Exam

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Significant Figures: In the product A · B · C, *A* has 5 significant figures, *B* has 2 significant figures, and *C* has 3 significant figures. How many significant figures does the product have?
A) 10 B) 4 C) 5 D) 2 E) 3
Answer: D

2) Significant Figures: In the quotient $\frac{A}{B \cdot C}$, A has 5 significant figures, *B* has 2 significant figures, and *C* has 3 significant figures. How many significant figures does the quotient have?
A) 1 B) 0 C) 2 D) 3 E) 4
Answer: C

3) Significant Figures: In the sum *A* + *B* + *C*, *A* is accurate to 5 decimal places, *B* is accurate to 2 decimal places, and *C* is accurate to 3 decimal places. What is the correct number of decimal places in the sum?
A) 4 B) 3 C) 10 D) 2 E) 5
Answer: D

4) Significant Figures: In the difference *A* - *B* - *C*, *A* is accurate to 5 decimal places, *B* is accurate to 2 decimal places, and *C* is accurate to 3 decimal places. What is the correct number of decimal places in the difference?
A) 4 B) 3 C) 0 D) 5 E) 2
Answer: E

5) Significant Figures: How many significant figures are in the number 0.0037010?
A) seven B) five C) six D) eight E) four
Answer: B

6) Significant Figures: How many significant figures are in the number 0.010?
A) two B) three C) one D) four
Answer: A

7) Significant Figures: How many significant figures are in the number 120.070?
A) five B) three C) four D) six
Answer: D

8) Significant Figures: The number of significant figures in 10,001 is
A) five. B) two. C) six. D) three.
Answer: A

9) Significant Figures: The number of significant figures in 0.01500 is

A) four. B) five. C) two. D) three.

Answer: A

10) Significant Figures: The number of significant figures in 0.040 is

A) four. B) one. C) three. D) two.

Answer: D

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

11) Significant Figures: Which of the following numbers has 4 significant figures; which has 5 significar

(a) 3001
(b) 0.00370
(c) 4774.00
(d) 29.290

Answer: (a) has 4 significant figures; (d) has 5 significant figures

12) Significant Figures: In a parallel universe, the quantity π has the value 3.14049… . Express π in that

(a) four significant figures
(b) five significant figures.

Answer: (a) 3.140 (b) 3.1405

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

13) Metric System: The metric system is preferred over the British system in science for the following main reason.

A) The metric system is more precise than the British system.
B) Metric quantities are natural whereas British quantities are invented.
C) Metric quantities can be defined more accurately than the quantities in the British system.
D) Conversions between metric quantities are especially easy because they are all related by factors of ten.

Answer: D

14) Dimensional Analysis: When adding several quantities

A) the quantities can have any combination of units.
B) the quantities must all have exactly the same units.
C) the quantities must all be dimensionless.

Answer: B

15) Dimensional Analysis: When multiplying several quantities

A) the quantities can have any combination of units.
B) the quantities must all have exactly the same units.
C) the quantities must all be dimensionless.

Answer: A

16) Dimensional Analysis: When dividing several quantities
A) the quantities can have any combination of units.
B) the quantities must all have exactly the same units.
C) the quantities must all be dimensionless.
Answer: A

17) Dimensional Analysis: When subtracting several quantities
A) the quantities can have any combination of units.
B) the quantities must all have exactly the same units.
C) the quantities must all be dimensionless.
Answer: B

18) Estimation: A reasonable estimate for the mass of a typical female college student is
A) 200 kg. B) 20 kg. C) 150 kg. D) 50 kg.
Answer: D

19) Estimation: A reasonable estimate for the height of an ordinary adult male is
A) 300 cm. B) 200 cm. C) 50 cm. D) 70 cm.
Answer: B

20) Estimation: A reasonable estimate for the mass of a typical new-born baby is
A) 1 kg. B) 20 kg. C) 3 kg. D) 10 kg.
Answer: C

21) Estimation: A reasonable estimate for the height of the walls in an ordinary American home is
A) 2.5 m. B) 8 m. C) 10 m. D) 1.5 m.
Answer: A

