AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS IX

ANNUAL EXAMINATIONS 2021

Chemistry

Total Time: 1 hour 40 minutes

Total Marks: 50 (40-Theory & 10-Alternate to Practical)

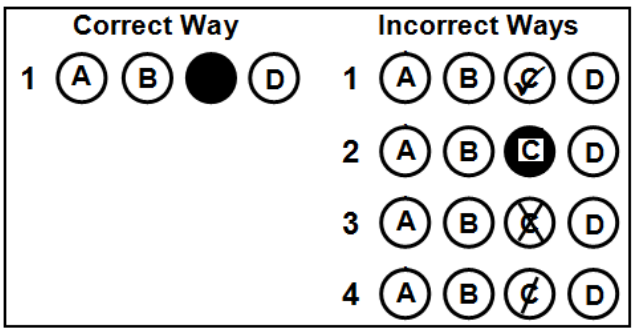
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INSTRUCTIONS

1. Read each question carefully.
2. Answer the questions on the separate answer sheet provided. DO NOT write your answers on the question paper.
3. There are 100 answer numbers on the answer sheet. Use answer numbers 1 to 50 only.
4. Question Distribution:

Theory	Alternate to Practical (ATP)
40 MCQs	10 MCQs

5. In each question, there are four choices A, B, C, D. Choose ONE. On the answer grid, black out the circle for your choice with a pencil as shown below.



Candidate's Signature

6. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
7. DO NOT write anything in the answer grid. The computer only records what is in the circles.
8. The marks obtained on the 40 MCQs will be equated to the total marks of 65 for the theory examination results.
9. You may use a simple calculator if you wish.

THEORY (Questions 1-40)

1. If hydrogen is replaced with deuterium in each of the given compounds, then the formula of which of these is written INCORRECTLY?

   A. DF
   B. ND_3
   C. MgOD
   D. C_2D_5OD

2. How many atoms of chlorine are there in 250 g of chlorine gas?

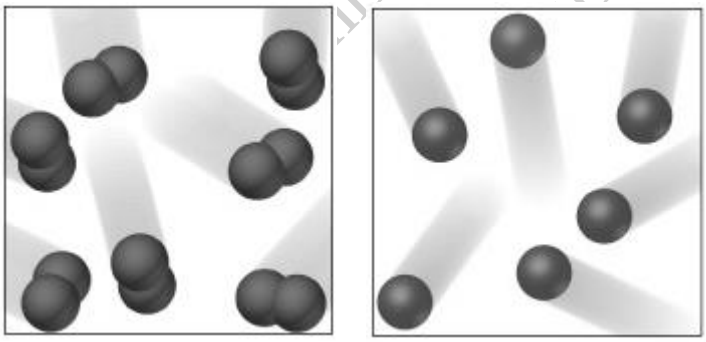
   (**Note**: $^{35.5}_{17}Cl$)

   A. 2.12×10^{24}
   B. 4.24×10^{24}
   C. 4.43×10^{24}
   D. 8.85×10^{24}

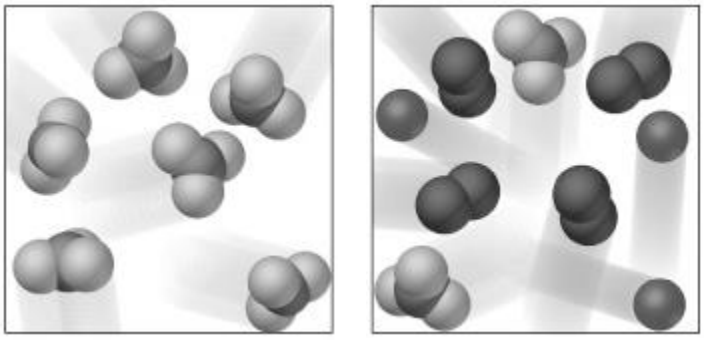
3. Which of the following chemical equations is balanced?

