Answer Key

Class 9 Chemistry · Chapter 2 — Matter

Paper	Source
Model Paper 2025	FBISE Model Paper · Curriculum 2022-23 · Inclusive Scheme of Studies 2024
2025, 1st Exam Paper 1	FBISE SSC-I · 2025 · Versions B and D · 1st Exam
2025, 1st Exam Paper 2	FBISE SSC-I · 2025 · Version D · 1st Exam (incl. Old Curriculum 2006 pages)
2025, 2nd Exam	FBISE SSC-I · 2025 · 2nd Exam
Model Paper 2026 (50% MCQs)	FBISE Model Paper · National Curriculum 2022-23 · 50% MCQs + 50% Descriptive
2026, Paper D	FBISE SSC-I · 2026 · Paper D
2026, Paper M	FBISE SSC-I · 2026 · Paper M
2026, Paper B	FBISE SSC-I · 2026 · Paper B

Past paper questions from Federal Board SSC-I Chemistry papers (2025 and 2026), with answers. Each question is printed in full, followed by its answer in the shaded box. Answers follow the Chapter 2 (Unit 2: Matter) textbook. Total: 38 questions.

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Model Paper 2025

Curriculum 2022-23, Inclusive Scheme of Studies 2024

Section A — MCQ

Q1(xii). Suggest which statement about solubility is INCORRECT?

A) It refers to the ability of a solute to dissolve in a solvent
B) It is measured in grams per liter of solvent
C) It is affected by temperature, pressure, and the nature of the solute and solvent.
D) It is independent of temperature.

Answer: D) It is independent of temperature.

The solubility of a substance depends on the solvent, temperature and pressure, so the statement that it is independent of temperature is incorrect.

Section B — Short Questions

Q2(iii). Compare following properties of liquid Crystals with liquids.

a. Molecular arrangement
b. Fluidity **[1.5+1.5]**

Answer

Liquid crystals compared with liquids

Property	Liquid crystal	Liquid
a. Molecular arrangement	Molecules keep some order: they are partly arranged in a regular pattern (like a solid) while still able to move	Molecules are arranged randomly, with no regular pattern
b. Fluidity	Can flow, but less freely than a liquid because of the partial order	Flow freely and take the shape of the container

Liquid crystals are the cloudy state formed when some crystalline solids are heated. They have many properties of liquids and some properties of solids. On heating further, they change to a clear, transparent liquid.

Section C — Long Questions

Q5. Define solubility. How can it be affected by the change in temperature? Explain with graph. **[1+2+3]**

Answer

Definition [1]

Solubility is the maximum amount of solute that dissolves in a specified amount of solvent (usually 100 g) at a specific temperature. It depends on the solvent used, the temperature and the pressure.

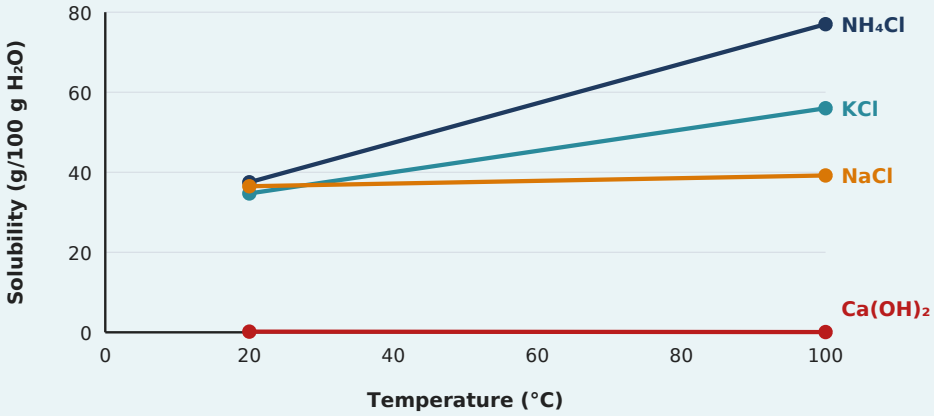
Effect of temperature [2]

- **Increases with temperature** for some solutes, e.g. KCl, NH_4Cl, KNO_3.
- **Decreases with temperature** for some solutes, e.g. $Ca(OH)_2$, Na_2SO_4.
- For NaCl the change is very small.

