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Quiz 3 (Total: 20 points) **Due back by Wed. 8 Feb. at 10 p.m., in Canvas**

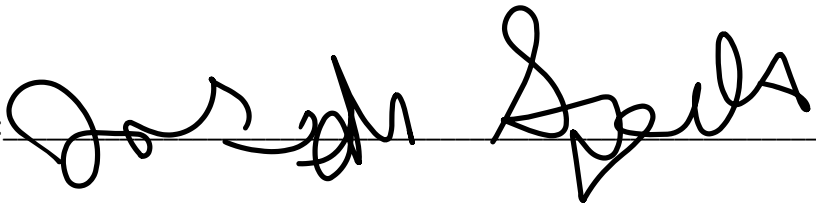
- *This assignment pertains to Chapters 1 and 2 from your textbook.*
- *Assignments will only be graded if the honor code statement is completed and signed.*
- *Save your entire assignment as <u>one</u> **PDF document** and upload it in the appropriate assignment folder on Canvas.*

Being a student of high standards, I pledge to embody
the principles of *academic integrity*.

This quiz is my own work. I did not seek (or get) outside help or collaboration with any of the questions and their solutions. I did not post any of the questions on an electronic platform (like Chegg) nor did I solicit answers or solutions from any electronic platform (like Chegg). I also did not offer my solutions or answers to any other student.

I understand that this quiz is "open book" and "open notes" which means that I was permitted to use my prescribed textbook and lecture notes when addressing any of the questions. I have properly cited any other resources, with full cognizance of the regulations pertaining to plagiarism, copyright infringement, academic cheating, etc., as stipulated in the Student Code.

I acknowledge that academic violations will be dealt with according to the UIUC Student Code, Article 1, Part 4.

Student's signature: 

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Date: 2/7/23

Complete the following table (rows b – f) for water. Show all relevant calculations for Questions b to f in the space provided beneath the table. Mention in your calculations for each case (b – f) from which property table you determined the unknown values, i.e. Table A-2, Table A-3, Table A-4, or Table A-5. [10 points for tabulated values + 10 points for calculations = 20 points total]

	***T*, °C**	***p*, kPa**	u_f, **kJ/kg**	u_g, **kJ/kg**	***u*, kJ/kg**	**Phase description**
(a)	50	12.35	209.32	2443.5	-	Saturated mixture
(b)	143.6	361.71	604.20	2553.42	-	Saturated mixture
(c)	219.78	2318	-	2602.4	-	Saturated Mixture
(d)	190	2500	-	-	803.87	Compressed liquid
(e)	466.21	4000	-	-	3173.09	Superheated Vapor
(f)	250	500	-	-	2723.5	Superheated Vapor

I will explain how to interpolate here and then follow this procedure for the rest of the questions as to not repeat myself every time.

To interpolate,

1) Locate the values that are immediately greater and immediately lower than your given value.

2) Take the difference of your given value and the lower bound. Then divide this by the difference between your upper and lower bound, giving how far between the two table values your given value is. This value will be called “y” in future calculations.

3) Multiple the quantity found in step 2 (y) by the difference between the desired quantity at the upper bound and the desired quantity at the lower bound.

4) Add the desired quantity at the lower bound to the result from step 3 and this is the answer.

B) Use Table A-2 because we are given temperature and that it is a saturated solution. Then, asked to find p, u_f, and u_g.

$$y = \frac{143.6 - 140}{150 - 140} = \frac{3.6}{10} = .36$$

$$p = (y * (p_{@T=150} - p_{@T=140}) + p_{@T=140}) * \frac{100kPa}{bar} = (.36 * (4.758 - 3.613) + 3.613) * 100$$

$$= 361.7122\ kPa$$

$$u_f = y * \left(u_{f@T=150} - u_{f@T=140}\right) + u_{f@T=140} = .36 * (631.68 - 588.74) + 588.74$$

$$= 604.1984\ kJ/kg$$

$$u_p = y * \left(u_{g@T=150} - u_{g@T=140}\right) + u_{g@T=140} = .36 * (2559.5 - 2550.0) + 2550.0$$

$$= 2553.42 kJ/kg$$

C) Use table A-3 because we are given a pressure. Also, we know it is a saturated solution because for the two values the pressure lies between (20 and 25 bar), the u_g we are given satisfies the inequality,

$$u_{g@p=20bar} < u_g < u_{g@p=25bar}$$

$$y = \frac{23.18 - 20}{25 - 20} = \frac{3.18}{5} = .636$$

$$T = y * (T_{@p=25bar} - T_{@p=20bar}) + T_{@p=20bar} = .636 * (224.0 - 212.4) + 212.4$$

$$= 219.7776\ Degrees\ C$$

D) Use table A-5 because we are given pressure and that the mixture is a compressed liquid. We will also be using the p=25 bar section because 25 bar = 2500 kPa, which is the given pressure.

$$y = \frac{190 - 180}{200 - 180} = \frac{10}{20} = \frac{1}{2} = .5$$

$$u = y * (u_{@T=200} - u_{@T=200}) + u_{@T=200} = .5 * (848.1 - 759.63) + 759.63 = 803.865 kJ/kg$$

E) Use table A-4 because the T given is greater than the T_{sat} at this given pressure (40 bar) and this is the table for superheated water vapor given pressure. We will also use the 40 bar section because the given pressure is 40 bar.

$$y = \frac{466.2 - 440}{500 - 440} = \frac{26.2}{60} = .4367$$

$$u = y * (u_{@T=500} - u_{@T=440}) + u_{@T=440} = .4367 * (3099.5 - 2992.2) + 2992.2$$

$$= 3039.05433\ kJ/kg$$

F) Use table A-4 because T given is greater than T_{sat} at this given pressure (5 bar) and this is the table for superheated water vapor given pressure. We will also use the 5 bar section because the given pressure is 5 bar.

$$y = \frac{250 - 240}{280 - 240} = \frac{10}{40} = \frac{1}{4} = .25$$

$$u = y * (u_{@T=280} - u_{@T=240}) + u_{@T=240} = .25 * (2771.2 - 2707.6) + 2707.6$$

$$= 2724.5kJ/kg$$