22) Estimation: A reasonable estimate for the duration of a typical physics lecture is
A) 1000 s. B) 10,000 s. C) 3500 s. D) 600 s.
Answer: C

23) Estimation: A reasonable estimate for the mass of an ordinary passenger car is
A) 1000 kg B) 10,000 kg C) 100 kg D) 5000 kg
Answer: A

24) Significant Figures: What is the product of 12.56 and 2.12 expressed to the correct number of significant figures?
A) 27 B) 26.627 C) 26.6 D) 26.23
Answer: C

25) Significant Figures: What is the quotient of 2.43 ÷ 4.561 expressed to the correct number of significant figures?
A) 5.3×10^{-1} B) 5.33×10^{-1} C) 5.3278×10^{-1} D) 5.328×10^{-1}
Answer: B

26) Significant Figures: What is $\frac{0.674}{0.74}$ expressed to the correct number of significant figures?

A) 0.9108 B) 0.9 C) 0.911 D) 0.91

Answer: D

27) Significant Figures: What is $0.205^{2/3}$, to the correct number of significant figures?

A) 0.35 B) 0.3477 C) 0.3 D) 0.348

Answer: D

28) Significant Figures: Add 1299 g and 45.1 kg and express your answer in milligrams (mg) to the correct number of significant figures.

A) 4.64×10^5 mg B) 4.64×10^6 mg C) 4.64×10^4 mg D) 4.64×10^7 mg

Answer: D

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

29) Significant Figures: What is $\sqrt{\frac{4.302(15.6 - 1.2)}{22.1 + 19.4}}$ expressed to the correct number of significant figures?

Answer: 1.22

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

30) Significant Figures: The length and width of a rectangle are 1.125 m and 0.606 m, respectively. Multiplying, your calculator gives the product as 0.68175. Rounding properly to the correct number of significant figures, the area of the rectangle should be written as

A) 0.682 m^2 B) 0.68 m^2 C) 0.6818 m^2 D) 0.68175 m^2

Answer: A

31) Significant Figures: What is the sum of 2.67 + 1.976 + 2.1 expressed to the correct number of significant figures?

A) 6.746 B) 6.7460 C) 6.7 D) 6.75

Answer: C

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

32) Significant Figures: Express the sum of 420.77, 13.821, and 2317.8 to the correct number of significant figures.

Answer: 2752.4

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

33) Significant Figures: What is the difference between 103.5 and 102.24 expressed to the correct number of significant figures?

A) 1.2600 B) 1.260 C) 1.3 D) 1.26

Answer: C

34) Significant Figures: What is the sum of 1.53 + 2.786 + 3.3 expressed to the correct number of significant figures?

A) 7.6 B) 7 C) 7.616 D) 7.6160 E) 7.62

Answer: A

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

35) Significant Figures: Express the result of the following calculation to the proper number of significant figures: $50.19 - 7966 \times 10^{-3}$.

Answer: 42.22

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

36) Significant Figures: What is the result, expressed to the proper number of significant figures, of adding 23.4 to 91.237 and then subtracting 23.4?

A) 91.3 B) 91.237 C) 91 D) 91.2 E) 91.0

Answer: D

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

37) Significant Figures: Express the result of the following calculation, in scientific notation, to the proper number of significant figures: $\frac{395600.1}{6.72} + 19$.

Answer: 5.9×10^4

38) Significant Figures: Add the following lengths, each obtained from a different measuring instrument, and round the answer to the proper number of significant figures: 20.02 m, 5.91 m, 0.0097 m, and 2.467 m.

Answer: 28.41 m

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

39) Significant Figures: The last page of a book is numbered 764. The book is 3.0 cm thick, not including its covers. What is the average thickness (in centimeters) of a page in the book, rounded to the proper number of significant figures?

A) 0.0079 cm
B) 0.0039 cm
C) 0.00393 cm
D) 0.00785 cm
E) 0.072 cm

Answer: A

40) Significant Figures: The length and width of a rectangle are 1.125 m and 0.606 m, respectively. You calculate the rectangle's perimeter by adding these numbers and multiplying by two. Your calculator's display reads 3.462. To the correct number of significant figures, the perimeter should be written as

A) 3.46 m. B) 3.4620 m. C) 3.5 m. D) 3.462 m.

