Scores
 part one: number correct_____ x 4 = _____ minus number wrong _____ = _____ (A)

 part two: _____ (B)   Total score (A)+(B) _____

Part one Instructions: Work in teams of two. You should use the formulas, constants, and conversion factors provided and your notes. <u>Record your answers by circling the letter to the right</u>. Each correct answer worth 4 points; one point will be deducted for each wrong answer. (Maximum score on part 1 is 24 points.)

	In problems 1 through 6 you are to **choose the closest answer**.	Circle the letter of the correct answer
1.	If the velocity in a 12 inch pipe is 1.65 ft/sec, what is the velocity, (ft/sec) in a 3 inch diameter jet issuing from a nozzle attached to the pipe? (a) 2.64 (b) 3.64 (c) 5. (d) 26.4 (e) 30.	a b c d e
2.	Water flows through a 12 inch diameter pipe at the rate of 500 gallons per minute. The pipe later reduces to a 6 inch diameter pipe. Calculate the velocity in the smaller pipe in ft/sec. (a) 1.42 (b) 14.2 (c) 5.67 (d) 9.20 (e) 56.7	a b c d e
3.	Using the Darcy equation, calculate the head loss in a horizontal pipe of constant cross-sectional area if the inside diameter of the pipe is 6 inches, the pipe is carrying water flowing at a speed of 2 ft/sec, and the length of the pipe is 200 ft. The friction factor has been determined to be 0.024. (a) $0.25\,ft$ (b) $0.596\,ft$ (c) $0.921\,ft$ (d) $1.25\,ft$ (e) $4.93\,ft$	a b c d e
4.	What size asphalted cast-iron pipe is needed to carry water at a discharge of 12 cfs and with a head loss of 4 ft per 1000 ft of pipe. Use f =0.0155. (a) $12\,in$ (b) $15\,in$ (c) $18\,in$ (d) $21\,in$ (e) $24\,in$	a b c d e
5.	The theoretical velocity (ft/sec) generated by a 10 foot static head is: (a) 12.2 (b) 17.9 (c) 25.4 (d) 29.2 (e) 35.8	a b c d e
6.	What is the static head (ft) corresponding to a flow velocity of 10 ft/sec? (a) 1.55 (b) 1.75 (c) 2.05 (d) 2.25 (e) 2.50	a b c d e

(over)

Part two Instructions: Work in teams of two. You should use the formulas, constants, and conversion factors provided and your notes. <u>Record your answers by circling the letter to the right</u>. Each correct answer worth 4 points; one point will be deducted for each wrong answer. (Maximum score on part 2 is 24 points.)

	In problems 7 through 12 you are to **choose the closest answer**.	Circle the letter of the correct answer
7.	A 24-inch water pipe carries 15 cfs. At point A the elevation is 150 feet and the pressure is 30 psi. At point B, 4000 feet downstream from A, the elevation is 130 feet and the pressure is 35 psi. Determine the <u>head loss</u> in feet, h_L, between A and B. (a) 3.5 (b) 5.0 (c) 8.5 (d) 15.0 (e) 17.5	a b c d e
8.	What <u>flow</u> (in cfs) can be expected in a 4 ft wide rectangular channel laid on a slope of 4 ft in 10,000 ft, if the water flows 2.5 ft deep? Use a Manning's roughness factor of $n = .015$. (a) 2.13 (b) 3.15 (c) 15.9 (d) 21.3 (e) 31.5	a b c d e
9.	In a hydraulics laboratory, a flow of 14.5 cfs was measured from a rectangular channel flowing 4 ft wide and 2.5 ft deep. If the slope of the channel was .00040, what is the Manning <u>roughness factor</u> for the lining of the channel? (a) .010 (b) .015 (c) .019 (d) .022 (e) .025	a b c d e
10.	On what <u>slope</u> should a 24 inch diameter sewer pipe be laid in order that 6.00 cfs will flow when the sewer is half full? Use $n = .013$. (a) .0004 (b) .0008 (c) .0009 (d) .0012 (e) .0028	a b c d e
11.	How <u>wide</u> must a rectangular channel be constructed in order to carry 500 cfs at a depth of 6 ft on a slope of .00040? Use $n = .010$. (Hint: Use of a numeric solver on the calculator is recommended.) (a) 6.2 ft (b) 10.1 ft (c) 13.1 ft (d) 15.6 ft (e) 19.2 ft	a b c d e
12.	A vitrified sewer pipe flows .80 full. What is the <u>hydraulic radius</u> in as a function of the diameter? (a) 0.291d (b) 0.304d (c) 0.632d (d) 0.98d (e) 1.50d	a b c d e