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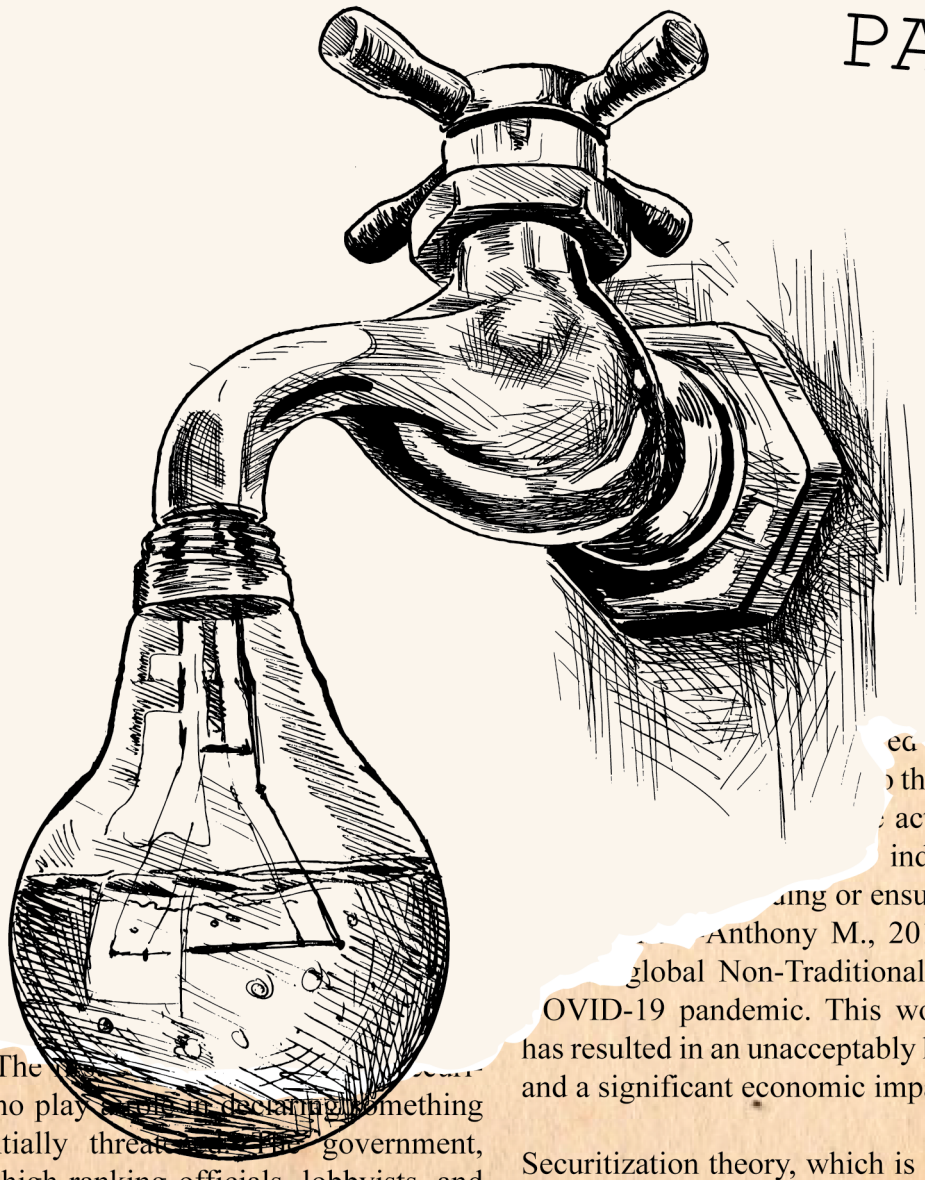
PART I



issue. The ... actors who play a role in declaring something that is existentially threat... government, represented by high-ranking officials, lobbyists, and even pressure from a group are all examples of securitizing actors. Next is the issue or threat that potentially brings harmful effects towards peace and stability of the country and lastly is the reference object or who needs the security. This is how actors assure the

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... Anthony M., 2018). One of the m...
...global Non-Traditional Security risks is the ...OVID-19 pandemic. This worldwide health crisis has resulted in an unacceptably high number of deaths and a significant economic impact.