Answer: D

41) Significant Figures: A rectangular garden measures 15 m long and 13.70 m wide. What is the length of a diagonal from one corner of the garden to the other?

A) 19 m B) 20 m C) 4.1×10^2 m D) 18 m

Answer: B

42) Significant Figures: If a circle has a radius of 1.109 m, what is its area expressed to the correct number of significant figures?

A) 3.86379 m^2
B) 3.8638 m^2
C) 3.86 m^2
D) 3.864 m^2
E) 3.863 m^2

Answer: D

43) Significant Figures: A train travels at a constant speed of 60.4 mi/h for 101.5 min. What distance does the train cover expressed to the correct number of significant figures?

A) 102.2 mi B) 102.181 mi C) 100 mi D) 102.18 mi E) 102 mi

Answer: E

44) Significant Figures: 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 expressed to the correct number of significant figures?

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

Answer: D

45) Significant Figures: A traveler has about $536 in his checking account, about $2107 in his savings account and exactly $7.62 in his wallet. To the greatest precision warranted, how much money does this shopper have?

A) $2651 B) $2650 C) $2650.620 D) $2650.62 E) $2650.6

Answer: A

46) Significant Figures: To get to her physics class, Alice walks 0.25 mi to the bus stop. She takes the bus 1.2 mi to the train station. She takes the train 13 mi and walks the remaining 0.17 mi to her class. How far is her commute expressed to the correct number of significant figures?

A) 14.62 mi B) 14.6 mi C) 15 mi D) 14.620 mi E) 10 mi

Answer: C

47) Significant Figures: What is $56 + \frac{32.00}{1.2465 + 3.45}$ written with the correct number of significant figures?

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

Answer: A

48) Significant Figures: Using a digital balance the mass of a certain piece of wood is read as 12.946 g. Thinking in terms of accuracy and significant figures, what value would you record on your data sheet if the balance is accurate to one-tenth of a gram?

A) 12.95 g B) 12.9 g C) 13.0 g D) 13 g

Answer: B

49) Scientific Notation: Which of the following numbers is the *smallest*?

A) 15×10^{-3}
B) 0.00000015×10^{6}
C) 0.00015×10^{3}
D) 0.15×10^{0}

Answer: A

50) Scientific Notation: Which one of the following numbers is equivalent to the number 0.0001776?

A) 1.776×10^{-4} B) 1776×10^{-5} C) 177.6×10^{-7} D) 17.76×10^{-3}

Answer: A

51) Scientific Notation: Write out the number 8.42×10^{-5} in full with a decimal point and correct number of zeros.

A) 0.000842 B) 0.00000842 C) 0.00842 D) 0.0000842

Answer: D

52) Scientific Notation: What is the result of the calculation $(0.410 + 0.021) \times (2.20 \times 10^{3})$?

A) 880 B) 950 C) 946 D) 948

Answer: D

53) Scientific Notation: Express $(2.2 \times 10^{6})^{-1/2}$ in scientific notation.

A) 1.5×10^{4} B) 1.5×10^{-5} C) 1.5×10^{3} D) 6.7×10^{-4}

Answer: D

54) Metric System: Express the number 13.5 gigameters in meters without using scientific notation.

A) 135,000,000,000 m
B) 13,500,000,000 m
C) 135,000 m
D) 135,000,000 m

Answer: B

55) Metric System: A volume of 100 mL is equivalent to which one of the following volumes?

A) 1 kL
B) 0.1 L
C) 10^{-6} μL
D) 0.01 ML

Answer: B

56) Metric System: The volume of a 10-mL test tube is equivalent to which one of the following quantities?

A) 0.1 L
B) 0.001 ML
C) 0.01 L
D) 0.001 kL
E) 1×10^{-6} L

Answer: C

57) Metric System: The number 0.00325×10^{-8} cm can be expressed in millimeters as

A) 3.25×10^{-10} mm.
B) 3.25×10^{-9} mm.
C) 3.25×10^{-12} mm.
D) 3.25×10^{-11} mm.

Answer: A

58) Metric System: An area of 1.00×10^{2} cm^2 is how many square meters?

