HW12 - due 6 pm Day 24 (Thu. Aug. 28) (6223837)

Question 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

1. Question Details OSColPhys1 15.P.001.WA. [2611785]

What is the change in internal energy of a system that takes in 2.83×10^6 J of heat, and does 4.50×10^5 J of work while dissipating 6.07×10^6 J of heat?

[ ] -3.69e+06 J

2. Question Details OSColPhys1 15.P.002.WA. [2611483]

149 J of energy is transferred to a system consisting of 2.0 moles of an ideal gas. If the volume of this gas stays at a constant 3.6 L, calculate the change in internal energy of the gas.

[ ] 149 J

3. Question Details OSColPhys1 15.P.006.Tutorial.WA. [2611964]

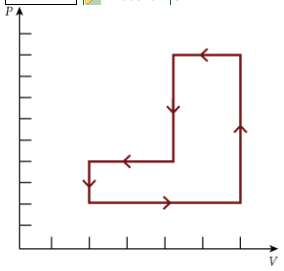
Determine the change in internal energy of a monatomic ideal gas that expands from an initial volume of 1.73 m^3 to a final volume of 2.77 m^3. During this process the pressure of the gas remains at a constant value of 1.82×10^5 Pa.

[ ] 2.84e+05 J

4. Question Details OSColPhys1 15.P.008.WA. [2611603]

A gas is taken through the cyclical process shown in the figure below. If each unit on the horizontal axis equals 3.00 m^3 and each unit on the vertical axis equals 3.75×10^5 Pa determine the net work done by the gas.

[ ] -2.03e+07 J



5. Question Details OSColPhys1 15.P.009.WA. [2611439]

The volume and pressure of a gas are 4.00 m^3 and 2.1 atm respectively.

(a) If this gas expands to three times its initial volume while the pressure is constant, determine the work done *on* the gas.

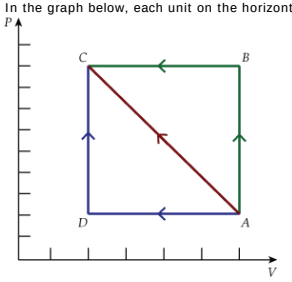
[ ] -1.70e+06 J

(b) On the other hand, if this gas is compressed to one-third its initial volume while the pressure is constant, determine the work done *on* the gas.

[ ] 5.67e+05 J

6. Question Details OSColPhys1 15.P.010.WA. [2611801]

In the graph below, each unit on the horizontal axis is 4.5 m^3 and each unit on the vertical axis is 2.0 atm.



(a) A gas is compressed along the path AC. What is the work done on the gas in this case?

[ ] 2.01e+07 J

(b) If the gas is instead compressed along the path ABC, what is the work done on the gas?

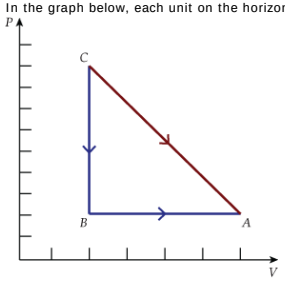
[ ] 3.28e+07 J

(c) What is the work done on the gas if the path of compression is along ADC?

[ ] 7.29e+06 J

7. Question Details OSColPhys1 15.P.011.WA. [2611693]

In the graph below, each unit on the horizontal axis is 2.10 × 10^{-3} m^3 and each unit on the vertical axis is 0.2 atm.



(a) Determine the change in internal energy of the gas if 2422 J of heat is added as it expands in volume along the direct path CA.

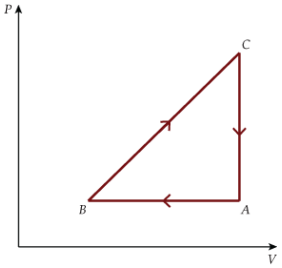
[ ] 1490 J

(b) To get the same change in internal energy, how much heat must be added to the gas as it goes along the path CBA?