Securitization theory, which is employed as a framework analysis, is the basic theory that underpins the analysis in this study. Securitization developed from Copenhagen School (COPRI – Copenhagen Peace Research Institute) of security studies pioneered by Barry Buzan, Ole Weaver and Jaap De Wilde (1998),

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VOTING FOR STRUCTURES

Knowing Art & MolecularInnovations for Pharmacists-In-Training

a chapter by

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Molecular Innovations of Pharmacists-in-Training

Pharmacy students or the pharmacists-in-training (PIT), were given examples of diversified molecular structures with various biological functions during their introductory pharmaceutical organic chemistry course. These molecules would consist of glucose, cholesterol, and penicillin, among others (Nahar et al. 2019). Infinitene (molecular formula: C48H24), the Molecule of the Year 2021, was also introduced to the PIT as a helically twisted, figure-eight compound-look (Figure 1). This was celebrated as an innovation in synthetic chemistry, to produce such structure of an infinity (¥)-shaped entity. The molecule is a non-planar aromatic carbon atoms system with a twisted or looped framework (Krzeszewski et al. 2022; Orozco-Ic, et al. 2022). The chemistry lessons were delivered at the lecture hall after a two-year hiatus, due to the COVID-19 pandemic. However, within the fourth week of the October 2022 – February 2023 semester, a national announcement was made regarding the varsity academic calendar (DVCAI's Office, 2022). The undergraduates were invited to re-join the blended, online and distance learning (ODL), in conjunction with the 15th Malaysian General Election (GE15) on Saturday, the 19th of November 2022 (Week 6). Therefore, all first-year pharmacy students were invited to individually vote one molecule as the Molecule of the Year 2022 through an email sent to the lecturer-in-charge and as means for recording attendance for a non-physical class.

Voting for the Molecule of the Year 2022

A call to vote was made at the end of the PHC414 Fundamentals of Pharmaceutical Chemistry lecture, on Friday the 11th of November 2022 (in the Week 5 of the semester). There was a total of 187 registered, eligible voters, from the 2022 September enrolment (17% male, 83% female), equivalent to the 21st batch of UiTM PIT (known as the Rx21). A customised ballot paper featuring the infinitene was emailed to all students (Figure 1). Reminders were also given via email, the addresses obtained from the student IDs as corresponding email addresses. The selected molecules were then received via the students' emails as pictorials or multimedia messages.

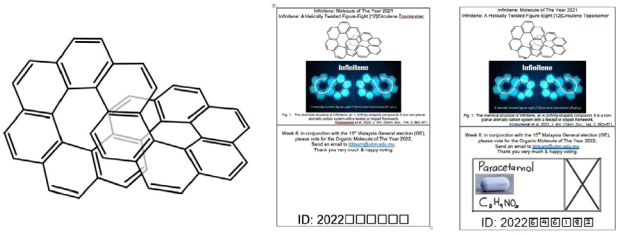


Figure 1: The chemical structure of infinitene, an ¥ (infinity-shaped) organic compound (left) and the empty ballot paper featuring infinitene (middle), was emailed to all students. An example of a voted compound for paracetamol, was received (right).

Voting Results for the Molecule of the Year 2022

The voting results were presented at Week 9 of the semester in the lecture hall, after the PIT ended their mid semester break and test. It was found that the voters' turnout was 95 percent, equivalent to a total of 180 students. Their responses were included in a datasheet and 75 nominations of compounds were obtained. These results can be recognised as 65 organic molecules, 4 inorganic substances, 4 natural resources and 3 general class of compounds (Figure 2). In this voting process, some of the ballots turned out to be spoiled votes. These were referred to as informal responses, due to the replies for the inorganic

substances, natural resources and general class of compounds, instead of organic molecules or hydrocarbons, as stated on the ballots. The given examples of natural resources consisted of chocolates, diamond, green tea, and honey. Therefore, the students were advised to respond accurately in any lesson task, and they accepted this reminder in a jovial manner. Meanwhile, general classes of compounds were mentioned, such as the carbohydrate, flavanols and polyphenols (Figure 2). Some instances for inorganic constituents were also received. They comprised of water (H2O) molecule [specific source from the Zam Zam well (Khalid et al. 2014)], atmospheric gases such as carbon dioxide (CO2) and oxygen (O2), plus aluminium hydroxide [molecular formula: Al(OH)3]. It is anticipated that student's experiences in handling gastric problem, could provide the inspiration to vote for Al(OH)3. This inorganic compound is the well-known chemical component in antacids to relieve the gastric (MIMS, 2022). Hence, this compound was selected and in accordance with the knowledge from PIT.

