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KAWALAN TIKUS DI MAKMAL SAINS UiTM CAWANGAN SABAH, KAMPUS TAWAU

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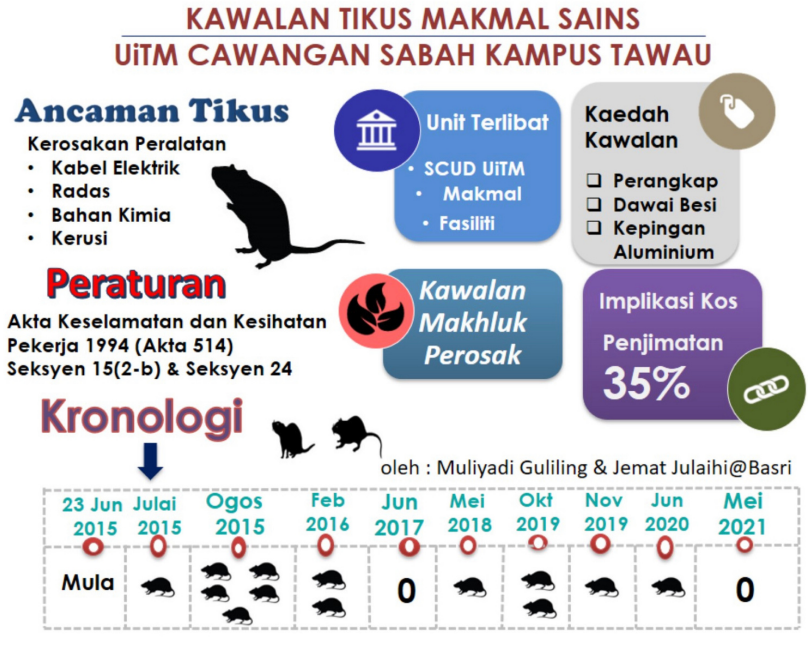
Ancaman tikus di Makmal Sains, UiTM Cawangan Sabah Kampus Tawau telah menyebabkan kerosakan peralatan seperti kabel elektrik, alat radas, bahan-bahan kimia dan kerusi. Sehubungan itu, unit Jawatankuasa Keselamatan dalam Bangunan (SCUD) UiTM, Unit Makmal Sains dan Unit Fasiliti telah mengambil langkah proaktif bagi mengatasi masalah serangan haiwan perosak.

Di antara langkah-langkah mitigasinya ialah 1) **Kawalan Fizikal**. Menutup lubang-lubang tikus dengan menggunakan kepingan aluminium pada siling, lantai dan longkang. 2) **Kawalan Mekanikal**. Memasang perangkap tikus menggunakan umpan seperti ikan kering dan sabun mandi. Perangkap diletakkan di ruang yang terbuka untuk laluan tikus. 3) **Kawalan Sanitasi Persekitaran**. Penggunaan tong sampah yang bertutup dan mencukupi untuk buangan sisa-sisa bahan makmal. Penstoran bahan kimia menggunakan peti sejuk serta almari besi tertutup supaya tidak dimasuki tikus. 4) **Kawalan Makhluk Perosak Secara Bersepadu**. Pemeriksaan setiap ruangan dan bangunan Makmal Sains oleh pihak vendor yang dilantik. Penilaian melalui pemantauan berterusan setiap bulan bagi memastikan kaedah ini adalah berkesan dan ditambah baik sekiranya perlu.

Langkah kawalan tikus yang dimulakan sejak 23 Jun 2015 telah menunjukkan kesan yang positif. Sehingga bulan Mei 2021, kos pembelian semula peralatan makmal yang rosak telah berjaya dijimatkan sebanyak 35%.



THE ART OF ASKING THE RIGHT QUESTIONS

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It is common to ask students at the end of lecture if they have any question. At once, there will be that awkward silence indicating the students are trying to come up with a good question, so as to avoid sounding or looking stupid. On the other point of view, the lecturer is trying the best to think up something witty to break the momentary tongue-tied situation.

