Halliday/Resnick/Walker
Fundamentals of Physics 8th edition

Classroom Response System Questions

Chapter 1 Measurement

Interactive Lecture Questions
1.2.1. When we measure physical quantities, the units may be anything that is reasonable as long as they are well defined. It’s usually best to use the international standard units. Density may be defined as the mass of an object divided by its volume. Which of the following units would probably not be acceptable units of density?

a) gallons/liter

b) kilograms/m$^3$

c) pounds/ft$^3$

d) slugs/yd$^3$

e) grams/milliliter
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c) pounds/ft^3

d) slugs/yd^3

e) grams/milliliter
1.3.1. Complete the following statement: The ratio \( \frac{1 \text{ milligram}}{1 \text{ kilogram}} \) is equal to

a) \( 10^2 \)

b) \( 10^3 \)

c) \( 10^6 \)

d) \( 10^{-3} \)

e) \( 10^{-6} \)
1.3.1. Complete the following statement: The ratio \( \frac{1 \text{ milligram}}{1 \text{ kilogram}} \) is equal to

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b) \( 10^3 \)

c) \( 10^6 \)

d) \( 10^{-3} \)

e) \( 10^{-6} \)
1.3.2. Which one of the following choices is equivalent to $8.0 \text{ m}^2$?

a) $8.0 \times 10^{-4} \text{ cm}^2$

b) $8.0 \times 10^2 \text{ cm}^2$

c) $8.0 \times 10^{-2} \text{ cm}^2$

d) $8.0 \times 10^4 \text{ cm}^2$

e) $8.0 \times 10^3 \text{ cm}^2$
1.3.2. Which one of the following choices is equivalent to 8.0 m²?

a) $8.0 \times 10^{-4}$ cm²

b) $8.0 \times 10^{2}$ cm²

c) $8.0 \times 10^{-2}$ cm²

d) $8.0 \times 10^{4}$ cm²

e) $8.0 \times 10^{3}$ cm²
1.3.3. A certain physical quantity, $R$, is calculated using the formula: $R = 4a^2(b - c)$ where $a$ is a speed (a distance traveled per unit time interval) and $b$ and $c$ are distances. What is the SI unit for $R$?

a) cm/h

b) cm²/s

c) m²/h

d) m²/s

e) m³/s
1.3.3. A certain physical quantity, $R$, is calculated using the formula: $R = 4a^2(b - c)$ where $a$ is a speed (a distance traveled per unit time interval) and $b$ and $c$ are distances. What is the SI unit for $R$?

a) cm/h

b) cm$^2$/s

c) m$^2$/h

d) m$^2$/s

e) m$^3$/s
1.4.1. Express 61 mg in kilograms.

a) 6.1 kg

b) 0.061 kg

c) 0.00061 kg

d) 0.000061 kg

e) 0.0000061 kg
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c) 0.00061 kg

d) 0.000061 kg

e) 0.0000061 kg
1.4.2. A section of a river can be approximated as a rectangle that is 48 m wide and 172 m long. Express the area of this river in square kilometers.

a) $8.26 \times 10^{-3}$ km$^2$

b) 8.26 km$^2$

c) $8.26 \times 103$ km$^2$

d) 3.58 km$^2$

e) $3.58 \times 10^{-2}$ km$^2$
1.4.2. A section of a river can be approximated as a rectangle that is 48 m wide and 172 m long. Express the area of this river in square kilometers.

a) $8.26 \times 10^{-3}$ km$^2$

b) 8.26 km$^2$

c) $8.26 \times 10^3$ km$^2$

d) 3.58 km$^2$

e) $3.58 \times 10^{-2}$ km$^2$
1.4.3. Express the following statement as an algebraic expression: “There are 264 gallons in a one cubic meter container.” Let $G$ represent the number of gallons and $M$ represent the number of one cubic meter containers.

a) $G = 264M$

b) $G = M/264$

c) $G = 0.00379M$

d) $M = G/264$

e) $M = G$
1.4.3. Express the following statement as an algebraic expression: “There are 264 gallons in a one cubic meter container.” Let $G$ represent the number of gallons and $M$ represent the number of one cubic meter containers.

a) $G = 264M$

b) $G = M/264$

c) $G = 0.00379M$

d) $M = G/264$

e) $M = G$
1.4.4. Given that one inch is equal to 25.4 mm. How many feet equal 21 m?