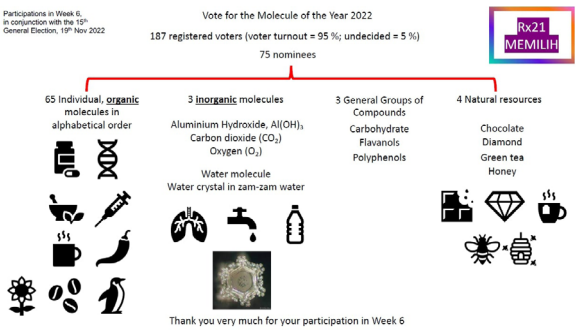


Figure 2: The overall electoral votes for the Molecule of the Year 2022 were categorised, summarised and displayed in the lecture hall.

Caffeine: Suggested Molecule of the Year 2022

Majority of the students voted organic compounds as the candidate for the Molecule of the Year 2022. They were 65 individual molecules (Figure 2), and all results from this election could be listed in alphabetical order (Figure 3). The substances ranged from a small compound, for example, glucose, the sugar molecule, to a large polynucleotide structure such as the deoxyribonucleic acid or the DNA. The highest vote for the Molecule of the Year 2022 (14%) was dedicated to caffeine (Figure 4), an example of a crude drug and a natural substance, found in coffee bean extracts (Santos et al. 2013). This molecule is a subject for teaching and learning for PIT (Ferguson, 1998). It was included in the pharmaceutical analysis laboratory and practical module, for second year UiTM pharmacy undergraduates. It was also a compound choice in the final year research project.

Figure 3: All candidates for the Molecule of the Year 2022 were arranged alphabetically and presented to the PIT in the lecture hall

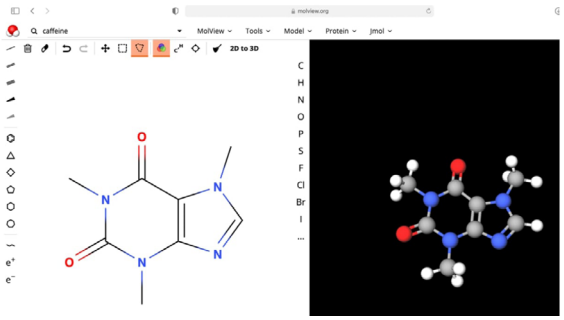


Figure 4: The highest vote for the Molecule of the Year 2022 was assigned to caffeine (molecular formula: C8H10N4O2), as shown in MolView in two- and three-dimensional structures.

Voting Behaviours and Influences According to the Structural and Molecular Innovations

There could be some explanations on the intellectual and psychological forces that could influence the PIT's voting behaviours. Earlier lecture delivery was concentrating on the saturated hydrocarbons. Therefore, PIT can relate the geometrical structure with their voting choices. As can be seen in caffein (Figure 4), the methyl group (-CH3) is a tetrahedral carbon, possessing four vertex corners. It is obvious that only one bond is oppositely directed, in comparison to the other three bonds, that are all going toward the

same direction.

Object-Oriented, Molecular Geometry and Their Examples

The selection for the molecules might be based on their shapes or look-alikes, for example a penguin, the blooming sunflower, the Olympic symbol ( ) and the crown. The corresponding compounds would respectively be penguinone (Bailly, 2022), sulflower (Chernichenko et al. 2006), olympicene (Valentine et al. 2013) and crown ethers (Ullah et al. 2022) (Figure 5 - 8).