A) 1.00×10^{2} m^2
B) 1.00×10^{-3} m^2
C) 1.00×10^{-2} m^2
D) 1.00×10^{4} m^2
E) 1.00 m^2

Answer: C

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

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

Answer: 10^{-15} ym

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

60) Metric System: Express the sum 1.00 kg + 1531 g + 2.54×10^{4} mg in kilograms with the correct number of significant figures.

A) 2.56 kg
B) 2.79 kg
C) 2.53 kg
D) 27.9 kg

Answer: A

61) Metric System: The quantity 0.00325×10^{-8} cm is equivalent to

A) 3.25×10^{-9} mm.
B) 3.25×10^{-11} mm.
C) 3.25×10^{-10} mm.
D) 3.25×10^{-12} mm.
E) 3.25×10^{-8} mm.

Answer: C

62) Metric System: A weight lifter can bench press 171 kg. How many milligrams is this?

A) 1.71×10^{6} mg B) 1.71×10^{8} mg C) 1.71×10^{7} mg D) 1.71×10^{9} mg

Answer: B

63) Metric system: How many nanoseconds does it take for a computer to perform one calculation if it performs 6.7×10^{7} calculations per second?

A) 65 ns B) 11 ns C) 67 ns D) 15 ns

Answer: D

64) Metric system: A certain CD-ROM disk can store 600 megabytes of information. If an average word requires 9.0 bytes of storage, how many words can be stored on one disk?

A) 2.1×10^{7} words B) 2.0×10^{9} words C) 6.7×10^{7} words D) 5.4×10^{9} words

Answer: C

65) Metric system: The wavelength of the light from a certain laser is 0.66 microns, where 1 micron = 1.0×10^{-6} m. What is this wavelength in nanometers? (1 nm = 10^{-9}m)

A) 6.6×10^{1} nm B) 6.6×10^{3} nm C) 6.6×10^{4} nm D) 6.6×10^{2} nm

Answer: D

66) Conversion of Units: If you are 5'10" tall, what is your height in meters? (2.54 cm = 1.00 in.)

A) 1.6 m B) 1.7 m C) 1.5 m D) 1.8 m

Answer: D

67) Conversion of Units: Given that 1.00 in. = 2.54 cm and 1.00 yd = 36.0 in., how many meters are in 7.00 yd?

A) 1.78×10^{3} m B) 6.40 m C) 640 m D) 36.3 m

Answer: B

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

68) Conversion of Units: 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 ft^3

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

69) Conversion of Units: Express 50 mi/h in units of meters per second. (1 mi = 1609 m)
A) 2.2 m/s B) 22 m/s C) 45 m/s D) 49 m/s
Answer: B

70) Conversion of Units: Given that 1.00 in. = 2.54 cm, how many square centimeters are in 1.00 square inch?
A) 5.08 B) 6.45 C) 1.59 D) 2.54
Answer: B

71) Conversion of Units: A plot of land contains 5.8 acres. How many square meters does it contain? (1.0 acre = 43,560 ft^2 and 2.54 cm = 1.00 in.)
A) 5.0×10^4 m^2 B) 7.0×10^4 m^2 C) 2.3×10^4 m^2 D) 7.1×10^3 m^2
Answer: C

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

72) Conversion of Units: The density of water is 1.00 g/cm^3. What is its density in kg/m^3?
Answer: 1.00×10^3 kg/m^3

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

73) Conversion of Units: A light-year (ly) is the distance that light travels in one year. The speed of light is 3.00×10^8 m/s. How many miles are there in 1.00 ly? (1.00 mi = 1.609 km and one year is 365.25 days.)
A) 2.87×10^{13} mi
B) 5.88×10^{15} mi
C) 9.46×10^{12} mi
D) 9.46×10^{15} mi
E) 5.88×10^{12} mi
Answer: E

74) Conversion of Units: A speed of 60 mi/h is closest to which of the following? (2.54 cm = 1.00 in.)
A) 30 km/h B) 120 m/s C) 30 m/s D) 60 m/s E) 20 m/s
Answer: C

