



# Chemistry 1301A Practice Final Exam

## - Solutions -

### Introduction

Dear Student,

Thank you for opening the Chemistry 1301A practice final exam solutions for Chemistry 1301A. This resource has been created by the Education Team at WebStraw. The Education Team consists of students that have previously taken and/or students that are currently taking Chemistry 1301A.

### Purpose

This resource focuses on key concepts that are important for students to understand to succeed within this course. This resource was created by students for other students. Our goal is to help students (1) further develop their understanding of course content and (2) achieve greater academic success. (3) Our resource is also open access meaning there are no financial or legal barriers to students who wish to access and use our resource.

### Instructions

Upon completion of the Practice Questions, compare your thought-process and answers to the solutions provided.

### Disclaimer

This resource is supplementary to your course content and is not meant to (1) replace any of the resources provided to you by your instructor nor is it meant to (2) be used as a tool to learn the course material from scratch. We assume that students who use this resource will have a basic understanding of the course content. As such, many of the solutions expect you to have the basic knowledge of understanding (e.g. knowing the formula for equilibrium). This resource does not contain everything you need to know for your evaluations. Please refer to the course material provided by your instructors if there are any discrepancies between our resource and your course content.

We wish you the best of luck on your exams!

The WebStraw Team

**Note to Instructors:** If this resource has been created for your course and you would like to collaborate with us, please email us at [team@webstraw.ca](mailto:team@webstraw.ca)

# 1. Fundamental Concepts

## Question Type: “Compounds and Stoichiometry”

### Thought process:

We must first solve for the number of moles of  $\text{K}_2\text{MnO}_4$ . We are told that water reacts in excess so  $\text{K}_2\text{MnO}_4$  is the limiting reagent. Given the concentration and volume of  $\text{K}_2\text{MnO}_4$ , use the formula  $n = CV$  to solve for the number of moles.

$$n = (0.75 \text{ mol/L})(0.4 \text{ L}) = 0.3 \text{ mol } \text{K}_2\text{MnO}_4$$

From the balanced chemical equation, it shows that for every 1 mole of hydrogen produced, it takes 2 moles of  $\text{K}_2\text{MnO}_4$ .

$$0.3 \text{ mol } \text{K}_2\text{MnO}_4 \times (1 \text{ mol } \text{H}_2 / 2 \text{ mol } \text{K}_2\text{MnO}_4) = 0.15 \text{ mol } \text{H}_2$$

To determine how much volume 0.15 mol of hydrogen gas takes up under standard conditions, use the formula  $PV=nRT$  where V is the variable we are trying to solve for.

$$V = nRT/P$$

$$V = (0.15 \text{ mol } \text{H}_2)(8.314 \text{ L kPa/mol K})(298.15 \text{ K}) / (101.33 \text{ kPa}) = 3.67 \text{ L } \text{H}_2$$

As for the effect of increasing the temperature by 30%, Charles's law tells us that temperature and volume are directly proportional. Therefore, a 30% increase in temperature would result in a 30% increase in volume.

**Answer: A)**

# 1. Fundamental Concepts

## Question Type: “Solubility of Elements”

### Thought process:

In a coordination complex, the ligand will favour the ion with **the greatest positive charge** and form coordinate covalent bonds. This is due to transition metals' ability to take on multiple oxidation states, hence why transition metals are sometimes found in cofactors and coenzymes to bind ligands.

**Answer: C)**

# 1. Fundamental Concepts

## Question Type: “pH Calculations using Concentration”

### Thought Process:

We can convert the given pOH to pH using the formula  $\text{pH} + \text{pOH} = 14$ .

$$\text{pOH} + \text{pH} = 14$$

$$\text{pH} = 14 - 8.30$$

$$\text{pH} = 5.70$$

Now that we have the pH, we can find the concentration of  $\text{H}^+$  by the following relationship:

$$[\text{H}^+] = 10^{-\text{pH}}$$

$$[\text{H}^+] = 10^{-5.70} = 1.995 \times 10^{-6} \text{ M}$$

Firstly, calculate the concentration of  $\text{H}^+$  in the solution being added.

$$[\text{H}^+] = 10^{-\text{pH}} = 10^{-5} \text{ M}$$

We define this as  $C_1$ . Now, we use the common equation  $C = n/V$  to determine the concentration of  $\text{H}^+$  in the combined solution.