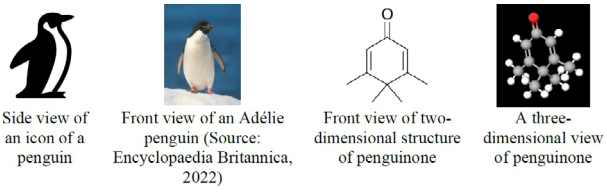


Figure 5: The name penguinone (molecular formula: C10H14O) is derived from the compound's molecular structure, which has a resemblance to that of a penguin.

Penguinone got its name from the similarity of its two-dimensional structure to a penguin.The presentation is however, slightly lost in its three-dimensional model (Figure 5). The compound has its own systematic name, according to The International Union of Pure and Applied Chemistry (IUPAC) nomenclature. In the sulflower's case (Figure 6), the essential molecular innovation by Chernichenko (2006) and co-researchers involved simultaneous treatment of a heterocyclic or sulfur-containing compound, with an excess of sulfur (S) atoms. Subsequent thermal decomposition of the crude poly-organosulfur molecules in vacuum led to the elimination of the excess of sulfur, through hydrogen sulfide (H2S) and elemental S atoms. The synthesis and characterization of an unprecedented persulfurated coronene, PSC (molecular formula: C24S12) with an all-sulfur terminated edge structure, was considered as the second-generation sulflower (Dong et al. 2017; Figure 6), in which all hydrogen atoms in coronene (chemical formula: C24H12) are substituted with sulfur atoms. The PSC was generously provided to Jensen et al. (2019) for a collaborative project, funded by the European Research and Molecular Innovation Programme. This information for hydrocarbon lecture was shared among the PIT, via such learning and voting activities.

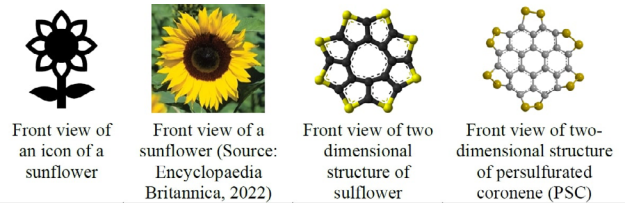


Figure 6: The sulflower's molecular formula is C16S8 or (C2S)8, which allows one to classify it as a form of carbon sulfide (CS2). It is a highly symmetric planar structure, resembling the bloom of a sunflower or an eight-pointed star (Chernichenko et al. 2006).

Figure 7 shows another nominated compound, olympicene (Valentine et al. 2013). It is an organic, carbon-based molecule, which comprises of five rings. Four of them are the aromatic or unsaturated benzene rings that are joined in the shape of the Olympic rings.

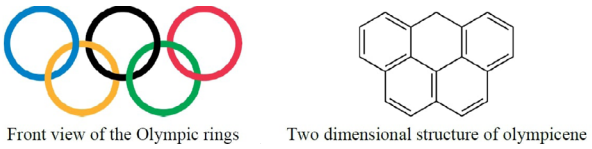
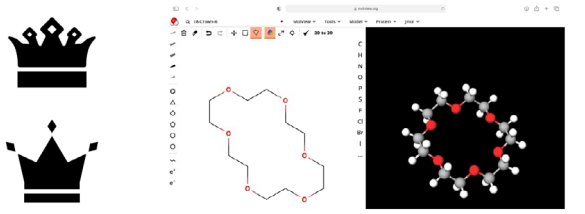


Figure 7: The name olympicene (molecular formula: C19H12) is taken after the Olympic symbol, consisting of five linked rings.

Prior to this electoral process, the students were introduced to molecular geometry. This is among the reasons for selecting infinitene (Figure 1) as an example, apart for its prizeworthy criteria as the Molecule of the Year 2021. Innovative compounds were synthesized as crown ethers (Ullah et al. 2022) and these molecules were also nominated by the PIT. The compounds' shape is like a crown (Figure 8). They are macrocyclic compounds with carbon atom bridges separated by oxygen (O) atoms (Nahar et al. 2019). They can coordinate with metal ions and are widely used in the drug delivery process.



