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SCO INTERNATIONAL OLYMPIAD

GRADE 9 CHEMISTRY

QUESTION PAPER

Official Question Paper Set H | 2026-27

- **Designed for Grade 9 learners and aligned with SCO International Chemistry Olympiad preparation.**
- **Covers Matter in Our Surroundings, Pure Substances & Mixtures, Atoms and Molecules, and Atomic Structure.**
- **PDF-ready academic layout with compact question labels, clean blocks, answer keys, and stakeholder-friendly learning support.**
- **Global reference orientation: particle models, evidence-based enquiry, data interpretation, and chemistry reasoning.**

Matter	Mixtures	Atoms	Molecules	Chemistry
States	Separation	Formulae	Ions	Reasoning

SCO International Chemistry Olympiad- Class 9

Official Question Paper Set H | 2026-27 Rebranded Edition

Candidate Guidelines

Exam Name	SCO International Chemistry Olympiad
Class / Grade	Class 9
Question Paper Set	Set H
Duration	60 minutes
Type of Exam	Objective Type / Multiple Choice Questions
Total Questions	50
Marking	General, Case Study, and Reason/Assertion questions carry 1 mark each; Achievers Section questions carry 2 marks each.
Calculator	Not allowed unless specifically permitted by the examination authority.

Important Instructions

- Read each question carefully and choose only one correct option.
- Use the OMR sheet or online answer screen exactly as instructed by the invigilator/platform.
- Rough work should be done only in the space provided or on permitted rough sheets.
- This paper is designed for conceptual understanding, evidence-based reasoning, and application of chemistry in familiar situations.

Syllabus Coverage

- Matter in Our Surroundings: particle model, states of matter, diffusion, evaporation, latent heat.
- Is Matter Around Us Pure?: pure substances, mixtures, solutions, suspensions, colloids, concentration, separation methods.
- Atoms and Molecules: laws of chemical combination, symbols, formulae, molecular mass, mole concept, ions.
- Structure of the Atom: subatomic particles, Rutherford and Bohr models, shells, atomic number, mass number, isotopes and isobars.

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General Chemistry Reasoning

Q1. A bottle of perfume is opened at the back of a classroom. After a few minutes, students at the front can smell it. Which explanation is most accurate?

A. Perfume particles stop moving after opening the bottle.
B. Perfume particles move randomly and spread through air by diffusion.
C. Air particles are converted into perfume particles.
D. The smell travels only because the teacher walks around.

Q2. Which statement best compares the particle arrangement in ice, water, and steam?

A. Particles in all three states are fixed in one place.
B. Ice has closely packed particles in fixed positions; water particles slide past one another; steam particles are far apart and move freely.
C. Steam particles are more tightly packed than ice particles.
D. Water particles have no mass, but ice particles have mass.

Q3. Which change is an example of sublimation?

A. Melting of wax
B. Evaporation of water
C. Solid camphor changing directly into vapour
D. Freezing of water

Q4. During boiling, the temperature of pure water remains constant until the liquid changes into vapour. What is the best reason?

A. Heat is not supplied during boiling.
B. Supplied heat is used as latent heat to overcome particle attraction.
C. Water particles stop moving.
D. Boiling destroys the mass of water.

Q5. Why does sweat help cool the human body?

A. Evaporation absorbs heat from the skin.
B. Sweat particles become heavier.
C. Sweat reflects all sunlight.
D. Sweat turns into ice instantly.

Q6. Which condition will generally increase the rate of evaporation of water from a wet cloth?

A. Lower temperature and still air
B. Higher humidity and lower surface area
C. Higher temperature, larger surface area, and moving air
D. Keeping the cloth folded in a closed box

Q7. A sample has the same composition and same properties throughout. It cannot be separated by simple physical methods. It is most likely a:

A. compound or element
B. heterogeneous mixture
C. suspension
D. temporary mixture

Q8. Which of the following is a heterogeneous mixture?

A. Salt solution
B. Air
C. Muddy water
D. Brass alloy

Q9. Which observation is most likely to show the Tyndall effect?

A. A beam of light becomes visible when passed through milk diluted with water.
B. Sugar dissolves completely in water.
C. Copper wire conducts electricity.
D. Ice melts at 0°C.

Q10. A mixture contains sand, salt, and water. Which method is most suitable to obtain salt from the mixture?

A. Filter to remove sand, then evaporate water from the filtrate.
B. Use a magnet to pull out salt.
C. Only decant the mixture and stop.
D. Freeze the mixture and collect salt crystals immediately.

