SCO INTERNATIONAL CHEMISTRY OLYMPIAD

CLASS 10 | SAMPLE PAPER WITH ANSWER KEY & EXPLANATIONS

Academic Year | Question Paper Set S

Designed for global school learners with concept clarity, reasoning, applications, and responsible scientific thinking.

Designed from Class 10 Chemistry syllabus pathways and aligned with SCO's guided preparation, practice, reporting, and future-ready academic growth.

- question blocks with compact numbering, options, answer key, and detailed explanations
- grade-appropriate chemistry reasoning across reactions, acids/bases, metals, carbon, periodicity, and energy

Chemical Reactions	Acids, Bases & Salts	Metals & Non-Metals
Carbon Compounds	Periodic Classification	Sources of Energy

Exam Code	Grade	Document
IChO	10	SCO Official

Guidelines for the Candidate

Total Questions	50
Time	60 minutes
Marking Pattern	General, Case Study, and Reason/Assertion: 1 mark each; Achievers Section: 2 marks each

- Use only one response for each question. Every question has exactly one correct answer.
- Read case passages carefully. All passage text is included inside the relevant question block.
- Calculators are not required. Use chemical reasoning, balanced equations, and class-level calculations.
- For OMR use, darken only the circle corresponding to the selected option.
- Before attempting the paper, complete the name, registration ID, and contact details in the space provided by the exam centre.

Name:	**Registration ID: .....**
School / Country:	**Contact No.: .....**

Section A - General Chemistry Questions

Q1 Chemical Reaction and Equation

Which observation confirms that a chemical reaction has taken place when two clear solutions are mixed?

A. Only the beaker changes position
B. A precipitate forms and colour changes
C. The volume of the beaker changes
D. The stopwatch starts

Answer: B

Explanation: Formation of a precipitate or colour change indicates new substances have formed.

Q2 Chemical Reaction and Equation

Which equation is correctly balanced?

A. $H_2 + O_2 \rightarrow H_2O$
B. $2H_2 + O_2 \rightarrow 2H_2O$
C. $H_2 + 2O_2 \rightarrow H_2O$
D. $2H_2 + 2O_2 \rightarrow H_2O$

Answer: B

Explanation: The balanced equation has four H atoms and two O atoms on each side: $2H_2 + O_2 \rightarrow 2H_2O$.

Q3 Chemical Reaction and Equation

Rusting of iron is mainly an example of:

A. oxidation
B. neutralisation
C. evaporation
D. crystallisation

Answer: A

Explanation: Rusting involves iron reacting with oxygen and moisture to form hydrated iron oxide; iron is oxidized.

Q4 Acid Bases and Salt

Which indicator turns pink in a basic solution?

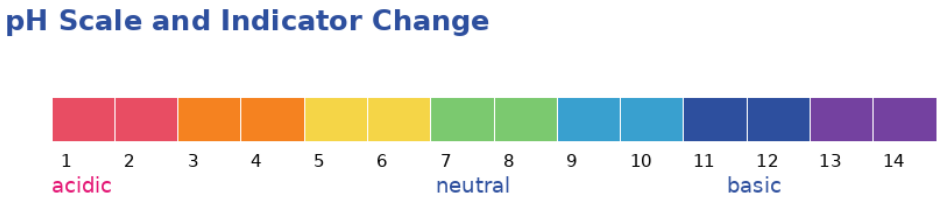
A. Methyl orange
B. Phenolphthalein
C. Blue litmus
D. Universal indicator only

Answer: B

Explanation: Phenolphthalein is colourless in acidic solution and pink in basic solution.

Q5 Acid Bases and Salt

Which pH value represents the strongest acid among the options?



A. 2
B. 7

C. 9
D. 12

Answer: A

Explanation: Lower pH means stronger acidity. pH 2 is the most acidic among the choices.

Q6 Acid Bases and Salt

Plaster of Paris is chemically:

A. $CaSO_4.2H_2O$
B. $CaSO_4.1/2H_2O$
C. $Na_2CO_3.10H_2O$
D. $NaHCO_3$

Answer: B

Explanation: Plaster of Paris is calcium sulfate hemihydrate, $CaSO_4.1/2H_2O$.

Q7 Metals and Non Metals

Which metal is liquid at room temperature?