   A. $CH_{4(g)} + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(g)}$
   B. $NaCl_{(aq)} + BeF_{2(aq)} \rightarrow NaF_{(aq)} + BeCl_{2(s)}$
   C. $AgNO_{3(aq)} + LiOH_{(aq)} \rightarrow AgOH_{(s)} + LiNO_{3(aq)}$
   D. $Al_2(SO_4)_{3(aq)} + CaCl_{2(aq)} \rightarrow AlCl_{3(aq)} + CaSO_{4(s)}$

4. Which of the following diagrams represents a pure compound?



A B



C D

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5. $AlCl_{3(aq)} + NaOH_{(aq)} \rightarrow Al(OH)_{3(s)} + NaCl_{(aq)}$

   To balance the given equation, the coefficient '3' should be placed before

   A. $AlCl_{3(aq)}$ and $NaCl_{(aq)}$
   B. $NaOH_{(aq)}$ and $NaCl_{(aq)}$
   C. $AlCl_{3(aq)}$ and $Al(OH)_{3(s)}$
   D. $NaOH_{(aq)}$ and $Al(OH)_{3(s)}$

6. A compound **X** has an empirical formula C_4H_9 and its molecular mass is 114 g/mol.

   Which of the following represents the molecular formula of compound **X**?

   (**Note**: ${}^{12}_{6}C$ and ${}^{1}_{1}H$)

   A. C_6H_{11}
   B. C_7H_{12}
   C. C_8H_{18}
   D. $C_{12}H_{27}$

7. Molecular formula of hexane is C_7H_{16} and that of calcium carbonate is $CaCO_3$.

   One mole of these substances contains the same

   (**Note**: ${}^{12}_{6}C$, ${}^{1}_{1}H$, ${}^{40}_{20}Ca$ and ${}^{16}_{8}O$)

   A. type of atoms.
   B. type of bonding.
   C. number of atoms.
   D. number of grams.

8. The species that does NOT carry an electrical charge is a/ an

   A. anion.
   B. cation.
   C. proton.
   D. neutron.

9. Which of the following statements is TRUE for ${}^{40}_{18}Ar$?

   A. It contains an equal number of protons and neutrons.
   B. It contains more number of neutrons than electrons.
   C. It contains more number of electrons than protons.
   D. It contains more number of protons than neutrons.

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10. In Rutherford's experiment which led to the discovery of atomic nucleus, the alpha particles were bombarded on a very thin sheet of gold foil.

    These alpha particles are positively charged and each particle consists of

    A. one proton and one neutron.
    B. one proton and two neutrons.
    C. two protons and one neutron.
    D. two protons and two neutrons.

11. A metal compound has the formula XCl_2 and a relative formula mass of 95.211.

    The relative atomic mass of X is

    (**Note**: $^{35.5}_{17}Cl$)

    A. 24.211
    B. 59.711
    C. 61.211
    D. 78.211

12. Which of the following statements is TRUE about Bohr's atomic model?

    A. It shows that an atom produces continuous spectrum.
    B. It proves that the energy of each orbit in an atom is quantised.
    C. It proves that the plum-pudding model of an atom was correct.
    D. It shows that electrons emit radiations when revolving around the nucleus.

13. An atom of hydrogen contains one proton and zero neutrons. Suppose a neutron is added to the nucleus of hydrogen atom.

    This addition of one neutron will cause

    A. an increase in the positive charge on the nucleus.
    B. the hydrogen atom to convert into one of its isotopes.
    C. an increase in the atomic number of the hydrogen atom.
    D. the hydrogen atom to convert into a new atom of a different element.

14. In contrast to group II elements, group I elements are less

    A. hard.
    B. reactive.
    C. electropositive.
    D. metallic in character.

15. Which periodic trend is observed in moving down group 17 of the modern periodic table?

    A. Decreasing reactivity
    B. Decreasing boiling point
    C. Increasing electronegativity
    D. Increasing ionisation energy

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16. An element has atomic number 14.

In which period of the periodic table will it be placed?

A. 1
B. 2
C. 3
D. 4

17. The horizontal rows in the modern periodic table are known as

A. shells.
B. blocks.
C. groups.
D. periods.

18. According to the modern periodic law, the elements in the periodic table are arranged as per their

A. proton number.
B. neutron number.
C. nucleon number.
D. valence shell electrons.

19. The following table shows the difference between all the elements of **X** and **Y** families.

Property	**X**	**Y**
Reactivity	Unreactive	Reactive
Occurrence	Monoatomic	Diatomic

With reference to the given table, **X** and **Y** families can be identified as

	X	**Y**
A	noble gases	oxygen group
B	alkali metals	halogens
C	noble gases	halogens
D	alkali metals	oxygen group

20. The ion of an element, $\mathbf{Z}^{-3}$ has atomic mass 31 and atomic number 15.

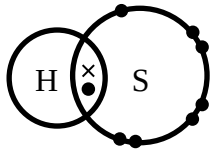
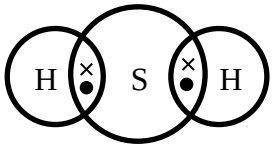
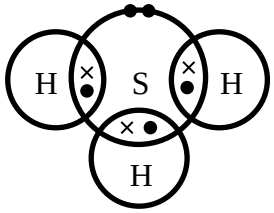
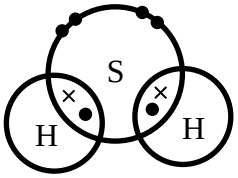
How many valence electrons are present in element **Z**?

