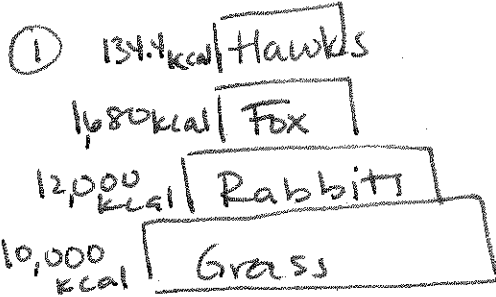


# Practice Problem Answers



Grass → rabbit 12%

$$\begin{array}{r}
 10,000 \text{ kcal} \\
 \times \quad .12 \\
 \hline
 200000 \\
 + 1000000 \\
 \hline
 12,000.00
 \end{array}$$

12,000 kcal Rabbit

Rabbit → Fox 14%

$$\begin{array}{r}
 12,000 \\
 \times \quad .14 \\
 \hline
 48000 \\
 + 120000 \\
 \hline
 168000
 \end{array}$$

1,680 kcal Fox

Fox → Hawk 8%

$$\begin{array}{r}
 1680 \\
 \times \quad .08 \\
 \hline
 13440 \\
 + 80000 \\
 \hline
 13440
 \end{array}$$

134.4 kcal Hawks

⑧  $GPP = 150 \text{ g/m}^2/\text{d}$

$RL = 25\% \rightarrow 0.25 = 37.5 \text{ g/m}^2/\text{d}$

$\rightarrow 1 \text{ g} = 2000 \text{ cal corn}$

Insolation Energy =  $500 \text{ cal/cm}^2/\text{d}$

$NPP = GPP - RL$

$NPP = 150 \text{ g/m}^2/\text{d} - 150 \text{ g/m}^2/\text{d} (0.25)$

$= 150 \text{ g/m}^2/\text{d} - 37.5 \text{ g/m}^2/\text{d}$

$= 112.5 \text{ g/m}^2/\text{d}$

$$\begin{array}{r} 150 \\ \times 0.25 \\ \hline 750 \\ + 3000 \\ \hline 3750 \end{array}$$

$$\begin{array}{r} 150.0 \\ - 37.5 \\ \hline 112.5 \end{array}$$

Overall Efficiency:

$\frac{\text{Energy NPP}}{\text{Insolation Energy}} \times 100$

$\frac{112.5 \text{ g/m}^2/\text{d} (2000 \text{ cal/g})}{500 \text{ cal/cm}^2/\text{d} (10000 \text{ cal/m}^2)}$

$\frac{225 \times 10^3}{5 \times 10^6}$

$$\frac{112.5}{2} = 225.0$$

$= \frac{45 \times 10^{-3}}{1} \times 100$

$$\begin{array}{r} 0.45 \\ 5 \overline{) 2.25} \\ \underline{- 2.0} \phantom{0} \\ 25 \phantom{0} \end{array}$$

$= 4.5\%$

- 9) 11 mg O<sub>2</sub>/L      Light } 5 mg O<sub>2</sub>/L = NPP  
      6 mg O<sub>2</sub>/L      Initial } 4 mg O<sub>2</sub>/L = RL  
      2 mg O<sub>2</sub>/L      Dark

↑ Already photosynthesized + loss O<sub>2</sub> through respiration

$NPP = GPP - RL$

$5 \text{ mg O}_2/\text{L} = GPP - 4 \text{ mg O}_2/\text{L}$

$9 \text{ mg O}_2/\text{L} = GPP$

13)  $GPP = 0.014 \text{ g/cm}^2/\text{d}$

$RL = 0.25$

$1 \text{ g} = 1000 \text{ cal}$

$NPP = 0.014 \text{ g/cm}^2/\text{d} - (0.014 \text{ g/cm}^2/\text{d} \cdot 0.25)$

