

All answers come from old quizzes. I have not checked them !!!
Nor do I generally trust these old answers because I'm not sure they
were ever checked.

Practice Quiz 2

These are Q's from old quizzes. I do not
quarantee that the Q's on this year's
quiz will be the same, or even similar.

C

- 1) A weather balloon is filled with helium and released. What kind of a process is approximated as the balloon rises in the air? Assume the balloon material is an excellent insulator.
- A) Isobaric B) Isochoric C) Adiabatic D) Isothermal

- 2) Water flows over Niagara Falls (height 50m) at the rate of about 1 Million kg/s. Suppose that all the water passes through a turbine connected to an electric generator producing 400MW of electric power. If the water has negligible kinetic energy after leaving the turbine, by how much has its temperature increased between the top of the falls and the outlet of the turbine? ($c = 4.184 \text{ kJ/kgK}$)

C

- A) not at all
B) 0.001 degree Celsius
C) 0.01 degree Celsius
D) 0.1 degree Celsius
E) 1 degree Celsius

- 3) If a diatomic gas is heated to a very low temperature. How many degrees of freedom are active?

A

- A) 3 B) 5 C) 7 D) 9

- 5) A piston-cylinder system contains 0.50 mol of hydrogen at 400K and 300kPa. The gas undergoes an expansion that quadruples the system volume. Calculate the work done if the expansion is isothermal.

C

- A) 0.5 kJ B) 1.0 kJ C) 2.0 kJ D) 4.0 kJ E) 8.0 kJ

- 7) Given the cyclic processes 1 and 2, which of the statements is most accurate.

Process 1: Isochoric pressure increase, followed by adiabatic expansion, followed by isothermal compression to arrive back at the starting point.

Process 2: Isochoric pressure decrease, followed by isobaric expansion, followed by isothermal compression to arrive back at the starting point.

C

- A) One of the two processes is not possible as it can't get you back to the starting point.
B) In both cases, the gas does the same amount of work.
C) W is larger in process 1 than in process 2.
D) W is smaller in process 1 than in process 2.
E) Neither of the two processes makes any sense because neither can possibly get you back to the starting point.

- 10) A system has a heat source supplying heat at a rate of 352W and is doing work at a rate of 235W. At what rate is the internal energy of the system changing?
A) 50W B) 100W C) 200W D) 400W

B

- 2) A gas has 6 degrees of freedom. Find the adiabatic exponent γ .
A) 3 B) 3/2 C) 3/4 D) 4/3

D

- 4) Two identical containers are filled with 10 mol s of gas each. They are both at the same temperature, yet the internal energies of the two gases differ. How can this be?
A) They differ in their respective adiabatic exponent.
B) The gases are at different pressure.
C) It can not be.
D) None of the above.

A

- 8) A piston-cylinder system has initial volume 1.0 liters, and contains ideal gas at 300K and 1.0atm, with $C_v=2.5R$. The piston is held fixed and the cylinder placed in contact with a heat reservoir at 600K. Once equilibrium is reached, the gas is allowed to expand isothermally. When the pressure reaches 1atm, the gas is cooled at constant pressure to 300K. This cyclic process is repeated once a second. What is the rate at which the gas does work?
A) 10W B) 20W C) 40W D) 80W E) 160W

C

- 9) In a closed but uninsulated container, 500g of water is shaken violently until its temperature increases by 3 degrees C. The mechanical work required is 9kJ. How much heat is transferred to the environment during the process? ($c_w = 4.184 \text{ kJ/kg}\cdot\text{K}$)
A) 1kJ B) 3kJ C) 10kJ D) 30kJ

B

- 10) A system has a heat source supplying heat at a rate of 252W and is doing work at a rate of 135W. At what rate is the internal energy of the system changing?
A) 50W B) 100W C) 200W D) 400W

B

1) A reversible heat engine operates between $T_c = 20$ degree Celsius and $T_h = 100$ degree Celsius.

What is its efficiency?

- A) 0.2 B) 0.4 C) 0.6 D) 0.8

D

4) A Carnot engine is operated as an air conditioner to cool a house in the summer. The air conditioner removes 15 kJ of heat per second from the house, and maintains the inside temperature at 293 K, while the outside temperature is 310 K. The power required for the air conditioner under these operating conditions, in SI units, is closest to:

- A) 1500 B) 1300 C) 1100 D) 1700 E) 900

E

6) Which of the following is a TRUE statement?

- A) The second law of thermodynamics is a consequence of the first law of thermodynamics.
B) It is not possible to convert work entirely into heat.
C) It is possible for heat to flow spontaneously from a hot body to a cold one or from a cold one to a hot one, depending on whether or not the process is reversible or irreversible.
D) It is impossible to transfer heat from a cooler to a hotter body.
E) All of these statements are false.

E

9) A 1220 kg sample of water at 0 degree Celsius is cooled to -29 degree Celsius, and freezes in the process. How much heat is liberated? (For water $L_f = 334$ kJ/kg and $L_v = 2257$ kJ/kg. The specific heat of ice is 2050 J/(kg K).)

- A) 335,000 kJ B) 480,000 kJ C) 138,000 kJ D) 556,000 kJ

B

4) If you add some heat to a substance is it possible for the temperature of the substance to remain unchanged?

- A) Yes. B) No.

A

10) A piston-cylinder system contains 0.50 mol of hydrogen at 400K and 300kPa. The gas undergoes an expansion that quadruples the system volume. Calculate the work done if the expansion is isothermal.

- A) 0.5 kJ B) 1.0 kJ C) 2.0 kJ D) 4.0 kJ E) 8.0 kJ

C