A. 5
B. 8
C. 12
D. 15

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21. The dot and cross structure for the molecule of hydrogen sulphide is

(**Note**: ${}^{1}_{1}\mathrm{H}$ and ${}^{32}_{16}\mathrm{S}$)

			
A	B	C	D

22. Which of the following properties is TRUE for ionic compounds?

A. They are malleable and ductile.
B. They have low melting and boiling points.
C. They are brittle and dissolve easily in non-polar solvents.
D. They dissolve in polar solvents and conduct electricity in molten form.

23. Compared to ionic and covalent bonds, intermolecular forces of attractions are

A. weaker than both types of bonding.
B. stronger than both types of bonding.
C. stronger than ionic bonds but weaker than covalent bonds.
D. stronger than covalent bonds but weaker than ionic bonds.

24. Atoms **P** and **Q**, belonging to the 2nd period of the modern periodic table, have 1 and 6 electrons in their valence shells respectively.

The compound which **P** and **Q** are likely to form is

A. PQ
B. PQ_2
C. P_2Q
D. P_3Q

25. ${}^{11}_{5}\mathrm{B}$ and ${}^{27}_{13}\mathrm{Al}$ are in the same group of the modern periodic table. Hence, they both have the same number of

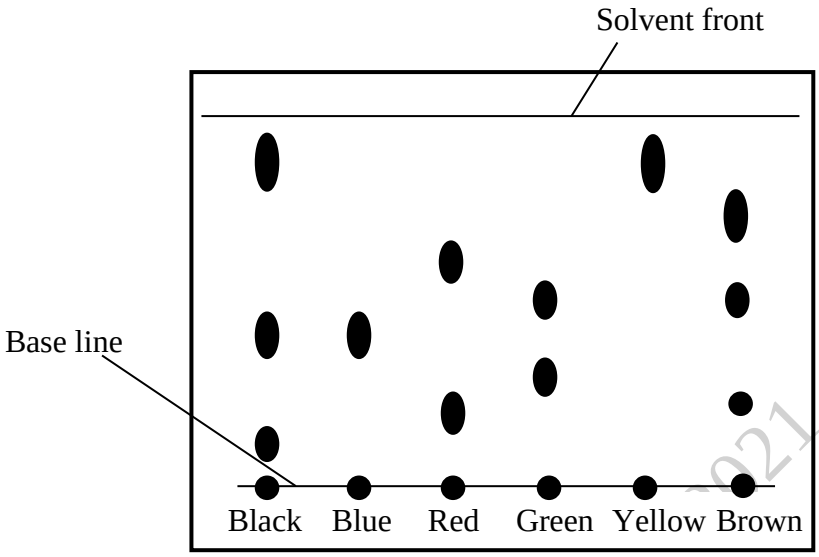
A. protons.
B. neutrons.
C. inner electrons.
D. valence electrons.

26. On chemical combination, which of these elements can form triple covalent bonds?

A. Two atoms of oxygen
B. Two atoms of nitrogen
C. Two atoms of sulphur and one atom of carbon
D. Two atoms of oxygen and one atom of carbon

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27. The given diagram shows a chromatogram of several inks.



Chromatogram

Based on the given chromatogram, it can be inferred that

A. red and blue inks are present in brown ink.
B. yellow and blue inks are present in black ink.
C. black is a mixture of blue, red and green inks.
D. brown is a mixture of red, green and black inks.

28. Which of the following is NOT an example of aqueous solution?

A. Black tea
B. Sea water
C. Orange juice
D. Whipped cream

29. What is the molarity of a solution containing 32 g of potassium sulphate (K_2SO_4) in 350 cm^3 of solution?

(**Note**: Molar mass of K_2SO_4 = 174 g mol^{-1})

A. 0.06 M
B. 0.09 M
C. 0.52 M
D. 64.37 M

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30. Sodium chloride crystals can be separated from sand using four different processes that are mentioned in the given table.

