Name _____ Show all work on other paper to get credit.
IB Physics – Review: Thermodynamics.

1. The work done in the expansion of a gas at constant pressure
   a. is zero since there is no change in pressure.
   b. can't be found since we don't know the force.
   c. is the area under the curve of a *PV* diagram.
   d. is the slope of a *PV* curve.
   e. equals $V(P_f - P_i)$

2. Gas in a container expands at a constant pressure of 3.0×10^5 N/m^2 . Find the work done (in J) by the gas if the initial volume is 5.0 m^3 and the final volume is 10.0 m^3.
   a. 0 b. 150 J c. 1.5×10^6 J d. 1500 J e. not given

3. Gas in a container increases its pressure from 1 atm to 3 atm while keeping its volume constant. Find the work done (in J) by the gas if the volume is 5 liters.
   a. 10 b. 10 c. 10 d. 0 e. 15

4. An adiabatic free expansion refers to the fact that
   a. the pressure remains constant.
   b. the temperature remains constant.
   c. the volume remains constant.
   d. no heat is transferred between a system and its surroundings.

5. An isothermal process refers to the fact that
   a. the volume remains constant.
   b. the temperature remains constant.
   c. no heat is transferred between a system and its surroundings.
   d. the pressure remains constant.
   e. the internal energy is not constant.

6. An isobaric process refers to the fact that
   a. the volume remains constant.
   b. the temperature remains constant.
   c. the pressure remains constant.
   d. no heat is transferred between a system and its surroundings.
   e. the internal energy is constant

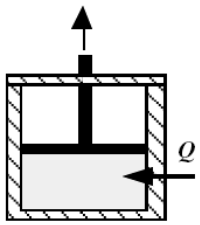
7. An isochoric process refers to the fact that
   a. the temperature remains constant.
   b. no heat is transferred between a system and its surroundings.
   c. the pressure remains constant.
   d. the volume remains constant.
   e. the internal energy is constant.

8. An *isobaric* process is represented on a *pressure-volume* graph by which one of the following sets of points?
   (a) a parabola (c) a vertical line (e) a circle
   (b) a hyperbola (d) a horizontal line

9. A concentration difference of a certain solute of 1.0 x10^{-2} kg/m^3 is maintained between the ends of a tube with a length of 3.5 m and a cross-sectional area of 0.25 m^2. When 0.0040 g of the solute is introduced to the tube, it takes 350 minutes for this solute to diffuse through the solvent to the opposite end of the tube. What is the diffusion constant for the solute?

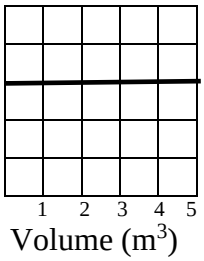
(a) 2.7 x10^{-7} m^2/s (c) 7.5 x10^{-10} m^2/s (e) 1.1 x10^{-11} m^2/s
(b) 4.5 x10^{-9} m^2/s (d) 6.3 x10^{-8} m^2/s

10. When the gas enclosed beneath the piston shown in the figure receives 2250 J of heat, *Q*, from its surroundings, it performs 1930 J of work in raising the piston. What is the change in the internal energy of the gas?



(a) –320 J
(b) +320 J
(c) –4180 J
(d) +4180 J
(e) zero joules

11. Label the vertical axis for the graph at the right so that the work done by the gas is 1.5x10^6 J.



12. A Carnot heat engine is to be designed with an efficiency of 85%. If the low temperature reservoir is 25 °C, what is the temperature of the "hot" reservoir?

13. A sample of a monatomic ideal gas is originally at 27 °C. What is the final temperature of the gas if both the pressure and volume are tripled?

14. The efficiency of a Carnot heat engine is 30% when the low temperature reservoir is 700 K and the high temperature reservoir is 1000 K. The efficiency can be increased to 40% if both temperatures are **changed** by the same amount. What is this amount? (Show your work.)

15. How much heat energy does it take to convert 5.0 kg of ice at -20.0 °C to steam? (Specific heat of ice, 2.108x10^3 J/kg°C . Other needed constants on formula page.)

16. Find the final temperature if 250 g of iron at 450 °C is added to 550 g of water at 12.5 °C.
(Specific heat of iron, 450 J/kg°C.)