

**FINAL EXAM MATH REVIEW**  
**REMEMBER ALWAYS SHOW YOUR WORK**

**HALF LIFE**

1. The half-life of boron is approximately 2 days. 2 weeks later, the amount of boron was measured. What would be the closest fraction of the original amount remaining?

1.  $\frac{1}{2} = 2 \text{ days}$        $2 \text{ weeks} = 14 \text{ days}$

| %               | days |
|-----------------|------|
| 100             | 0    |
| $\frac{1}{2}$   | 2    |
| $\frac{1}{4}$   | 4    |
| $\frac{1}{8}$   | 6    |
| $\frac{1}{16}$  | 8    |
| $\frac{1}{32}$  | 10   |
| $\frac{1}{64}$  | 12   |
| $\frac{1}{128}$ | 14   |

2. The half-life of uranium is about 6 days. Approximately 5 weeks later, the amount of uranium is measured. What would be closest fraction of the original amount remaining?

2.  $\frac{1}{2} = 6 \text{ days}$        $5 \text{ weeks} = 35 \text{ days}$

|                |    |
|----------------|----|
| 100            | 0  |
| $\frac{1}{2}$  | 6  |
| $\frac{1}{4}$  | 12 |
| $\frac{1}{8}$  | 18 |
| $\frac{1}{16}$ | 24 |
| $\frac{1}{32}$ | 30 |
| $\frac{1}{64}$ | 36 |

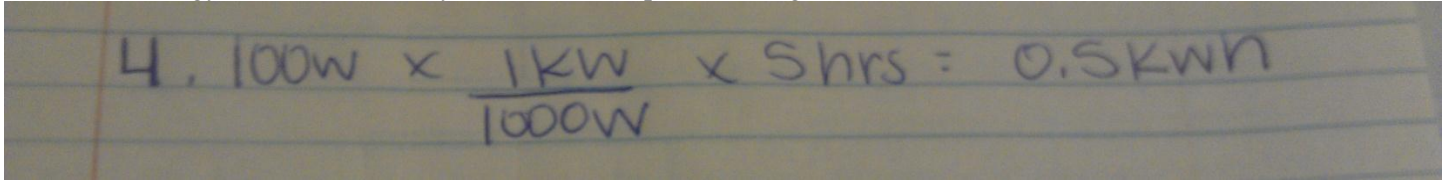
3. Uranium-235 has a half-life of 710 million years. If it is determined that a certain amount of stored U-235 will be considered safe only when its radioactivity has dropped to 0.10 percent of the original level, approximately how much time must the U-235 be stored securely to be safe?

3.  $\frac{710 \times 10^6 \text{ years}}{0.10} = \frac{710 \times 10^6}{10 \times 10^{-2}}$

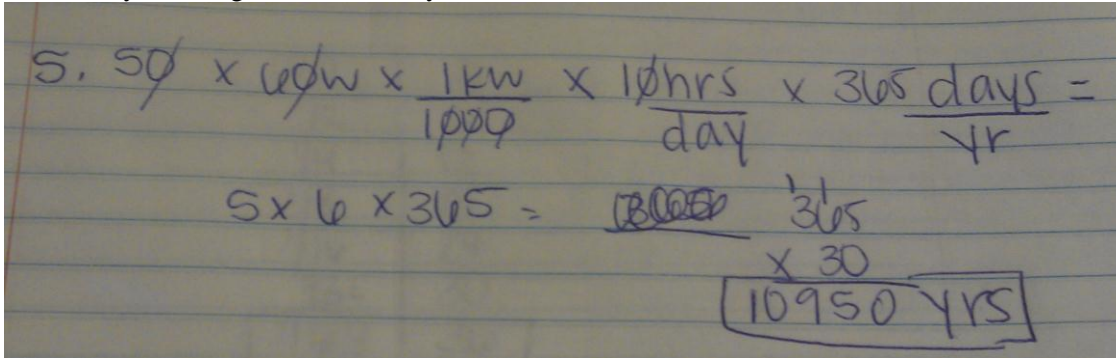
$71 \times 10^8 = 7.10 \times 10^9 \text{ years}$

