A-Level Chemistry Practice Test 7

60 original multiple-choice questions in AQA / Edexcel / OCR exam style (AS + A2). Choose one answer for each question. The full answer key is on the last page — worked explanations for every question are free at QuaidianPoint.com.

Name: _____ Class: _____ Score: _____ / 60

Atomic Structure & Periodicity

Q1. A sample of boron contains 19.9% of ^10B and 80.1% of ^11B. What is the relative atomic mass of boron in this sample?

(A) 10.6
(B) 10.8
(C) 11.0
(D) 10.5

Q2. The successive ionisation energies of an element show a large increase between the 4th and 5th ionisation energies. In which group of the Periodic Table is the element?

(A) Group 2
(B) Group 3
(C) Group 4
(D) Group 5

Q3. How many electrons are there in an Fe^3+ ion? (Atomic number of Fe = 26)

(A) 23
(B) 26
(C) 29
(D) 21

Q4. An atom has the electron configuration 1s2 2s2 2p6 3s2 3p3. Which element is it?

(A) Silicon
(B) Sulfur
(C) Chlorine
(D) Phosphorus

Q5. Why does the first ionisation energy generally increase across Period 3 from sodium to argon?

(A) The shielding effect decreases across the period
(B) The nuclear charge increases while the electrons are added to the same shell
(C) The atomic radius increases across the period
(D) The number of electron shells increases across the period

Amount of Substance

Q6. What volume is occupied by 0.250 mol of a gas at a pressure of 100 kPa and a temperature of 300 K? (R = 8.31 J K^-1 mol^-1)

(A) 0.62 dm^3
(B) 62 dm^3
(C) 6.2 dm^3
(D) 2.4 dm^3

Q7. In a preparation, the theoretical yield of a product is 25.0 g and the actual yield obtained is 19.5 g. What is the percentage yield?

(A) 78%
(B) 128%
(C) 22%
(D) 88%

Q8. What volume of 0.0400 mol dm^-3 sulfuric acid is needed to neutralise 25.0 cm^3 of 0.100 mol dm^-3 sodium hydroxide solution?

(A) 12.5 cm^3
(B) 25.0 cm^3
(C) 62.5 cm^3
(D) 31.3 cm^3

Q9. A compound contains 40.0% carbon, 6.7% hydrogen and 53.3% oxygen by mass. What is its empirical formula?

(A) CHO
(B) CH2O
(C) C2H4O2
(D) CH3O

Q10. Calcium oxide is made by heating calcium carbonate: CaCO3(s) → CaO(s) + CO2(g). (Mr: CaO = 56, CO2 = 44) What is the atom economy for the production of CaO?

(A) 44%
(B) 66%
(C) 56%
(D) 100%

Q11. How many molecules are there in 8.0 g of methane, CH4? (Mr of CH4 = 16; Avogadro constant = 6.02 × 10^23 mol^-1)

(A) 3.01 × 10^23
(B) 6.02 × 10^23
(C) 1.20 × 10^24
(D) 1.51 × 10^23

Bonding & Structure

Q12. What are the shape and bond angle in a molecule of boron trifluoride, BF3?

(A) Trigonal pyramidal, 107°
(B) Tetrahedral, 109.5°
(C) Linear, 180°
(D) Trigonal planar, 120°

Q13. Which substance exhibits hydrogen bonding between its molecules?

(A) CH4
(B) NH3
(C) H2S
(D) HCl

Q14. Which statement correctly defines the lattice enthalpy of an ionic compound?

(A) The enthalpy change when 1 mol of the compound is formed from its elements in their standard states
(B) The enthalpy change when 1 mol of the solid dissolves in water
(C) The enthalpy change when 1 mol of an ionic compound is formed from its gaseous ions
(D) The enthalpy change when 1 mol of ionic bonds is broken in the solid

Q15. Which bond is the most polar?

(A) H−F
(B) H−Cl
(C) C−H
(D) O−H

Q16. How many sigma bonds and pi bonds are there in a molecule of ethene, C2H4?

(A) 4 sigma, 2 pi
(B) 6 sigma, 0 pi
(C) 4 sigma, 1 pi
(D) 5 sigma, 1 pi

Q17. Which statement explains why diamond has a very high melting point?