The option that shows the CORRECT order of these processes is

	First Process → Last Process			
A	filter	evaporate	dissolve	crystallise
B	dissolve	filter	evaporate	crystallise
C	dissolve	evaporate	crystallise	filter
D	filter	dissolve	crystallise	evaporate

31. If 16 g of sodium chloride is dissolved in water to prepare 200 cm^3 of saline solution, the mass/volume (m/v) percentage of sodium chloride solution will be

A. 0.07
B. 0.08
C. 7.41
D. 8.00

32. The given table shows the classification of substances based on their solubility in water.

	Soluble	**Insoluble**
I	Benzene	Magnesium hydroxide
II	Potassium sulphate	Magnesium hydroxide
III	Benzene	Carbon tetrachloride
IV	Potassium sulphate	Carbon tetrachloride

The option that shows the CORRECT classification of these substances is

A. I and II.
B. I and III.
C. II and IV.
D. III and IV.

33. A fizzy (carbonated) drink is which type of solution?

	Solute	**Solvent**
A	Liquid	Liquid
B	Gas	Liquid
C	Gas	Gas
D	Liquid	Gas

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34. Galvanising is one of the methods to prevent iron from rusting. This method involves coating of iron with a protective layer of

A. tin.
B. zinc.
C. aluminium.
D. magnesium.

35. When molten sodium chloride is electrolysed, the chemical equation that shows the change taking place at the cathode is

A. $Na_{(s)} - 2e^- \longrightarrow Na^{2+}_{(l)}$
B. $Na^{2+}_{(l)} - 2e^- \longrightarrow Na_{(s)}$
C. $Na_{(s)} + e^- \longrightarrow Na^{+}_{(l)}$
D. $Na^{+}_{(l)} + e^- \longrightarrow Na_{(s)}$

36. An electrolytic cell does NOT show the use of

A. inert metals as electrodes.
B. a battery to supply energy.
C. salt bridge to control the migration of ions.
D. single electrolyte for the conduction of ions.

37. When a piece of metal **M** is placed in an aqueous solution of metal **X** ions in a test tube, it is observed that the amount of solid metal (**M**) decreases while the solid metal (**X**) deposits at the bottom of the test tube over time.

The option that shows the CORRECT representation of metal **M** and **X** is

	M	**X**
A	iron	aluminium
B	iron	sodium
C	zinc	copper
D	zinc	magnesium

38. When an aqueous solution of sodium chloride is electrolysed, the substance that is produced at the cathode is

A. oxygen gas.
B. chlorine gas.
C. hydrogen gas.
D. sodium metal.

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39. To prevent underground iron pipes from rapid corrosion, blocks of metal **X** are buried close to the pipes and connected by wires. This is called sacrificial protection.

The metal **X** is

A. tin.
B. lead.
C. copper.
D. magnesium.

40. Which of the following is an example of electrolyte?

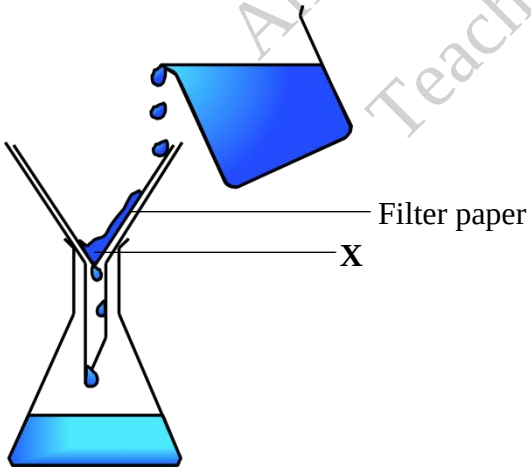
A. Benzene
B. Sulphuric acid
C. Distilled water
D. Carbon tetrachloride

<u>ALTERNATE TO PRACTICAL</u> (ATP: Questions 41-50)

41. A student separated a mixture of ammonium chloride and iron fillings using a magnet. This is because iron is

A. highly electronegative.
B. highly electropositive.
C. a metallic solid.
D. an ionic solid.

42. A suspension is filtered using the following setup.



In the given setup, **X** that remains on the filter paper is identified as the

A. filtrate.
B. residue.
C. crystals.
D. precipitates.

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43. If, in a mixture of sand and alum, we replace alum with sugar, then which of the following is the MOST appropriate sequence of steps to obtain pure sample of sugar?

