DO NOT WRITE ON THE BLUE TABLES.
RETURN THE BLUE TABLES WITH YOUR EXAM.
DO NOT STAPLE THE 3 EXAM SHEETS TOGETHER.

Put your answers on the same sheet as the question, Use many digits in your computation. You must give the units of your answers. You must write clearly. Encircle the right answer number in multiple choice. To correct, erase the wrong circle as well as you can and encircle the corrected answer number twice. Best possible answer for multiple choice. *Not following those requirements will result in reduced or no credit.*

1. (5%) A 10 Pa gage pressure will raise a water-filled manometer that is open to the atmosphere by

   (a) 1 mm
   (b) 1 cm
   (c) 1 dm

2. (5%) How many of pressure, volume, and temperature are intensive (0, 1, 2, or 3)? 2

3. (5%) The critical pressure of He is 2.27 bar

4. (5%) A rigid container contains saturated vapor. If we decrease the pressure, we will get

   (a) vapor
   (b) two-phase
   (c) liquid

5. (5%) Two kg of helium contains 0.5 kmoles.

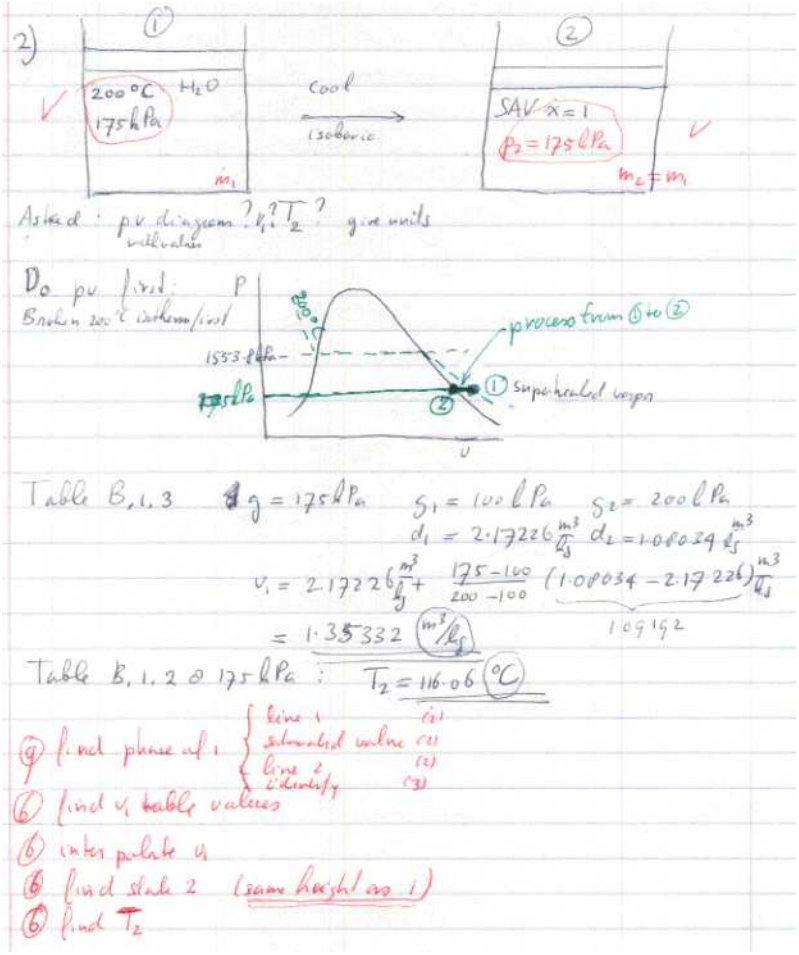
6. (5%) Water in a pressure cooker boils at 120°C. The *gage* pressure in the cooker is

   (a) 0.5 atm
   (b) 1 atm
   (c) 2 atm

7. (5%) A substance is confined inside a cylinder with cross-sectional area 2 cm^2 by a piston. There is atmospheric pressure at the other side of the piston. If we press down on the piston with 40 N of force, the *absolute* pressure in the substance is 3 bar.

8. (33%) A constant pressure piston-cylinder set-up contains water at 200°C and 175 kPa. Use the pv diagram to derive the phase the water is in, marking it as 1. Find the specific volume v_1 in this state, with units. Now the substance is cooled until it becomes saturated vapor. Show this state too in the same pv diagram, marking it as 2. Find the temperature T_2 in this final state, with units.

   You must show the derivations and reasoning completely and correctly for full credit. You must give units. Most accurate procedure only unless stated otherwise.



9. (32%) A closed container with a volume of 2 dm^3 contains ozone (molecular weight 48 kg/kmol) at a pressure of 100 kPa and a temperature of 15°C. Find the mass and number of moles of ozone in the container.

   You must show the derivations and reasoning completely and correctly for full credit. You must give units. Most accurate procedure only unless stated otherwise.