

Name: _____ period: _____ date: _____

ch. 2, 5, 11 conversion factor, light, mole test 65 points honors chemistry

In problems involving calculations, show your work in an organized manner, include the appropriate formula / equation, conversion factors, units and the proper number of significant figures in your answer.

1. Fill-in the below blank; no work need be shown. [10 points]

2pts

a. $\frac{88.0}{2.0} = 44$

b. $\frac{888.0}{2.0} = 444.0$ or equivalent

c. half of 888 = 444

d. $21.6 + 35.27 = 56.87 \rightarrow 56.9$

e. $12.0 * 7.0 = 84$

2. Solve; show your work. [10 points]

a. $25 \text{ m}^3 = \text{ ____ mL}$

$25 \text{ m}^3 \left(\frac{10^2 \text{ cm}}{\text{m}} \right)^3 \frac{\text{mL}}{\text{cm}^3} = 25 \cdot 10^6 \text{ mL}$

1pt

b. $\frac{100 \text{ m}}{11 \text{ seconds}} = \text{ ____ } \frac{\text{miles}}{\text{hour}}$; hint: 1760 yards = 1 mile & 2.54 cm = 1 inch, exactly

$\frac{100 \text{ m}}{11 \text{ sec}} \cdot \frac{10^2 \text{ cm}}{\text{m}} \cdot \frac{\text{inch}}{2.54 \text{ cm}} \cdot \frac{\text{yard}}{36 \text{ inch}} \cdot \frac{\text{mi}}{1760 \text{ yard}} \cdot \frac{60 \text{ sec}}{\text{min}} \cdot \frac{60 \text{ min}}{\text{hour}} = \frac{20 \text{ mi}}{\text{hr}}$

3. Solve regarding light. [10 points]

a. If its wavelength = 275 nm, then its frequency = ?

$\lambda f = c \rightarrow f = \frac{c}{\lambda} = \frac{3.0 \cdot 10^8 \text{ m} (\frac{1}{s})}{275 \text{ nm}} \cdot \frac{10^9 \text{ nm}}{\text{m}} = 1.1 \cdot 10^{15} \text{ Hz}$

2+3pts

b. If the energy of light is $5.0 \cdot 10^{-21} \text{ J}$, then what is it's wavelength ?

(i) $E = hf$

$5.0 \cdot 10^{-21} \text{ J} = 6.63 \cdot 10^{-34} \text{ Js } f$

$f = 7.54 \cdot 10^{12} \text{ Hz}$

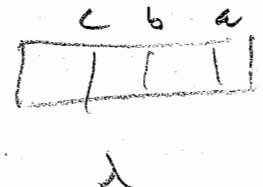
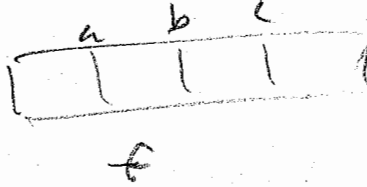
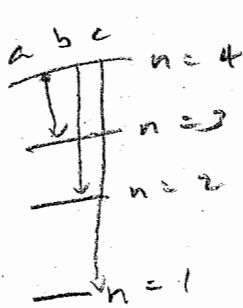
(ii) $\lambda f = c$

$\lambda = \frac{c}{f} = \frac{3 \cdot 10^8 \text{ m/s}}{7.54 \cdot 10^{12} \text{ Hz}}$

$= 4.0 \cdot 10^{-5} \text{ m}$

4. If there are electrons in the $n = 4$ electron energy level in hydrogen atoms, [20 points]

a. sketch and appropriately label the horizontal axis of the appropriate absorption or emission spectrum, which shows *all* possible signals; label each signal in the spectrum by lower case letters



need not label spectrum for part a

b. clearly identify the electron energy level transition(s) corresponding to each signal in the spectrum

see above spectrum

match e^- energy diagram & spectrum

5pt

c. is it an absorption or emission spectrum?

d. which electron energy transition / signal has the highest energy? lowest energy?

c

a

5. solve. [15 points]

a. 25 millimoles of calcium chloride = ___ grams

$$25 \text{ mmol } \text{CaCl}_2 \cdot \frac{1 \text{ mol}}{10^3 \text{ mmol}} \cdot \frac{111 \text{ g}}{\text{mol}} = 2.8 \text{ g}$$

5pt

b. 75 kg of water = ___ moles of water

$$75 \text{ kg} \cdot \frac{10^3 \text{ g}}{\text{kg}} \cdot \frac{\text{mol}}{18 \text{ g}} = 4167 \rightarrow 4.2 \cdot 10^3 \text{ mol}$$

c. 1.0 gram of carbon dioxide = ___ molecules

$$1 \text{ g } \text{CO}_2 \cdot \frac{6.02 \cdot 10^{23} \text{ molecules}}{44 \text{ g } \text{CO}_2} = 1.4 \cdot 10^{22} \text{ molecules}$$