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Application Questions Chapter 5

1. Prepare a table identifying several energy transitions that take place during the typical operation of an automobile. 10pts

Chemical potential energy to thermal energy	Combustion of gasoline
Thermal energy to kinetic energy	Energy used for acceleration of the vehicle through piston movement
Electric energy to sound energy	Working of radio
Fuel to rational energy and heat	Starter motor
Chemical energy to electric energy	Automobile battery to the starter motor

2. Which is the least expensive source of energy in kilojoules per dollar: a box of breakfast cereal that weighs 32 ounces and costs $4.23, or a liter of isooctane (density, 0.6919 g/mL) that costs $0.45? Compare the nutritional value of the cereal with the heat produced by combustion of the isooctane under standard conditions. A 1.0-ounce serving of the cereal provides 130 Calories. 10pts

Cereal: 130 cal/ounce x 10^{-3} kcal/cal x 4.184 kj/kcal = 0.544kj/ounce
0.544kj/ounce x 32.0 ounce = 17.408kj
17.408kj / $4.23= 4.12kj/$

Isooctane: Q= $\Delta_c H^\circ n$ Q= energy released by combustion
$\Delta_c H^\circ$= heat of combustion of isooctane
n= number of moles of isooctane

1L x 10^3 ml/L x 0.6919g/ml= 691.9g
691.9g / 114.2285g*mol= 6.057
-5461.3 kj/mol x 6.057mol= -3.307 x 10^4 kj
Q=3.307 x 10^4 kj
3.307 x 10^4 kj / $0.45 = 7.349 x 10^4 kj/$
7.349 x 10^4 kj/$>> 4.12kj/$

More kilojoules of energy can be obtained by burning isooctane than eating cereal by buying $1 of them.