(A) It has a giant ionic lattice
(B) It has a giant covalent structure in which every atom is held by strong covalent bonds
(C) Strong hydrogen bonds hold the atoms together
(D) Delocalised electrons move throughout the structure

Energetics & Thermodynamics

Q18. A student burns 0.0200 mol of propan-1-ol and uses the energy to heat 500 g of water. The temperature of the water rises by 11.5 K. What is the enthalpy of combustion of propan-1-ol? (Specific heat capacity of water = 4.18 J g^-1 K^-1)

(A) −1200 kJ mol^-1
(B) −600 kJ mol^-1
(C) −2400 kJ mol^-1
(D) +1200 kJ mol^-1

Q19. Use the standard enthalpies of formation to calculate the enthalpy change for CH4(g) + 2O2(g) → CO2(g) + 2H2O(l). (ΔHf / kJ mol^-1: CH4 = −75, CO2 = −394, H2O = −286)

(A) −816 kJ mol^-1
(B) +891 kJ mol^-1
(C) −891 kJ mol^-1
(D) −1041 kJ mol^-1

Q20. Which reaction has a positive entropy change of the system?

(A) H2O(l) → H2O(s)
(B) 2Mg(s) + O2(g) → 2MgO(s)
(C) N2(g) + 3H2(g) → 2NH3(g)
(D) CaCO3(s) → CaO(s) + CO2(g)

Q21. A reaction has ΔH = −100 kJ mol^-1 and ΔS = −200 J K^-1 mol^-1. Above which temperature does the reaction become infeasible?

(A) 200 K
(B) 500 K
(C) 1000 K
(D) 50 K

Q22. Use mean bond enthalpies to calculate the enthalpy change for H2(g) + Cl2(g) → 2HCl(g). (Bond enthalpies / kJ mol^-1: H−H = 436, Cl−Cl = 242, H−Cl = 431)

(A) −184 kJ mol^-1
(B) +184 kJ mol^-1
(C) −92 kJ mol^-1
(D) −368 kJ mol^-1

Q23. Which equation represents the standard enthalpy of formation of water?

(A) 2H2(g) + O2(g) → 2H2O(l)
(B) H2(g) + O(g) → H2O(l)
(C) H2(g) + 0.5O2(g) → H2O(l)
(D) H+(aq) + OH-(aq) → H2O(l)

Kinetics & Rate Equations

Q24. In an experiment on the reaction A + B → products, doubling [A] at constant [B] increased the rate by a factor of 4, and doubling [B] at constant [A] doubled the rate. What is the overall order of the reaction?

(A) 1
(B) 2
(C) 4
(D) 3

Q25. What are the units of the rate constant for a second-order reaction?

(A) mol^-1 dm^3 s^-1
(B) s^-1
(C) mol dm^-3 s^-1
(D) mol^-2 dm^6 s^-1

Q26. Raising the temperature increases the rate constant of a reaction mainly because...

(A) the activation energy is decreased
(B) a greater proportion of colliding molecules have energy greater than or equal to the activation energy
(C) the molecules collide less frequently
(D) the enthalpy change of the reaction becomes more negative

Q27. A reaction has a constant half-life of 40 s that is independent of the initial concentration. What is the order of the reaction?

(A) Zero order
(B) Second order
(C) First order
(D) Third order

Q28. For the reaction with rate = k[A][B], the rate is 4.0 × 10^-5 mol dm^-3 s^-1 when [A] = 0.10 mol dm^-3 and [B] = 0.20 mol dm^-3. What is the value of k?

(A) 2.0 × 10^-5 mol^-1 dm^3 s^-1
(B) 8.0 × 10^-6 mol^-1 dm^3 s^-1
(C) 4.0 × 10^-4 mol^-1 dm^3 s^-1
(D) 2.0 × 10^-3 mol^-1 dm^3 s^-1

Equilibria (Kc & Kp)

Q29. For the equilibrium A(aq) + B(aq) ⇌ C(aq) + D(aq), the initial concentrations of A and B are each 1.00 mol dm^-3. At equilibrium, [C] = 0.60 mol dm^-3. What is the value of Kc?

(A) 1.50
(B) 2.25
(C) 0.44
(D) 3.60

Q30. Nitrogen dioxide exists in equilibrium with dinitrogen tetroxide: N2O4(g) ⇌ 2NO2(g). What happens to the equilibrium yield of NO2 when the pressure is increased at constant temperature?

(A) The yield of NO2 increases
(B) There is no effect on the equilibrium position
(C) Kp increases
(D) The equilibrium shifts to the left and the yield of NO2 decreases

Q31. What is the correct expression for Kp for the equilibrium N2(g) + 3H2(g) ⇌ 2NH3(g)?