Solution 1:  $n(\text{H}^+) = 1.995 \times 10^{-6}(V_1)$  → this is the starting solution

Solution 2:  $n(\text{H}^+) = 10^{-5}(2V_1)$  → this is the solution being added

Total:  $C(\text{total}) = n(\text{total}) / V(\text{total}) = (1.995 \times 10^{-6}(V_1) + 10^{-5}(2V_1)) / (V_1 + 2V_1) = (1.995 \times 10^{-6} + 20 \times 10^{-6}) / 3 = 7.3317 \times 10^{-6} \text{ M}$

The relationship  $\text{pH} = -\log[\text{H}^+]$  is used to determine the pH of the new combined solution

$$\text{pH} = -\log(7.3317 \times 10^{-6}) = 5.13$$

$$\text{Hence pOH} = 14 - 5.63 = 8.87$$

# 1. Fundamental Concepts

## Question Type: “Identity of an Element”

### Thought Process:

The atomic mass of an element shown on a periodic table is simply the **weighted averages** of its stable isotopes. For this answer, there are an infinite amount of answers if the concept of a weighted average is understood.

An easy way to approach this question is to imagine a specific scenario and assign a number of atoms to  $^{119}\text{Wb}$  and  $^{124}\text{Wb}$ . Let's say that there are 20 atoms of  $^{119}\text{Wb}$  and 2 atoms of  $^{124}\text{Wb}$ . With only two isotopes, the average atomic mass of Wb across these 22 atoms is 119.45 amu. We must use  $^{120}\text{Wb}$  to adjust the overall average mass to achieve the 119.49 amu that is indicated in the question. This can be done through an algebraic equation, where X represents the number of  $^{120}\text{Wb}$  atoms needed to raise the average across our sample to 119.49 from the current 119.45.

Start with the weighted average formula:

$$119.49 \text{ amu} = \frac{20 \text{ atoms}}{(22+x) \text{ atoms}} (119 \text{ amu}) + \frac{2 \text{ atoms}}{(22+x) \text{ atoms}} (124 \text{ amu}) + \frac{x \text{ atoms}}{(22+x) \text{ atoms}} (124 \text{ amu})$$

And solve for X

[...]

$$X = 1.53$$

This means that the combination of 20  $^{119}\text{Wb}$ , 2  $^{124}\text{Wb}$ , and 1.53  $^{120}\text{Wb}$  atoms yield an average mass of 119.49 amu. This correlates to isotopic abundances of 85.0%, 8.5%, and 6.5% respectively, and is a feasible distribution for all of the Wb isotopes in existence. Because there are infinite values that can be assigned to  $^{119}\text{Wb}$  and  $^{124}\text{Wb}$  at the beginning, there are also an infinite amount of abundances that satisfy the 119.49 amu average.

# 1. Fundamental Concepts

## Question Type: “Resulting Mixture Calculation”

### Thought Process:

For a question such as this one, we must first determine the number of moles of HCl in the new solution. To accomplish this, we add the molar contributions of each of the original samples.

$$n_T = n_1 + n_2 = C_1V_1 + C_2V_2 = (1.50M)(2.00L) + (2.00M)(4.00L) = 11.00\text{mol}$$

Next, determine the total volume using the equation  $V_T = V_1 + V_2 = 2.00L + 4.00L = 6.00L$

$$C_T = n_T / V_T = (C_1V_1 + C_2V_2) / (V_1 + V_2) = 11.00\text{mol} / 6.00L = 1.83M$$

**Answer: 1.83M**

## 2. Atomic Theory

### Question Type: “Quantum Numbers I”

#### Thought process:

Solving this question requires an understanding of the limitations on each quantum number:

- The principal quantum number ( $n$ ) of an electron is equal to the energy level it is a part of.
  - Nickel is in the third period. Hence the  $n$  value must be either 1, 2, or 3.
- The azimuthal quantum number ( $l$ ) ranges from 0 to  $n-1$ , and dictates the orbital shape.
  - For a p orbital,  $l = 1$ . Note that  $0 \leq l \leq 3$  and hence follows the above limitation (telling us that a third energy level electron, or for that matter a first or second energy level electron as well, may be apart of a p orbital)
- The magnetic quantum number ( $m_l$ ) goes from  $-l$  to  $l$ . Hence for a p orbital the  $-1 \leq m_l \leq 1$
- The spin quantum number ( $m_s$ ) can be  $+\frac{1}{2}$  or  $-\frac{1}{2}$

Upon observation, the only possible answer that fulfils the above conditions is e)

Answer: e)

## 2. Atomic Theory

### Question Type: “Orbitals and Bonding”

#### Thought Process:

A clover shaped orbital represents a d orbital. Since it lies on the yz plane, we can deduce that it is a  $d_{yz}$  orbital. Note that there are **no radial nodes**, so it must be in the third energy level. Hence its a  $3d_{yz}$  orbital.

