

Answers to Period 1 Exercises

E.1 The British thermal unit (BTU) is a common unit of measurement for thermal energy. If one gallon of gasoline contains 126,000 BTU's, what is the energy content of 10 gallons of gasoline?

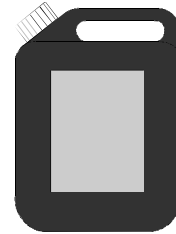
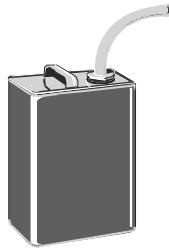
- a) 1.26×10^4 BTU's
- b) 1.26×10^5 BTU's
- c) 1.26×10^6 BTU's
- d) 1.26×10^7 BTU's
- e) 1.25×10^8 BTU's

$$126,000 = 1.26 \times 10^5$$

$$\frac{1.26 \times 10^5 \text{ BTUs}}{1 \text{ gal}} \times 10 \text{ gal} = 1.26 \times 10^6 \text{ BTUs}$$

E.1 = c

E.2 How much does the gasoline in each container cost per gallon?



a) \$1.00 for
0.75 gallons

b) \$10.00 for
8 gallons

c) \$7.00 for
5 gallons

a) $\frac{\$1.00}{0.75 \text{ gal}} = \frac{\$1.33}{1 \text{ gal}}$

b) $\frac{\$10.00}{8 \text{ gal}} = \frac{\$1.25}{1 \text{ gal}}$

c) $\frac{\$7.00}{5 \text{ gal}} = \frac{\$1.40}{1 \text{ gal}}$

E.3 3×10^5 times 5×10^7 is between

- a) 10^{10} and 10^{11}
- b) 10^{11} and 10^{12}
- c) 10^{12} and 10^{13}
- d) 10^{13} and 10^{14}
- e) 10^{14} and 10^{15}

$$3 \times 10^5 \text{ times } 5 \times 10^7 = 15 \times 10^{12} = 1.5 \times 10^{13}$$

E.3 = **d** between 10^{13} and 10^{14} because

$$10^{13} = 1 \times 10^{13} \text{ and}$$

$$10^{14} = 1 \times 10^{14} = 10 \times 10^{13}$$

E.4 Which of the following expression(s) is/are correct?

a) $10^A \times 10^B = 10^{A \times B}$

b) $10^A / 10^B = 10^{A / B}$

c) $10^A \times 10^{B/D} = 10^{[A \times B] / D}$

d) $10^{A+B} \times 10^C = 10^{A+B+C}$

e) None of the expressions is correct.

a) $10^A \times 10^B = 10^{A+B}$

b) $10^A / 10^B = 10^{A-B}$

c) $10^A \times 10^{B/D} = 10^{A+(B/D)}$

d) $10^{A+B} \times 10^C = 10^{A+B+C}$

E.4 = d

E.5 What is the efficiency of an energy conversion process, which requires 1,200 joules of energy to produce 400 joules of useful energy?

- a) 8%
- b) 33%
- c) 50%
- d) 75%
- e) 300%

$$\begin{aligned}\text{Efficiency} &= \frac{\text{Useful Energy Out}}{\text{Total Energy In}} = \frac{400 \text{ joules}}{1,200 \text{ joules}} \\ &= \frac{1}{3} = 33\%\end{aligned}$$

E.5 = b

E.6 Because of their large amounts, energy reserves are commonly expressed in a unit called the quad, for quadrillion. One quad is the equivalent of 10^{15} BTU's. If residential and commercial buildings use annually 30×10^{15} BTU's (= 3.0×10^{16} BTU's), how many quads of energy do they require?

- a) 3.0×10^1 quads
- b) 3.0×10^2 quads
- c) 3.0×10^0 quads
- d) 1.5×10^1 quads
- e) 1.5×10^2 quads

$$1 \text{ quad} = 10^{15} \text{ BTUs}$$

$$3.0 \times 10^{16} \text{ ~~BTUs~~} \times \frac{1 \text{ quad}}{10^{15} \text{ ~~BTUs~~}}$$

$$= 3.0 \times 10^{16-15} \text{ quads} = 3.0 \times 10^1 \text{ quads}$$

E.6 = a

E.7 The population of a certain country doubles every 30 years. If the population was 20 million in 1990, when will it reach 80 million, assuming that the doubling rate remains constant?

- a) 2020
- b) 2050
- c) 2080
- d) 2110
- e) 2140

population in 1990 = 20 million

“ in 2020 = 40 million

“ in 2050 = 80 million

E.7 = b

E.8 Use the data in Table 1.5 to find when a population of 1,000,000 people, with an annual growth rate of 16%, will reach 8,000,000.

- a) 4.7 years
- b) 9.4 years
- c) 14.1 years
- d) 18.8 years
- e) 23.5 years

A 16% growth rate has a **4.7 yr** doubling time

population now = 1,000,000

" in 4.7 yrs = 2,000,000

" in 9.4 yrs = 4,000,000

" in 14.1 yrs = 8,000,000

E.8 = c

Answers to Period 1 Exercises

E.1 c

E.2 a) \$1.33/gal

b) \$1.25/gal

c) \$1.40/gal

E.3 d

E.4 d

E.5 b

E.6 a

E.7 b

E.8 c