pendulum to swing back and forth once. If the only dimensional quantities that the period depends on are the acceleration of gravity, g , and the length of the pendulum, L , what combination of g and L must the period be proportional to? Acceleration has dimensions of $[L][T^{-2}]$.

- A) g/L
- B) gL^2
- C) gL
- D) $\sqrt{gL}$
- E) $\sqrt{L/g}$

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 1-3

18) In fluid flow, the character of the flow can be determined by the Reynolds number, Re , which is a dimensionless quantity that can be expressed in terms of the speed v of the fluid, the density ρ (mass per unit volume) of the fluid, the viscosity η of the fluid, and a length D which is characteristic to the flow. Re can be expressed in the form $Re = kv\eta^a\rho^bD^c$, where k , a , b , and c are dimensionless constants. What must be the values of b , c , and d ? The dimensions of viscosity are $[M]/[L][T]$.

- A) $b = 1$, $c = -1$, $d = 1$
- B) $b = 1$, $c = -1$, $d = -1$
- C) $b = -1$, $c = 1$, $d = 1$
- D) $b = -1$, $c = 1$, $d = -1$
- E) $b = -1$, $c = -1$, $d = 1$

Answer: C

Diff: 3 Var: 1 Page Ref: Sec. 1-3

19) How many significant figures are in 0.00054?

- A) 2
- B) 3
- C) 4
- D) 5
- E) 6

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-4

20) How many significant figures are in 0.0067?

- A) 1
- B) 2
- C) 3
- D) 4
- E) 5

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-4

21) How many significant figures are in 10,002?

- A) ambiguous
- B) 2
- C) 3
- D) 4
- E) 5

Answer: E

Diff: 1 Var: 1 Page Ref: Sec. 1-4

22) How many significant figures are in 120.07?

- A) 6
- B) 5
- C) 4
- D) 3
- E) 2

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-4

23) How many significant figures are in 576,000?

- A) 3
- B) 4
- C) 5
- D) 6
- E) ambiguous

Answer: E

Diff: 1 Var: 1 Page Ref: Sec. 1-4

24) What is the sum of $1.53 + 2.786 + 3.3$?

- A) 8
- B) 7.6
- C) 7.62
- D) 7.616
- E) 7.6160

Answer: B

Diff: 1 Var: 3 Page Ref: Sec. 1-4

25) What is the difference between 103.5 and 102.24?

- A) 1
- B) 1.3
- C) 1.26
- D) 1.260
- E) 1.2600

Answer: B

Diff: 1 Var: 3 Page Ref: Sec. 1-4

26) What is the product of 11.24 and 1.95?

- A) 22
- B) 21.9
- C) 21.92
- D) 21.918
- E) 21.9180

Answer: B

Diff: 1 Var: 3 Page Ref: Sec. 1-4

27) What is the cosine of 55° ?

- A) 0.6
- B) 0.57
- C) 0.574
- D) 0.5736
- E) 0.57360

Answer: B

Diff: 1 Var: 3 Page Ref: Sec. 1-4

28) What is $34 + (3) \times (1.2465)$ written with the correct number of significant figures?

- A) 37.7
- B) 37.74
- C) 4×10^1
- D) 38
- E) 37.7395

Answer: D

Diff: 1 Var: 5 Page Ref: Sec. 1-4

29) What is $56 + (32.00)/(1.2465 + 3.45)$ written with the correct number of significant figures?

- A) 62.8
- B) 62.812
- C) 62.81
- D) 63
- E) 62.8123846

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-4

30) A pepperoni pizza has 2.80 megacalories. Juan eats exactly $\frac{1}{3}$ of the pizza. How many kilocalories has he consumed? (One food "calorie" is actually a kilocalorie.)

- A) 930 kcal
- B) 933 kcal
- C) 933.3 kcal
- D) 933.33 kcal
- E) 933.333 kcal

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-4

31) A train travels at a constant speed of 60.4 miles per hour for 101.5 minutes. What distance does the train cover?

- A) 100 miles
- B) 102 miles
- C) 102.2 miles
- D) 102.18 miles
- E) 102.181 miles

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-4

32) How long does it take for a train traveling 60.4 miles per hour to travel 81 miles?

- A) 0.75 hours
- B) 0.745 hours
- C) 1.34 hours
- D) 1.3 hours
- E) 1 hour

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-4

33) A dog has three puppies. Spot weighs 12 ounces. Rascal weighs 9.5 ounces. Socks weighs 10.2 ounces. What is the total weight of the litter?

- A) 31.7 ounces
- B) 31 ounces
- C) 32 ounces
- D) 30 ounces
- E) 31.70 ounces

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 1-4

34) Jane has about \$536 in her checking account, about \$2107 in her savings account and exactly \$7.62 in her purse. To the best precision possible, how much money does Jane have?

- A) \$2651
- B) \$2,650
- C) \$2,650.6
- D) \$2,650.62
- E) \$2,650.620

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-4

35) To get to school, Alice walks 0.25 mile to the bus stop. She takes the bus 1.2 miles to the train station. She takes the train 13 miles and walks the remaining 0.17 mile to work. How far is her commute?

- A) 14.6 miles
- B) 10 miles
- C) 15 miles
- D) 14.62 miles
- E) 14.620 miles

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 1-4

36) 0.0001776 can also be expressed as

- A) 1.776×10^{-3} .
- B) 1.776×10^{-4} .
- C) 17.72×10^4 .
- D) 1772×10^5 .
- E) 177.2×10^7 .

Answer: B

Diff: 1 Var: 5 Page Ref: Sec. 1-4

37) Convert 1.2×10^{-3} to decimal notation.