(A) Kp = p(NH3)^2 / [p(N2) × p(H2)^3]
(B) Kp = p(N2) × p(H2)^3 / p(NH3)^2
(C) Kp = p(NH3) / [p(N2) × p(H2)]
(D) Kp = [p(N2) × p(H2)^3]^2 / p(NH3)

Q32. A catalyst is added to a reversible reaction that has reached equilibrium. What is the effect on Kc and on the composition of the equilibrium mixture?

(A) Kc increases and more product is formed
(B) Kc decreases and more reactant is formed
(C) Kc is unchanged and the composition is unchanged
(D) Kc is unchanged but more product is formed

Q33. For the equilibrium H2(g) + I2(g) ⇌ 2HI(g), the equilibrium partial pressures are: H2 = 20 kPa, I2 = 20 kPa, HI = 60 kPa. What is the value of Kp?

(A) 3.0
(B) 9.0
(C) 0.11
(D) 90

Redox & Electrode Potentials

Q34. What is the oxidation state of chromium in K2Cr2O7?

(A) +3
(B) +4
(C) +6
(D) +7

Q35. The standard electrode potentials are: Mg^2+/Mg = −2.37 V; Zn^2+/Zn = −0.76 V; Fe^2+/Fe = −0.44 V; Cu^2+/Cu = +0.34 V. Which metal is the strongest reducing agent?

(A) Magnesium
(B) Zinc
(C) Iron
(D) Copper

Q36. What is the EMF of a cell made from a zinc electrode in zinc sulfate solution connected to a copper electrode in copper(II) sulfate solution? (E: Zn^2+/Zn = −0.76 V; Cu^2+/Cu = +0.34 V)

(A) 0.42 V
(B) −1.10 V
(C) 0.76 V
(D) 1.10 V

Q37. A current of 2.00 A is passed through copper(II) sulfate solution for 1930 s. What mass of copper is deposited at the cathode? (Mr of Cu = 63.5; Faraday constant = 96 500 C mol^-1)

(A) 2.54 g
(B) 1.27 g
(C) 0.64 g
(D) 5.08 g

Q38. The standard electrode potentials are: Cl2/Cl- = +1.36 V; Br2/Br- = +1.09 V; I2/I- = +0.54 V. Which reaction is feasible under standard conditions?

(A) 2Cl- + Br2 → 2Br- + Cl2
(B) 2I- + Cl- → I2 + Cl2
(C) Cl2 + 2Br- → 2Cl- + Br2
(D) Br2 + 2Cl- → 2Br- + Cl2

Acids, Bases & Buffers

Q39. What is the pH of a 0.010 mol dm^-3 solution of hydrochloric acid?

(A) 2.00
(B) 1.00
(C) 12.00
(D) 2.30

Q40. A 0.100 mol dm^-3 solution of a weak acid HA has Ka = 1.8 × 10^-5 mol dm^-3. What is the pH of the solution?

(A) 1.00
(B) 4.74
(C) 2.50
(D) 2.87

Q41. What is the pH of a 0.050 mol dm^-3 solution of sodium hydroxide at 25 °C? (Kw = 1.0 × 10^-14 mol^2 dm^-6)

(A) 12.30
(B) 12.70
(C) 1.30
(D) 13.00

Q42. A buffer solution contains 0.10 mol dm^-3 ethanoic acid and 0.20 mol dm^-3 sodium ethanoate. Ka for ethanoic acid = 1.8 × 10^-5 mol dm^-3 (pKa = 4.74). What is the pH of the buffer?

(A) 4.74
(B) 4.44
(C) 5.04
(D) 5.74

Q43. A 0.100 mol dm^-3 solution of a weak acid has a pH of 3.00. What is the value of Ka for the acid?

(A) 1.0 × 10^-5 mol dm^-3
(B) 1.0 × 10^-3 mol dm^-3
(C) 1.0 × 10^-6 mol dm^-3
(D) 3.0 mol dm^-3

Inorganic Chemistry

Q44. The sulfates of the Group 2 elements become less soluble down the group. Which is the least soluble Group 2 sulfate?

(A) MgSO4
(B) CaSO4
(C) SrSO4
(D) BaSO4

Q45. Which halide ion is the strongest reducing agent?

(A) F-
(B) I-
(C) Cl-
(D) Br-

Q46. Excess ammonia solution is added to a solution containing Cu^2+ ions. What is observed?

