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**

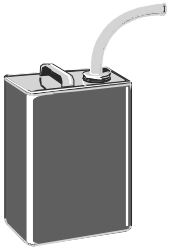
e) 1.25×10^8 **BTU's**

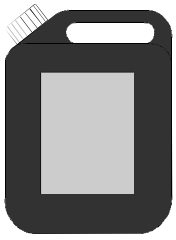
$126{,}000 = 1.26 \times 10^5$

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

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}

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

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

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

$$\text{Efficiency} = \frac{\text{Useful Energy Out}}{\text{Total Energy In}} = \frac{400 \text{ joules}}{1{,}200 \text{ joules}}$$

$$= 1/3 = 33\%$$

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 ($= 3.0 \times 10^{16}$ 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 quad $= 10^{15}$ BTUs

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

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