Side view of the icon of the crowns

Top view for two- and three-dimensional structures of crown ether (Source: MolView)

Figure 8: The term "crown" refers to the resemblance between a crown on someone's head (left) and the structure of the oxygenated compound (right).

The Coronavirus Disease 2019 (COVID-19) pandemic

Following the Coronavirus Disease 2019 (COVID-19) pandemic, the Movement Control Order (MCO) was implemented by the Malaysian government in March 2020, followed by the Declaration of Emergency and the suspension of Parliament. The Public Health Security was implemented without a parliamentary vote (Yaacob et al. 2022). In this election activity, the PIT voted for the vaccines and medicines (Table 1). The vaccines included Tozinamaren, or the Pfizer–BioNTech COVID-19 vaccine, labelled under the Comirnaty brand. Another vaccine was Nirmatrelvir (molecular formula: C23H32F3N5O4), which is a part of Paxlovid, a COVID-19 oral antiviral. Both are the biotechnological and innovative products of Pfizer Inc. In the meantime, drugs and controlled medicines were also suggested as the Molecule of the Year 2022, due to their roles in the health maintaining and treatments for illnesses.

Table 1: Some Suggestions for The Molecule of the Year 2022.

No.	Medicines	Function
1	Acetaminophen / Paracetamol	A medication used to treat fever (Figure 1).
2	Aspirin / Acetylsalicylic acid	A drug used to reduce pain and fever.
3	Cetirizine	An antihistamine used to relieve allergy.
4	Doxycycline	An antibiotic used to treat of bacterial infections
5	Lorazepam	To treat anxiety
6	Metformin	A medication to treat type 2 diabetes.
7	Morphine	A pain medication.
8	Penicillin	An antibiotic.
9	Tramadol	A pain medication.

UiTM Di Hatiku

One of the chosen organic molecules is mauveine, which consists of two chemicals or dyes, mauveine A and mauveine B. Mauveine is the first commercial dye, discovered by William Henry Perkin in 1856 (Plater, 2014). The dye is purple in colour, which is also UiTM's official colour (Pantone 254C) (Communications Department, UiTM, 2022) and Society of Pharmacy Students' (SOPHYS) colour (SophysUiTM). This compound shade would represent PIT as the family member of UiTM. The innovation in synthetic chemistry also provided such inspiration in the art and design of the logo for SOPHYS (Figure 9).

Figure 9: The varsity logo (left) and SOPHYS' logo (right) use the shades of mauveine.

Conclusion

The list of nominees for the Molecule of the Year 2022 was announced in Week 9 of the semester, after the students returned from their one-week break and finished their mid semester test. Such activity is hoped to encourage students to expand their readings and knowledge, in addition for them to prepare for the next pharmaceutical chemistry topic, the stereochemistry. The exemplary characteristic of the innovation of infinitene (Figure 1) is that the synthesized compound possesses a non-superimposable mirror image, due to directional arrangements of the aromatic rings. Terms like enantiomer, diastereoisomer, topoisomer, and atropisomer were discussed, in relation to the suggested compounds for the consecutive lessons as mentioned in the course plan.

After the 15th Malaysian General Election (GE15), the 2022 FIFA World Cup, an international football tournament was organised from the 20th of November – 18th of December (FIFA, 2022). A soccer ball was described in the lecture as a sample of an object with a superposable mirror image. This characteristic is important in stereochemistry lessons since the buckminsterfullerene or the fullerene (molecular formula: C60) (Hirsch & Brettreich, 2005; Chernichenko et al. 2006) is identical to a soccer ball and would be a compound, similar with its reflective mirror

image. The spherical fullerene molecule (Figure 10) was not nominated. However, the choice of nominating Molecule of the Year 2022 in the voting activity, would have reflected the students' attention in current affairs and their preferences, plus their artistic visions and architectural of the molecular
geometry, either synthetic or natural compounds.

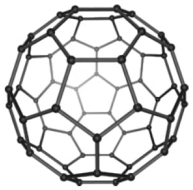


Figure 10: The soccer ball for the 2022 World Cup (left) and the chemical molecule of buckminsterfullerene (right).

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Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

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Setuju.

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