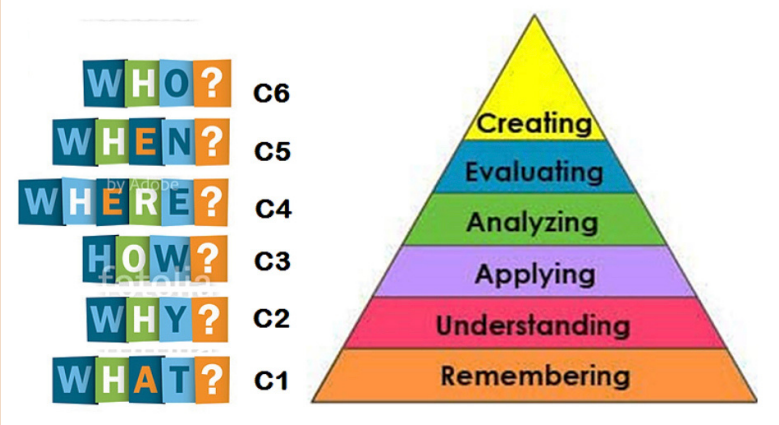

Figure 1. A pyramidal presentation of Scientific Inquiry incorporating Bloom's Taxonomy, Cognitive Domain and Research Questions. The three lower tiers indicate lower thinking skills that characterise descriptive or technically classified as fundamental studies while the upper thinking skills indicate application or explorative studies. These skills would depend very much on the level of intellectuality and academic context.

In Nature of Science, one important element that would prompt a research is Scientific Inquiry. A basic probe is descriptive in which a question starts with the 'what', 'why' and 'how' questions. The answers to such questions would build up the fundamental aspect of a concept. The establishment of concept is achieved through observation; thus, the main question is more on 'what'. 'What is it?', is a question that needs description of the concept, that may be in biological, physical, or chemical form. Therefore, the sciences that are involved are known as Natural Sciences as we are studying the natural form of the concept. Then, the next stage of question, 'why', which would put together the concept in terms of rationale for the concept. The description will further elaborate the mechanism in order to understand the behaviour of the concept.

On that basis, fundamentals of concept are constructed. Hence, knowing the scientific content will provide level of knowledge. The best strategy is, ask yourself, 'Do you know anything about it?'. If the answer to that question is 'No', then you should ask a question that starts with 'What?'. However, if the answer is, 'Yes.', then you should begin the question by asking 'Why?'. At this level, the aim of asking questions correctly is to store and understand the concept.

For those with basic understanding, they would immediately pose a 'How?' question. They would like to apply the concept in order to understand the whole mechanism. The interrogation would eventually lead to proof and validation of concept. At this point, the person is fairly capable to use the basic information in making decision for his or her own survival. For some, this is a juncture to move forward. It is a turning point that pivotal to acquire higher level in knowledge possession.

Ascending to higher level of thinking, the process should involve contemplation. In this case, being ponderous is an essential technique. Investigations which involve 'Which?, Where?, Who?', would require much time to solve. For that reason, this is often where the research gap is. All is good when a concept is recently discovered, but to an issue that has been well explored, finding an academic dispute is very much gruelling. In this situation, going back to the basic concept and comparing it with additional views would aid in focusing the study matter. The best way to do this is to take time to read up on related materials and note down relevant information. I find that when things get entangled, a step back to check the starting point often helps me get untangle.

'HE WHO ASK A QUESTION IS A FOOL FOR FIVE MINUTES, HE WHO DOES NOT ASK A QUESTION REMAINS A FOOL FOREVER.' - CHINESE PROVERB

STUDENTS' CORNER

Exomala orientalis

By — Emmai Anak Setina , Student

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Scientific classification.

Genus: Exomala
Family: Rutelidae
Order: Coleoptera-Beetles
Class: Insecta- Bugs, Grubs, Insects
phylum: Arthropoda-Arthropods, Crustaceans, Indris, sifakas, and woolly lemurs

Photo : Emmai Anak Setina Student (AS201)

15 mm in size with mottled, metallic-brown and black-colored elytra and a similarly-colored thorax and head during the adult stage. The oriental beetle (*Exomala orientalis*) is the smaller, less colorful cousin of the Japanese Beetle. Usually, the oriental beetle won't threaten or hurt humans. It is native to Asia. However, it was introduced to North America and has since spread to and become a pest in several mid-Atlantic states. Its invasive range extends from Maine to South Carolina and Wisconsin.