Answer: C)



## 2. Atomic Theory

### Question Type: “Quantum Numbers II”

#### Thought Process:

Calcium is in group 2 and it is an alkaline earth-metal. This means that it has 2 valence electrons and they occupy the 4s orbital.

Principal Number:  $n = 4$

Angular Momentum Number:  $l = 0$  (s-orbital)

Magnetic Number:  $m_l = 0$  (s orbital only has one orbital)

Magnetic Spin Number:  $m_s = -\frac{1}{2}$  (second electron in the last orbital)

## 2. Atomic Theory

### Question Type: “Ionization Energy and Reactivity”

#### Thought process:

First ionization energy is the energy required to remove the first valence electron from a neutral atom.

This energy is dependent on how strong the attractive force is between the protons in the nucleus and the electrons of the atom; the **more protons** there are in the nucleus, the **stronger** the electrons are attracted to the nucleus. This pattern is consistent with atoms that have increasing proton numbers, but the same distance between the electrons and protons.

However, as you travel down the group, the electrons are occupying higher energy level orbitals, meaning they are further away from the nucleus. This weakens its attraction to the nucleus and the electrons can be more easily pulled off the atom. This effect usually trumps the effect of additional protons, and results in **reduced ionization energy**.

Lithium, sodium, potassium and cesium are all in the same group and because cesium is the atom with the largest size (electrons are far from the nucleus), it is the easiest to rip electrons out of. As a result, it reacts faster in redox reactions since less energy is required to ionize it.

**Answer: d)**

## 2. Atomic Theory

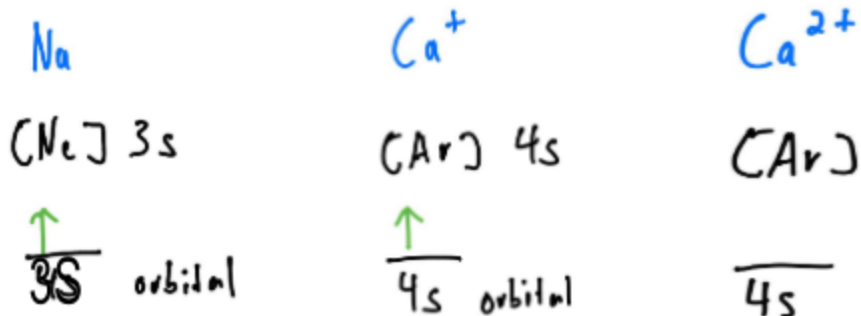
### Question Type: “Diamagnetism”

#### Thought process:

To approach this question, knowing the electron configuration of each species and the orbital arrangements are very important.

Diamagnetic species are species that have orbitals which are either **completely filled or empty**. These species cannot have a single electron occupying an orbital.

Here are the orbital and simplified electron configurations:



Since Ca<sup>2+</sup> is the only species to not have a singly occupied orbital. It is the only species that is diamagnetic

Answer: c)

# 2. Atomic Theory

## Question Type: “Quantum Mechanical Models of Atoms”

### Thought process:

Recall the three principles and what their definition:

1. **Hund's rule** states that subshells with multiple orbitals (p, d, and f) fill electrons so that every orbital in a shell gets one electron before any of them get the second
2. **Aufbau's principle** states that electrons fill energy levels in order of increasing energy, completely filling one sublevel before beginning to fill the next
3. **Pauli's Exclusion Principle** states that two electrons cannot have the same quantum number, or the same spin.

Every orbital already contains one electron, so Hund's rule is not violated. We can see that the Aufbau principle is violated since the 2s orbital is filled before 1s. We know that two electrons of the same orbital cannot have the same spin, thus Pauli's Exclusion Principle is violated as seen in the 2s orbital.

**Answer: B)**

## 2. Atomic Theory

### Question Type: “Electron Configuration”

#### Thought process:

We must remember that **chromium is an exception** to the rules of electron configuration. According to the normal rules, chromium should have the electron configuration  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^4$ . However, moving an electron from the 4s subshell to the 3d subshell leads to more stability, producing the electron configuration  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$ .