Graph [3]

Solubility (g/100 g H_2O) is plotted on the y-axis against temperature (°C) on the x-axis. Values are from Table 2.2 of the textbook:

Solute	At 20 °C	At 100 °C
NaCl	36.5	39.2
KCl	34.7	56
NH_4Cl	37.5	77
$Ca(OH)_2$	0.173	0.066



Reading the graph: the KCl and NH_4Cl lines rise steeply (solubility increases with temperature), the NaCl line is almost flat, and the $Ca(OH)_2$ line falls (solubility decreases with temperature). Every point on a line is a saturated solution at that temperature.

2025, 1st Exam Paper 1

Versions B and D

Section A — MCQ

Q12 (Versions B and D). In which state of matter do particles have the least compressibility?

A) Solid B) Liquid C) Gas D) Plasma

Answer: A) Solid

Particles in a solid are packed very closely with almost no empty space between them, so a solid is not compressible.

Section B — Short Questions

Q2(ii) OR (Version B). Briefly describe the following properties of gas:

a) Density

b) Fluidity **[1.5+1.5]**

Answer

Properties of gases

Property	Gas
a) Density	Low density at normal conditions, because there are large spaces between the molecules.
b) Fluidity	Gases can flow. Their particles are far apart and move freely, so a gas spreads out and takes the shape of its container.

Section C — Long Questions

Q6 (Version B). What is meant by allotropy? Discuss any two allotropes of carbon. **[1+1.5+1.5]**

Answer

Allotropy [1]

The property of an element to exist in different physical forms in the same physical state is called allotropy. These different forms are called allotropes: the atoms of the same element are arranged in different ways, giving different structural forms. Diamond, graphite and buckyballs are allotropes of carbon.

Two allotropes of carbon [1.5 + 1.5]

Graphite

- Flat two-dimensional layers of hexagonally arranged carbon atoms; each C atom is covalently bonded to three other C atoms.
- Weak intermolecular forces between the layers let them slide over one another, so graphite is soft and slippery and is used as a lubricant.
- It is a good conductor of electricity.

Diamond

- Each C atom is covalently bonded to four other C atoms in a rigid, three-dimensional tetrahedral network.
- It is the hardest and purest crystalline allotrope of carbon, with a very high melting point.
- All outer electrons are used in bonding, so there are no free electrons and diamond does not conduct electricity.

2025, 1st Exam Paper 2

Version D, Sections B and C

Section B — Short Questions

Q2(iii). Briefly describe the following properties of solids:

a) Compressibility

b) Density **[3]**

Answer

Properties of solids

Property	Solid
a) Compressibility	Not compressible. The particles are packed very closely and there is almost no empty space between them.
b) Density	High density at normal conditions, because the particles are tightly packed.

Section C — Long Questions

Q6. Compare colloid and suspension. Give one example of each. **[2+2]**

Answer

Colloid compared with suspension [2]

Point	Colloid	Suspension
Nature	Heterogeneous mixture	Heterogeneous mixture
Particle size	1 to 10^3 nm; too small to be seen by the naked eye	Greater than 10^3 nm (1000 nm); big enough to be seen
Filtration	Passes through ordinary filter paper but not through ultra-filter paper	Cannot pass through ordinary or ultra-filter paper
On standing	Does not settle; particles stay evenly spread	Particles separate and settle down

Examples [2]

- Colloid: milk (or blood, ink, jelly, toothpaste).
- Suspension: muddy water (or chalk in water, milk of magnesia).

Note: Textbook Table 2.3 prints "visible by naked eye" for colloids, but the text of the chapter says colloid particles are too small to be seen. The text is followed here.

Old Curriculum 2006 pages

These pages follow the older syllabus. Only questions matching Chapter 2 topics are included.

Q4 (MCQ). Which of the following list contains only elements?

A) Water, Oxygen
B) Hydrogen, Oxygen, Salt
C) Air, Water, Fire
D) Sulphur, Carbon

Answer: D) Sulphur, Carbon

Sulphur and carbon are the only pure elements. Water and salt are compounds, air is a mixture, and fire is not matter.

Q8 (MCQ). Amalgam used by dentist is an example of:

A) Solid in liquid
B) Solid in solid
C) Liquid in solid
D) Liquid in liquid

Answer: A) Solid in liquid

An amalgam is a solution of a metal (solid) in liquid mercury.

Q11 (MCQ). 10g sugar in 100g water is an example of:

A) Solvent B) Colloid C) Suspension D) Aqueous solution

Answer: D) Aqueous solution

Sugar dissolves completely in water to form a homogeneous mixture, which is an aqueous solution.

