CHEM 103 Summer 2023

06/01/23

Your car runs out of gas by an abandoned gas station that has a sign saying: “Next gas, 80 miles”. You get out and look around and find a scale as well as a container with some gasoline in it. You weigh the container and find that it weighs 21.7 pounds. You then empty the container into your car’s gas tank. When you reweigh the empty container you find that it weighs 3.4 pounds. You know that the density of gasoline is 0.85 grams per cubic centimeter. You also know that your car gets 27 miles per gallon. Are you going to make it to the next gas station?

$21.7\text{ lb} - 3.4\text{ lb} = 18.3\text{ lb gas}$

$18.3\text{ lb gas} \times \frac{1\text{ kg}}{2.2\text{ lb}} = 8.31\text{ kg gas} \times \frac{1000\text{ g}}{\text{kg}} = 8310\text{ g gas}$

$8310\text{ g gas} \times \frac{1\text{ cm}^3}{0.85\text{ g}} \times \frac{1\text{ L}}{1000\text{ cm}^3} \times \frac{1\text{ gallon}}{3.7\text{ L}} = 2.64\text{ gallons}$

$2.64\text{ gallons} \times \frac{27\text{ miles}}{\text{gallon}} = 71.3\text{ miles}$ – won't make it to gas station

While scavenging through a wrecked Corellian freighter you find a shiny piece of beskar that weighs 42 quads. You take the beskar to the scrap market on Jakku where they offer you a price of 19 quasi-farthings per ounce (note that 11 quads is equivalent to 72 grams). At the currency exchange, 8.3 imperial credits can be traded for 4.9 quasi-farthings. You can buy 2 days worth of rations for 9 pieces of standard scrip – but they will not accept imperial credits (the café owner is making a political statement). Luckily you find a Wookie who will exchange your imperial credits for standard scrip – but at an extortionary rate of 3.5 imperial credits for 2 pieces of scrip. If you sell the beskar how many days of food can you buy?

$42\text{ quads} \times \frac{72\text{ grams}}{11\text{ quads}} \times \frac{1\text{ kg}}{1000\text{ g}} \times \frac{2.2\text{ lb}}{1\text{ kg}} \times \frac{16\text{ ounces}}{1\text{ lb}} = 9.68\text{ ounces beskar}$

$9.68\text{ ounces} \times \frac{19\text{ qf}}{\text{ounce}} \times \frac{8.3\text{ credits}}{4.9\text{ qf}} \times \frac{2\text{ scrip}}{3.5\text{ credits}} \times \frac{2\text{ days food}}{9\text{ scrip}} = 29.6\text{ days of food}$

but you have to buy 2 days/9 scrip at a time

so you can buy 38 days of food