As Cr becomes oxidized to become  $Cr^+$ , it must **lose an electron**. This is taken from the furthest orbital from the nucleus which is 4s, giving the final electron configuration as  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$ .

**Answer: C)**

# 3. Structures and Bonding

## Question Type: “Best Lewis Structure”

### Thought process:

Recall that in order to determine the most suitable Lewis structure, there are 2 main concepts to consider—**formal charges** and the **OCTET rule**. The best Lewis structure should contain the **smallest formal charge** where any existing charges should agree with electronegativity rules (Eg. a more electronegative atom should possess the negative charge in a bond since it has more pull on electrons), and shouldn't violate the OCTET rule.

Using this criteria, let's analyze which structure is the best and which ones are not.

The **KEY** to this question is recognizing that  $\text{KNO}_3$  is an ionic compound, meaning the Lewis structure is drawn as two ions. Knowing this, we can automatically eliminate A), B) and C).

However, if you happen to forget this, we can also see that structures A) to C) violate the above criteria. In A), potassium shares two bonds despite only having 1 valence electron; a very strange and uncommon configuration. For B), the oxygen atoms on the top and bottom of the structure possess positive charges in their bonds with nitrogen, thus not agreeing with electronegativity rules. This also presents the most formal charges (net -2) of all the structures presented. For C), the OCTET rule is violated for nitrogen which has 2 electrons more than it can hold.

Between D) and E), the nitrogen in structure d) shares the same problem as structure c) where the nitrogen is overfilled. Thus, structure E) is the best structure for  $\text{KNO}_3$ .

**Answer: E)**

# 3. Structures and Bonding

## Question Type: “MO Diagrams”

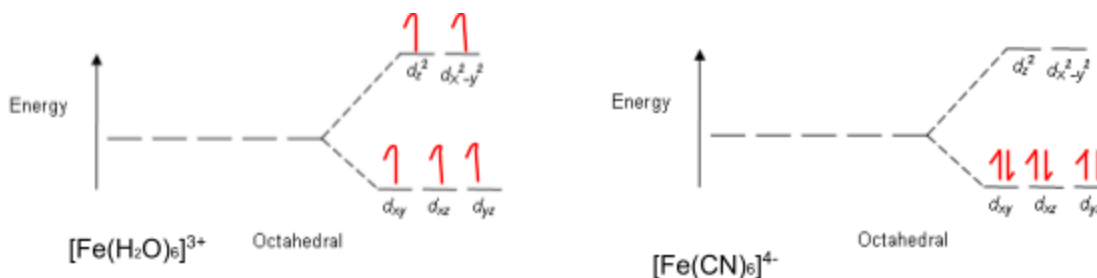
### Thought process:

\*constructing MO diagrams for coordination complexes may or may not be covered so treat this as extra practice

In order to complete the MO diagrams, first compute the number of electrons each compound contains. For the coordination complexes, find the number of electrons for the metal using **oxidation numbers** and the **overall charge**. For example, in the coordination complex of iron and water, iron has an oxidation number of +3. Since it usually has 8 valence electrons, we apply the oxidation number and remove 3 electrons to get 5 valence electrons.

Choice b) and d) also require understanding of crystal field splitting, low/high-spin configurations, and the spectrochemical series—which will be provided on the exam. After computing for the number of electrons the iron atoms contain, determine if the complex will take on high or low-spin configuration based on the strength of the ligand it is attached to. Strong field ligands tend to take on **low-spin configurations** since placing electrons in the higher degenerate orbitals ( $e_g$ ) causes repulsion with the external crystal field. Alternatively, weak field ligands tend to take on **high-spin configurations** because there's less repulsion, making it more energetically stable.

In our case, both ligands are considered weak and will therefore take on high-spin configurations. When drawing the electron distribution for both coordination complexes, only  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$  contains **unpaired** electrons.



Answer: D)

# 3. Structures and Bonding

## Question Type: “Hybridization of Complex Structures”

### Thought process:

For a), in order for oxygen to be  $sp^3$  hybridized, it must have 4 regions of electron density. Looking at the ether compound, the oxygen has 4 electron domains (2 bonds + 2 lone pairs). Thus, it is  $sp^3$  hybridized.

**Tip:** To remember the number of electron domains associated with each hybridization state, remember that orbitals cannot be gained or lost in hybridization.  $sp^3$  is made of 3 p orbitals and one s orbital, so it must create 4 hybrid orbitals.

For b), the top carbon in the bond is not  $sp^3$  hybridized because it only has 3 regions of electron density ( $sp^2$  hybridized). Therefore, the bond is actually an overlap of 1  $sp^2$  and 1  $sp^3$  orbital.