Q2(iv) OR (Short). Predict the solubility of following substances:

a. Methanol in water

b. Oil in benzene

c. Sodium chloride in water **[3]**

Answer

Solubility of the substances

Substance	Solubility	Reason
a. Methanol in water	Soluble (mixes completely)	Both are polar, and methanol forms hydrogen bonds with water.
b. Oil in benzene	Soluble	Both are non-polar.
c. Sodium chloride in water	Soluble (about 36.5 g/100 g at 20 °C)	Polar water molecules pull the Na^+ and Cl^- ions apart.

Rule: like dissolves like. Polar solutes dissolve in polar solvents and non-polar solutes dissolve in non-polar solvents.

Q2(viii) (Short). Describe colloids and suspension with one suitable example of each. **[3]**

Answer

Colloid: a heterogeneous mixture whose particles are larger than those of a true solution (1 to 1000 nm) but too small to be seen by the naked eye. The particles stay evenly spread and do not settle, and they scatter a beam of light (Tyndall effect). Example: milk.

Suspension: a heterogeneous mixture in which solid particles are spread through a liquid without dissolving. The particles are bigger than 1000 nm, can be seen, and settle down when the mixture is left standing. Example: chalk in water (muddy water).

Q2(viii) OR (Short). What is meant by solution and percentage of solution? **[3]**

Answer

Solution: a homogeneous mixture of two or more substances in which one substance (the solute) is dissolved in another (the solvent). Example: sugar in water.

Percentage of solution: the amount of solute present in 100 parts of solution.

- Mass/mass: % = (mass of solute ÷ mass of solution) × 100. Example: 10 g sugar in 90 g water makes 100 g of solution, so it is a 10 % solution.
- Mass/volume: g of solute per 100 mL of solution. Volume/volume: mL of solute per 100 mL of solution.

Note: Percentage of solution is an old-syllabus topic and is not in the new Chapter 2 textbook.

Q2(ix) (Short). Briefly explain any two allotropic forms of carbon. **[3]**

Answer

Allotropy is the existence of an element in different physical forms in the same state. Two allotropes of carbon are:

- **Graphite:** flat layers of hexagonally arranged carbon atoms, each bonded to three others. The layers slide easily, so it is soft and slippery (a lubricant), and it conducts electricity.
- **Diamond:** each carbon atom is bonded to four others in a rigid tetrahedral network. It is the hardest substance, has a very high melting point and does not conduct electricity.

2025, 2nd Exam

Section A — MCQ

Q12. Most compressible state of matter is:

A) Gas B) Liquid C) Solid D) Plasma

Answer: A) Gas

Gases have large empty spaces between their molecules, so they are very compressible.

Section B — Short Questions

Q2(iii). What is meant by BEC? How are BECs formed? **[1+2]**

Answer

Meaning of BEC [1]

A Bose-Einstein condensate (BEC) is a state of matter in which separate atoms are cooled to a temperature very close to absolute zero (0 K or −273 °C).

Formation of BEC [2]

- The atoms of a substance are cooled to temperatures very close to absolute zero, so they lose almost all their energy and motion.
- At this extreme cold the separate atoms clump together and behave like a single entity.
- BEC can only be observed under extreme conditions of cold temperature. Superfluids and superconductors are the two main materials that contain BEC.

Section C — Long Questions

Q6. Compare solutions and colloids. (Any three points) Give one example of each. **[3+1]**

Answer

Solutions compared with colloids (any three points) [3]

Point	Solution	Colloid
Nature	Homogeneous mixture	Heterogeneous mixture
Particle size	Less than 1 nm; not visible	1 to 10^3 nm; not visible to the naked eye
Filtration	Passes through normal and ultra-filter paper	Passes through normal filter paper but not ultra-filter paper
Light	Cannot scatter light (particles too small)	Scatters light (Tyndall effect)
Stability	Does not separate	Does not separate

Examples [1]

- Solution: sea water (or sugar in water).
- Colloid: milk.

Note: Textbook Table 2.3 prints "visible by naked eye" for colloids, but the text says they cannot be seen. The text is followed here.

