

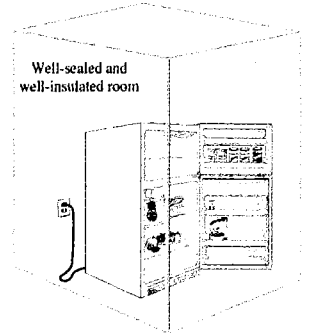
國立中央大學 111 學年度碩士班考試入學試題

所別： 能源工程研究所 碩士班 不分組(一般生)

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科目： 基礎熱力學

所有題目皆為問答題，需寫完整計算過程。請按題號順序作答，避免被漏改。若您要先做後面題目，請先在答案本預留空間。



1. (10 %) Consider a room whose door and windows are tightly closed, and whose walls are well-insulated. Now let's place a refrigerator inside the room with its door open, and plug it into a wall outlet. What do you think will happen to the average temperature of air in the room (increase constant, or decrease)? Give your answer with an explanation.
2. (10 %) In the absence of compressed liquid tables, how is the specific volume of a compressed liquid at a given pressure and temperature determined?
3. (12 %) Plot the pressure-volume and temperature-entropy diagrams for a Carnot cycle and explain the unique characteristics of four processes.
4. (8 %) Explain the purpose of heat engine and heat pump.
5. (10 %) Identify which of the following devices are work-consuming, work-producing and work-neutral (no work involved): a) steam turbine, (b) pump, (c) nozzle, (d) diffuser, (e) mixing chamber, (f) refrigerator, (h) electrical heater, (i) gasoline engine, (j) heat pump, (k) heat exchanger.
6. For ideal gases,
 - (10 %) (a) show that $c_p = c_v + R$,
 - (10 %) (b) 請從物理現象解釋為何 $c_p \geq c_v$.
7. For a Brayton cycle,
 - (10 %) (a) 使用再生器如何影響循環之熱效率？為什麼？
 - (10 %) (b) 當壓力比很大時，使用再生器反而會降低循環之熱效率嗎？為什麼？
8. (10 %) A refrigerator uses R-134a as the working fluid. If the environment temperature is 26°C, what is the minimum pressure to which the refrigerant should be compressed? Why?

Saturated refrigerant-134a—Temperature table

Temp., T °C	Specific volume, m^3/kg			Internal energy, kJ/kg			Enthalpy, kJ/kg			Entropy, kJ/kg-K		
	Sat. press., P_{sat} kPa	Sat. liquid, v_f	Sat. vapor, v_g	Sat. liquid, u_f	Evap., u_{fg}	Sat. vapor, u_g	Sat. liquid, h_f	Evap., h_{fg}	Sat. vapor, h_g	Sat. liquid, s_f	Evap., s_{fg}	Sat. vapor, s_g
20	572.07	0.0008160	0.036012	78.85	162.19	241.04	79.32	182.33	261.64	0.30062	0.62192	0.92254
22	608.27	0.0008209	0.033867	81.64	160.45	242.09	82.14	180.55	262.69	0.31012	0.61168	0.92180
24	646.18	0.0008260	0.031869	84.44	158.68	243.13	84.98	178.74	263.72	0.31959	0.60148	0.92107
26	685.84	0.0008312	0.030008	87.26	156.89	244.15	87.83	176.90	264.73	0.32905	0.59131	0.92036
28	727.31	0.0008366	0.028271	90.09	155.08	245.17	90.70	175.03	265.73	0.33849	0.58117	0.91967
30	770.64	0.0008421	0.026648	92.93	153.24	246.17	93.58	173.13	266.71	0.34792	0.57105	0.91897
32	815.89	0.0008477	0.025131	95.79	151.37	247.17	96.49	171.19	267.67	0.35734	0.56095	0.91829
34	863.11	0.0008535	0.023712	98.67	149.48	248.15	99.41	169.21	268.61	0.36675	0.55086	0.91760
36	912.35	0.0008595	0.022383	101.56	147.55	249.11	102.34	167.19	269.53	0.37615	0.54077	0.91692