S6 Chemistry Practice Paper | Hess law, equilibrium constant, electrolysis, titration and buffer, polymerisation and rate order

Chemistry | Time allowed：60 minutes | Total marks：100 marks | 24

：CH4(g) −74.8 kJ mol⁻¹、CO2(g) −393.5 kJ mol⁻¹、H2O(l) −285.8 kJ mol⁻¹。C(s) + O2(g) → CO2(g) ΔH −393.5 kJ mol⁻¹、2H2(g) + O2(g) → 2H2O(l) ΔH −571.6 kJ mol⁻¹、CH4(g) + 2O2(g) → CO2(g) + 2H2O(l) ΔH −890.3 kJ mol⁻¹。

1. (a) Find the standard enthalpy of complete combustion of methane from the formation enthalpies.

2. (b) Find the energy released by burning 8.0 g of methane completely, with M(CH4) = 16.0 g mol-1, to one decimal place.

3. (c) Use Hess law with the three combustion enthalpies to find the standard enthalpy of formation of methane and compare it with the given value.

4. (d) Given the atomisation enthalpy of C(s) as +715 kJ mol-1 and the bond enthalpy of H2(g) as +436 kJ mol-1, find the C-H bond enthalpy to one decimal place.

700 K ， 0.20 mol H2、0.20 mol I2 1.60 mol HI 2.0 dm³ ， H2(g) + I2(g) ⇌ 2HI(g) 。

5. (a) Find the equilibrium concentration of each species and Kc.

6. (b) A further 1.00 mol of HI is added at constant temperature. Find the reaction quotient Qc at that instant and state the direction of the shift.

7. (c) Another experiment has 0.10 mol of H2, 0.30 mol of I2 and 0.60 mol of HI in 2.0 dm3. Find Qc and state the direction of the shift.

8. (d) In a 1.0 dm3 vessel the starting amounts are 0.50 mol of H2 and 0.50 mol of I2. Find the equilibrium concentration of HI and the percentage conversion of H2.

2.0 A (II) 30 minutes （96500 C mol⁻¹，Ar(Cu) = 63.5、Ar(Ag) = 107.9） 。

9. (a) Find the charge passed and the number of moles of electrons, to four decimal places.

10. (b) Find the mass of copper deposited at the cathode, to two decimal places.

11. (c) If 5.0 A is passed through silver nitrate solution for 1.5 hours instead, find the mass of silver deposited to one decimal place.

12. (d) Electrolysis of dilute sulphuric acid gives 240 cm3 of hydrogen at a molar volume of 24.0 dm3 mol-1. Find the volume of oxygen, the charge passed and the time needed at 0.50 A, in minutes to one decimal place.

0.100 M 25.0 cm³ 0.100 M （Ka = 1.8 × 10⁻⁵ ） 。

13. (a) Find the volume of sodium hydroxide needed to reach the equivalence point.

14. (b) Find the pH of the acid before any alkali is added, to two decimal places.

15. (c) Find the pH after 20.0 cm3 of sodium hydroxide has been added, to two decimal places.

16. (d) Find the pH after 12.5 cm3 of sodium hydroxide has been added and explain the buffer action at that point.

280000 （C2H4，28.0 g mol⁻¹） 。-6,6 ，C12H22N2O2。PET C10H8O4（Ar：C = 12.01、H = 1.008、N = 14.01、O = 16.00） 。

17. (a) Find the degree of polymerisation of the polyethylene.

18. (b) Find the molar mass of the nylon-6,6 repeat unit, to two decimal places.

19. (c) If the nylon has an average molecular mass of 22632, find its degree of polymerisation and state how condensation polymerisation differs from addition polymerisation.

20. (d) Find the molar mass of the PET repeat unit and the average molecular mass when the degree of polymerisation is 150, as a whole number.

A + B → C ：[A] = 0.10 M、[B] = 0.10 M，2.0 × 10⁻³ mol dm⁻³ s⁻¹；[A] = 0.20 M、[B] = 0.10 M，8.0 × 10⁻³；[A] = 0.10 M、[B] = 0.20 M，4.0 × 10⁻³。

21. (a) Find the order with respect to A and with respect to B and write the rate equation.

22. (b) Find the rate constant k and its unit.

23. (c) Find the initial rate when [A] = 0.30 M and [B] = 0.15 M.

24. (d) A second reaction is first order with k = 0.0693 min-1. Find its half-life and the time for the concentration to fall from 0.80 M to 0.10 M.