75) Conversion of Units: Which of the following speeds is *greatest*? (2.54 cm = 1.00 in.)
A) 10 m/s B) 10 km/h C) 10 yd/s D) 10 ft/s E) 10 mi/h
Answer: A

76) Conversion of Units: A person on a diet loses 1.6 kg in a week. How many micrograms per second (μg/s) are lost?
A) 1.6×10^5 μg/s B) 2.6×10^3 μg/s C) 44 μg/s D) 6.4×10^4 μg/s
Answer: B

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

77) Conversion of Units: There are 640 acres in a square mile, 5280 ft in one mile, and 3.28 ft in one meter. How many acres are there in a hectare, which is a square one hundred meters on each side?

Answer: 2.47 acres

78) Conversion of Units: 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. An organic farmer wants to pick enough berries to fill 40,000 pint containers. How many bushels of berries does the farmer need?

Answer: 625 bushels

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

79) Conversion of Units: A typical ruby-throated hummingbird is 8 cm long. Express its length in millimeters and micrometers (μm).

A) 80 mm; 800 μm
B) 800 mm; 0.8 μm
C) 800 mm; 0.008 μm
D) 80 mm; 80,000 μm
E) 0.8 mm; 8000 μm

Answer: D

80) Conversion of Units: A jogger has a mass of 50 kg. Express her mass in grams and micrograms (μg).

A) 50,000 g; 5×10^{10} μg
B) 500,000 g; 500×10^{6} μg
C) 500,000 g; 5000 μg
D) 50,000 g; 5×10^{6} μg
E) 50,000 g; 50,000 μg

Answer: A

81) Conversion of Units: 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) 0.329 dekadollars; 32.9 decidollars
D) 329 dekadollars; 32.9 decidollars
E) 32.9 dekadollars; 329 decidollars

Answer: C

82) Conversion of Units: The following conversion equivalents are given:

1.00 gal = 231 in^3 1.0 ft = 12 in 1.0 min = 60 s

If a pipe delivers water at the rate of 95 gal/min, its rate of flow in ft^3/s is closest to

A) 0.19 ft^3/s. B) 0.14 ft^3/s. C) 0.21 ft^3/s. D) 0.17 ft^3/s. E) 0.15 ft^3/s.

Answer: C

83) Conversion of Units: The following conversion equivalents are given:
1.0 m = 100 cm 1.0 in = 2.54 cm 1.0 ft = 12 in
If a bin has a volume of 1.5 m^3, the volume of the bin, in ft^3, is closest to
A) 47 ft^3. B) 59 ft^3. C) 35 ft^3. D) 41 ft^3. E) 53 ft^3.
Answer: E

84) Conversion of Units: The following conversion equivalents are given:
1.0 mile = 5280 ft 1.0 ft = 12 in 1 m = 39.37 in
1.0 hour = 60 min 1.0 min = 60 s
If a deer runs at 4.7 mi/h, its speed, in meters per second, is closest to
A) 2.5 m/s. B) 2.1 m/s. C) 2.3 m/s. D) 1.7 m/s. E) 1.9 m/s.
Answer: B

85) Conversion of Units: speed of 65 miles per hour is the same as which of the following? (1.00 ft = 30.48 cm)
A) 29 m/s B) 37 m/s C) 42 m/s D) 32 m/s E) 24 m/s
Answer: A

86) Conversion of Units: The following conversion equivalents are given:
1.0 kg = 1000 g 1.0 l = 1000 cm^3 1.0 l = 0.0353 ft^3
The density of a certain liquid is 0.83 g/cm^3. The density of this liquid, expressed in kg/ft^3, is closest
A) 24 kg/ft^3. B) 26 kg/ft^3. C) 19 kg/ft^3. D) 28 kg/ft^3. E) 21 kg/ft^3.
Answer: A

87) Conversion of Units: Your car gets 34.7 mi/gal on a vacation trip in the U.S. If you were figuring your mileage in Europe, how many km/L did it get? (3.79 L = 1.00 gal; 1.00 mi = 1.61 km)
A) 55.9 km/L B) 9.16 km/L C) 14.7 km/L D) 32.4 km/L
Answer: C