A. Mercury
B. Iron
C. Aluminum
D. Zinc

Answer: A

Explanation: Mercury is the common metal that is liquid at room temperature.

Q8 Metals and Non Metals

Which non-metal is lustrous?

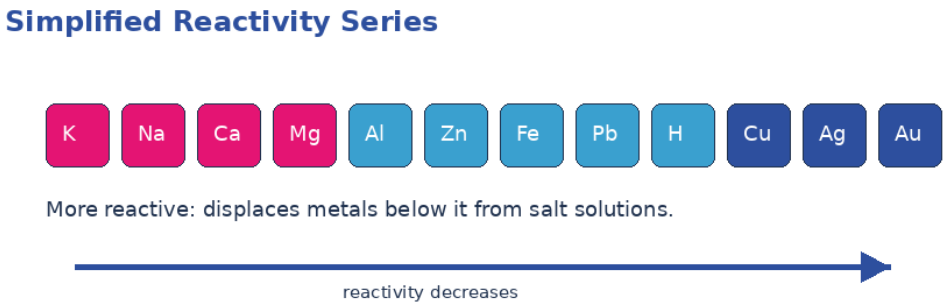
A. Sulfur
B. Iodine
C. Oxygen
D. Nitrogen

Answer: B

Explanation: Iodine is a lustrous non-metal.

Q9 Metals and Non Metals

Which method is commonly used to prevent rusting of iron?



A. Keeping it wet
B. Painting or galvanising
C. Adding acid
D. Heating in open air

Answer: B

Explanation: Painting prevents contact with air and moisture; galvanising coats iron with zinc.

Q10 Carbon and Its Compounds

What is the general formula of alkanes?

A. C_nH_{2n+2}
B. C_nH_{2n}
C. C_nH_{2n-2}
D. C_nH_n

Answer: A

Explanation: Alkanes are saturated hydrocarbons with general formula C_nH_{2n+2}.

Q11 Carbon and Its Compounds

Which process converts vegetable oils into vanaspati ghee?

A. Hydrogenation
B. Fermentation
C. Neutralisation
D. Sublimation

Answer: A

Explanation: Hydrogenation adds hydrogen to unsaturated oils in the presence of a catalyst.

Q12 Carbon and Its Compounds

Which compound is vinegar mainly an aqueous solution of?

A. Ethanol
B. Ethanoic acid
C. Methane
D. Sodium carbonate

Answer: B

Explanation: Vinegar contains dilute ethanoic acid.

Q13 Periodic Classification of Elements

Mendeleev arranged elements primarily according to:

A. increasing atomic masses
B. increasing atomic numbers only
C. alphabetical order
D. density only

Answer: A

Explanation: Mendeleev used atomic mass and chemical properties to arrange elements.

Q14 Periodic Classification of Elements

Modern periodic law is based on:

A. atomic mass
B. atomic number
C. number of neutrons
D. state of matter

Answer: B

Explanation: The modern periodic table is arranged by increasing atomic number.

Q15 Periodic Classification of Elements

Which trend generally increases down a group?

A. Atomic radius
B. Ionization energy
C. Electronegativity
D. Non-metallic character always

Answer: A

Explanation: New shells are added down a group, so atomic radius generally increases.

Q16 Sources of energy

Which is a renewable source of energy?

A. Coal
B. Petroleum
C. Solar energy
D. Natural gas

Answer: C

Explanation: Solar energy is renewable because it is continuously available from the Sun.

Q17 Sources of energy

Which problem is associated with burning fossil fuels?

A. No gases are produced
B. Greenhouse gas emission
C. No energy is released
D. Oxygen is created

Answer: B

Explanation: Burning fossil fuels releases CO_2 and other pollutants, contributing to global warming and air pollution.

Q18 Chemical Reaction and Equation

A white insoluble substance forms when $BaCl_2$ solution is mixed with Na_2SO_4 solution. The white solid is:

A. $BaSO_4$
B. NaCl
C. $BaCl_2$
D. Na_2SO_4

Answer: A

Explanation: Ba^{2+} and SO_4^{2-} combine to form insoluble barium sulfate, $BaSO_4$.

Q19 Acid Bases and Salt

Which substance is used for bleaching cotton and linen in industry?

