Support Worksheet – Topic 3, Worksheet 2

1 The pressure of an ideal gas is 2.4×10^{6} Pa and its volume is 4.1×10^{-3} m^3. The temperature of the gas is 320 K. Calculate the number of moles in the gas. [1]

2 The volume of an ideal gas is doubled at constant pressure. The initial temperature of the gas was 47 °. Calculate the new temperature of the gas. [1]

3 An amount of work of 2.2 kJ is done on a gas and 2.8 kJ of heat is transferred out of the gas. Calculate the change in the internal energy of the gas. [2]

4 State the difference between an isothermal and an adiabatic expansion of an ideal gas. [2]

5 In an isothermal expansion of an ideal gas to a volume *V* an amount of 2500 J of energy is absorbed by the gas. In an adiabatic expansion of the same gas from the same initial state to a state of volume *V* the work done would be

A zero

B less than 2500 J

C 2500 J

D more than 2500 J [1]

6 An ideal gas undergoes a cyclic change on a *p*-*V* diagram. State how you would use the diagram to calculate the net work performed. [1]

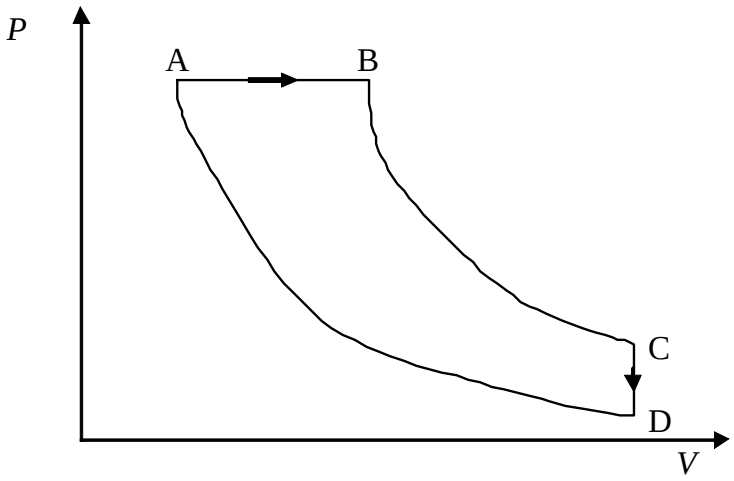
7 Explain, using the molecular model of an ideal gas, why the temperature of the gas will decrease in an adiabatic expansion. [2]

8 Two identical fixed containers, X and Y, contain the same number of molecules at the same temperature and pressure. The gases may be considered to be ideal. The molecules in container Y have double the mass of the molecules in X. It is required to raise the temperature of both gases by 1 K. State and explain whether equal or different quantities of energy must be supplied to each gas. [2]

9 The same quantity of heat is transferred into identical quantities of two ideal gases. The first gas absorbs the heat at constant volume and the second at constant pressure. Determine in which case the temperature increase will be the largest. [3]

10 An ideal gas expands adiabatically. Explain, in terms of molecular motion, why the pressure decreases. [2]

11 The pressure–volume diagram below shows a thermodynamic cycle.

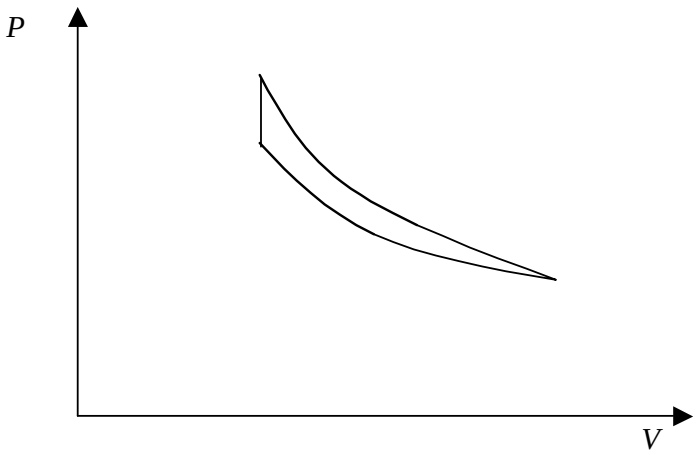


The curved parts of the cycle are isothermals. Explain along which parts of the cycle energy is

a supplied to the gas. [1]

b extracted from the gas. [1]

12 The pressure –volume diagram below shows a thermodynamic cycle consisting of one isothermal, one isochoric and one adiabatic change. Identify each change on the diagram.



[3]