[ ] 1830 J

8. Question Details OSColPhys1 15.P.012.WA. [2611656]

A gas undergoes the process shown in the diagram below. During the process AB, the internal energy of the gas decreases and a certain amount of heat Q goes out of the system for the process CA. Use this information to answer the questions below.



(a) What are the signs of W (work done by the gas), Q, and ΔU for the process CA?

(b) What are the signs of W (work done by the gas), Q, and ΔU for the process AB?

(c) What are the signs of W (work done by the gas), Q, and ΔU for the process BC?

9. Question Details OSColPhys1 15.P.015.WA. [2611477]

A certain monatomic gas inside a cylinder is at a temperature of 22°C. It takes 628 J of work done on the gas to compress it and increase the temperature to 145°C. If there are originally 9.0 moles of gas inside the cylinder, calculate the quantity of heat flowing into or out of the gas. (Indicate the direction with the sign of your answer. Let "into the gas" be positive, and "out of the gas" be negative.)

13.2 kJ

10. Question Details OSColPhys1 15.P.016.WA. [2611563]

(a) An ideal gas maintained at a constant pressure of 184 kPa receives 1200 J of energy. If the internal energy of the gas increases by 422 J determine the change in volume of the gas.

0.00423 m^3

(b) What is the change in volume if the increase in internal energy is 1200 J?

0 m^3

11. Question Details OSColPhys1 15.P.017.WA. [2611578]

The pressure of a monatomic gas is 198 kPa. The gas is compressed from an initial volume of 0.76 m^3 to a final volume of 0.48 m^3 while maintaining the pressure constant. How much heat flows into or out of the gas? (Indicate the direction with the sign of your answer. Let "into the system" be positive, and "out of the system" be negative.)

-139 kJ

12. Question Details OSColPhys1 15.P.020.WA. [2611478]

A certain heat engine does 23.2 kJ of work and dissipates 8.74 kJ of waste heat in a cyclical process.

(a) What was the heat input to this engine?

31.9 kJ

(b) What was its efficiency?

72.6 %

13. Question Details OSColPhys1 15.P.021.WA. [2611490]

An electrical power station uses 1.13 × 10^{14} J of heat input with an efficiency of 24.7%.

(a) How much work is done?

2.79e+13 J

(b) How much waste heat is produced by the station?

8.51e+13 J

(c) What is the ratio of waste heat to work output?

$\frac{\text{waste heat}}{\text{work output}}$ = 3.05

14. Question Details OSColPhys1 15.P.026.WA. [2611650]

Determine the efficiency of a Carnot engine if the work it does is 4.27 times less than the heat that flows into the system.

23.4 %

15. Question Details OSColPhys1 15.P.027.WA. [2611800]

A certain gasoline engine has an efficiency of 47.3%. What would the hot reservoir temperature be for a Carnot engine having that efficiency, if it operates with a cold reservoir temperature of 185°C?

596 °C

16. Question Details OSColPhys1 15.P.028.Tutorial.WA. [2611949]

Steam locomotives have an efficiency of 19.7% and operate with a hot steam temperature of 385°C.

(a) What would the cold reservoir temperature be if this were a Carnot engine?

255 °C

(b) What would the maximum efficiency of this steam engine be if its cold reservoir temperature were 150°C?

35.7 %

17. Question Details OSColPhys1 15.P.030.WA. [2611853]

The hot and cold reservoirs of a Carnot engine are 273°C and 74.2°C respectively. The temperature of the hot reservoir is raised by 47°C in order to increase the efficiency of the engine.

(a) What is the efficiency after the increase in temperature?

41.4 %

(b) Instead of raising the temperature of the hot reservoir, if the temperature of the cold reservoir is decreased by 47°C, what would be the efficiency of the engine?

45 %

18. Question Details OSColPhys1 15.P.041.WA. [2611848]

When heat is added to a block of ice, it increases its entropy by 39 J/K. If the block has a mass of 0.48 kg, how much of this melts? The latent heat of fusion of ice is 33.4 × 10^{4} J/kg.

0.0319 kg