A. Baking soda
B. Bleaching powder
C. Washing soda
D. Common salt

Answer: B

Explanation: Bleaching powder releases chlorine and is used as a bleaching agent.

Q20 Metals and Non Metals

Why do metals conduct electricity?

A. Their atoms are very heavy
B. They contain mobile delocalized electrons

C. They dissolve in water
D. They are all magnetic

Answer: B

Explanation: Delocalized electrons can move through the metallic lattice, carrying charge.

Section B - Case Study and Application Questions

Q21 Chemical Reaction and Equation

Case Study: A student heats copper powder in a china dish. The reddish-brown powder becomes black. Which product is formed?

A. Copper carbonate
B. Copper oxide
C. Copper chloride
D. Copper sulfate

Answer: B

Explanation: Copper reacts with oxygen on heating to form black copper(II) oxide, CuO.

Q22 Acid Bases and Salt

Case Study: A school laboratory labels two bottles as acid and base. Bottle A changes turmeric paper reddish-brown, while Bottle B turns blue litmus red. Which identification is correct?

A. A is acid, B is base
B. A is base, B is acid
C. Both are acids
D. Both are neutral

Answer: B

Explanation: Bases turn turmeric reddish-brown; acids turn blue litmus red.

Q23 Metals and Non Metals

Case Study: A student puts copper turnings in zinc sulfate solution and observes no change. What is the best conclusion?

A. Copper is more reactive than zinc
B. Copper cannot displace zinc from its salt
C. Zinc is a non-metal
D. Copper dissolves completely

Answer: B

Explanation: Copper is less reactive than zinc and therefore cannot displace zinc from zinc sulfate.

Q24 Carbon and Its Compounds

Case Study: A cooking gas mainly contains hydrocarbons that burn in oxygen. What safety issue is most important if oxygen supply is limited?

A. Only water is produced
B. Carbon monoxide can be produced
C. No reaction occurs
D. The gas becomes a metal

Answer: B

Explanation: Incomplete combustion of hydrocarbons can produce poisonous carbon monoxide.

Q25 Periodic Classification of Elements

Case Study: Element X is in Group 1 and Period 3. Element Y is in Group 17 and Period 3. Which type of compound is likely between X and Y?

A. Ionic compound

B. Metallic alloy
C. Covalent network only
D. No compound

Answer: A

Explanation: Group 1 element loses one electron and Group 17 element gains one electron; an ionic compound forms.

Q26 Sources of energy

Case Study: A school compares coal and solar panels for electricity. Which reason favours solar panels during operation?

A. They emit smoke continuously
B. They need daily mining
C. They generate electricity without combustion emissions
D. They always work at night without storage

Answer: C

Explanation: Solar panels do not burn fuel during operation, so they produce electricity without combustion emissions.

Q27 Acid Bases and Salt

Case Study: A farmer adds too much chemical fertiliser and the soil becomes acidic. Which salt/base type can help reduce acidity?

A. Calcium carbonate
B. Sodium chloride
C. Copper chloride
D. Dilute sulfuric acid

Answer: A

Explanation: Calcium carbonate is basic and can neutralise acidic soil.

Q28 Chemical Reaction and Equation

Case Study: A food packet contains an iron powder sachet to absorb oxygen. What type of reaction helps preserve the food?

A. Oxidation of iron
B. Neutralisation of salt
C. Reduction of oxygen only without iron
D. Fermentation

Answer: A

Explanation: Iron reacts with oxygen and removes it from the packet, slowing oxidation of food.

Q29 Carbon and Its Compounds

Case Study: Soap fails to make good lather in hard water. Which substance is mainly responsible?

A. Calcium and magnesium ions
B. Sodium ions only
C. Distilled water
D. Oxygen gas

Answer: A

Explanation: Hard water contains Ca^{2+} and Mg^{2+} ions that react with soap to form scum.

Q30 Metals and Non Metals

Case Study: A metal oxide reacts with hydrochloric acid to form salt and water. What is the likely nature of this oxide?

A. Basic oxide
B. Neutral gas
C. Acidic oxide only
D. Organic compound

Answer: A

Explanation: Most metal oxides are basic and neutralise acids to form salt and water.

Section C - Reason and Assertion Questions

For Q31-Q40, use: A = both true and reason explains assertion; B = both true but reason does not explain; C = assertion true, reason false; D = assertion false, reason true.