Model Paper 2026 (50% MCQs)

National Curriculum 2022-23, 50% MCQs and 50% Descriptive

Section A — MCQ

Q1. Diamond is used in cutting tools. The reason for this use is:

A) It has a layered structure with weak van der Waals forces
B) It is a highly dense form of pure carbon
C) It has a strong three-dimensional network structure
D) It contains delocalized free electrons

Answer: C) It has a strong three-dimensional network structure

Each carbon atom in diamond is bonded to four others in a rigid tetrahedral network. This makes it the hardest substance with a very high melting point.

Q2. Which of the following is a compound?

A) Air B) Iron C) Carbon dioxide D) Brass

Answer: C) Carbon dioxide

Carbon dioxide is formed when carbon and oxygen atoms chemically combine. Iron is an element, while air and brass are mixtures.

Q3. Which of the following combinations is correctly matched?

A) Sugar + Water → Suspension
B) Milk → Colloid
C) Sand + Water → Solution
D) Air → Suspension

Answer: B) Milk → Colloid

Milk is a colloid. Sugar in water is a solution, sand in water is a suspension, and air is a gaseous solution.

Scenario-Based MCQs (Q45–Q48)

Scenario: Ali melts a piece of wax in a test tube by heating it in a water bath. After removing the heat source, he observes that the liquid wax slowly turns back into a solid.

Q45. What is the name of the process when liquid wax turns into a solid?

A) Condensation B) Evaporation C) Freezing D) Melting

Answer: C) Freezing

The change of a liquid into a solid on cooling is called freezing.

Q46. Why is this change considered a physical change?

A) A new substance is formed
B) The chemical composition changes
C) The change is reversible and no new substance is formed
D) Heat is released permanently

Answer: C) The change is reversible and no new substance is formed

Wax melts and freezes again without forming a new substance, so only its physical state changes.

Q47. During this change, what happens to the particles of wax?

A) They break into new atoms
B) They become chemically different
C) They come closer together without changing identity
D) They disappear

Answer: C) They come closer together without changing identity

On cooling, wax particles come closer and lose energy, but they remain the same particles.

Q48. Which property remains unchanged during this process?

A) State B) Shape C) Chemical composition D) Volume

Answer: C) Chemical composition

In a physical change, the chemical composition of matter stays the same, while state and shape can change.

Section B — Short Questions

Q1 OR. State the difference between a compound and a mixture. In your answer, briefly describe the composition of each type of substance. **[3]**

Answer

Point	Compound	Mixture
Formation	Formed when two or more different atoms combine chemically	Formed when two or more substances combine physically
Composition	Fixed (definite) ratio of elements. It is a completely new substance, different from the elements it is made of.	Variable proportions. Each substance keeps its own chemical composition and properties (tea = milk, water, tea leaves, sugar).
Separation	Only by chemical means	By physical methods
Examples	Water, carbon dioxide	Tea, air, brass

Q6 OR. How different states of matter (solids, liquids, gases, and plasma) are involved in chemical interactions. **[2]**

The "Define Chemistry" part belongs to Chapter 1.

Answer

- **Solids:** particles are tightly packed, so reactions take place at the surface (a powder reacts faster than a lump). Solids can also melt or dissolve to react.
- **Liquids:** particles are close but free to move, so they collide easily. Most laboratory reactions and reactions in living things take place in liquid (aqueous) solutions.
- **Gases:** particles are far apart and move fast. Gases such as oxygen take part in reactions like combustion, and many reactions produce gases.
- **Plasma:** an ionized gas of ions and free electrons at very high energy. It is highly reactive and is found in lightning and stars.

A change of state is a physical change. Only a chemical interaction forms a new substance.

2026, Paper D

Section A — MCQ

Q1. Which state of matter is represented by air?

A) Solid B) Liquid C) Gas D) Plasma

Answer: C) Gas

Air is a mixture of gases such as nitrogen and oxygen, so it is in the gaseous state.

Q2. Diamond and graphite are allotropic forms of:

A) Oxygen B) Carbon C) Silicon D) Sulfur

Answer: B) Carbon

Diamond, graphite and buckyballs are different structural forms (allotropes) of carbon.