## ENERGY

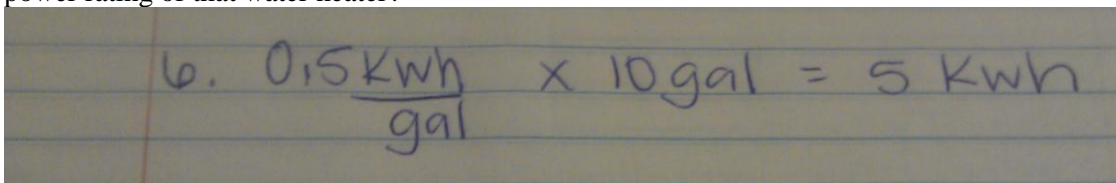
4. How much energy, in kWh, is used by a 100-watt computer running for 5 hours?


$$4. 100w \times \frac{1kw}{1000w} \times 5hrs = 0.5kwh$$

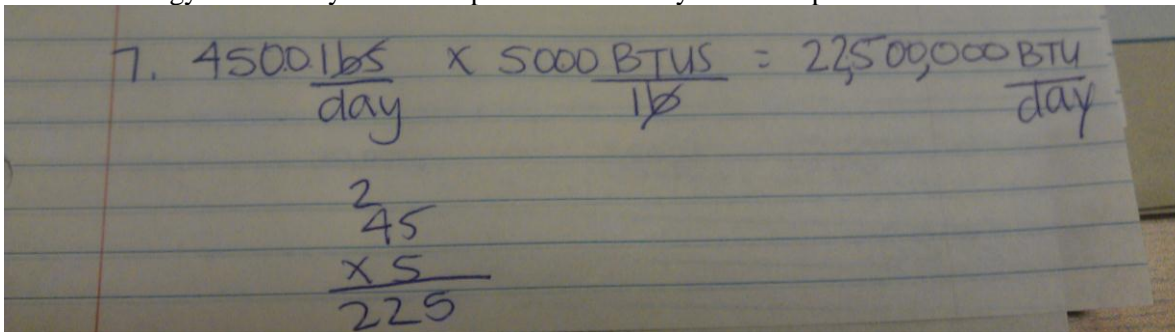
5. A home uses 50, 60 watt light bulbs for 10 hours a day. Approximately how many kilowatt-hours of electrical energy are used by those light bulbs in one year?


$$5. 50 \cancel{0} \times 60w \times \frac{1kw}{1000} \times \frac{10hrs}{day} \times \frac{365 days}{yr} =$$
$$5 \times 6 \times 365 = \cancel{10950} \times 30 = \boxed{10950 YRS}$$

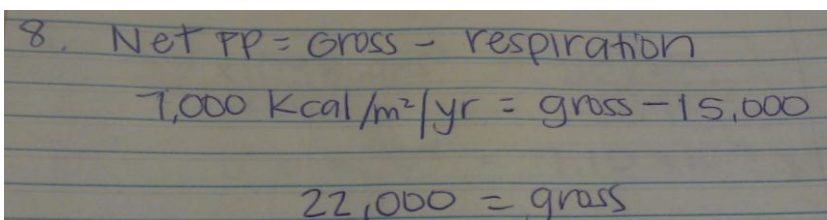
6. A hot water heater requires .5 kWh/gallon of water it heats. If a typical shower uses 10 gallons of water, what is the power rating of that water heater?


$$6. \frac{0.5kwh}{gal} \times 10gal = 5kwh$$

7. A typical coal-burning power plant uses 4,500 lbs of coal per day. Each pound of coal produces 5,000 BTUs of electrical energy. How many BTUs are produced each day from this plant?


$$7. \frac{4500 lbs}{day} \times \frac{5000 BTUS}{lb} = 22,500,000 \frac{BTU}{day}$$
$$\begin{array}{r} 2 \\ 45 \\ \times 5 \\ \hline 225 \end{array}$$

8. The net primary productivity of a particular rain forest ecosystem is found to be 7,000 kcal/m<sup>2</sup>/yr. If respiration by the producers is 15,000 kcal/m<sup>2</sup>/yr., what is the gross primary productive for this ecosystem?


$$8. \text{Net PP} = \text{Gross} - \text{respiration}$$
$$7,000 \text{ Kcal/m}^2/\text{yr} = \text{gross} - 15,000$$
$$22,000 = \text{gross}$$



## RATES AND PERCENTS

| YEAR | CONSUMPTION<br>(million barrels per day) |
|------|--|
| 1980 | 60                                       |
| 1981 | 61                                       |
| 1982 | 63                                       |
| 1983 | 65                                       |
| 1984 | 66                                       |
| 1985 | 67                                       |
| 1986 | 67                                       |
| 1987 | 67                                       |
| 1988 | 70                                       |
| 1989 | 72                                       |
| 1990 | 75                                       |
| 1991 | 100                                      |

9. If the US has an oil reserve of 2,000 billion barrels and it continues to use oil at the 1991 rate, ABOUT how many YEARS will the oil last?

