48 points total   School _____

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.	Water flows through a 3 in diameter pipe at a velocity of 10 ft/s. Find the volume flow rate in gpm. $(a)\,22$ $(b)\,36$ $(c)\,220$ $(d)\,361$ $(e)\,440$	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. (Continuity) $(a)\,1.42$ $(b)\,14.2$ $(c)\,5.67$ $(d)\,9.20$ $(e)\,56.7$	a b $<c>$ d e
3.	Convert 28 mgd into cfs. $(a)\,1.55cfs$ $(b)\,15.5cfs$ $(c)\,23.7cfs$ $(d)\,31.5cfs$ $(e)\,43.4cfs$	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. (Darcy) $(a)\,12in$ $(b)\,15in$ $(c)\,18in$ $(d)\,21in$ $(e)\,24in$	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.	Water flows through a 1/2 in diameter hose at 3 gallons per minute. Water velocity in $ft/\sec$ is nearest to: $(a)\,1.$ $(b)\,5.$ $(c)\,10.$ $(d)\,20.$ $(e)\,50.$	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.	Given a frictionless flow of water at 125.6 $ft^3/\sec$ in a long, horizontal, conical pipe, of diameter 2 ft at one end and 6 ft at the other. The pressure head at the smaller end is 18 ft of water. Find the pressure head in ft at the larger end. (Hint: frictionless $\Rightarrow h_L = 0$; horizontal $\Rightarrow z_1 = z_2$) (*a*) 3.5 (*b*) 15.0 (*c*) 28.5 (*d*) 42.5 (*e*) 57.5	$a \quad b \quad c \ <d> \ e$
8.	A rectangular channel, 16 ft wide, carries a flow of 192 cfs. The depth of water on the downstream side of the hydraulic jump is 4.20 ft. What is the depth upstream? (Reminder: q is volume flow rate <u>per unit width</u> of channel) (*a*) 0.213 (*b*) 0.455 (*c*) 1.10 (*d*) 1.39 (*e*) 1.51	$a \ <b> \ c \quad d \quad e$
9.	What is the loss of head (ft) through the hydraulic jump in problem 8 above? (*a*) 1.19 (*b*) 3.49 (*c*) 6.85 (*d*) 8.22 (*e*) 11.18	$a \quad b \ <c> \ d \quad e$
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	$a \quad b \quad c \quad d \ <e>$
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	$a \quad b \ <c> \ d \quad e$
12.	A vitrified sewer pipe flows .90 full. What is the <u>hydraulic radius</u> as a function of the diameter? (*a*) 0.298*d* (*b*) 0.304*d* (*c*) 0.632*d* (*d*) 0.98*d* (*e*) 1.50*d*	$<a> \ b \quad c \quad d \quad e$