Q31 Chemical Reaction and Equation

Assertion: Decomposition reactions require energy in the form of heat, light, or electricity. Reason: A compound is broken into simpler substances during decomposition.

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

Answer: A

Explanation: The reason correctly explains the type of reaction; energy is often required to break bonds.

Q32 Acid Bases and Salt

Assertion: pH below 7 indicates an acidic solution. Reason: Acidic solutions have a higher concentration of H^+ ions than neutral water.

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

Answer: A

Explanation: More H^+ ions correspond to pH below 7.

Q33 Metals and Non Metals

Assertion: Copper does not react with dilute hydrochloric acid under normal conditions. Reason: Copper is less reactive than hydrogen.

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

Answer: A

Explanation: Copper cannot displace hydrogen from dilute acids because it is below hydrogen in the reactivity series.

Q34 Carbon and Its Compounds

Assertion: Ethene undergoes addition reaction more readily than ethane. Reason: Ethene has a double bond with a reactive pi bond.

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

Answer: A

Explanation: The C=C bond in ethene provides the site for addition reactions.

Q35 Periodic Classification of Elements

Assertion: Noble gases have very low reactivity. Reason: They have incomplete valence shells.

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

Answer: C

Explanation: Noble gases are mostly inert because they have complete valence shells.

Q36 Sources of energy

Assertion: A good fuel should have high calorific value. Reason: A higher calorific value means more energy is released per unit mass.

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

Answer: A

Explanation: This directly explains why high calorific value is desirable.

Q37 Acid Bases and Salt

Assertion: Distilled water is neutral at room temperature. Reason: It contains equal concentration of H^+ and OH^- ions.

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

Answer: A

Explanation: Neutral solutions have equal H^+ and OH^- concentrations.

Q38 Metals and Non Metals

Assertion: Metals are generally sonorous. Reason: Metals produce sound when struck because their lattice transmits vibrations.

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

Answer: A

Explanation: The metallic lattice helps transmit vibrations, creating a ringing sound.

Q39 Carbon and Its Compounds

Assertion: Detergents can work better than soaps in hard water. Reason: Detergents do not form insoluble scum easily with Ca^{2+} and Mg^{2+} ions.

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

Answer: A

Explanation: This is a practical advantage of detergents over soaps in hard water.

Q40 Chemical Reaction and Equation

Assertion: Double displacement reactions involve exchange of ions. Reason: In all double displacement reactions, oxygen gas must be evolved.

A. Both Assertion and Reason are true, and Reason correctly explains Assertion.

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

Answer: C

Explanation: Ion exchange is true, but oxygen gas evolution is not required.

Section D - Achievers Section

Q41 Chemical Reaction and Equation

A student reacts 4.8 g of magnesium with excess oxygen. Atomic mass Mg = 24. If $2Mg + O_2$ -> 2MgO, how many moles of MgO are formed?

A. 0.1 mol
B. 0.2 mol
C. 0.4 mol
D. 2.0 mol

Answer: B

Explanation: Moles of Mg = 4.8/24 = 0.2 mol. The mole ratio Mg:MgO is 1:1, so MgO formed = 0.2 mol.

Q42 Acid Bases and Salt

At half neutralisation of a weak acid by a strong base, why does the solution resist pH change?

A. Only water is present
B. Weak acid and conjugate base are both present
C. All ions disappear
D. Strong acid forms

Answer: B

Explanation: A buffer contains a weak acid and its conjugate base, which neutralise small amounts of added acid or base.

Q43 Metals and Non Metals

A metal M reacts with steam but not with cold water. It also forms an amphoteric oxide. Which metal is most likely?

A. Sodium
B. Aluminum
C. Copper
D. Gold

Answer: B

Explanation: Aluminum forms amphoteric Al_2O_3 and reacts with steam under suitable conditions but not vigorously with cold water due to its oxide layer.

Q44 Carbon and Its Compounds

A compound C_2H_4 reacts with hydrogen in presence of nickel to form C_2H_6. What process occurs?

A. Hydrogenation/addition
B. Oxidation only
C. Neutralisation
D. Precipitation

Answer: A

Explanation: Hydrogen adds across the double bond of ethene to form ethane; this is hydrogenation.