9.  $2000 \times 10^9 \text{ barrels} = 20 \times 10^5 \text{ days}$   
 $\frac{20 \times 10^5 \text{ barrels}}{100 \times 10^6 \text{ barrels/day}}$

$20 \times 10^5 \text{ days} \times \frac{1 \text{ yr}}{365 \text{ days}}$

365  $\overline{) 20000.0}$   
 $\underline{1825}$   
 $1750$   
 $\underline{1400}$   
 $2900$

$54.8 \approx 55 \text{ yrs}$

10. What was the approximate percent increase in consumption from 1980 to 1991?

10.  $\frac{100 \times 10^6 - 60 \times 10^6}{60 \times 10^6} \times 100$

$\frac{100 - 60}{60} \times 100$

11. The combustion of one gallon of automobile fuel produces about 10 pounds of carbon (in CO<sub>2</sub>). Two autos are making a trip of 500 miles. The first auto gets 15 miles per gallon and the second gets 20 miles per gallon. Approximately how much less carbon (in CO<sub>2</sub>) will be produced by the second auto on this trip?

11.  $500 \text{ miles} \times \frac{1 \text{ gal}}{15 \text{ miles}} \times \frac{10 \text{ lbs}}{\text{gal}} = \frac{5000}{15} = 333$

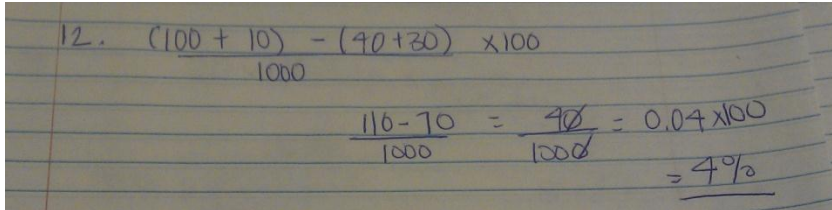
$500 \text{ miles} \times \frac{1 \text{ gal}}{20 \text{ miles}} \times \frac{10 \text{ lbs}}{\text{gal}} = \frac{5000}{20} = 250$

$\begin{array}{r} 333 \\ - 250 \\ \hline 83 \end{array} = 83 \text{ lb difference}$

### PERCENT GROWTH RATE

$$\frac{(\text{Crude birth rate} + \text{immigration rate}) - (\text{Crude death rate} + \text{emigration rate})}{\text{Total population}} \times 100 = \% \text{ Growth rate}$$

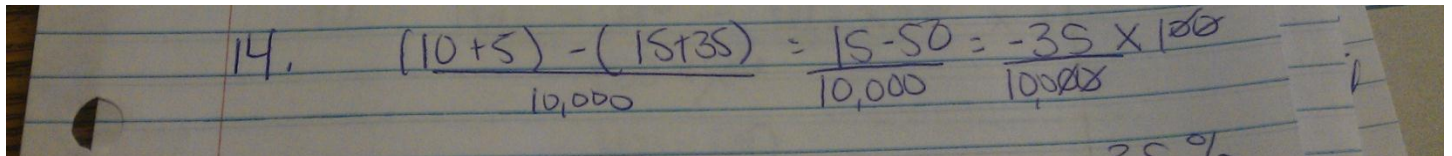
12. If a population of 1000 experiences 100 births, 40 deaths, 10 immigrants, and 30 emigrants, what is the population growth rate?



Handwritten calculation for problem 12:

$$12. \frac{(100 + 10) - (40 + 30)}{1000} \times 100$$
$$\frac{110 - 70}{1000} = \frac{40}{1000} = 0.04 \times 100$$
$$= 4\%$$

13. If a population of 10,000 experiences 10 births, 15 deaths, 5 immigrants, and 35 emigrants, what is the population growth rate? .



Handwritten calculation for problem 13:

$$13. \frac{(10 + 5) - (15 + 35)}{10,000} \times 100 = \frac{15 - 50}{10,000} = \frac{-35}{10,000} \times 100$$
$$= -3.5\%$$