Response c) shows a single bond which is also a sigma bond. While sigma bonds are free to rotate about its axis, we must consider that the bond is in a ring and therefore cannot rotate as freely as it would on its own. Therefore, this statement is correct.

For d), the carbon indicated is  $sp^2$  hybridized meaning it has 3 regions of electron density, taking on a trigonal planar shape.

**Answer: B)**



# 3. Structures and Bonding

## Question type: “Ranking the Melting Points”

### Thought process:

The order goes like **carboxylic acids > alcohols > ketone > ether**. Since acids can act as a hydrogen bond donor and acceptor, they are the hardest to break down and boil. The **KEY** to this question is understanding the general rule that the stronger the intermolecular forces (inter - referring to between molecules), the higher the boiling point. When the intermolecular forces are weak, then the boiling point will be lower.

**Answer: 1 and 4**

# 3. Structures and Bonding

## Question Type: “Hybridization & VSEPR Theory”

### Thought process:

- A) Yes. In this molecule both C atoms are  $sp^2$  hybridized. So, the geometry around each carbon atom is **trigonal planar**. So, all the atoms are present on the same plane.
- B) Yes. The structure is **bent** and only contains 2 atoms bonded to an oxygen, therefore they have to be on the same plane.
- C) No. The bond shape is **tetrahedral**, therefore it's not planar.
- D)  $BeCl_2$  has a **linear** bond shape, so all atoms are in the same plane.
- E) The bond shape of the central carbon is linear ( $sp$ ), so the three carbons are in the same plane. The carbons on the side are  $sp^2$  hybridized with a trigonal planar bonding shape, so the hydrogens could also be on the same plane as the carbons.

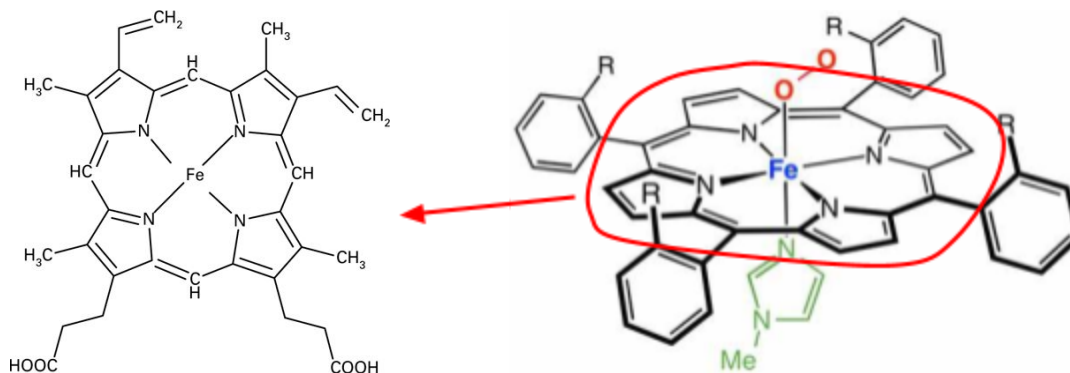
# 4. Transition Metals

## Question Type: “Structure and Function of Transition Metals”

### Thought process:

\*\*keep in mind that answers will differ depending on each individual, however, we've highlighted some key terms we feel are important in answering this question

Hemoglobin is a protein made up of 4 subunits connected by intermolecular forces. In the centre of each subunit, 4 nitrogen donor atoms are coordinated to a metal ion to form a porphyrin (Square planar shape) ring, specifically an iron porphyrin or a heme group as the nitrogen atoms all bind to a central  $\text{Fe}^{2+}$  cation. Iron—having a coordination number of 6—can bind to 2 other atoms as 4 spots are already taken up by the nitrogen donor atoms. The last 2 spots are filled by the protein histidine (which holds the iron in place and joins heme group to the rest of the hemoglobin protein) and oxygen, the main transport item for hemoglobin.



To signal the proteins to receive  $\text{O}_2$ , a process called cooperative bonding is used. The presence of oxygen oxidizes the  $\text{Fe}^{2+}$  cation, causing it to become smaller and fit into the porphyrin ring. The movement of iron then moves histidine which is connected to the rest of the protein by intermolecular forces, allowing oxygen to be taken up by hemoglobin.