Q11. Which separation technique is best for separating coloured dyes in black ink?

A. Hand picking
B. Paper chromatography
C. Sieving
D. Magnetic separation

Q12. Which method is most appropriate for separating two miscible liquids with different boiling points, such as alcohol and water?

A. Fractional distillation
B. Filtration
C. Winnowing
D. Sedimentation only

Q13. A solution contains 20 g of salt dissolved in 180 g of water. What is the mass percentage of salt in the solution?

A. 10%
B. 11.1%
C. 20%
D. 180%

Q14. A student says, “All clear liquids are pure substances.” Which response is scientifically correct?

A. Correct, because clarity always means purity.
B. Incorrect, because many solutions are clear but still contain dissolved substances.
C. Correct, because mixtures are always cloudy.
D. Incorrect, because pure water is never clear.

Q15. Which option correctly classifies oxygen gas (O_2), water (H_2O), and salt water?

A. Element, compound, mixture
B. Compound, element, pure substance
C. Mixture, compound, element
D. Element, mixture, compound

Q16. The law of constant proportions states that a pure compound always contains:

A. elements in any random ratio by mass
B. the same elements in the same fixed ratio by mass
C. only one kind of atom
D. equal numbers of protons and neutrons

Q17. Magnesium forms Mg2+ and chlorine forms Cl-. What is the formula of magnesium chloride?

A. MgCl
B. MgCl2
C. Mg2Cl
D. Mg2Cl2

Q18. What is the molecular mass of carbon dioxide, CO2? (Atomic masses: C = 12, O = 16)

A. 28 u
B. 32 u
C. 44 u
D. 48 u

Q19. One mole of any substance contains approximately:

A. 6.022 x 10^23 particles
B. 6.022 x 10^3 particles
C. 22.4 particles
D. 100 particles

Q20. The molar mass of CaCO3 is closest to: (Ca = 40, C = 12, O = 16)

A. 68 g/mol
B. 84 g/mol
C. 100 g/mol
D. 116 g/mol

Q21. A neutral sodium atom has atomic number 11. How many electrons does Na+ have?

A. 9
B. 10
C. 11
D. 12

Q22. Rutherford's alpha-particle scattering experiment showed that:

A. atoms are solid spheres with no empty space
B. most of an atom is empty space and positive charge is concentrated in a small nucleus
C. electrons are found inside the nucleus
D. neutrons have positive charge

Q23. According to the Bohr model, what is the maximum number of electrons in the second shell?

A. 2
B. 4
C. 8
D. 18

Q24. An atom has 17 protons and 18 neutrons. What are its atomic number and mass number?

A. 17 and 35
B. 18 and 35
C. 35 and 17
D. 17 and 18

Q25. Isotopes are atoms of the same element that have:

A. different numbers of protons
B. same number of protons but different numbers of neutrons
C. same mass number but different atomic numbers
D. different electron charge only

Q26. Chlorine has isotopes Cl-35 and Cl-37. If their approximate abundances are 75% and 25%, the relative atomic mass is closest to:

A. 35.0
B. 35.5
C. 36.0
D. 37.0

Q27. An element has electronic configuration 2,8,1. Which statement is most accurate?

A. It is likely to gain one electron.
B. It has one valence electron and is likely to form a +1 ion.
C. It has a full outer shell and is unreactive.
D. It has eight valence electrons.

Q28. Which pair is an example of isobars?

A. C-12 and C-14
B. Ar-40 and Ca-40
C. Cl-35 and Cl-37
D. H-1 and H-2

Q29. Which formula is correctly written for aluminium oxide if aluminium is Al3+ and oxide is O2-?

A. AlO
B. Al2O3
C. Al3O2
D. AlO2

Q30. Which particle diagram best represents a pure compound?

A. Only identical single atoms
B. Different types of particles not joined together
C. Identical groups made of two or more different atoms chemically joined
D. Large visible grains mixed unevenly

Case Study and Data-Based Questions

Q31. Case Study: A student heats ice in a beaker and records that temperature remains constant during melting. What does this constant temperature indicate?

A. No heat is absorbed
B. Heat is used to change state rather than raise temperature
C. Particles disappear during melting
D. The thermometer stops working whenever ice melts

Q32. In the same investigation, the student spreads water on a steel plate and sees it dry faster under a fan. Which variable mainly increases the rate of evaporation?

