McMaster University | Graduate Study | Dr Nik Popov
Engineering Physics | Course EP716
Reactor Thermal-Hydraulics Design

Student:	Test #3
Date: 27 Nov 2002	Fuel-coolant Heat Transfer Critical Heat Flux Pressure Drop
Scope:	1. Derive the fuel temperature at the surface of the fuel pellet as a function of axial direction, and find the location of the maximum temperature, and show the maximum temperature. **[20 points]** 2. In a fuel element with UO2 pellet radius of 1 cm, and linear power of 500 W/cm, find the difference in fuel centreline temperature between the following two cases: • Heat conduction coefficient in the UO2 is constant at 0.025 (W/cm K) • Heat conduction coefficient in the UO2 is linearly dependent on temperature (two zone approach) i. 0.07 (W/cm K) @ 500 K ii. 0.03 (W/cm K) @ 1300 K iii. 0.025 (W/cm K) @ 2300 K **[20 points]** 3. Explain the definition of CHF in terms of • Minimum CHF Ratio (MCHFR) • Minimum CHF Power (MCHFPR) • Minimum Critical Power Ratio (CPR) Provide an explanation of the diagram, and how do you understand the use of each of the three methods. **[20 points]** 4. Explain the impact of separate effects relevant to CHF in CANDU fuel bundles. Provide a rationale which separate effects and how can be used in CHF enhancing design modifications. **[20 points]** 5. Explain the factors that influence the pressure drop in general piping and CANDU fuel bundles. Identify important differences between the single-phase and two-phase pressure drop calculations. **[20 points]**