***Physics for Scientists and Engineers, 4e, Global Edition* (Knight)**
Chapter 1 Concepts of Motion

1.1 Conceptual Questions

1) The current definition of the standard meter of length is based on
A) the distance between the earth's equator and north pole.
B) the distance between the earth and the sun.
C) the distance traveled by light in a vacuum.
D) the length of a particular object kept in France.
Answer: C
Var: 1

2) The current definition of the standard second of time is based on
A) the frequency of radiation emitted by cesium atoms.
B) the earth's rotation rate.
C) the duration of one year.
D) the oscillation of a particular pendulum kept in France.
Answer: A
Var: 1

3) The current definition of the standard kilogram of mass is based on
A) the mass of the earth.
B) the mass of the sun.
C) the mass a particular object kept in France.
D) the mass of a cesium-133 atom.
Answer: C
Var: 1

4) If a woman weighs 125 lb, her mass expressed in kilograms is x kg, where x is
A) less than 125.
B) greater than 125.
Answer: A
Var: 1

5) If a tree is 15 m tall, its height expressed in feet is x ft, where x is
A) less than 15.
B) greater than 15.
Answer: B
Var: 1

6) If a flower is 6.5 cm wide, its width expressed in millimeters is x mm, where x is
A) less than 6.5.
B) greater than 6.5.
Answer: B
Var: 1

7) If an operatic aria lasts for 5.75 min, its length expressed in seconds is *x* s, where *x* is
A) less than 5.75.
B) greater than 5.75.
Answer: B
Var: 1

8) Scientists use the metric system chiefly because it is more accurate than the English system.
A) True
B) False
Answer: B
Var: 1

9) When adding two numbers, the number of significant figures in the sum is equal to the number of significant figures in the least accurate of the numbers being added.
A) True
B) False
Answer: B
Var: 1

10) When determining the number of significant figures in a number, zeroes to the left of the decimal point are never counted.
A) True
B) False
Answer: B
Var: 1

1.2 Problems

1) 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
Var: 5

2) Write out the number 7.35×10^{-5} in full with a decimal point and correct number of zeros.
A) 0.00000735
B) 0.0000735
C) 0.000735
D) 0.00735
E) 0.0735
Answer: B
Var: 5

3) 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
Var: 5

4) 0.00325×10^{-8} cm can also be expressed in mm as
A) 3.25×10^{-12} mm.
B) 3.25×10^{-11} mm.
C) 3.25×10^{-10} mm.
D) 3.25×10^{-9} mm.
E) 3.25×10^{-8} mm.
Answer: C
Var: 1

5) If, in a parallel universe, π has the value 3.14149, express π in that universe to four significant figures.
A) 3.141
B) 3.142
C) 3.1415
D) 3.1414
Answer: A
Var: 1

6) The number 0.003010 has
A) 7 significant figures.
B) 6 significant figures.
C) 4 significant figures.
D) 2 significant figures.
Answer: C
Var: 1

7) What is $\frac{0.674}{0.74}$ to the proper number of significant figures?

A) 0.91
B) 0.911
C) 0.9108
D) 0.9
Answer: A
Var: 50+

8) What is the value of $\pi(8.104)^2$, written with the correct number of significant figures?
A) 206.324
B) 206.323
C) 206.3
D) 206
E) 200
Answer: C
Var: 1

9) What is the sum of 1123 and 10.3 written with the correct number of significant figures?
A) 1.13×10^3
B) 1133.3000
C) 1.1×10^3
D) 1133.3
E) 1133
Answer: E
Var: 1

10) What is the sum of 1.53 + 2.786 + 3.3 written with the correct number of significant figures?
A) 8
B) 7.6
C) 7.62
D) 7.616
E) 7.6160
Answer: B
Var: 3

11) What is the difference between 103.5 and 102.24 written with the correct number of significant figures?
A) 1
B) 1.3
C) 1.26
D) 1.260
E) 1.2600
Answer: B
Var: 3

12) What is the product of 11.24 and 1.95 written with the correct number of significant figures?
A) 22
B) 21.9
C) 21.92
D) 21.918
E) 21.9180
Answer: B
Var: 3

13) What is the result of 1.58 ÷ 3.793 written with the correct number of significant figures?
A) 4.1656×10^{-1}
B) 4.166×10^{-1}
C) 4.17×10^{-1}
D) 4.2×10^{-1}
E) 4×10^{-1}
Answer: C
Var: 3

14) What is 34 + (3) × (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
Var: 5

15) 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
Var: 1

16) Add 3685 g and 66.8 kg and express your answer in milligrams (mg).
A) 7.05×10^{7} mg
B) 7.05×10^{4} mg
C) 7.05×10^{5} mg
D) 7.05×10^{6} mg
Answer: A
Var: 50+

17) Express $(4.3 \times 10^{6})^{-1/2}$ in scientific notation.
A) 4.8×10^{-4}
B) 2.1×10^{3}
C) 2.1×10^{-5}
D) 2.1×10^{4}
Answer: A
Var: 40

18) What is $0.205^{2/3}$, expressed to the proper number of significant figures?
A) 0.348
B) 0.35
C) 0.3
D) 0.3477
Answer: A
Var: 50+

19) 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 should be written as
A) 0.7 m^2.
B) 0.68 m^2.
C) 0.682 m^2.
D) 0.6818 m^2.
E) 0.68175 m^2.
Answer: C
Var: 1

20) The following exact conversion equivalents are given: 1 m = 100 cm , 1 in = 2.54 cm, and 1 ft = 12 in. If a computer screen has an area of 1.27 ft^2, this area is closest to
A) 0.00284 m^2.
B) 0.0465 m^2.
C) 0.118 m^2.
D) 0.284 m^2.
E) 4.65 m^2.
Answer: C
Var: 1

21) In addition to 1 m = 39.37 in., the following exact conversion equivalents are given: 1 mile = 5280 ft , 1 ft = 12 in , 1 hour = 60 min, and 1 min = 60 s. If a particle has a velocity of 8.4 miles per hour, its velocity, in m/s, is closest to
A) 3.8 m/s.
B) 3.0 m/s.
C) 3.4 m/s.
D) 4.1 m/s.
E) 4.5 m/s.
Answer: A
Var: 50+

22) A weight lifter can bench press 171 kg. How many milligrams (mg) is this?