A. Moving air around the liquid
B. More dissolved salt in water
C. Smaller exposed surface only
D. Lower temperature

Q33. The student notices that acetone feels cooler than water on the skin. The best explanation is that acetone:

A. evaporates faster and absorbs heat more rapidly
B. has no particles
C. has a higher freezing point than water
D. turns into a solid on the skin

Q34. Which conclusion from the heating curve of a pure substance is valid?

A. A flat region may indicate a change of state.
B. Temperature always rises continuously during heating.
C. Mass increases when boiling starts.
D. Particles stop moving after melting.

Q35. Which design improvement would make the heating investigation more reliable?

A. Record temperature at regular time intervals.
B. Change the thermometer each minute without noting it.
C. Use unknown quantities of ice each trial.
D. Ignore room temperature.

Q36. Case Study: A muddy salt-water sample is filtered. What passes through the filter paper?

A. Mud particles only
B. Salt solution
C. Dry salt crystals only
D. Only pure water molecules

Q37. After filtration, the filtrate is heated until dry. What remains in the dish?

A. Mud only
B. Salt crystals
C. Filter paper
D. Steam only

Q38. A teacher shines a torch through a colloid and observes a visible light path. Which concept is demonstrated?

A. Sublimation
B. Tyndall effect
C. Fractional distillation
D. Isotopic abundance

Q39. A student compares a solution and suspension. Which property helps identify a suspension?

A. It is always colourless.
B. Particles may settle on standing.
C. It cannot be filtered by any method.
D. It always has a fixed boiling point.

Q40. Which safety and accuracy habit is best when performing separation experiments?

A. Label all samples and heat carefully under supervision.
B. Smell unknown chemicals directly.
C. Use more heat than necessary to save time.
D. Mix unknown samples without recording observations.

Reason and Assertion

Reason and Assertion Answer Format

- A: Both Assertion and Reason are true, and Reason correctly explains Assertion.
- B: Both are true, but Reason does not correctly explain Assertion.
- C: Assertion is true but Reason is false / or as specified in the options.
- D: Assertion is false but Reason is true / or both false as specified in the options.

Q41. Assertion: Evaporation causes cooling. Reason: High-energy particles escape from the liquid surface, lowering the average energy of the remaining liquid.

A. Both Assertion and Reason are true, and Reason correctly explains Assertion.
B. Both are true, but Reason does not explain Assertion.
C. Assertion is true but Reason is false.
D. Assertion is false but Reason is true.

Q42. Assertion: A compound can be separated into its elements by simple filtration. Reason: Compounds are formed by chemical combination in a fixed ratio.

A. Both true and Reason explains Assertion.
B. Both true but Reason does not explain Assertion.
C. Assertion is false but Reason is true.
D. Both are false.

Q43. Assertion: Isotopes of an element have the same chemical properties. Reason: They have the same number of electrons in neutral atoms.

A. Both true and Reason explains Assertion.
B. Both true but Reason does not explain Assertion.
C. Assertion true but Reason false.
D. Assertion false but Reason true.

Q44. Assertion: The path of light is visible in a true solution. Reason: True-solution particles are large enough to scatter light strongly.

A. Both true and Reason explains Assertion.
B. Both true but Reason does not explain Assertion.
C. Assertion true but Reason false.
D. Both Assertion and Reason are false.

Q45. Assertion: Atomic number identifies an element. Reason: Atomic number equals the number of protons in the nucleus.

A. Both true and Reason correctly explains Assertion.
B. Both true but Reason does not explain Assertion.
C. Assertion true but Reason false.
D. Assertion false but Reason true.

Achievers Section

Q46. Achievers: A 50 g solution contains 5 g of sugar. What is the concentration by mass percentage?

A. 5%
B. 10%
C. 45%
D. 55%

Q47. Achievers: A sample contains 3.01 x 10^23 molecules of water. Approximately how many moles of water are present?

A. 0.25 mol
B. 0.50 mol
C. 1.00 mol
D. 2.00 mol

Q48. Achievers: An element X has configuration 2,8,7. Which formula is most likely for its compound with magnesium (Mg2+)?

A. MgX
B. MgX2
C. Mg2X
D. Mg2X3

Q49. Achievers: Which set correctly matches separation method to mixture?

A. Sublimation - sand and salt
B. Chromatography - coloured dyes in ink
C. Magnetic separation - alcohol and water
D. Filtration - copper sulphate solution into copper and sulphate ions

Q50. Achievers: A neutral atom has mass number 27 and 14 neutrons. Which statement is correct?

A. It has atomic number 13 and 13 electrons.
B. It has atomic number 14 and 27 electrons.
C. It has atomic number 41 and 14 electrons.
D. It has atomic number 27 and 13 electrons.