88) Conversion of Units: An oak tree was planted 22 years ago. How many seconds does this correspond to? (Do not take leap days into account.)
A) 2.8×10^8 B) 1.2×10^7 C) 2.9×10^7 D) 6.9×10^8
Answer: D

89) Conversion of Units: At a certain time, 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) 0.28 B) 2.8 C) 28 D) 280 E) 2800
Answer: D

90) Conversion of Units: The king's chamber of the great pyramid in Egypt is 10.43 m long, 5.21 m wide, and 5.82 m high. What is the volume of the chamber in cubic feet, expressed to the correct number of significant figures? (1.00 in. = 2.54 cm)

A) 6530 ft^3 B) 13,200 ft^3 C) 3720 ft^3 D) 316 ft^3 E) 11,200 ft^3

Answer: E

91) Conversion of Units: Rover eats 0.50 pound of dry dog food per day. How many 5.0-kg sacks of dog food does his owner need to buy in a year? (1.0 kg weighs 2.2 lb)

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

Answer: E

92) Conversion of Units: The peak of Mt. Everest, at 10,900 m, is the highest point above sea level in the world. What is its elevation in miles? (1.00 m = 3.281 ft)

A) 6.20 mi B) 6.77 mi C) 17.6 mi D) 67.1 mi E) 0.630 mi

Answer: B

93) Conversion of Units: The Hope Diamond weighs 44.5 carats, and there are 200 mg per carat. What is the mass of the Hope Diamond in kilograms?

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

Answer: B

94) Conversion of Units: The column of Trajan, erected in Rome in 106-113 A.D., is 125 feet tall. What is its height in centimeters? (2.54 cm = 1.00 in.)

A) 591 cm B) 3810 cm C) 38,100 cm D) 1510 cm E) 2520 cm

Answer: B

95) Conversion of Units: There are 640 acres in a square mile, and 5280 feet in 1.00 mile. What is the length in feet (to the nearest foot) of the side of a square having an area of 1.00 acre?

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

Answer: C

96) Conversion of Units: An American football field, including end zones, is 360 feet long and 160 feet wide. If you needed to describe it for someone in Europe using the metric system, which one of the following quantities would be closest to its area in square meters? (2.54 cm = 1.00 in.)

A) 13,200 m^2 B) 12,100 m^2 C) 88.0 m^2 D) 4920 m^2 E) 5350 m^2

Answer: E

97) Conversion of Units: Leonardo da Vinci's *Mona Lisa* is 21 in. wide and 30.25 in. tall. What is the area of the painting in square centimeters? (1.00 m = 39.37 in.)

A) 3300 cm^2 B) 2400 cm^2 C) 4100 cm^2 D) 660 cm^2 E) 1600 cm^2

Answer: C

98) Conversion of Units: A cylindrical drinking glass has a diameter of 2.5 in. and is 5.5 in. tall. What is the volume of the drinking glass in cubic centimeters? (2.54 cm = 1.00 in.)

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

Answer: A

99) Conversion of Units: A football field is 120 yd long and 50 yd wide. What is the area of the football field, in square meters, given that 1.0 yd = 91.44 cm?

A) 5.0×10^3 m^2 B) 2.4×10^3 m^2 C) 4.2×10^3 m^2 D) 3.7×10^3 m^2

Answer: A

100) Conversion of Units: Wall posters are usually sold curled up in cylindrical cardboard tubes. If the length of the tube is 0.845 m, and the inside diameter of the tube is 2.40 mm, what is the area of the poster expressed in square centimeters to the correct number of significant figures? (Assume the poster is just as long as the tube and does not overlap itself.)

A) 202.8 cm^2 B) 637.1 cm^2 C) 637 cm^2 D) 319 cm^2 E) 203 cm^2

Answer: C

101) Conversion of Units: A spherical fruit has a radius of 3.23 cm. What is the volume of the fruit in cubic meters?

A) 1.41×10^{-4} m^3 B) 4.23×10^{-4} m^3 C) 1.41 m^3 D) 4.23 m^3

Answer: A

102) Conversion of Units: A thick-walled metal pipe of length 0.200 m has an inside diameter of 20.0 mm and an outside diameter of 2.40 cm. What is the *total* surface area of the pipe, counting the ends, in square centimeters?

