ICSE CLASS 10 EXAMINATION

PRACTICE QUESTION PAPER

CHEMISTRY (SCIENCE PAPER – 2)

Chapter 2: Chemical Bonding

Maximum Marks: 40 ***Time allowed: One hour***

1. Answers to this Paper must be written on the paper provided separately.
*2. You will not be allowed to write during the first **10** minutes. This time is to be spent in reading the question paper.*
*3. **The time given at the head of this Paper is the time allowed for writing the answers.***
*4. **Section A** is compulsory. Attempt **any two** questions from **Section B**.*
5. The intended marks for questions or parts of questions are given in brackets [ ].

SECTION A (20 Marks)

*(Attempt **all** questions from this Section.)*

Question 1

Choose the correct answers to the questions from the given options. [8]
(Do not copy the question, write the correct answers only.)

(i) The atomic numbers of some pairs of elements are given below. Which pair of elements will combine to form an **electrovalent** compound?

(a) 6 and 17
(b) 7 and 1
(c) 17 and 17
(d) 12 and 9

(ii) Which one of the following ions has the same electronic configuration as an atom of argon (atomic number 18)?

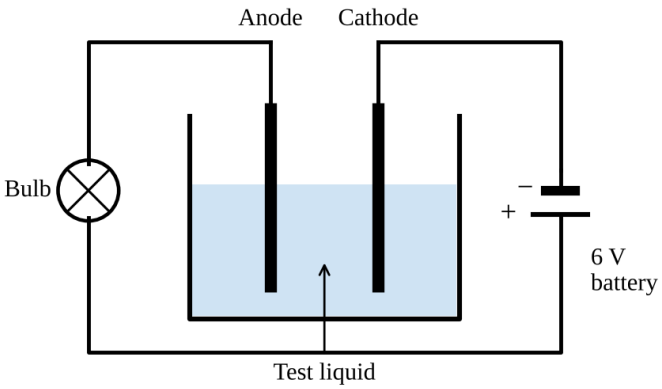
(a) Na^{+}
(b) O^{2-}
(c) Ca^{2+}
(d) Al^{3+}

(iii) The properties of four substances P, Q, R and S are recorded in the table below. Which substance is most likely to be a **polar covalent** compound?

Substance	Melting point (°C)	Soluble in water	Conducts electricity		
			Solid	Molten	Aqueous solution
P	801	Yes	No	Yes	Yes
Q	−114	Yes	No	No	Yes
R	−182	No	No	No	No
S	962	Yes	No	Yes	Yes

(a) P
(b) Q
(c) R
(d) S

(iv) A student uses the set-up shown below to test the electrical conductivity of different liquids, one at a time. With which of the following liquids will the bulb **not** glow?



(a) Sugar solution
(b) Sodium chloride solution
(c) Dilute hydrochloric acid
(d) Copper sulphate solution

(v) How many electrons are shared between the two atoms in a molecule of nitrogen?
(a) 2
(b) 4
(c) 8
(d) 6

(vi) **Assertion (A):** Ionic compounds conduct electricity in the molten state but not in the solid state.

Reason (R): In the molten state the ions of an ionic compound are free to move.

(a) (A) is true but (R) is false.

(b) (A) is false but (R) is true.

(c) Both (A) and (R) are true, and (R) is the correct explanation of (A).

(d) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

(vii) Which statement is correct about a molecule of carbon tetrachloride (CCl_4)?

(a) It has four single covalent bonds and is a non-polar molecule.

(b) It has four double covalent bonds and is a polar molecule.

(c) It has four electrovalent bonds and is a polar molecule.

(d) It has four single covalent bonds and is a polar molecule.

(viii) In which of the following species is a coordinate bond present?

(a) CH_4

(b) H_3O^+

(c) NaCl

(d) HCl

Question 2

(i) Complete the following sentences by choosing the correct option from the brackets: [3]

(a) A methane molecule is a _____ molecule. (polar / non-polar)

(b) Ionic compounds are _____ in organic solvents such as benzene. (soluble / insoluble)

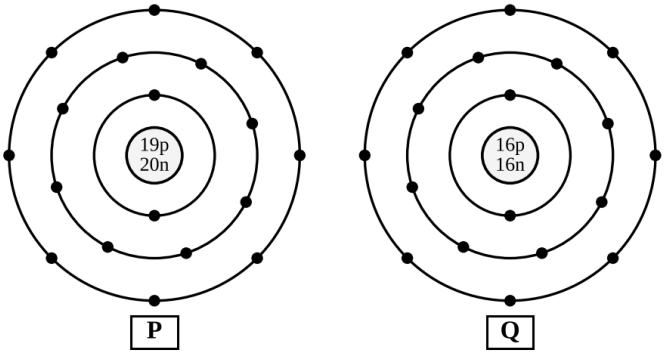
(c) The formula of the compound formed between calcium and chlorine is _____. (CaCl / $CaCl_2$)

(ii) Match Column A with Column B. (Write the answers as (a)–(number), and so on.) [3]

Column A	**Column B**
(a) Sodium chloride	1. A non-polar covalent compound that is insoluble in water
(b) Carbon tetrachloride	2. An ionic compound that conducts electricity in the molten state
(c) Hydrogen chloride	3. A polar covalent compound that forms ions in water
	4. A gas which contains a triple covalent bond

Question 3

(i) The diagram below shows the structure of two ions P and Q. (The numbers of protons and neutrons are shown in the nucleus.) [3]



(a) State the charge on each of the ions P and Q.

