Homework, Section 2

• Specific Impulse is a commonly used measure of performance For Rocket Engines,and for steady state-engine operation is defined As:

$$I_{sp} = \frac{1}{g_0} \frac{F_{thrust}}{\dot{m}_{propellant}} \rightarrow g_0 = 9.806 \frac{m}{\sec^2} (mks)$$

• At 100% Throttle a Solid Rocket Motor has the Following performance characteristics

F_{vac}	=	90,000 Nt
F_{sl}	=	60,000 Nt
Isp_{vac}	=	280 sec.

Homework, Section 2

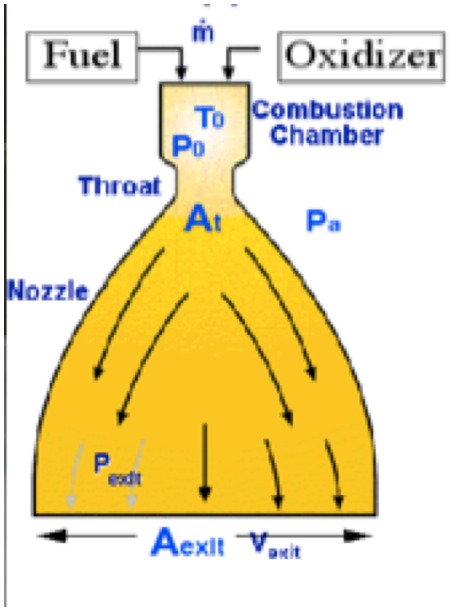
- Additional data

p_∞ Sea level	-- 101.325 kpa
p_∞ 20km altitude	-- 5.4748 kpa
p_e	-- 35 .000 kpa

- Exit nozzle gas has a molecular weight of 19.4831 kg/kg-mole

Cp=1649.18 J/kg-K, …… T_{exit} = 1800 °K

- What is the diameter of the Nozzle exit?
- What is the Nozzle Exit Mach Number
- What is the Specific Impulse and Thrust of the Rocket motor at 20 km altitude?



Homework, Section 2, Concluded

- ***If our Rocket Weighs 10,000 kg Dry, how Much Propellant is Needed to Accelerate by 1 km/sec @ 20,000 meters altitude***

  that is, a change in velocoty