S5 Chemistry Practice Paper 2 | Atomic structure, bonding, titration, equilibrium, electrolysis and organic chemistry

Senior Secondary Chemistry

S5 Chemistry practice paper 2 with worked solutions covering atomic structure, bonding, titration, equilibrium, electrolysis and organic chemistry.

1. Atomic structure and periodicity (18 marks)

Show your reasoning; give the relative atomic mass to 3 decimal places.

#	Question
1	(a) State the number of protons, neutrons and electrons in the sulfide ion 32S2-.
2	(b) An element has the electron configuration 1s2 2s2 2p6 3s2 3p5. State its period and group.
3	(c) Explain why the first ionisation energy of magnesium is higher than that of aluminium.
4	(d) Copper consists of 69.2% Cu-63 and 30.8% Cu-65. Calculate its relative atomic mass.

2. Chemical bonding and structure (16 marks)

Your explanations must refer to electron pairs and molecular shape.

#	Question
5	(a) Use VSEPR theory to state the shapes and approximate bond angles of NH3 and H2O.
6	(b) Decide whether CO2, H2O and NH3 are polar molecules and give brief reasons.
7	(c) Compare the structure types and melting points of NaCl, SiO2 and I2.
8	(d) Each water molecule in ice forms 4 hydrogen bonds. Calculate the number of hydrogen bonds in 1 mol of ice.

3. Moles, concentration and titration (16 marks)

Show the working and units; give answers to 3 significant figures.

#	Question
9	(a) 25.0 cm3 of 0.100 M NaOH is completely neutralised by 0.0500 M H2SO4. Find the volume of acid required.
10	(b) Calculate the number of moles in 5.85 g of sodium chloride (M = 58.5 g/mol).
11	(c) 50.0 cm3 of 2.00 M hydrochloric acid is diluted with water to 250 cm3. Find the new concentration.
12	(d) A reaction has a theoretical yield of 12.0 g but gives 9.60 g. Find the percentage yield.

4. Reaction rates and chemical equilibrium (18 marks)

Show how the orders are deduced and give units.

#	Question
13	(a) Doubling [A] quadruples the rate, while doubling [B] has no effect. Write the rate equation and state the order with respect to A and B.
14	(b) For H2(g) + I2(g) <=> 2HI(g), [H2] = [I2] = 1.00 M initially and [HI] = 1.60 M at equilibrium. Find Kc.
15	(c) For N2(g) + 3H2(g) <=> 2NH3(g) (delta H < 0), state the effect of increasing pressure and of raising temperature on the position of equilibrium.
16	(d) How does a catalyst affect the reaction rate and the equilibrium constant?

5. Acids and bases, redox and electrolysis (16 marks)

Give pH to 2 decimal places and other answers to 3 significant figures.

#	Question
17	(a) Find the pH of 0.0100 M HCl and of 0.0100 M NaOH.
18	(b) Find the pH of 0.100 M CH3COOH (Ka = 1.8 x 10^-5).
19	(c) Find the oxidation number of manganese in KMnO4 and of chromium in K2Cr2O7.
20	(d) A current of 2.00 A passes through CuSO4 solution for 30.0 minutes. Find the mass of copper deposited at the cathode (Cu = 63.5).

6. Organic chemistry: functional groups and isomerism (16 marks)

Give names or structural formulae.

#	Question
21	(a) Name the functional group present in ethanol, ethanoic acid, ethyl ethanoate and propanone.
22	(b) State the number of structural isomers of C4H10 and of C2H6O.
23	(c) Name the reaction types for converting ethanol to ethene and for heating ethanol with ethanoic acid to form ethyl ethanoate.
24	(d) Compare the reaction of ethene and of methane with bromine, and name the product of the ethene reaction.