A) 276 cm^2 B) 277 cm^2 C) 279 cm^2 D) 278 cm^2

Answer: C

103) Conversion of Units: The radius of the earth is 3963 mi. Which one of the following numbers is closest to the surface area of the earth? (1.0 mi = 1609 m)

A) 2.6×10^{14} m^2 B) 4.9×10^7 m^2 C) 1.3×10^{14} m^2 D) 5.1×10^{14} m^2

Answer: D

104) Conversion of Units: A large school district has 300 school buses. If each school bus is used 3.0 hours each day, the average speed of the school buses is 15 mi/h, and the fuel economy of the buses is 10 mi/gal. How much does it cost to run these buses for 22 school days if gasoline costs $4.10 a gallon?

A) $180,000 B) $60,000 C) $120,000 D) $240,000

Answer: C

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

105) Conversion of Units: A 2.00-qt bottle of soda is on sale for $1.29. What should be the price of a 2.00-L bottle of the same soda to yield the same value? (1.00 qt = 0.947 L)

Answer: $1.36

106) Conversion of Units: In a country where the unit of currency is the Passi, kerosene costs 130 Passi per liter, and one dollar buys 227 Passi. What is the cost of kerosene in *dollars per gallon*? (1.00 gal = 3.79 L)

Answer: $2.17 per gallon

107) Conversion of Units: The tank of a certain car holds 16 gallons of gasoline. (1.00 gal = 3.785 L)
(a) How many liters of gasoline does this tank hold?
(b) How many kilometers can the car travel on one tank if it gets 25 miles per gallon?

Answer: (a) 61 L (b) 640 km

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

108) Density: The mass of Mars, 6.40×10^{23} kg, is about one-tenth that of Earth, and its radius, 3395 km, is about half that of Earth. What is the mean density (mass divided by volume) of Mars in kilograms per cubic meter?

A) 9.76×10^{2} kg/m^3
B) 7.81×10^{3} kg/m^3
C) 3.90×10^{3} kg/m^3
D) 1.95×10^{3} kg/m^3

Answer: C

109) Density: The average density of blood is 1.06×10^{3} kg/m^3. If you donate a pint of blood to the Red Cross, how many grams of blood have you donated? (2.00 pt = 1.00 qt, 1.00 L = 1000 cm^3, 1.00 qt = 0.947 L, and density is mass per unit volume.)

A) 5020 g
B) 502 g
C) 5.02×10^{5} g
D) 0.502 g
E) 5.02 g

Answer: B

110) Density: Concrete is sold by the cubic yard. What is the mass, in kilograms, of 1.00 cubic yard of concrete that is 5.00 times as dense as water? (1.00 m = 1.094 yd, a cubic meter of water has a mass of 1000 kg, and density is mass per unit volume.)

A) 3820 kg
B) 8730 kg
C) 6550 kg
D) 764 kg
E) 2420 kg

Answer: A

111) Density: A porch roof that slopes upward at 45° measures 3.0 m × 5.0 m. It is covered with a slab of insulating material that is 2.0 cm thick. If the density of the insulation is 15 kg/m^3, what is the weight of the insulation, in pounds, on the roof? (1.00 kg weighs 2.2 lb and density is mass per unit volume.)

A) 20 lb B) 4.5 lb C) 9.9 lb D) 9.0 lb E) 990 lb

Answer: C

112) Dimensional Analysis: If we find $v = A\lambda$, where λ is a length and v is a speed, what are the SI units for A?

A) m/s^2 B) s^{-1} C) kg · m/s D) m^2/s E) s

Answer: B

113) Dimensional Analysis: The rate R at which paint can be sprayed from a spray gun can be expressed as $R = a \cdot t$. If R is measured in m^3/s, and time t is measured in seconds, what are the SI units of a?

A) m^3/s B) m^{3}s^3 C) m^3 D) m^3/s^2 E) m^{3}s

Answer: D

114) Dimensional Analysis: The distance d through which a beam of length L is deflected when it is subjected to a fixed load may be described by the relationship $d = RL^2$. What are the SI units of the constant R?