# 4. Transition Metals

## Question Type: “Bidentate and Chelating Ligands”

### Thought Process:

A bidentate ligand describes a ligand that has **2 donor atoms directly bonded to a metal centre**. However, such donor atoms do not have to bind to the **same** metal centre, a characteristic of chelating ligands. The atoms in a bidentate ligand can attach independently to a metal centre as seen in **bridging ligands**, or only one atom attaches to a metal centre as seen with **terminal ligands**.

However, a chelating ligand need not have only 2 donor atoms, but can have any number of donor atoms. So all chelating ligands are **polydentate**, but not necessarily bidentate. Hence the statement is **false**.

# 4. Transition Metals

Question type: “Understanding Stereochemistry of Chemical Species”

**Thought process:**

When you see an octahedral structure with 2 sets of three identical ligands, they can be classified as fac or mer.

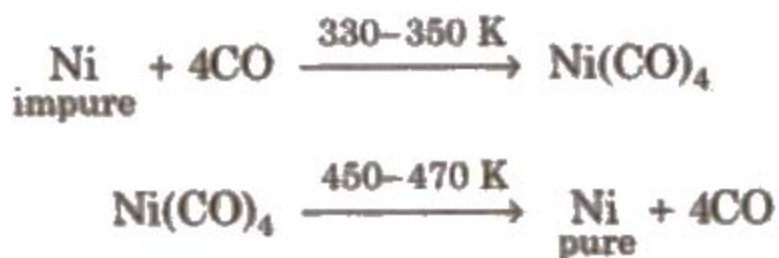
When 3 ligands occupy one face of the octahedral geometry, it is said to be a fac isomer. But in mer, identical ligands exist in  $90^\circ$ - $90^\circ$ - $180^\circ$  bond angles.

**Answer: Mer**

# 4. Transition Metals

## Question type: “Understanding the Mond Process”

Thought process:



The mond process can be best described using 2 simple steps for **purifying nickel**.

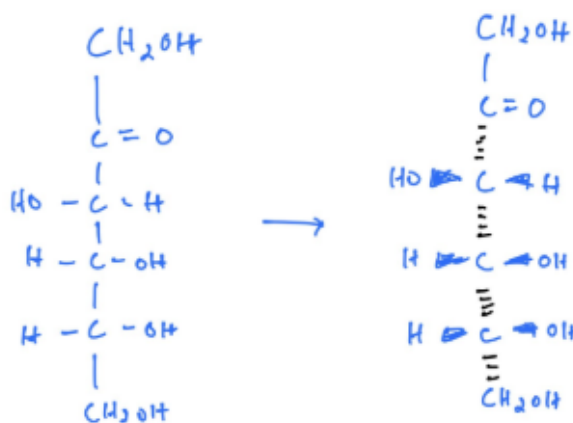
- 1) In this first step, impure nickel will react with **carbon monoxide gas** to form nickel carbonyl gas. This gas is highly volatile and easily separated from impurities, which remain in a solid state.
- 2) The Nickel carbonyl gas will be collected and heated to be decomposed into pure nickel and carbon monoxide. Note that the carbon monoxide can be reused.

# 5. Structure and Shapes of Organic Molecules

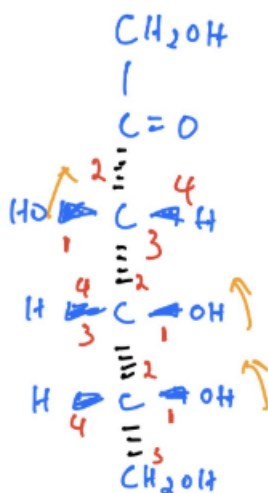
## Question Type: "Absolute Configuration"

### Thinking Process:

We can first convert the structure into a **dashed-wedge diagram** to better understand its spatial positioning.

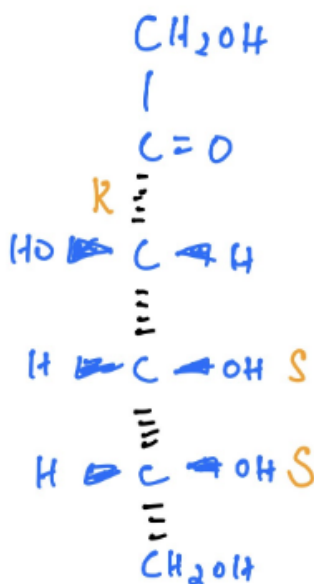


Next, label the priority of the substituents groups according to their atomic number.

