2. NATURE OF MATTER - CHARACTERISTICS OF MATTER

SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

Mutliple Choice Question Type :

1. Which of the following is the property of Solid?
A) Can be compressed B) Have definite shape
C) Have low density D) Intermolecular force is less

Answer:B

Solution:Solids have a fixed shape and volume due to tightly packed particles.

2. Which of the following is a property of both liquids and gases, but not solids?
A) has definite volume. B) can be compressed
C) has a definite shape D) has a definite texture

Answer:B

Solution:Liquids and gases can be compressed (gases more easily than liquids), but solids cannot.

3. When a gas undergoes compression, what happens to its particles?
A) They move farther apart. B) They move closer together.
C) They stop moving. D) They change into a liquid.

Answer:B

Solution:Compression reduces the space between gas particles.

4. Why does a helium balloon deflate over time when left in a room?
A) Helium escapes through the rubber
B) The balloon loses its elasticity
C) Helium undergoes sublimation
D) Helium reacts with the air

Answer:A

Solution:Helium atoms are small and can diffuse through tiny pores in the balloon material.

5. Which of the following materials is an example of a good conductor of electricity in the solid state?
A) Rubber B) Wood C) Copper D) Plastic

Answer:C

Solution:Metals like copper are excellent electrical conductors due to free electrons.

6. Which of the following statements about solids is false?
A) Particles are closely packed.

B) Solids have a definite shape and volume.
C) Particles have significant freedom of movement.
D) Solids resist changes in shape.
Answer:C
Solution:Solids have tightly packed particles that vibrate but cannot move freely.
7. What causes surface tension in liquids?
A) High viscosity B) Cohesive forces between liquid molecules
C) Low density D) Evaporation
Answer:B
Solution:Surface tension is due to strong intermolecular forces at the liquid's surface.
8. What happens to the particles in a liquid when it is cooled?
A) They move faster and become more spread out.
B) They stop moving altogether.
C) They vibrate more but stay close together.
D) They change into a gas state.
Answer:C
Solution:Cooling reduces particle movement, but they remain close (may form a solid).
9. Which of the following statements about liquids is true?
A) Liquids have a definite shape and volume.
B) Liquids take the shape of the container but have a constant volume.
C) Liquids have particles with very little freedom of movement.
D) Liquids cannot flow.
Answer:B
Solution:Liquids flow and adapt to container shape but maintain a fixed volume.
10. In which state of matter do particles have more energy than in a solid but less than in a gas?
A) Solid B) Liquid C) Gas D) Plasma
Answer:B
Solution:Energy order: Solid < Liquid < Gas < Plasma
11. Matter may be a gas, a solid, or a liquid.It can change from one state to another.Which of the following may cause matter to change state?
A)a change in mass B)a change in color
C)a change in volume D)a change in temperature
Answer:D
Solution:Heating or cooling can cause melting, freezing, evaporation, or condensation.

JEE ADVANCED LEVEL QUESTIONS

Mutli Correct Answer Type :

1. Select the characteristics that apply to both liquids and gases.

A) Definite shape B) Takes the shape of the container

C) Definite volume D) Particles have more kinetic energy compared to solids

Answer:B,D

Solution:Both liquids and gases adapt to the shape of their container.
Liquids and gases have higher particle motion than solids.

2. Identify the properties that are common to all three states of matter.

A) Definite volume B) Indefinite shape

C) Particles in constant motion D) Fixed arrangement of particles.

Answer:C

Solution:Solids (vibrations), liquids (sliding past each other), and gases (free movement) all have particles in motion.

Assertion and Reason Ty pe :

3. Assertion : Solids have a definite shape and volume.
Reason : The particles in a solid are closely packed and have a fixed position.

Answer:A

Solution:Assertion (True): Solids have a fixed shape and volume because their particles are held rigidly.
Reason (True & Correct Explanation): The closely packed arrangement and fixed positions of particles in solids restrict movement, leading to definite shape and volume.

4. Assertion : The particles in a gas are more tightly packed than those in a liquid.
Reason : In a gas, particles have more kinetic energy, resulting in greater separation between them.

Answer:D

Solution:Assertion (False): Gas particles are far less tightly packed than liquid particles (gases have large empty spaces between molecules).
Reason : While it is true that gas particles have high kinetic energy and greater separation, this contradicts the assertion (which claims gases are more tightly packed).