A) m^3
B) m^{-1}
C) m^2
D) R is dimensionless
E) m

Answer: B

115) Dimensional Analysis: 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, distance/time^2, distance/time^3
C) time, time, time
D) distance, time, time^2
E) distance, distance/time, distance/time^2

Answer: E

116) Dimensional Analysis: Using dimensional analysis, which one of the following equations is dimensionally correct? In these equations, x has units of meters, t has units of seconds, v has units of meters per second, and a has units of meters per second^2.

A) $v = 2ax$ B) $x^2 = 2av$ C) $x = v/t$ D) $x = at$ E) $t^2 = x/a$

Answer: E

117) Dimensional Analysis: In Einstein's famous equation $E = mc^2$, describing the relationship between matter and energy, E stands for energy, m stands for mass, and c is the speed of light in vacuum. What are the SI units of E?

A) $\text{kg} \cdot \text{m}^2 / \text{s}^2$
B) kg/s
C) $\text{s}^2 / (\text{kg} \cdot \text{m})$
D) $\text{kg} \cdot \text{m/s}^2$
E) kg/s^2

Answer: A

118) Dimensional Analysis: The kinetic energy K of an object of mass m moving with speed v is given by the formula $K = \frac{1}{2}mv^2$. The SI unit of kinetic energy is the joule, J. Use this formula to express the joule in terms of the fundamental SI quantities of mass, length, and time.

A) $\text{J} = \text{kg}^2 \cdot \text{m}^2/\text{s}^2$ B) $\text{J} = \text{kg} \cdot \text{m/s}$ C) $\text{J} = \text{kg} \cdot \text{m/s}^2$ D) $\text{J} = \text{kg} \cdot \text{m}^2/\text{s}^2$

Answer: D

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

119) Dimensional Analysis: The gravitational force of attraction F between two tiny masses m_1 and m_2 that are separated by a distance r is $F = G\frac{m_1 m_2}{r^2}$. In the SI system, force has units of $\text{kg} \cdot \text{m/s}^2$. Use the given gravitational force formula to determine the SI units of G in terms of the fundamental quantities of mass, length, and time.

Answer: $\frac{\text{m}^3}{\text{kg} \cdot \text{s}^2}$

120) Dimensional Analysis: 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: $b = 1/2$, $c = 1/2$

121) Dimensional Analysis: 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: $b = 0$, $c = 1/2$, $d = -1/2$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

122) Dimensional Analysis: Newton's second law, $F = ma$, relates force F, mass m, and acceleration a. Use this equation to deduce the SI units of force.

A) s^2 / (kg · m)
B) kg · m/s^2
C) m^2/s^2
D) m/s^2
E) kg · m/s

Answer: B

123) Estimation: Estimate how many pennies would you have to stack to reach from the floor to an average 8-ft ceiling.

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

Answer: D

124) Estimation: Estimate the number of times the earth will rotate on its axis during a human's lifetime.

A) 3×10^6 B) 3×10^8 C) 3×10^5 D) 3×10^7 E) 3×10^4

Answer: E

125) Estimation: Estimate the thickness, in meters, of an ordinary sheet of paper.

A) 10^{-7} m B) 10^{-8} m C) 10^{-4} m D) 10^{-6} m E) 10^{-5} m

Answer: C

126) Estimation: Which of the following is the most reasonable estimate of the number of characters (typed letters or numbers) in a 609-page book? Assume an average of 194 words per page and a reasonable average number of letters per word.

A) 5×10^7 char B) 5×10^6 char C) 5×10^5 char D) 5×10^4 char

Answer: C

127) Estimation: A marathon race is 26 mi and 385 yd long. Estimate how many strides would be required to run a marathon. Assume a reasonable value for the average number of feet/stride.

A) 4.5×10^5 strides B) 4.5×10^3 strides C) 4.5×10^4 strides D) 4.5×10^6 strides

Answer: C

128) Estimation: Estimate the number of times an average person's heart beats in a lifetime. Assume the average heart rate is 69 beats/min and a life span of 75 years.

A) 3×10^7 beats B) 3×10^{10} beats C) 3×10^8 beats D) 3×10^9 beats

Answer: D