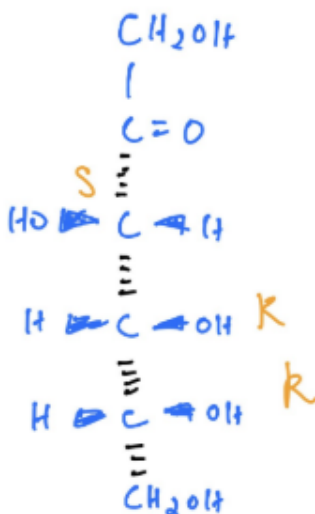


# 5. Structure and Shapes of Organic Molecules

In order to determine R/S configuration, you could either use your model kits to build the R and S structures and compare them with fructose, or you could **swap** the positioning of constituents to **give the other enantiomer**. We have shown the second method below.



We first assigned R/S configurations based on how the priority groups are positioned. However, the lowest priority group (hydrogen) is not at the back. We can simply swap the -H bond with any of the vertical bonds going into the page. **By swapping 2 bonds, we are left with the other configuration.**



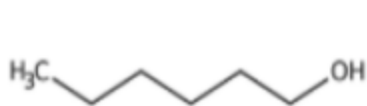


# 5. Structure and Shapes of Organic Molecules

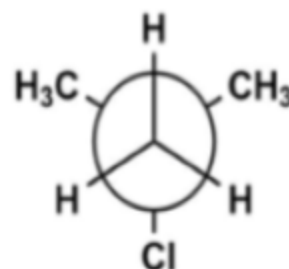
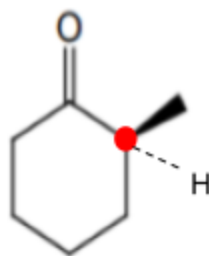
## Question Type: “Chirality and Light”

### Thinking Process:

To start, first identify the molecules that have **chiral centers**.



No chiral centers



No chiral centers

Since only the second structure has a chiral center, it is the only molecule of the three that is optically active

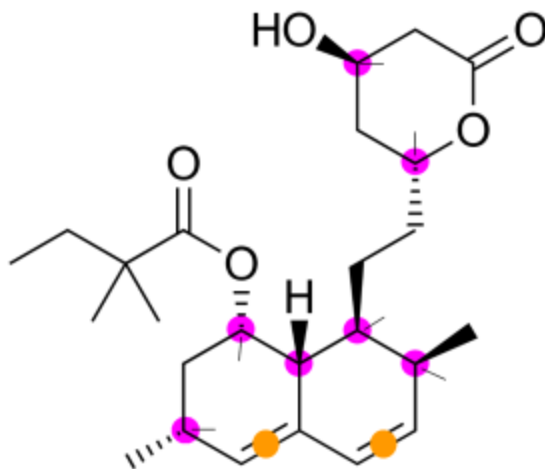
# 5. Structure and Shapes of Organic Molecules

## Question Type: “Stereoisomerism”

### Thinking Process:

To count the number of possible stereoisomers, we use the formula  $2^n$  where n represents the number of sites where stereoisomerism is possible. Remember that chiral centers are not the only place where stereoisomerism exists; alkenes bonded to different constituents can also exhibit **E/Z stereoisomerism**.

Answer:  $2^9$



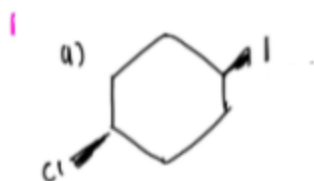
# 5. Structure and Shapes of Organic Molecules

## Question Type: "Identifying Isomers"

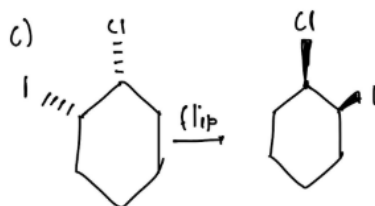
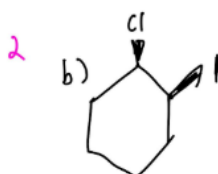
### Thinking Process:

Constitutional isomers are defined as molecules that share the **same molecular formula** but **differ in their connectivity**.

The first structure will be counted as the first constitutional isomer.

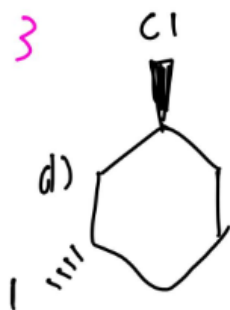


The next two molecules (b and c) are actually **identical**, but their orientations have been flipped. This will be a trick as the exam wants to test you on your skills of manipulating diagrams and variations of the same molecule. Since structure b) and c) are identical and differ in connectivity from structure 1), they are the 2nd constitutional isomer.