a) 53.0 ft
b) 82.7 ft
c) 63.0 ft
d) 68.9 ft
e) 47.9 ft
1.4.4. Given that one inch is equal to 25.4 mm. How many feet equal 21 m?

a) 53.0 ft
b) 82.7 ft
c) 63.0 ft
d) 68.9 ft
e) 47.9 ft
1.4.5. Given that one inch is equal to 25.4 mm. How many meters equal 11.3 ft?

a) 3.4 m
b) 4.4 m
c) 2.9 m
d) 1.3 m
e) 2.2 m
1.4.5. Given that one inch is equal to 25.4 mm. How many meters equal 11.3 ft?

a) 3.4 m
b) 4.4 m
c) 2.9 m
d) 1.3 m
e) 2.2 m
1.4.6. Approximately how many seconds are there in a century?

a) 86 400 s

b) $5.0 \times 10^6$ s

c) $3.3 \times 10^8$ s

d) $3.2 \times 10^9$ s

e) $8.6 \times 10^4$ s
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d) $3.2 \times 10^9$ s

e) $8.6 \times 10^4$ s
1.4.7. A glacier is receding at a constant rate of 0.4 cm per day. After 3.0 years, by what length has the glacier receded? Express your answer in meters.

a) 17.1 m
b) 4.38 m
c) 9.82 m
d) 1.46 m
e) 12.7 m
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e) 12.7 m
1.4.8. Which one of the following pairs of units may not be added together, even after the appropriate unit conversions have been made?

a) feet and centimeters

b) seconds and slugs

c) meters and miles

d) grams and kilograms

e) hours and years
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e) hours and years
1.5.1. A unit of length used in astronomy and in the area of physics called special relativity is the light-year. The light-year (ly) is defined as the distance that light travels in vacuum in a one year interval of time. Estimate the order of magnitude of the number of kilometers in one light-year.

a) 7
b) 9
c) 11
d) 13
e) 15
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a) 7

b) 9

c) 11

d) 13

e) 15
1.5.2. Consider each of the following comparisons between various length units. Which one of these comparisons is false?

a) $1 \text{ m} > 10 \text{ cm}$

b) $1000 \text{ nm} < 1 \text{ mm}$

c) $1 \text{ foot} < 10 \text{ cm}$

d) $1 \text{ mile} > 1 \text{ km}$

e) $10 \text{ inches} < 1 \text{ m}$
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1.6.1. In an atomic clock there are approximately $9.193 \times 10^9$ oscillations of the specified light emitted by cesium-133 atoms. The text describes the typically accuracy of atomic clocks in terms of two atomic clocks differing by only one second in 6000 years. Assume one of the clocks gains one second in six thousand years, approximately what is the change in the number of oscillations of the light each second?

a) $+1.970 \times 10^{-9}$ oscillations/s

b) $+18.11$ oscillations/s

c) $+2.542 \times 10^{-3}$ oscillations/s

d) $+4.983$ oscillations/s

e) $+0.9222$ oscillations/s
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1.6.2. Consider each of the following comparisons between various time units. Which one of these comparisons is false?

a) $84,600 \text{ s} = 1 \text{ day}$

b) $1 \text{ h} > 3000 \text{ s}$

c) $1 \text{ ns} > 1000 \mu\text{s}$

d) $1 \text{ s} = 1000 \text{ ms}$

e) $1 \text{ y} = 5.26 \times 10^5 \text{ h}$
1.6.2. Consider each of the following comparisons between various time units. Which one of these comparisons is false?

a) $84\,600\,\text{s} = 1\,\text{day}$

b) $1\,\text{h} > 3000\,\text{s}$

c) $1\,\text{ns} > 1000\,\mu\text{s}$

d) $1\,\text{s} = 1000\,\text{ms}$

e) $1\,\text{y} = 5.26 \times 10^5\,\text{h}$
1.7.1. Gold can be compressed to a thickness of 1.0 micron to make gold leaf. If each cubic centimeter of gold has a mass of 19.32 g, what mass of gold leaf in grams is needed to cover a statue with a total surface area of 12 m²? **Note:** a micrometer is sometimes called a micron.

a) $1.2 \times 10^{-5}$ g

b) 1.6 g

c) 0.62 g

d) 231.8 g

e) $2.3 \times 10^{-3}$ g
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