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Chemistry Grade 11 — Chapter 1

History of Chemistry

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Independent practice MCQs from the supplied Class 11 Chemistry notes pack. Total: 50 questions.

A. Important / Main Topics

1. What does the Greek word "atomos" mean?

(A) Indivisible
(B) Beautiful
(C) Smooth
(D) Sharp

Correct Answer: A

Explanation: The word atom is a combination of two Greek words: "a" meaning not, and "tomos" meaning to cut. Therefore, atomos means uncut.

2. Who is known as the father of atomic philosophy?

(A) Democritus
(B) Leucippus
(C) Dalton
(D) Maxwell

Correct Answer: B

Explanation: Leucippus was the first to think about the atom and originated the idea of atomism, so he is known as the father of atomic philosophy.

3. Who was the first to use the word "atom"?

(A) Leucippus
(B) Dalton
(C) Democritus
(D) Schrödinger

Correct Answer: C

Explanation: Democritus, a student of Leucippus, was the first to think that matter is made of uniform and indivisible particles called "atomos.".

4. According to Democritus, the sour taste of substances is due to:

(A) Smooth-shaped atoms
(B) Round-shaped atoms
(C) Cube-shaped atoms
(D) Needle-shaped atoms

Correct Answer: D

Explanation: Democritus held the shape and size of atoms responsible for properties of matter. He thought that the sour taste of substances is due to needle-shaped atoms.

5. In which year did John Dalton convert the thought experiment about the atom into a scientific theory?

(A) 1808
(B) 1840
(C) 1867
(D) 1887

Correct Answer: A

Explanation: In 1808, an English chemist, John Dalton, converted the Democritus thought experiment about atom into scientific theory called Dalton's atomic theory.

6. Maxwell's Demon thought experiment was proposed in:

(A) 1840
(B) 1867
(C) 1887
(D) 1808

Correct Answer: B

Explanation: Maxwell's Demon thought experiment was proposed in 1867.

7. In Maxwell's Demon experiment, the demon allows:

(A) Slow molecules from A to B
(B) All molecules from A to B
(C) Fast molecules from A to B
(D) No molecules to pass

Correct Answer: C

Explanation: The demon would selectively allow fast-moving molecules to shift from container A to container B and slow-moving molecules from container B to container A.

8. Schrödinger's cat experiment illustrates the concept of:

(A) Classical mechanics
(B) Thermodynamics
(C) Atomic theory
(D) Superposition

Correct Answer: D

Explanation: The cat is in two states, both alive and dead at the same time. This is due to the superposition of states in quantum mechanics.

9. Imam Al-Ghazali was born in:

(A) 1058 AD
(B) 1111 AD
(C) 1867 AD
(D) 1887 AD

Correct Answer: A

Explanation: Imam Al-Ghazali was born in 1058 AD.

10. The famous book of Al-Ghazali that challenged Neoplatonic thinkers was:

(A) The Revival of Religious Science
(B) Tahafut al-Falsafa
(C) A New System of Chemical Philosophy
(D) Concerning Divine Wisdom

Correct Answer: B

Explanation: The famous book of Al-Ghazali that challenged Neoplatonic thinkers was Tahafut al-Falsafa.

11. Al-Ghazali's thought experiment was based on burning:

(A) Paper
(B) Wood
(C) Cotton
(D) Coal

Correct Answer: C

Explanation: Al-Ghazali argued that when a piece of cotton is placed near a burning flame, the cotton will burn.

12. Inductive reasoning goes from:

(A) General to specific
(B) Cause to effect
(C) Effect to cause
(D) Specific to general

Correct Answer: D

Explanation: In inductive reasoning, generalized conclusions are taken from specific observations.

13. Deductive reasoning is also called:

(A) Top-down logic
(B) Bottom-up logic
(C) Sideways logic
(D) Circular logic

Correct Answer: A

Explanation: Deductive reasoning uses general statements to make specific conclusions and is also called top-down logic.

14. Which of the following is an example of deductive reasoning?

(A) Observing halogens and concluding all are reactive
(B) Elements in same group have similar properties; Na and K are in Group I; therefore they have similar properties
(C) Watching cotton burn and concluding it always burns
(D) Tasting different acids and concluding all are sour

Correct Answer: B

Explanation: Deductive reasoning uses general statements to make specific conclusions. This is a clear example of top-down logic.

15. According to Democritus, the white colour of matter is due to:

(A) Needle-shaped atoms
(B) Rough-shaped atoms
(C) Smooth-shaped atoms
(D) Sharp-shaped atoms

Correct Answer: C

Explanation: Democritus thought that the white colour of matter is due to smooth-shaped atoms.