- A) 1.200
- B) 0.1200
- C) 0.0120
- D) 0.0012
- E) 0.00012

Answer: D

Diff: 1 Var: 5 Page Ref: Sec. 1-4

38) The Gateway Arch in St. Louis is approximately 193 meters tall. What is its height in feet?

- A) 58.8 feet
- B) 64.3 feet
- C) 633 feet
- D) 759 feet
- E) 7,590 feet

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 1-5

39) Mrs. Jones went on a diet and lost 15 kilograms. How many pounds did she lose?

- A) 68 pounds
- B) 42 pounds
- C) 38 pounds
- D) 33 pounds
- E) 6.8 pounds

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-5

40) The Hoover Dam is 726 feet high. What is its height in kilometers?

- A) 0.726 kilometers
- B) 0.525 kilometers
- C) 0.221 kilometers
- D) 0.275 kilometers
- E) 0.138 kilometers

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 1-5

41) Rover eats 0.50 pound of dry dog food per day. How many 5.0-kilogram sacks of dog food does his owner need to buy in a year?

- A) 17
- B) 25
- C) 52
- D) 80
- E) 81

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-5

42) The peak of Mt. Everest, at 10,900 meters, is the highest point above sea level in the world. What is its elevation in miles?

- A) 17.6 miles
- B) 0.630 miles
- C) 6.77 miles
- D) 6.20 miles
- E) 67.1 miles

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 1-5

43) The length of the Appalachian Trail is 2,015 miles. How long is it in kilometers?

- A) 3,245 km
- B) 1,251 km
- C) 3,112 km
- D) 1,008 km
- E) 963 km

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-5

44) The Hope Diamond weighs 44.5 carats. There are 200 mg per carat. How many kilograms does the Hope Diamond weigh?

- A) 0.000890 kg
- B) 0.00890 kg
- C) 0.0890 kg
- D) 0.890 kg
- E) 8.90 kg

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-5

45) The column of Trajan, erected in Rome in 106-113 A.D., is 125 feet tall. What is its height in centimeters?

- A) 1,510 cm
- B) 591 cm
- C) 2,520 cm
- D) 3,810 cm
- E) 38,100 cm

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 1-5

46) Tutankhamen's gold coffin weighs 250 pounds. What is the mass of the coffin in kilograms?

- A) 110 kg
- B) 550 kg
- C) 130 kg
- D) 95 kg
- E) 11 kg

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-5

47) There are 640 acres in a square mile, and 5280 feet in one mile. What is the length in feet (to the nearest foot) of the side of a square having an area of one acre?

- A) 660 feet
- B) 209 feet
- C) 165 feet
- D) 412 feet
- E) 435 feet

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 1-5

48) An American football field, including end zones, is 360 feet long and 160 feet wide. What is its area in square meters?

- A) 4,920 square meters
- B) 5,350 square meters
- C) 88.0 square meters
- D) 12,100 square meters
- E) 13,200 square meters

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 1-5

49) Leonardo da Vinci's *Mona Lisa* is 21 inches wide and 30.25 inches tall. What is the area of the painting in square centimeters?

- A) 4,100 square cm
- B) 1,600 square cm
- C) 660 square cm
- D) 3,300 square cm
- E) 2,400 square cm

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 1-5

50) A drinking glass has a diameter of 2.5 inches and is 5.5 inches tall. What is the volume of the drinking glass in cubic centimeters?

- A) 170 cubic cm
- B) 440 cubic cm
- C) 350 cubic cm
- D) 710 cubic cm
- E) 530 cubic cm

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 1-5

51) The king's chamber of the great pyramid is 10.43 meters long, 5.21 meters wide, and 5.82 meters high. What is the volume of the chamber in cubic feet?

- A) 316 cubic feet
- B) 3,720 cubic feet
- C) 6,530 cubic feet
- D) 11,200 cubic feet
- E) 13,200 cubic feet

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 1-5

52) A waffle cone has a diameter of 2.5 inches and is 5.5 inches tall. What is the volume of the waffle cone in cubic centimeters?

- A) 58 cubic cm
- B) 150 cubic cm
- C) 240 cubic cm
- D) 440 cubic cm
- E) 620 cubic cm

Answer: B

Diff: 3 Var: 1 Page Ref: Sec. 1-5

53) Approximately how many times does an average human heart beat in a year?

- A) 4×10^5
- B) 4×10^6
- C) 4×10^7
- D) 4×10^8
- E) 4×10^9

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 1-6

54) Approximately how many times does an average human heart beat in a lifetime?

- A) 3×10^{11}
- B) 3×10^{10}
- C) 3×10^9
- D) 3×10^8
- E) 4×10^7

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 1-6

55) Approximately how many pennies would you have to stack to reach an average 8-foot ceiling?

- A) 2×10^3
- B) 2×10^2
- C) 2×10^4
- D) 2×10^5
- E) 2×10^6

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-6

56) Estimate the number of times Earth will rotate on its axis during a human's lifetime.

A) 3×10^4

B) 3×10^5

C) 3×10^6

D) 3×10^7

E) 3×10^8

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-6

57) Estimate the thickness of a piece of paper.

A) 10^{-4} meter

B) 10^{-5} meter

C) 10^{-6} meter

D) 10^{-7} meter

E) 10^{-8} meter

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 1-6

58) Estimate the number of pennies that would fit in a box one foot across by one foot wide by one foot tall.

A) 5×10^2

B) 5×10^3

C) 5×10^4

D) 5×10^5

E) 5×10^6

Answer: C

Diff: 2 Var: 1 Page Ref: Sec. 1-6

59) Estimate how many times you would have to fold a sheet of paper until it becomes as thick as a large dictionary (approximately 10 cm thick).

A) 10 times

B) 50 times

C) 100 times

D) 500 times

E) 1000 times

Answer: A

Diff: 3 Var: 1 Page Ref: Sec. 1-6