$= 0.014 \text{ g/cm}^2/\text{d} - 0.0035 \text{ g/cm}^2/\text{d}$

$= 0.0105 \text{ g/m}^2/\text{d}$

$$\begin{array}{r} 0.014 \\ - 0.25 \\ \hline 0.0035 \\ \hline 0.0105 \end{array}$$

$$\begin{array}{r} 0.0105 \\ - 0.0035 \\ \hline 0.0070 \end{array}$$

$\frac{0.0105 \text{ g/m}^2/\text{d} (1000 \text{ cal/g})}{9 \times 10^{10} \text{ cal/m}^2/\text{d} (9 \times 10^4 \text{ cm}^2)}$

$= \frac{105}{900}$

$$\begin{array}{r} 0.0116 \\ 900 \overline{) 10500} \\ \underline{900} \phantom{00} \\ 1500 \phantom{0} \\ \underline{900} \phantom{0} \\ 6000 \\ \underline{5400} \\ 600 \end{array}$$

$= 0.0116 \times 100$

$= 1.16\%$

$$(14) \text{ NPP} = 140 \text{ g/m}^2/\text{d}$$

$$RL = 20\% = 0.2$$

$$I\dot{E} = 800 \text{ cal/m}^2/\text{d}$$

$$I\dot{g} = 2000 \text{ cal}$$

$$140 \text{ g/m}^2/\text{d} = \text{GPP} - RL$$

$$140 \text{ g/m}^2/\text{d} = X - 0.2X$$

$$\frac{140 \text{ g/m}^2/\text{d}}{0.8} = \frac{0.8X}{0.8}$$

$$X = 175 \text{ g/m}^2/\text{d}$$

$$\begin{array}{r} 175 \\ 0.8 \overline{) 140} \\ \underline{136} \\ 4 \\ \underline{-4} \\ 0 \end{array}$$

$$\frac{140 \text{ g/m}^2/\text{d} (2000 \text{ cal/g})}{800 \text{ cal/m}^2/\text{d} (10^6 \text{ cm}^2/\text{m}^2)}$$

$$= \frac{28 \times 10^9}{8 \times 10^6}$$

$$= 3.5 \times 10^{-2} \times 100 = 3.5\%$$

$$\begin{array}{r} 03.5 \\ 8 \overline{) 28.0} \\ \underline{-24} \\ 40 \end{array}$$

- ① NPP 8000 kcal/m<sup>2</sup>  
 RL = 12000 kcal/m<sup>2</sup>/y  
 GP = ?

$$8000 \text{ kcal/m}^2/\text{y} = \text{GPP} - 12000 \text{ kcal/m}^2/\text{d}$$

$$20,000 \text{ kcal/m}^2/\text{y} = \text{GPP}$$

- ② RL 5 kg C/m<sup>2</sup>/y  
 NPP 10 kg C/m<sup>2</sup>/y  
 10 kg C/m<sup>2</sup>/y = GPP - 5 kg C/m<sup>2</sup>/y  
 15 kg C/m<sup>2</sup>/y = GPP

- ③ 5 kg L/m<sup>2</sup>/y (10,000 kJ/kg)  
 = 50,000 kJ/m<sup>2</sup>/y

- ④ L 10 mg/L > 1 mg/L = NPP  
 I 10 mg/L > 5 mg/L = RL  
 D 5 mg/L

$$1 \text{ mg/L} = \text{GPP} - 5 \text{ mg/L}$$

$$6 \text{ mg/L} = \text{GPP}$$

- ⑤ L 17 g/cm<sup>2</sup>/d > 7 g/cm<sup>2</sup>/d = NPP  
 I 10 g/cm<sup>2</sup>/d > 2.8 g/cm<sup>2</sup>/d = RL  
 D 7.2 g/cm<sup>2</sup>/d  
 7 g/cm<sup>2</sup>/d = GPP - 2.8 g/cm<sup>2</sup>/d  
 9.8 g/cm<sup>2</sup>/d = GPP

- ⑥ L 11g > 2g NPP  
 I 9g > 1g NPP  
 D 8g  
 2g = GPP - 1g  
 3g = GPP