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Answer Key with Short Explanations

Q.No.	Answer	Short Explanation
1	B	Diffusion occurs because particles move continuously and spread from a region of higher concentration to lower concentration.
2	B	The particle model explains solids, liquids, and gases by arrangement, spacing, and movement of particles.
3	C	Sublimation is the direct change from solid to gas without becoming liquid.
4	B	During a change of state, energy is used to change particle arrangement rather than to increase temperature.
5	A	Evaporation requires energy, which is taken from the skin, producing a cooling effect.
6	C	Evaporation increases with higher temperature, larger surface area, lower humidity, and wind/moving air.
7	A	Pure substances include elements and compounds. They have fixed composition and characteristic properties.
8	C	Muddy water is non-uniform and particles may settle, so it is heterogeneous.
9	A	Colloids scatter light, making the path of light visible. This is the Tyndall effect.
10	A	Sand is insoluble and can be filtered; dissolved salt can be obtained by evaporating water.
11	B	Chromatography separates substances based on different movement through a stationary phase with a solvent.
12	A	Fractional distillation separates miscible liquids when their boiling points differ.
13	A	Total mass = 20 + 180 = 200 g. Mass percentage = 20/200 x 100 = 10%.
14	B	A solution such as salt water can be clear and still be a mixture.
15	A	Oxygen is an element, water is a compound, and salt water is a mixture.
16	B	A compound has fixed composition by mass. Water always contains hydrogen and oxygen in a fixed ratio by mass.
17	B	One Mg^{2+} ion requires two Cl^- ions for charge balance, giving $MgCl_2$.
18	C	Molecular mass = 12 + 2(16) = 44 u.
19	A	A mole represents Avogadro's number of particles, approximately 6.022 x 10^23.
20	C	$CaCO_3$ = 40 + 12 + 3(16) = 100 g/mol.
21	B	A neutral sodium atom has 11 electrons. Na^+ has lost one electron, so it has 10 electrons.
22	B	Most alpha particles passed through the foil, while a few deflected strongly, showing a small dense positive nucleus.
23	C	The maximum number of electrons in a shell is 2n^2. For n = 2, maximum = 8.
24	A	Atomic number = number of protons = 17. Mass number = protons + neutrons = 35.
25	B	Isotopes have the same atomic number but different mass numbers due to different neutrons.
26	B	Average = 35(0.75) + 37(0.25) = 26.25 + 9.25 = 35.5.
27	B	The configuration 2,8,1 has one electron in the outermost shell, so it tends to lose one electron.
28	B	Isobars have the same mass number but different atomic numbers. Ar-40 and Ca-40 both have mass number 40.
29	B	Charge balance requires 2 aluminium ions (+6) and 3 oxide ions (-6), giving Al_2O_3.

30	C	A pure compound has identical molecules or formula units made from different elements chemically combined.
31	B	During melting, heat supplied is latent heat that changes state while temperature remains constant.
32	A	Moving air carries away water vapour, increasing evaporation.
33	A	Liquids that evaporate rapidly absorb heat quickly from surroundings, creating cooling.
34	A	Heating curves of pure substances show plateaus during melting or boiling.
35	A	Regular measurements make data more reliable and allow comparison.
36	B	Mud particles are retained; dissolved salt and water pass through as filtrate.
37	B	Evaporation removes water, leaving dissolved salt behind.
38	B	Colloidal particles scatter light, making its path visible.
39	B	Suspension particles are large enough to settle on standing.
40	A	Good laboratory practice includes labelling, supervision, and careful heating.
41	A	Cooling occurs because faster particles escape, reducing average kinetic energy of the remaining liquid.
42	C	Compounds cannot be separated by simple physical methods, but they do have fixed ratios.
43	A	Chemical properties depend mainly on electronic configuration, which is the same for neutral isotopes.
44	D	True solutions generally do not show the Tyndall effect because particles are too small to scatter light visibly.
45	A	Each element has a unique number of protons, so atomic number identifies the element.
46	B	Mass percentage = 5/50 x 100 = 10%.
47	B	3.01 x 10^23 is half of Avogadro's number, so it is about 0.5 mol.
48	B	X has seven valence electrons and tends to form X-. Mg2+ combines with two X- ions, giving MgX2.
49	B	Chromatography is used to separate coloured components such as dyes in ink.
50	A	Protons = mass number - neutrons = 27 - 14 = 13. A neutral atom has 13 electrons.