A) 1.71×10^{8} mg
B) 1.71×10^{9} mg
C) 1.71×10^{7} mg
D) 1.71×10^{6} mg
Answer: A
Var: 50+

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

A) 15 ns
B) 67 ns
C) 11 ns
D) 65 ns
Answer: A
Var: 50+

24) The shortest wavelength of visible light is approximately 400 nm. Express this wavelength in centimeters.

A) 4×10^{-5} cm
B) 4×10^{-7} cm
C) 4×10^{-9} cm
D) 4×10^{-11} cm
E) 400×10^{-11} cm
Answer: A
Var: 1

25) The wavelength of a certain laser is 0.35 micrometers, where 1 micrometer = 1×10^{-6} m. Express this wavelength in nanometers.

A) 3.5×10^{2} nm
B) 3.5×10^{3} nm
C) 3.5×10^{1} nm
D) 3.5×10^{4} nm
Answer: A
Var: 50+

26) A certain CD-ROM disk can store approximately 6.0×10^2 megabytes of information, where 10^6 bytes = 1 megabyte. If an average word requires 9.0 bytes of storage, how many words can be stored on one disk?
A) 6.7×10^7 words
B) 5.4×10^9 words
C) 2.1×10^7 words
D) 2.0×10^9 words
Answer: A
Var: 9

27) A plot of land contains 5.8 acres. How many square meters does it contain?
[1 acre = 43,560 ft^2]
A) 2.3×10^4 m^2
B) 7.1×10^3 m^2
C) 7.0×10^4 m^2
D) 5.0×10^4 m^2
Answer: A
Var: 50+

28) A person on a diet loses 1.6 kg in a week. How many micrograms/second (μg/s) are lost?
A) 2.6×10^3 μg/s
B) 1.6×10^5 μg/s
C) 44 μg/s
D) 6.4×10^4 μg/s
Answer: A
Var: 11

29) Albert uses as his unit of length (for walking to visit his neighbors or plowing his fields) the albert (A), the distance Albert can throw a small rock. One albert is 92 meters. How many square alberts is equal to one acre? (1 acre = 43,560 ft^2 = 4050 m^2)
Answer: 1.29 A^2
Var: 50+

30) Convert a speed of 4.50 km/h to units of ft/min. (1.00 m = 3.28 ft)
A) 0.246 ft/min
B) 82.3 ft/min
C) 165 ft/min
D) 246 ft/min
E) 886 ft/min
Answer: D
Var: 1

31) The exhaust fan on a typical kitchen stove pulls 600 CFM (cubic feet per minute) through the filter. Given that 1.00 in. = 2.54 cm, how many cubic meters per second does this fan pull?
A) 0.283 m^3/sec
B) 0.328 m^3/sec
C) 3.05 m^3/sec
D) 32.8 m^3/sec
Answer: A
Var: 1

32) The mass of a typical adult woman is closest to
A) 20 kg.
B) 35 kg.
C) 75 kg.
D) 150 kg.
Answer: C
Var: 1

33) The height of the ceiling in a typical home, apartment, or dorm room is closest to
A) 100 cm.
B) 200 cm.
C) 400 cm.
D) 500 cm.
Answer: B
Var: 1

34) 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
Var: 1

35) 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) 3×10^7
Answer: C
Var: 1

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

A) 2×10^2

B) 2×10^3

C) 2×10^4

D) 2×10^5

E) 2×10^6

Answer: B
Var: 1

37) Estimate the number of times the 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
Var: 1

38) Estimate the number of pennies that would fit in a box one foot long 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
Var: 1

39) A marathon 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) 4.5×10^4 strides
B) 4.5×10^3 strides
C) 4.5×10^5 strides
D) 4.5×10^6 strides
Answer: A
Var: 1

40) 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 SI units of $\text{m} \cdot \text{s}^{-2}$.).
A) g/ℓ
B) $g\ell^2$
C) $g\ell$
D) $\sqrt{g\ell}$
E) $\sqrt{\ell/g}$
Answer: E
Var: 1

41) The speed of a wave pulse on a string depends on the tension, F, in the string and the mass per unit length, μ, of the string. Tension has SI units of $\text{kg} \cdot \text{m} \cdot \text{s}^{-2}$ and the mass per unit length has SI units of $\text{kg} \cdot \text{m}^{-1}$. What combination of F and μ must the speed of the wave be proportional to?
A) F / μ
B) μ / F
C) $\sqrt{\mu / F}$
D) $\sqrt{\mu F}$
E) $\sqrt{F / \mu}$
Answer: A
Var: 1

42) The position x, in meters, of an object is given by the equation $x = A + Bt + Ct^2$, where t represents time in seconds. What are the SI units of A, B, and C?
A) m, m, m
B) m, s, s
C) m, s, s^2
D) m, m/s, m/s^2
E) m/s, m/s^2, m/s^3
Answer: A
Var: 1