5. Assertion : The compressibility of gases is much higher than that of liquids.
Reason : Gas particles are far apart and can be compressed more easily compared to the particles in liquids.

Answer:A

Solution:Assertion (True): Gases are highly compressible, unlike liquids (which are nearly incompressible).
Reason (True & Correct Explanation): Since gas particles have large intermolecular spaces, applying pressure reduces these gaps, making compression easy. Liquids, however, have closely packed particles that resist compression.

Statement Type :

6. Statement I : Solids cannot be compressed.
Statement II : This is due to compact arrangement of molecules

Answer:A

Solution:Statement I (True): Solids are nearly incompressible because their particles are already tightly packed.
Statement II (True & Correct Explanation): The rigid, compact arrangement of molecules in solids leaves almost no empty space, making compression extremely difficult.

7. Statement I : Molecules in a solid cannot interchange their position
Statement II : Solids have strong intermolecular force of attraction.

Answer:B

Solution:Statement I (True): In solids, molecules vibrate in fixed positions but do not freely move or interchange positions (unlike liquids/gases).
Statement II (True but Incorrect Explanation): While solids do have strong intermolecular forces, the immobility of molecules is due to their fixed lattice structure, not just the strength of forces. (For example, some solids like ice have hydrogen bonding, but the key reason for fixed positions is the crystalline arrangement.)

Comprehension Type :

Comprehension - I

8. Plasma state is observed at ..... temperature
A) Below 0^0 C B)Room temperature
C)100^0 C D)$10^{7\,0}$ C(Very high temperature)

Answer:D

Solution:Plasma is a high-energy state of matter formed at extremely high temperatures (typically millions of degrees).
It consists of ionized gas (free electrons and nuclei) and exists in stars, lightning, and fusion reactors.

9. ..... state is observed in sun ,and core of stars
A)Solid B) Liquid C)Plasma D) Gas

Answer:C

Solution:The sun and stars are made of plasma due to extreme temperatures (~millions of degrees).

Comprehension -II

10. What gives solids a definite shape and volume?
A) Free movement of particles
B) Closely packed particles with fixed arrangement
C) Particles far apart and moving freely
D) Lack of attraction between particles

Answer:B

Solution:Solids have a rigid structure due to tightly packed particles in a fixed arrangement.

This restricts movement, giving them fixed shape and volume.
11. What allows liquids to take the shape of their container?
A) Fixed arrangement of particles
B) Closely packed particles
C) Freedom of movement for particles
D) Rapid vibration of particles
Answer:C
Solution:Liquids have loosely bound particles that can slide past each other, allowing them to flow and adapt to container shape.
12. Which state of matter has neither a definite shape nor a definite volume?
A) Solid B) Liquid C) Gas D) Plasma
Answer:C
Solution:Gases expand freely to fill any container (no fixed shape or volume).
13. In which state do particles have the most freedom to move?
A) Solid B) Liquid C) Gas D) Plasma
Answer:C
Solution:Gas particles move randomly and freely due to weak intermolecular forces.
14. What is a characteristic of gases?
A) Fixed shape and volume
B) Closely packed particles
C) Far apart particles with free movement
D) All the above
Answer:C
Solution:Gases have large intermolecular spaces and high kinetic energy.
15. Which state of matter do not settle to the bottom of container
A)Solids B)Liquids C) Gases D)All
Answer:C
Solution:Gases fill the entire container uniformly (no settling).
Liquids settle due to gravity, and solids remain at the bottom.
Integer Type:
16. Among solid, liquid and gas how many of them can flow.....
Answer:2
Solution:Liquids can flow (e.g., water, oil).
Gases can flow (e.g., air, steam).
Solids cannot flow (they retain their shape unless broken).
17. Among milk ,water,ice,oxygen . How many are solids?.....
Answer:1
Solution:Milk $\rightarrow$ Liquid (colloidal suspension).
Water $\rightarrow$ Liquid (at room temperature).
Ice $\rightarrow$ Solid (frozen water).
Oxygen $\rightarrow$ Gas (at room temperature).

Conclusion: Only ice is a solid $\rightarrow$ 1.

