

Physics for Scientists and Engineers, 4e (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 operation 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 $1.58 \div 3.793$ 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 $34 + (3) \times (1.2465)$ 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

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: $1 \text{ m} = 100 \text{ cm}$, $1 \text{ in} = 2.54 \text{ cm}$, and $1 \text{ ft} = 12 \text{ in}$. 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 $1 \text{ m} = 39.37 \text{ in.}$, the following exact conversion equivalents are given: $1 \text{ mile} = 5280 \text{ ft}$, $1 \text{ ft} = 12 \text{ in}$, $1 \text{ hour} = 60 \text{ min}$, and $1 \text{ min} = 60 \text{ s}$. 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 ft²]

A) 2.3×10^4 m²

B) 7.1×10^3 m²

C) 7.0×10^4 m²

D) 5.0×10^4 m²

Answer: A

Var: 50+

28) A person on a diet loses 1.6 kg in a week. How many micrograms/second ($\mu\text{g/s}$) are lost?

A) 2.6×10^3 $\mu\text{g/s}$

B) 1.6×10^5 $\mu\text{g/s}$

C) 44 $\mu\text{g/s}$

D) 6.4×10^4 $\mu\text{g/s}$

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 ft² = 4050 m²)

Answer: 1.29 A²

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) $0.283 \text{ m}^3/\text{sec}$

B) $0.328 \text{ m}^3/\text{sec}$

C) $3.05 \text{ m}^3/\text{sec}$

D) $32.8 \text{ m}^3/\text{sec}$

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