Q45 Periodic Classification of Elements

An element has atomic number 16. Which statement is correct?

A. It has configuration 2,8,6 and tends to gain two electrons
B. It has one valence electron
C. It is a noble gas
D. It is in Group 1

Answer: A

Explanation: Atomic number 16 gives configuration 2,8,6. It tends to gain or share two electrons to complete its octet.

Q46 Sources of energy

Which pair best represents an energy source and its environmental concern?

A. Coal - CO_2 and air pollutants
B. Solar - soot production during operation
C. Wind - acid rain from combustion
D. Hydrogen fuel cell - carbon monoxide from carbon combustion

Answer: A

Explanation: Coal combustion releases CO_2 and other pollutants. Solar and wind do not involve combustion during operation.

Q47 Chemical Reaction and Equation

If 10 g $CaCO_3$ gives 4.4 g CO_2 on heating, what percentage of $CaCO_3$ decomposed? ($CaCO_3$ molar mass 100 g/mol; CO_2 molar mass 44 g/mol)

A. 50%
B. 75%
C. 100%
D. 25%

Answer: C

Explanation: 10 g $CaCO_3$ = 0.1 mol, which gives 0.1 mol CO_2 = 4.4 g. Since observed equals theoretical, decomposition is 100%.

Q48 Acid Bases and Salt

A water sample has pH 8.5 and forms lather poorly with soap. Which pair is most likely?

A. Acidic and soft
B. Basic and hard
C. Neutral and pure
D. Strong acid and distilled

Answer: B

Explanation: pH 8.5 indicates mild basic nature, and poor lather suggests hard water due to Ca^{2+}/Mg^{2+} ions.

Q49 Carbon and Its Compounds

Which molecule is an unsaturated hydrocarbon?

A. CH_4
B. C_2H_6
C. C_2H_4
D. C_3H_8

Answer: C

Explanation: C_2H_4 has a carbon-carbon double bond and is therefore unsaturated.

Q50 Periodic Classification of Elements

Which pair is most likely to form a covalent compound?

A. Na and Cl
B. Mg and O
C. C and H
D. K and Br

Answer: C

Explanation: Carbon and hydrogen are non-metals and form covalent bonds by sharing electrons.

Answer Key

Q	Ans	Q	Ans	Chapter Focus
1	B	26	C	Chemical Reaction and Equation / Sources of energy
2	B	27	A	Chemical Reaction and Equation / Acid Bases and Salt
3	A	28	A	Chemical Reaction and Equation / Chemical Reaction and Equation
4	B	29	A	Acid Bases and Salt / Carbon and Its Compounds
5	A	30	A	Acid Bases and Salt / Metals and Non Metals
6	B	31	A	Acid Bases and Salt / Chemical Reaction and Equation
7	A	32	A	Metals and Non Metals / Acid Bases and Salt
8	B	33	A	Metals and Non Metals / Metals and Non Metals
9	B	34	A	Metals and Non Metals / Carbon and Its Compounds
10	A	35	C	Carbon and Its Compounds / Periodic Classification of Elements
11	A	36	A	Carbon and Its Compounds / Sources of energy
12	B	37	A	Carbon and Its Compounds / Acid Bases and Salt
13	A	38	A	Periodic Classification of Elements / Metals and Non Metals
14	B	39	A	Periodic Classification of Elements / Carbon and Its Compounds
15	A	40	C	Periodic Classification of Elements / Chemical Reaction and Equation
16	C	41	B	Sources of energy / Chemical Reaction and Equation
17	B	42	B	Sources of energy / Acid Bases and Salt
18	A	43	B	Chemical Reaction and Equation / Metals and Non Metals
19	B	44	A	Acid Bases and Salt / Carbon and Its Compounds
20	B	45	A	Metals and Non Metals / Periodic Classification of Elements
21	B	46	A	Chemical Reaction and Equation / Sources of energy
22	B	47	C	Acid Bases and Salt / Chemical Reaction and Equation
23	B	48	B	Metals and Non Metals / Acid Bases and Salt
24	B	49	C	Carbon and Its Compounds / Carbon and Its Compounds
25	A	50	C	Periodic Classification of Elements / Periodic Classification of Elements

Space for Rough Work