Matrix Matching Type :

18. Answer:A-iv,B-ii,C-i,D-iii

Solution:

Column - I	**Column - II**
A) Bose-Einstein condensate	iv) fifth state of matter. .
B) Solids	ii) many no of free surfaces
C) Liquids	i) only one free surface
D) Gases	iii) no free surfaces

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Mutliple Choice Question Type :

1. The state of matter which has definite volume but not shape is

A) Gaseous state B) Liquid state C) Solid state D) Plasma

Answer:B

Solution:Liquids have a fixed volume but take the shape of their container.
Solids have both fixed shape and volume; gases/plasma have neither.

2. Intermolecular distances are maximum in

A) Solids B)Liquids C) Gases D) None

Answer:C

Solution:Gas particles are far apart (maximum empty space).
Solids (tightly packed) < Liquids (close but mobile) < Gases (widely spaced).

3. Oxygen is an example for ..... state of matter

A) Solids B)Liquids C) Gases D) Plasma

Answer:C

Solution:Oxygen (O_2) is a gas at room temperature.
It becomes liquid only below -183°C and solid below -218°C.

4. .....is an ionised gaseous state of matter

A) Solid B) Bose-Einstein C) Liquids D) Plasma

Answer:D

Solution:Plasma = Ionized gas (e.g., lightning, stars).
Contains free electrons and ions, unlike neutral gases.

5. Any material which has ..... and occupies ..... is called matter

A) Mass B) Space C) Both A and B D) None

Answer:C

Solution:Matter must have mass (A) and volume/space (B).
Example: Air (mass + occupies space).

6. Which of the following is solid ?

A)Wood B)Stone C) Rock D) All the above.

Answer:D

Solution:Wood, stone, and rock are all solids (fixed shape/volume).

7. The material with negligible intermolecular forces is ....
A) Solid B) Liquid C)Gas D)Plasma
Answer:C
Solution:Gases have very weak forces between particles (allows free movement).
Solids/liquids have stronger forces; plasma has ionized particles.
8. .....is the fifth state of matter
A) Solid B) Bose-Einstein C) Liquids D) Plasma
Answer:B
Solution: Bose-Einstein Condensate (BEC) is the fifth state of matter
BEC forms at near absolute zero (-273.15°C).
9. The state of matter with no definite shape but have definite volume is .....
A)Gas B)Solid C)Liquid D)None
Answer:C
Solution:Liquids flow (no fixed shape) but maintain a constant volume.
Gases have neither; solids have both.
10. Matter is made up of tiny particles called
A) Atoms B) Molecules C) Element D) Substance
Answer:A
Solution:Atoms are the smallest units of matter (e.g., oxygen atom).

JEE MAINS LEVEL QUESTIONS

Mutliple Choice Question Type :
1. What property is common to both solids and liquids?
A) Definite shape B) Indefinite shape
C) High compressibility D) Gas-like movement of particles
Answer:None
Solution:Definite volume is common to both solids and liquids
2. In which state of matter do particles have more freedom of movement: solids or liquids?
A) Solids B) Liquids
C) Both have the same degree of freedom
D) Neither, they both have fixed positions
Answer:B
Solution:Liquid particles can slide past each other while solid particles only vibrate in place.
3. Which state of matter is characterized by having particles that are closely packed but can slide past each other?
A) Liquids B) Gases C) Both liquids and gases D) Neither
Answer:A
Solution:Liquids have closely packed particles that can flow, unlike gases where particles are far apart.
4. What property is unique to gases and not typically found in liquids?
A) Definite volume B) Compressibility C) Fixed shape D) High density
Answer:B

Solution:Gases are highly compressible while liquids are nearly incompressible.
5. What distinguishes liquids from gases in terms of shape?
A) Liquids have a definite shape. B) Gases take the shape of the container.
C) Both have indefinite shapes. D) Gases have a fixed volume.
Answer:B
Solution:Both take container's shape, but the key difference is gases expand to fill the entire container while liquids don't.
6. Which factor primarily determines the compressibility of gases?
A) Particle spacing B) Temperature C) Pressure D) Atomic structure
Answer:A
Solution:Large spaces between gas particles allow compression.
7. What is a characteristic feature of liquids that distinguishes them from gases?
A) Fixed volume B) Assumes the shape of the container
C) Expands to fill the entire container D) Low fluidity
Answer:A
Solution:Liquids maintain constant volume while gases expand to fill containers.
8. In which state of matter do particles move more freely compared to liquids?
A) Liquids B) GasesC) Both have similar particle movement D) Solids
Answer:B
Solution:Gas particles have the most freedom of movement.
9. ..... can flow in all directions
A)Solid B)Liquid C) Gas D)Bose-Einstein condensate
Answer:C
Solution:Gases flow freely in all directions to fill containers.
10. Which of the following state of matter does not need a vessel to contain them?
A)Solid B)Liquid C)Gas D)Both B and C
Answer:A
Solution:Solids maintain their shape without containers.
11. Which of the following is the property of Solid?
A) Can be compressed B) Have definite shape
C) Have low density D) Intermolecular force is less
Answer:B
Solution:Solids maintain their shape due to fixed particle positions.
12. Which of the following is a property of both liquids and gases, but not solids?
A) has definite volume. B) can be compressed
C) has a definite shape D) has a definite texture
Answer:B
Solution:Both liquids and gases can be compressed (gases more easily), while solids cannot.