Coordinate: 6° 3'52''N 116°7'45'' E Kota Kinabalu Sabah 60m elevation

NICE CARD SET

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> "Not all readers are leaders, but all leaders are readers"
>
> HARRY S. TRUMAN

Naming of chemical compound is basic knowledge in Chemistry course. Students need much effort to write correct chemical formulae formulations and much more in giving correct names to chemical compounds. Thus, Nomenclature of Ionic Compounds for Elementary Level or **NICE card set** is the most appropriate educational game to assist students in dealing with "nomenclature of ionic compounds" topic as they play.

NICE card set was prepared by the Chemistry lecturer which consisted of four clusters. The orange cluster is simple cations such as sodium, calcium and aluminum ions. Green cluster is simple anions such as chloride, bromide, oxide and hydroxide ions. Transition elements cations such as Fe^{2+}, Fe^{3+}, Cu^{+} and Cu^{2+} in the yellow cluster and the polyatomic anions such as chlorate, nitrate, phosphate, sulphate and carbonate in the light green cluster. On both sides of the card, the symbols and names of cations or anions with different colours have been written. The answers for the "ionic compounds" card have also been provided.

In the card game, the students can choose two cards from orange-green cluster (Level 1) or choose the combination from yellow-green cluster cards (Level 2). The combination of two cards becomes the "ionic compounds". The same procedure was followed for the combination from orange-light green cluster cards (Level 3) and the combination from yellow-light green cluster cards (Level 4).

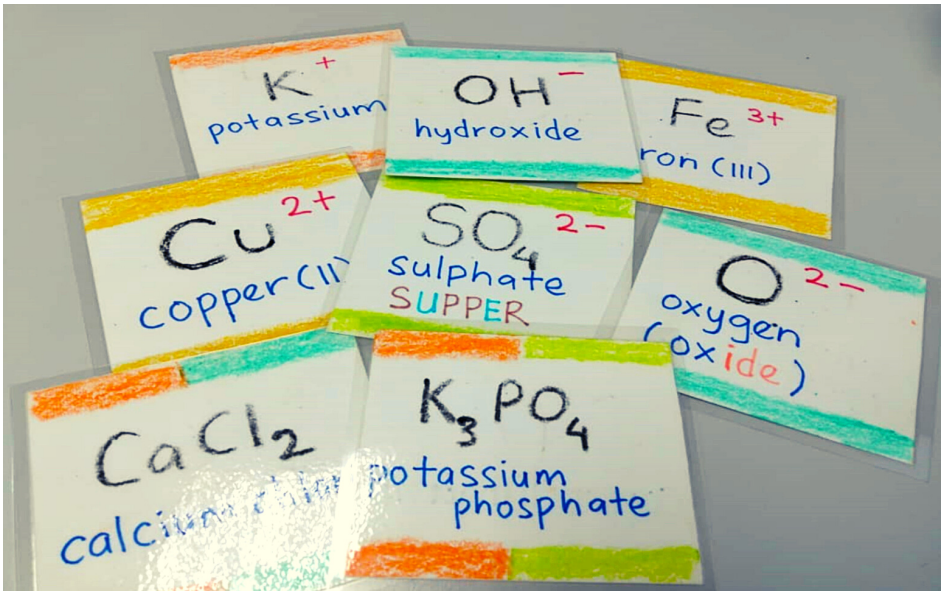

Figure 1 Sample of NICE card set

From the card activity, the students' understanding of the "nomenclature of ionic compounds" would be deeper and lasting. The card game will positively contribute to increase the students' positive attitudes and interests towards any Chemistry course.