Section B — Short Questions

Q2(i) OR. Differentiate between suspension and colloidal with one suitable example each. **[1.5+1.5]**

Answer

Point	Suspension	Colloid
Difference	Heterogeneous mixture; particles bigger than 1000 nm, visible, and settle on standing; cannot pass through filter paper	Heterogeneous mixture; particles 1 to 1000 nm, stay spread out and do not settle; scatter light (Tyndall effect)
Example	Muddy water (or chalk in water)	Milk (or blood, ink)

Section C — Long Questions

Q3. Differentiate between compounds, and mixtures with respect to:

a. Composition
b. Chemical bonding
c. Separation methods **[2+2+2]**

Answer

Point	Compound	Mixture
a. Composition	Two or more different elements combined in a fixed ratio; the properties differ from those of the elements (water, H_2O)	Two or more substances in any proportion; each keeps its own properties (tea, air)
b. Chemical bonding	Atoms are chemically bonded (ionic or covalent bonds)	No chemical bonds form between the substances
c. Separation methods	Only by chemical methods (e.g. electrolysis of water)	By physical methods such as filtration, evaporation, distillation, using a magnet

2026, Paper M

Section B — Short Questions

Q2(i) OR. How is solubility affected by increasing temperature for given solutions:

a. KCl in water (endothermic solution)

b. $Ca(OH)_2$ in water (exothermic solution) **[1.5+1.5]**

Answer

Solute	Effect of raising temperature	Solubility (g/100 g H_2O) at 20 °C → 100 °C
a. KCl in water (endothermic solution)	Solubility **increases**. Heat is absorbed when it dissolves, so heating helps it dissolve.	34.7 → 56
b. $Ca(OH)_2$ in water (exothermic solution)	Solubility **decreases**. Heat is released when it dissolves, so heating works against dissolving.	0.173 → 0.066

Q2(x) OR. Briefly describe the compressibility of solids, liquids and gases with reason. **[1+1+1]**

Answer

State	Compressibility	Reason
Solids	Not compressible	Particles are packed very closely, with almost no empty space.
Liquids	Moderately compressible	There are small spaces between the particles.
Gases	Very compressible	There are large empty spaces between the molecules.

Section C — Long Questions

Q3. Compare diamond and graphite in terms of their structure and properties. **[3+3]**

Answer

Structure [3]

Point	Diamond	Graphite
Arrangement	Rigid three-dimensional network	Flat two-dimensional layers of hexagons
Bonding	Each C atom covalently bonded to 4 other C atoms (tetrahedral shape)	Each C atom covalently bonded to 3 other C atoms in a layer; weak intermolecular forces between layers

Properties [3]

Property	Diamond	Graphite
Hardness	Hardest substance	Soft and slippery; layers slide over each other
Melting point	Very high	High
Electrical conductivity	Non-conductor (no free electrons)	Good conductor
Use	Cutting tools, jewellery	Lubricant, pencil lead

2026, Paper B

Section B — Short Questions

Q2(ii). Why solids have high density and very low compressibility whereas gases have opposite behavior? Explain briefly. **[1.5+1.5]**

Answer

- **Solids** have high density and very low compressibility because their particles are packed very closely, with almost no empty space between them. A lot of mass is held in a small volume and there is no room to squeeze them closer.
- **Gases** show the opposite behaviour because their molecules are far apart, with large empty spaces between them. So they have low density and can be compressed easily.

Q2(iv). Identify the given substances as solution, suspension or colloidal:

a. Air
b. Sand in water
c. Jelly **[1+1+1]**

Answer

Substance	Type	Reason
a. Air	Solution (gaseous solution)	A homogeneous mixture of gases (nitrogen, oxygen and others).
b. Sand in water	Suspension	Large particles that can be seen and settle down.
c. Jelly	Colloid	Particles of 1 to 1000 nm stay spread through the mixture and do not settle.

Q2(v). What is meant by 'element'? State one distinguishing feature that separates it from mixtures. **[2+1]**

Answer

Element [2]

An element is the simplest form of matter, made up of the same type of atoms (atoms with the same atomic number). It cannot be broken down into simpler substances by chemical means. Example: carbon, oxygen, iron.

Distinguishing feature [1]

An element contains only one type of atom, whereas a mixture contains two or more different substances that can be separated by physical methods.

Q2(vii). How is solubility affected by increasing temperature for given solutions:

a. KCl in water (endothermic solution)
b. $Ca(OH)_2$ in water (exothermic solution) **[1.5+1.5]**

Answer

Solute	Effect of raising temperature	Solubility (g/100 g H_2O) at 20 °C → 100 °C
a. KCl in water (endothermic solution)	Solubility **increases**. Heat is absorbed when it dissolves, so heating helps it dissolve.	34.7 → 56
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