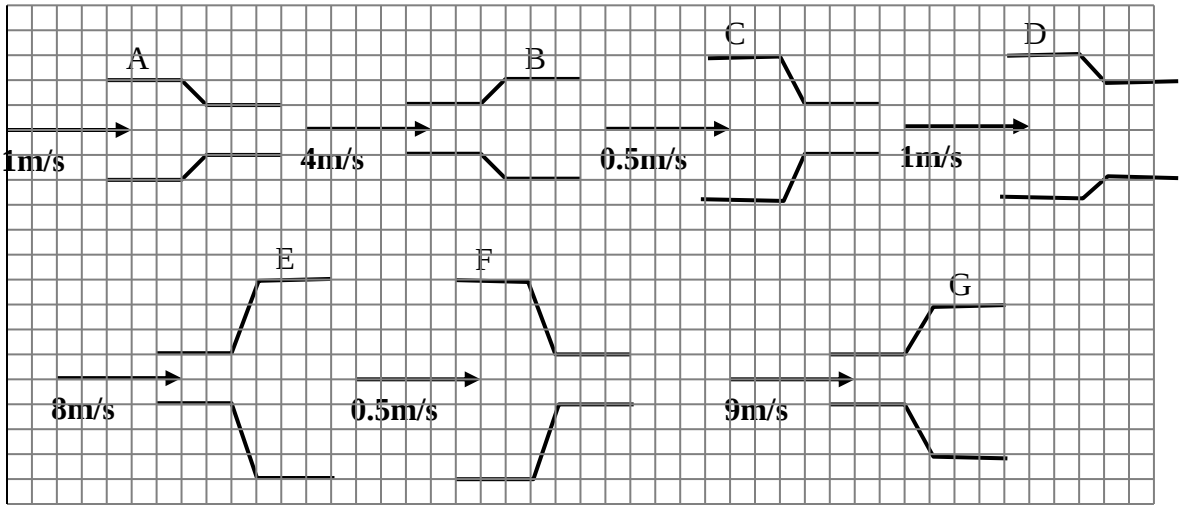
Name: _____

Date: _____ Period: _____

Fluids Worksheet 1 - Continuity

1. In each of the following diagrams, fluid flows smoothly through the tube under steady state conditions. Rank the velocity of fluid exiting the tubes from greatest to least. All drawings are to scale.

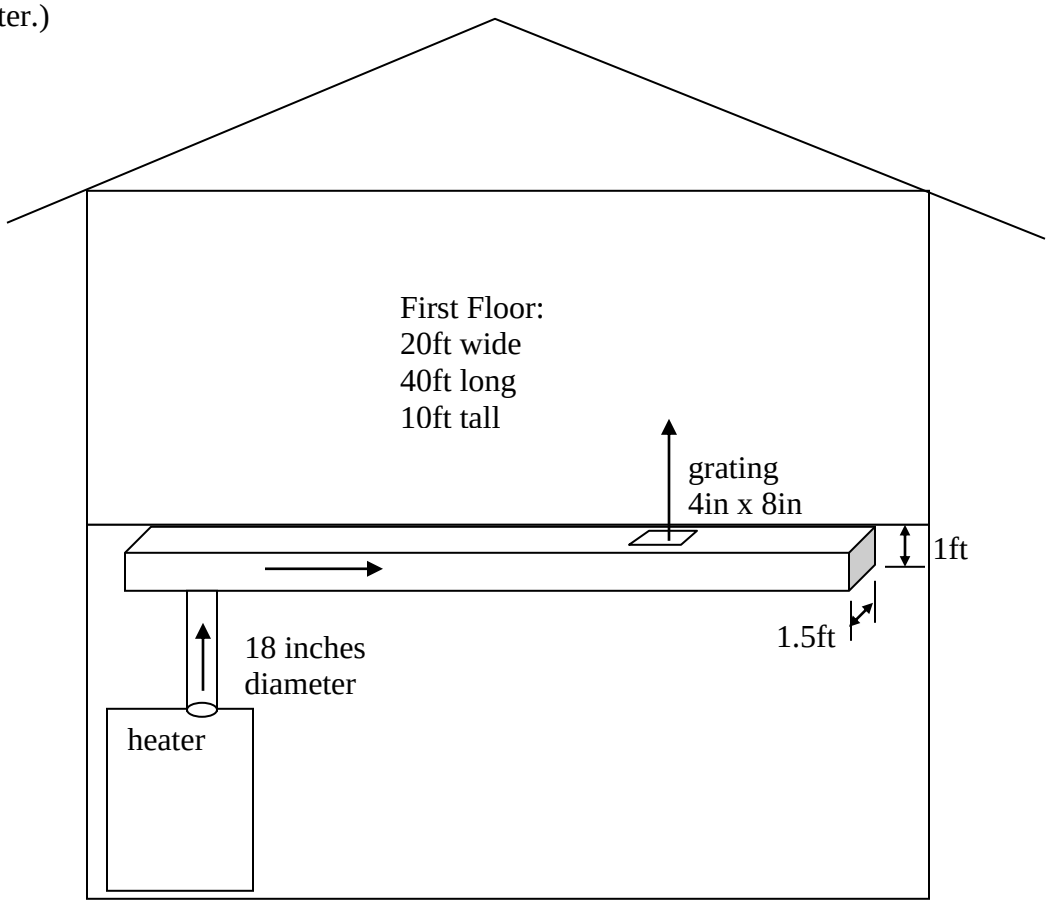


(a) Ranking.

(b) Carefully explain your reasoning.

2. The radius of the aorta is about 1.0cm and the blood passing through it has a speed of about 30cm/s. (a) A typical capillary has a radius of about 0.0004cm, and blood flows through it at a speed of about 0.0005m/s. Estimate how many capillaries there are in the body. (b) The major arteries of the body have a total cross-sectional area of about $2.0cm^2$. Estimate the speed of blood flow in these arteries.

3. As air leaves the heater in a house, it flows through a round circular duct with a diameter of 18 inches. Once the round duct reaches the basement ceiling, it connects with a 1ft x 1.5ft rectangular duct that carries the air underneath the first floor to a grating that is 4in x 8in. The first floor has dimensions of 20ft x 40ft x 10ft tall. (a) If the air has a velocity of 1200ft/min as it leaves the heater, determine its velocity in the square duct. (b) What is the velocity of the fluid as it passes through the grating? (c) How long does it take to replace the air on the first floor with warmer air from the heater? (The arrows in the diagram below show the air flow. As warm air is added to the first floor of the house it rises, forcing the colder air to fall through return vents and back to the heater.)



4. You are working as a civil engineer designing the water piping for a new subdivision. You have been asked by your boss to determine the correct size for a feeder pipe from the water main to one of the houses. The pipe must carry a maximum of 10 gallons per minute of water at a maximum velocity of 1.0ft/s. (a) What is the minimum diameter of pipe that would serve this purpose? (Round up to the nearest ½ inch). (b) The sole function of this pipe is carrying water to this one house. If the only water fixture turned on is the bathroom faucet, which has a flow rate of 1.5gal/min and a diameter of ¾ inch, what is the velocity of flow through the faucet and in the large pipe from part (a) at this time?