Actual (Momentum) Transport Prelim Questions

(solve the following w/o notes, books, etc...)

Time Allotment

45 min ① "A sphere of ice is inserted into a bath of 50°F water (of infinite dimensions).

i) How far will the sphere travel before it melts, and how long will it take?

ii) What is the terminal velocity?

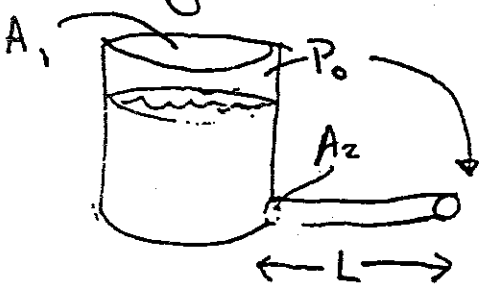
iii) How does f depend on Re?

iv) Draw temperature profile from sphere center (in radial direction).

v) What does the heat transfer coefficient depend on?

vi) Construct energy balance for system."

15 min ② "How long will it take for water to drain?



in ③ "Explain the different means of molecular transport. Are these the only means of transport? What are some differences?"

'0min ④ "Explain the 'lost work' term in Bernoulli's equation. What does it have to do with the friction factor in a pipe?"

)min ⑤ "How would you proceed to size a pump to transport fluid between two tanks (of varying size, elevation)?"

5min ⑥ "Draw the transient velocity profiles associated w/ laminar flow down a pipe. What is important in determining how far down the pipe a fully developed profile will occur (both laminar and turbulent)?"

our? ⑦ "You prick a soap film with a pin; film breaks & retracts. Calculate the velocity."

min ⑧ "Produce a plot of f v.s. Re. What is k/D? Why do such small k/D values greatly affect f?"

nin ⑨ "Derive the steady-state momentum balance for fully developed laminar flow in a pipe."