(A) A colourless solution forms
(B) A green precipitate forms
(C) A deep blue solution forms
(D) A purple gas is given off

Q47. Which reagent is used to test for sulfate ions in solution?

(A) Acidified barium chloride solution
(B) Acidified silver nitrate solution
(C) Sodium hydroxide solution
(D) Limewater

Q48. The thermal stability of the Group 2 carbonates increases down the group. Which carbonate is the most thermally stable?

(A) $MgCO_3$
(B) $CaCO_3$
(C) $SrCO_3$
(D) $BaCO_3$

Organic Chemistry I

Q49. When methane reacts with chlorine in ultraviolet light, the initiation step produces...

(A) Cl+ ions
(B) Chlorine free radicals
(C) Cl- ions
(D) Carbocations

Q50. The hydrolysis of halogenoalkanes with warm aqueous silver nitrate is used to compare their rates of reaction. Which halogenoalkane reacts fastest?

(A) 1-Chlorobutane
(B) 1-Bromobutane
(C) 1-Iodobutane
(D) 1-Fluorobutane

Q51. Propene reacts with hydrogen bromide to form a mixture of products. What is the major product?

(A) 2-Bromopropane
(B) 1-Bromopropane
(C) 1,2-Dibromopropane
(D) 2-Bromopropene

Q52. Propan-1-ol is heated under reflux with acidified potassium dichromate(VI). What is the organic product?

(A) Propene
(B) Propanal
(C) Propanone
(D) Propanoic acid

Q53. Ethanol is heated with concentrated sulfuric acid at 170 °C. What is the organic product?

(A) Ethane
(B) Ethene
(C) Diethyl ether
(D) Ethanoic acid

Q54. Bromoethane is heated with ethanolic potassium cyanide. What is the organic product?

(A) Ethylamine
(B) Ethane
(C) Propanenitrile
(D) Ethanol

Organic Chemistry II & Analysis

Q55. Which reagent can be used to distinguish between an aldehyde and a ketone?

(A) Tollens' reagent
(B) Bromine water
(C) Sodium metal
(D) 2,4-Dinitrophenylhydrazine

Q56. Propanoic acid is warmed with methanol in the presence of a concentrated sulfuric acid catalyst. What is the ester formed?

(A) Propyl methanoate
(B) Ethyl propanoate
(C) Methyl ethanoate
(D) Methyl propanoate

Q57. In the nitration of benzene, the electrophile that attacks the benzene ring is...

(A) An NO2 molecule
(B) The NO2+ ion
(C) An HNO3 molecule
(D) The NO+ ion

Q58. Which compound is the strongest base?

(A) Ammonia
(B) Phenylamine
(C) Ethylamine
(D) Ethanamide

Q59. A compound shows a strong, sharp absorption at about 1740 cm^-1 in its infra-red spectrum. Which bond is responsible for this absorption?

(A) O−H in an alcohol
(B) C−H
(C) C=C
(D) C=O in an ester

Q60. In thin-layer chromatography of a mixture of amino acids, the amino acids are located on the plate by spraying with...

(A) Ninhydrin
(B) Bromine water
(C) Tollens' reagent
(D) Limewater

Answer Key

Q1: B	Q11: A	Q21: B	Q31: A	Q41: B	Q51: A
Q2: C	Q12: D	Q22: A	Q32: C	Q42: C	Q52: D
Q3: A	Q13: B	Q23: C	Q33: B	Q43: A	Q53: B
Q4: D	Q14: C	Q24: D	Q34: C	Q44: D	Q54: C
Q5: B	Q15: A	Q25: A	Q35: A	Q45: B	Q55: A
Q6: C	Q16: D	Q26: B	Q36: D	Q46: C	Q56: D
Q7: A	Q17: B	Q27: C	Q37: B	Q47: A	Q57: B
Q8: D	Q18: A	Q28: D	Q38: C	Q48: D	Q58: C
Q9: B	Q19: C	Q29: B	Q39: A	Q49: B	Q59: D
Q10: C	Q20: D	Q30: D	Q40: D	Q50: C	Q60: A

Worked explanations for all 60 questions: quaidianpoint.com/a-level-chemistry-practice-test-7/ — plus 19 more free A-Level tests and 120 more practice tests for GCSE, IGCSE, IB, AP and ACS at QuaidianPoint.com.

Want 1-on-1 help? Book a personal chemistry lesson ($10/hour) at quaidianpoint.com/tutors/