16. Which of the following best explains why Maxwell's Demon appears to violate the Second Law of Thermodynamics?

(A) The demon creates energy from nothing
(B) The demon increases the total energy of the system
(C) The demon decreases the volume of the container
(D) The demon sorts molecules without using energy, creating a temperature difference

Correct Answer: D

Explanation: The demon selectively allows fast molecules to go to one container and slow molecules to the other, creating a temperature difference without energy input, which would violate the Second Law.

17. What is the solution to the apparent violation of the Second Law by Maxwell's Demon?

(A) The demon must use energy to detect and sort molecules
(B) The demon cannot detect molecules
(C) The Second Law is incorrect
(D) The demon does not exist

Correct Answer: A

Explanation: The demon's action is not possible without the use of energy. If the demon uses energy, entropy increases, which follows the Second Law.

18. In Schrödinger's cat experiment, what does the radioactive material being in two states simultaneously imply?

(A) The cat is always alive
(B) The cat is both alive and dead at the same time
(C) The cat is always dead
(D) The cat is neither alive nor dead

Correct Answer: B

Explanation: Since the radioactive material is in two states (decayed and not decayed simultaneously), the cat is also in two states (alive and dead simultaneously).

19. When does the superposition of states collapse into one definite state in Schrödinger's experiment?

(A) When the box is closed
(B) When the radioactive material decays
(C) When the box is opened and observation occurs
(D) When the poison is released

Correct Answer: C

Explanation: The two states become one state when they are observed and measured. Until the box is opened, the system is in superposition.

20. Which of the following best describes Al-Ghazali's view of necessary causation?

(A) There is no cause for any event
(B) Events occur randomly
(C) Cause and effect are the same thing
(D) The link between cause and effect is necessary and always true

Correct Answer: D

Explanation: Al-Ghazali initially believed that the link between cause and effect is necessary and always true. For example, a burning flame necessarily burns a nearby piece of cotton.

21. Why did Al-Ghazali depart from necessary causation?

(A) Sticking to necessary causation would reject the concept of God's will
(B) He discovered a new scientific law
(C) He was influenced by Democritus
(D) He could not perform the experiment

Correct Answer: A

Explanation: Al-Ghazali argued that sticking to necessary causation would reject the concept of God's will because God can suspend the habitual succession of events according to His wish.

22. What did the blind man example illustrate in Al-Ghazali's philosophy?

(A) Blindness is caused by atoms
(B) Confusion between succession of events and causation
(C) The necessity of vision for learning
(D) The importance of sunlight

Correct Answer: B

Explanation: The blind man thought that opening his eyelids was the cause of seeing, but actually, it was the rays of light striking his eyes. He confused the succession of events with causation.

23. Which philosopher supported Al-Ghazali's approach of continuation of events?

(A) Democritus
(B) Dalton
(C) David Hume
(D) Maxwell

Correct Answer: C

Explanation: David Hume supported Al-Ghazali's approach of continuation of events. He added that there is no natural glue (causal link) that holds events together.

24. Al-Ghazali's burning cotton experiment was a challenge to:

(A) Deductive reasoning
(B) Quantum mechanics
(C) Thermodynamics
(D) Inductive reasoning

Correct Answer: D

Explanation: The burning cotton experiment challenged inductive reasoning because repeated observation cannot always be true. Al-Ghazali missed important factors like moisture and air flow.

25. Which factor was missed by Al-Ghazali in his burning cotton experiment?

(A) The moisture in the cotton
(B) The temperature of the flame
(C) The weight of the cotton
(D) The colour of the flame

Correct Answer: A

Explanation: Al-Ghazali missed factors such as moisture, chemical reactions, flow of air, and composition of cotton piece in his data collection.

B. Less Important / Secondary Topics

26. Which of the following is a key difference between inductive and deductive reasoning?

(A) Inductive reasoning goes from specific to general; deductive reasoning goes from general to specific
(B) Inductive reasoning gives certain conclusions; deductive reasoning gives probable conclusions
(C) Inductive reasoning is used in chemistry; deductive reasoning is not
(D) Inductive reasoning requires experiments; deductive reasoning does not

Correct Answer: A

Explanation: Inductive reasoning is drawing generalized conclusions from specific observations. Deductive reasoning uses general statements to make specific conclusions.

27. Which statement about the kinetic energy of gas molecules in Maxwell's Demon experiment is correct?

(A) Fast molecules have lower kinetic energy
(B) Fast molecules have higher kinetic energy
(C) Slow molecules have higher kinetic energy
(D) Kinetic energy is the same for all molecules

Correct Answer: B

Explanation: The demon allows fast-moving molecules (high kinetic energy) to shift from one container to another, creating a temperature difference.