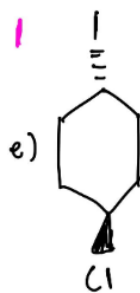


# 5. Structure and Shapes of Organic Molecules

Structure d) is different from the rest of the isomers before and has its own bonding arrangement, making it the 3rd constitutional isomer.



Molecule e) is a stereoisomer of molecule a) because they share the same connectivity. Therefore, structure e) is not a unique constitutional isomer.



Answer: **3 constitutional isomers**

# 5. Structure and Shapes of Organic Molecules

## Question Type: “Conformational Isomers with Newman Diagrams”

### Thought process:

For questions with Newman projections, make sure to draw from the perspective of both carbons and rotate the projections to match the given responses. In this case, the Newman projection produced will be the same regardless of which carbon you consider as the front/back.

As for energy favourability, this depends on the **conformation** and the **size** of the constituents. Eclipsed conformations are less energetically favourable than staggered conformations because they face **more repulsion** from substituents being close together, and larger groups prefer to be **further apart**.

Comparing the two eclipsed projections (3 and 4), projection 3 is the least favourable since both -OH groups are close together.

**Answer: C)**

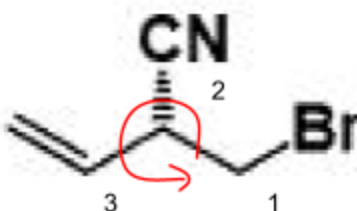
# 5. Structure and Shapes of Organic Molecules

## Question Type: “Absolute Configurations II”

### Thought process:

First, identify all the chiral centers on all four of the figures. Figure II is the only one to have more than one chiral center.

In Figure I, the compound contains a chiral center that is attached to a cyanide, a bromomethyl, an alkyl and also a hydrogen. The priorities are written in the image below.



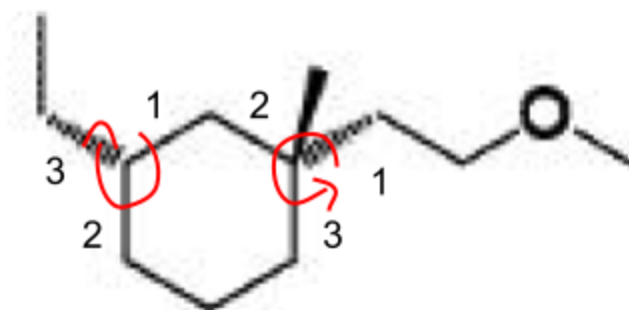
The cyanide substituent is drawn at the back, but we must have the lowest priority be drawn at the back. Using the same method we used before for the fischer projection question, we can swap bonds to move hydrogen to the back, giving us the opposite configuration. This compound initially has an S configuration, but with hydrogen at the back, it now displays **R configuration**. Therefore, Figure I must be part of the final answer

In Figure II, the compound contains two chiral centers:

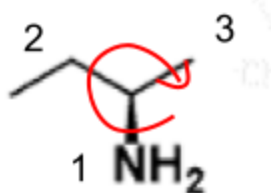
- The chiral center on the left contains an ethyl group, a hydrogen, and attachments to carbons in the aromatic ring. The priorities for the substituents are given in the diagram below. Initially, the absolute configuration would be assigned as R, but since the hydrogen must be put at the back of the compound, the **configuration is S**.
- The chiral centre to the right has its highest priority substituent at the back of the page so we must keep this in mind when we solve for the absolute configuration. Again, the priorities for the substituents are given in the diagram below. Initially, the absolute configuration would be assigned as S but since the methyl group must be put at the back of the compound, the **configuration is R**.

Therefore, Figure II must be part of the final answer

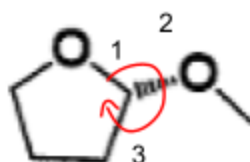
# 5. Structure and Shapes of Organic Molecules



In Figure III, the compound contains an amino group, an ethyl group, a methyl group and a hydrogen. The **absolute configuration is R**. Therefore, Figure III must be part of the final answer



In Figure IV, the chiral center is within a cyclic ether that contains an alkoxy group. This compound initially has an R configuration but since the hydrogen was not drawn at the back, the conformation is switched to an **S configuration**. Therefore; Figure IV is not part of the final answer



**Answer: D)**