JEE ADVANCED LEVEL QUESTIONS

Mutli Correct Answer Type :

1. Choose the correct features of gases:
A) Definite shape B) Expands to fill the entire container
C) Particles have fixed positions D) Low compressibility
Answer:B
Solution:Gases completely fill their container (B) because their particles move

freely and are far apart. They lack definite shape (A), fixed particle positions (C), and have high (not low) compressibility (D).
2. Which of the following properties are common to both liquids and gases?
A) Assumes the shape of the containerB) Fixed volume
C) Particles move freelyD) Definite shape
Answer:A,C
Solution:A) Both liquids and gases take their container's shape (liquids conform to the bottom, gases fill entirely).
C) Particles in both states move freely (liquids slide past each other; gases move randomly).
B) Only liquids have fixed volume.
D) Neither state has a fixed shape.
Comprehension Type :
3. What allows liquids to take the shape of their container?
A) Fixed positions of particles B) Closely packed particles
C) Rapid particle movement D) More freedom of movement
Answer:D
Solution:Liquids take the shape of their container because their particles are not fixed in position (unlike solids) but can slide past one another (unlike gases, which are completely free).
While particles in liquids are closely packed (B), this alone doesn't explain shape adaptation—it's their ability to move (D) that enables flow.
A) Incorrect: Fixed positions are a property of solids.
C) Incorrect: Rapid movement describes gases, not liquids.
4. Which state of matter has particles that move freely and rapidly, filling the entire space available to them?
A) Solids B) Liquids C) Gases D) Plasma
Answer:C
Solution:Gases have particles that move freely and randomly, expanding to fill any container (no definite shape/volume).
Integer Type :
5. Matter exist in ..... states.
Answer:5
Solution:Matter primarily exists in 5 states:Solid,Liquid,Gas,Plasma,Bose-Einstein Condensate (BEC)
6. Rubidium atoms turns to super cooled liquid at ..... nanokelvin temperature.
Answer:170
Solution:Rubidium (Rb) atoms form a Bose-Einstein Condensate (BEC) at ~170 nK (nanokelvin).
This is the temperature range where quantum effects dominate, causing atoms to behave as a single quantum state.

7. Among balloon, sponge and scale, how many of them can be compressed?

Answer:2

Solution:Balloon: Compressible (gas inside can be squeezed).
Sponge: Compressible (porous structure allows reduction in volume).
Scale (solid): Not compressible (rigid structure resists compression).

Matrix Matching Type :

Answer:A-ii,B-iv,C-i,D-iii

Solution:

8. Column - I	Column - II
A)Solids	ii) wood
B)Liquids	iv) kerosene
C)Gases	i)steam
D)Plasma	iii) ions and electyrons co-exist

KEY

			TEACHING TASK						
1	2	3	4	5	6	7	8	9	10
B	B	B	A	C	C	B	C	B	B
11									
D									
			JEE ADVANCED LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
B,D	C	A	D	A	A	B	D	C	B
11	12	13	14	15	16	17	18		
C	C	C	C	C	2	1	A-iv,B-ii,C-i,D-iii		
			LEARNERS TASK						
			CUQ'S						
1	2	3	4	5	6	7	8	9	10
B	C	C	D	C	D	C	B	C	A
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
NONE	B	A	B	B	A	A	B	C	A
11	12								
B	B								
			JEE ADVANCED LEVEL QUESTIONS						
1	2	3	4	5	6	7	8		
B	A,C	D	C	5	170	2	A-ii,B-iv,C-i,D-iii		