(b) Write the formula of the compound formed between P and Q.

(c) Name the type of bond present in this compound.

(ii) Give reasons for the following: [3]

(a) Sodium chloride conducts electricity in the molten state but not in the solid state.

(b) Carbon tetrachloride does not dissolve in water.

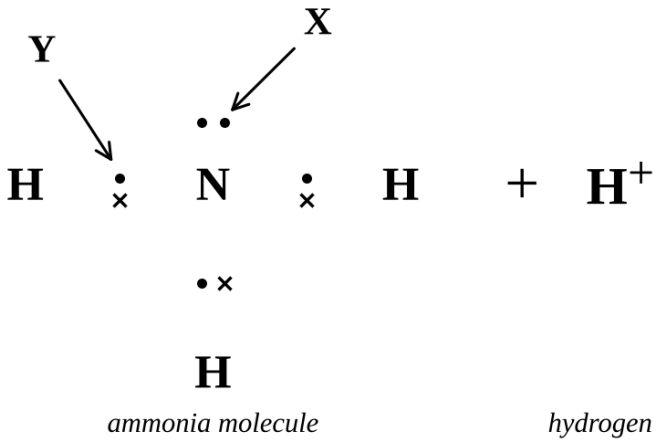
(c) Hydrogen chloride gas conducts electricity when dissolved in water, although it is a covalent compound.

SECTION B (20 Marks)

*(Attempt **any two** questions from this Section.)*

Question 4

The diagram below shows a molecule of ammonia and a hydrogen ion. Two electron pairs in the ammonia molecule are marked X and Y.



(i) Answer the following questions based on the diagram: [4]

(a) Name the pairs of electrons marked X and Y.

(b) Name the donor and the acceptor when ammonia combines with the hydrogen ion.

(c) Draw the electron dot diagram of the ion formed. Label the coordinate bond in it.

(ii) Answer the following questions: [3]

(a) Which atom of a water molecule donates a pair of electrons to a hydrogen ion to form the hydronium ion?

(b) Write an equation for the formation of the hydronium ion from a water molecule.

(c) Name all the types of bonds present in ammonium chloride.

(iii) Answer the following questions: [3]

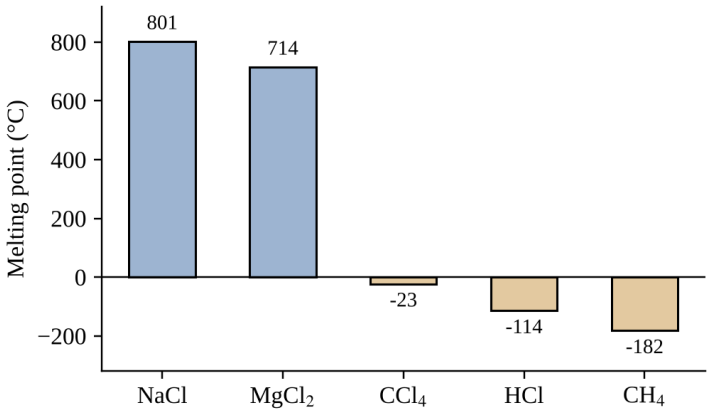
(a) How many shared pairs of electrons are present in the ammonium ion?

(b) How many lone pairs of electrons are present on the oxygen atom in the hydronium ion?

(c) Why are all four N–H bonds in the ammonium ion identical, although one of them is a coordinate bond?

Question 5

The bar graph shows the melting points of five compounds. Study the graph and answer the questions that follow.



(i) Answer the following questions based on the graph: [4]

(a) Name the two electrovalent compounds shown in the graph.

(b) Give a reason for the high melting points of these two compounds.

(c) Name the polar covalent compound shown in the graph.

(d) Why do covalent compounds like CH_4 have very low melting points?

(ii) Answer the following questions about magnesium chloride (atomic number of Mg = 12, Cl = 17): [3]

(a) Draw the electron dot diagram to show the formation of magnesium chloride.

(b) Why is the formula of magnesium chloride $MgCl_2$ and not MgCl?

(iii) State **three** differences between sodium chloride (an electrovalent compound) and carbon tetrachloride (a covalent compound) with reference to: [3]

(a) physical state at room temperature.

(b) solubility in water.

(c) electrical conductivity in the molten state.

Question 6

The diagram below shows the electron dot structures of two molecules P and Q. P contains two atoms of an element X and Q contains two atoms of an element Y. Only the outermost electrons are shown.



Molecule P **Molecule Q**

(i) Answer the following questions based on the diagram: [4]

(a) Which molecule, P or Q, contains a triple covalent bond?

(b) How many lone pairs of electrons are present on each atom of Y in molecule Q?

(c) The element Y belongs to period 3. Name the element Y.

(d) State a reason why both P and Q are non-polar molecules.

(ii) Hydrogen chloride is a polar covalent compound. [3]

(a) Draw the electron dot diagram of hydrogen chloride.

(b) Mark the partial charges on the atoms and explain why the molecule is polar.

(c) Write an equation to show what happens when hydrogen chloride gas dissolves in water.

(iii) Sodium burns in chlorine to form sodium chloride: $2Na + Cl_2 \rightarrow 2NaCl$ [3]

(a) Write the half equation for the oxidation reaction.

(b) Write the half equation for the reduction reaction.

(c) Name the oxidising agent and the reducing agent in this reaction.

****** END OF PAPER ******