I. Dissolution
II. Filtration
III. Evaporation until dry
IV. Crystallisation

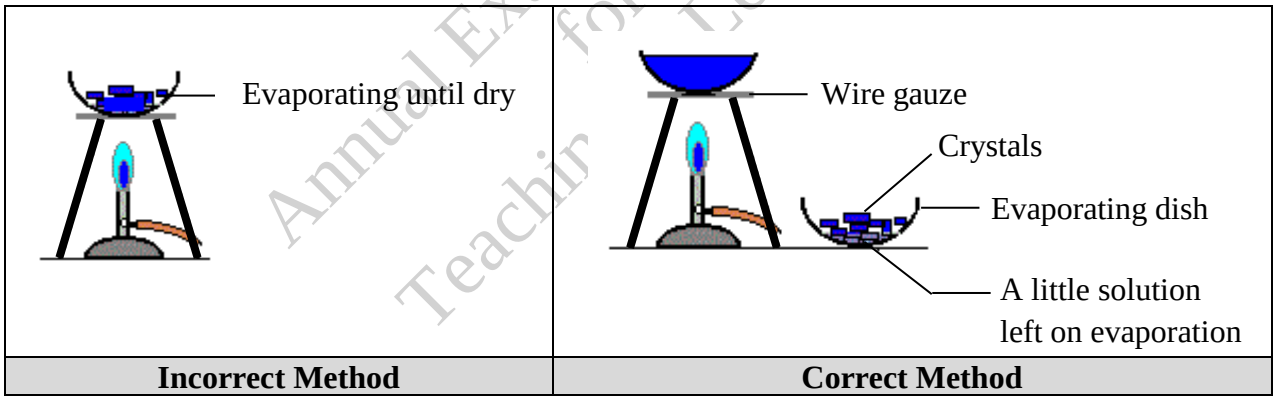
A. I and III
B. I and IV
C. I, II and III
D. I, II and IV

44. For an experiment, Sarah used a bottle of sodium carbonate solution which had the label 'primary standard'. This label indicates that the sodium carbonate solution

A. is hygroscopic in nature.
B. requires standardisation before its use.
C. is prepared from a secondary standard reagent.
D. has a strength which remains constant with time.

Use the given information to answer Q.45 and Q.46.

The given figures show two different ways of preparing copper sulphate crystals in the laboratory.



Incorrect Method	Correct Method

45. As shown in the figure, evaporating the solution in the china dish until it is dry is an incorrect method because

A. blue crystals of copper sulphate are formed in uneven shapes and sizes.
B. blue crystals of copper sulphate decompose into dull white-grey powder.
C. solubility of copper sulphate in water increases with the rise in temperature.
D. solubility of copper sulphate in water decreases with the decrease in temperature.

46. Once the crystals start forming, heating is stopped, and the solution is left undisturbed to be cooled slowly (refer the figure for correct method). This slow crystallisation is essential as it facilitates in yielding

A. deep violet crystals.
B. larger, highly pure crystals.
C. smaller, needle like crystals.
D. florescent greyish blue crystals.

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47. Copper sulphate is highly soluble in water at a high temperature, whereas its solubility in water decreases appreciably at low temperatures. This difference in solubility is utilised in the laboratory to get the crystals of copper sulphate from its solution.

Based on this information, crystallisation can be inferred as a process of

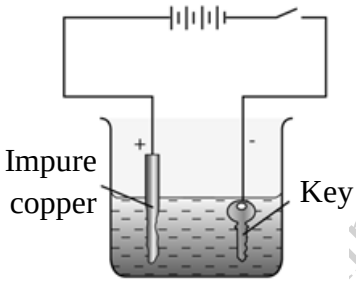
A. purifying substances.
B. increasing solubility.
C. decreasing solubility.
D. identifying substances.

48. A student is expected to prepare 0.5 M solution of sodium carbonate in a 100 mL flask. The mass of sodium carbonate that he/ she would require to prepare the desired solution is

(**Note:** $^{23}_{11}Na$, $^{12}_{6}C$ and $^{16}_{8}O$)

A. 0.53 g.
B. 2.55 g.
C. 5.3 g.
D. 50 g.

49. The MAIN purpose of the method shown in the given picture is to



A. purify the key.
B. make the key tensile.
C. save the key from corrosion.
D. increase the thickness of the key.

50. During the process of electroplating, electrodes made of metals are used because they primarily support the flow of

A. ions.
B. volts.
C. atoms.
D. electrons.

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