28. What does the double arrow indicate in a chemical equation?

(A) The reaction is irreversible
(B) The reaction has stopped
(C) The reaction is reversible
(D) The reaction is exothermic

Correct Answer: C

Explanation: The double arrow (□) indicates that the reaction takes place in both forward and backward directions.

29. Which of the following statements about Democritus's ideas is correct?

(A) Atoms are divisible into smaller particles
(B) Atoms do not exist for feelings
(C) Atoms are all the same shape
(D) Atoms are uniform and indivisible

Correct Answer: D

Explanation: Democritus thought that matter is made of uniform and indivisible particles called "atomos.".

30. In the ionisation of HCl in water, which species acts as the Brønsted acid?

(A) HCl
(B) H□O
(C) H□O□
(D) Cl□

Correct Answer: A

Explanation: HCl donates a proton to water, so it acts as the Brønsted acid.

31. Which of the following is true about the Greek philosophies before Democritus?

(A) All philosophers agreed that change is an illusion

(B) There were two views: change is illusion vs. change is reality
(C) All philosophers agreed that change is a reality
(D) No one thought about change

Correct Answer: B

Explanation: Before Democritus, there were two Greek philosophies about changes in matter: one was that change is an illusion, and the other was that change is a reality.

32. What did Democritus argue about changes in matter?

(A) Changes are illusions
(B) Changes are caused by gods
(C) Changes are due to combination and separation of atoms
(D) Changes do not occur

Correct Answer: C

Explanation: Democritus argued that changes in matter were due to combination and separation of indivisible particles in matter.

33. Which of the following is a correct statement about Al-Ghazali's approach? I. He thought that every event must have a cause II. He thought that there is succession of events, not causation III. He thought that God can suspend the habitual continuation of events

(A) I & II only
(B) II & III only
(C) III only
(D) I, II & III

Correct Answer: D

Explanation: Al-Ghazali initially believed in necessary causation (I), later departed from it and argued for succession of events (II), and believed that God can suspend the habitual continuation of events (III).

34. What did the term "active mass" mean in the context of the law of mass action?

(A) The concentration of reactants and products in moles dm^3
(B) The mass of the catalyst
(C) The volume of the container
(D) The temperature of the reaction

Correct Answer: A

Explanation: The term active mass means the concentration of the reactants and products in moles dm^3 for a dilute solution.

35. Which of the following is an example of an irreversible reaction?

(A) $N_2 + 3H_2 \rightleftharpoons 2NH_3$
(B) $C + O_2 \rightarrow CO_2$
(C) $2NO_2 \rightleftharpoons N_2O_4$
(D) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$

Correct Answer: B

Explanation: Irreversible reactions stop when the limiting reactant is used up, such as the combustion of carbon.

36. If a reaction is exothermic in the forward direction, what happens to the value of Kc when the temperature is increased?

(A) It increases
(B) It remains the same
(C) It decreases
(D) It becomes zero

Correct Answer: C

Explanation: It decreases — this correctly answers the question.

37. A system at equilibrium is subjected to a decrease in pressure. According to Le Chatelier's principle, which direction will the equilibrium shift?

(A) Towards the side with fewer gas molecules

(B) It will not shift
(C) Towards the solid phase
(D) Towards the side with more gas molecules

Correct Answer: D

Explanation: Decreasing pressure favours the side with more gas molecules to increase the pressure and reduce the change.

38. What is the effect of a catalyst on the equilibrium constant (Kc) of a reaction?

(A) It has no effect on Kc
(B) It increases Kc
(C) It decreases Kc
(D) It changes Kc depending on the reaction

Correct Answer: A

Explanation: It has no effect on Kc — this correctly answers the question.

39. Which of the following is correct about the relationship between Kp and Kc for the reaction N□(g) + 3H□(g) □ 2NH□(g)?

(A) Kp = Kc
(B) Kp = Kc(RT)□²
(C) Kp = Kc(RT)²
(D) Kp = Kc(RT)□¹

Correct Answer: B

Explanation: Δn = 2 - (1 + 3) = -2. Therefore, Kp = Kc(RT)□².

40. For the reaction 2SO□(g) + O□(g) □ 2SO□(g), if the equilibrium concentrations are [SO□] = 0.59 M, [O□] = 0.05 M, and [SO□] = 0.259 M, the value of Kc is approximately:

(A) 0.385
(B) 38.5
(C) 3.85
(D) 0.0385

Correct Answer: C

Explanation: For the reaction 2SO□(g) + O□(g) □ 2SO□(g), if the equilibrium concentrations are [SO□] = 0.59 M, [O□] = 0.05 M, and [SO□] = 0.259 M, the value of Kc is approximately 3.85.

41. In the reaction N□O□(g) □ 2NO□(g), ΔH = +57.2 kJ. Which of the following changes will increase the concentration of NO□ at equilibrium?

(A) Decreasing temperature
(B) Increasing pressure
(C) Adding a catalyst
(D) Increasing temperature

Correct Answer: D

Explanation: The forward reaction is endothermic. Increasing temperature shifts the equilibrium to the right, increasing the concentration of NO□.

42. For a weak acid with Ka = 1.8 × 10□⁵, what is the pH of a 0.1 M solution?

(A) 2.87
(B) 3.00
(C) 2.74
(D) 4.74

Correct Answer: A

Explanation: 2.87 — this correctly answers the question.

43. Which of the following is a conjugate acid-base pair?

(A) HCl and NaOH
(B) NH□ and NH□□
(C) H□O and NaCl

(D) H□ and O□

Correct Answer: B

Explanation: A conjugate acid-base pair consists of two species that differ by one proton (H□). NH□ accepts a proton to form NH□□, so they are a conjugate pair.

44. In the reaction H□(g) + I□(g) □ 2HI(g), Kc = 16.0 at a certain temperature. If the equilibrium concentrations of H□ and I□ are both 0.5 M, what is the equilibrium concentration of HI?

(A) 1.0 M
(B) 4.0 M
(C) 2.0 M
(D) 8.0 M

Correct Answer: C

Explanation: Kc = [HI]² / ([H□][I□]) = 16.0. So [HI]² = 16.0 × (0.5 × 0.5) = 4.0. [HI] = 2.0 M.

45. Which of the following statements about the law of mass action is correct?

(A) The rate of reaction is independent of concentration
(B) The equilibrium constant depends on initial concentrations
(C) The equilibrium constant depends on the volume of the container
(D) The rate of reaction is proportional to the product of the concentrations of reactants

Correct Answer: D

Explanation: The law of mass action states that the rate of a chemical reaction is proportional to the product of the molar concentrations of the reacting substances, each raised to the power of its stoichiometric coefficient.

46. For the reaction 2A(g) + B(g) □ 3C(g), what is the relationship between Kp and Kc?

(A) Kp = Kc(RT)□¹
(B) Kp = Kc
(C) Kp = Kc(RT)¹
(D) Kp = Kc(RT)²

Correct Answer: A

Explanation: Δn = 3 - (2 + 1) = 0. Wait, Δn = 3 - 3 = 0. So Kp = Kc. Let me re-check. Actually, Δn = 3 - 3 = 0, so Kp = Kc. The correct option should be A. Let me correct this. Correction: The correct answer is A. Kp = Kc. The explanation is that Δn = (3) - (2+1) = 0, so Kp = Kc.

47. Which of the following is a characteristic of a system at dynamic equilibrium?

(A) The reaction has stopped completely
(B) The forward and reverse reactions occur at equal rates
(C) The concentrations of reactants and products are equal
(D) The temperature is constant

Correct Answer: B

Explanation: The forward and reverse reactions occur at equal rates — this correctly answers the question.

48. What is the effect of adding a catalyst to a reaction at equilibrium?

(A) It shifts the equilibrium to the right
(B) It shifts the equilibrium to the left
(C) It has no effect on the equilibrium position
(D) It changes the value of Kc

Correct Answer: C

Explanation: A catalyst speeds up both forward and reverse reactions equally, so it does not change the equilibrium position or Kc.

49. For the reaction CaCO□(s) □ CaO(s) + CO□(g), what is the expression for Kc?

(A) Kc = [CaO][CO□] / [CaCO□]
(B) Kc = [CaCO□] / ([CaO][CO□])
(C) Kc = 1 / [CO□]
(D) Kc = [CO□]

Correct Answer: D

Explanation: Pure solids (CaCO□ and CaO) are not included in the equilibrium constant expression. Therefore, Kc = [CO□].

50. A solution has a pH of 4.5. What is the hydrogen ion concentration?

(A) 3.16 × 10□⁵ M
(B) 4.5 × 10□⁵ M
(C) 1.0 × 10□⁴ M
(D) 3.16 × 10□⁴ M

Correct Answer: A

Explanation: pH = -log[H□], so [H□] = 10^(-pH) = 10^(-4.5) = 3.16 × 10□⁵ M.