KEPENTINGAN SAINS BAHAN DALAM KEHIDUPAN MANUSIA

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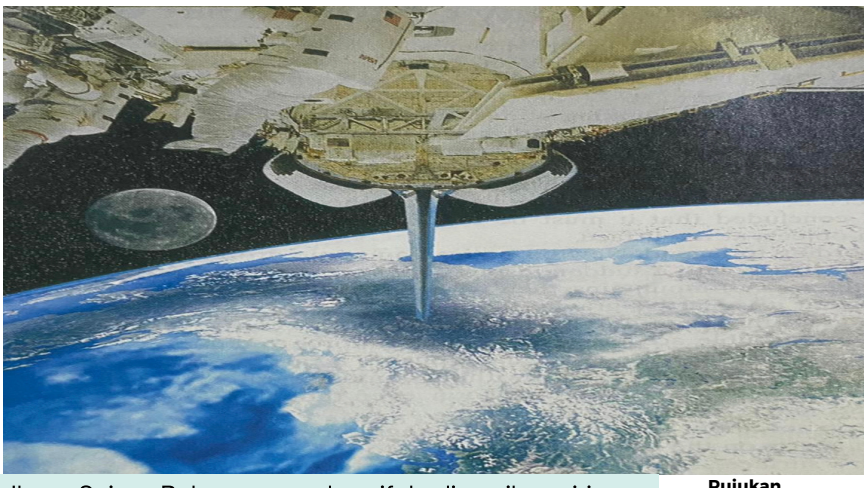
Pernahkah kita tertanya-tanya seperti soalan-soalan seperti “Sebuah kuali boleh tahan panas dan membolehkan kita untuk memasak makanan?”, “Duit syiling tidak akan berubah bentuk walaupun berada pada musim panas dan musim sejuk?”, “Baju kalis peluru tidak dapat ditembusi oleh peluru yang berkelajuan tinggi?” dan, mungkin banyak lagi persoalan yang berkaitan tentang bahan yang ada di sekeliling kita.

Sejarah revolusi Sains Bahan sudah bermula sejak tahun 1900an lagi. Semasa peperangan antara tentera Napoleon dan Rusia yang berlaku pada musim sejuk yang telah diceritakan oleh Aristotles dan Plutarch di mana butang jaket tentera Napoleon yang diperbuat daripada timah tulen telah berubah bentuk daripada bentuk pepejal ke serbuk (Gialanella et al., 2009). Keadaan ini dalam Sains Bahan dipanggil transformasi allotropik, dimana satu unsur/bahan mempunyai lebih daripada satu struktur bahan contohnya pada suhu 13.2°C timah tulen pada jaket yang dipakai oleh tentara Napoleon itu berubah bentuk daripada pepejal (bentuk- β timah putih) ke bentuk serbuk (bentuk- α timah kelabu) (Cornelius et al., 2017). Ternyata disini kita faham, setiap bahan itu mempunyai fungsi tertentu mengikut had kemampuanya. Dalam menentukan kesesuaian bahan yang digunakan dalam kehidupan kita, Sains Bahan amat signifikan untuk kita fahami.

Sains Bahan merupakan cabang ilmu yang mengkaji unsur/bahan dari skala atom hinggalah skala makro dimana ia bersifat hibrid dan ia merangkumi unsur Fizik, Kimia dan Kejuruteraan. Secara dasarnya, bahan boleh dikategorikan kepada lima kategori iaitu bahan logam, bahan seramik dan kaca, bahan polimer, bahan komposit dan bahan semikonduktor (Shackelford, 2014). Kefahaman daripada Sains bahan ini, antaranya struktur bahan, ketahanan bahan terhadap haba, suhu dan tekanan yang boleh ditujukan dalam sempadan fasa/gambar rajah fasa, ciri-ciri mekanikal, dan ciri-ciri kimia bahan dapat membantu untuk kita mengetahui potensi, had kemampuan dan parameter rekabentuk sesuatu bahan. Contohnya bahan aloi titanium (Ti) mempunyai ciri-ciri seperti ringan, kuat, tahan kakisan dan kebolehan menahan suhu ekstrem, maka bahan ini digunakan dalam pembuatan yang berkaitan aeroangkasa.

Pengetahuan tentang bahan ini tentunya memberi kesan kepada setiap aspek pengurusan kehidupan moden kita dan menjadi mangkin pengurusan yang lestari contohnya peralihan kebergantungan sumber tenaga bahan api fosil kepada penggunaan sumber tenaga yang boleh diperbaharui seperti *biomass*.



Ilmu Sains Bahan yang bersifat dinamik seiring dengan pengembangan kemodenan teknologi pastinya akan membantu melestarikan alam sekitar (Sumber Foto: (Giancoli, 2008))

Dalam berdepan dengan era globalisasi, ilmu Sains Bahan yang bersifat dinamik seiring dengan pengembangan kemodenan teknologi telah mendorong inovasi dan penemuan bahan baharu serta bahan termaju seperti *nanomaterials*, *biomaterial* dan bahan tenaga yang pastinya akan membantu melestarikan alam sekitar dan pembangunan mampan ekosistem kehidupan kita.

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A BRIEF OVERVIEW ON LITHIUM-ION CAPACITOR; A HYBRID CAPACITOR

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Lithium-ion capacitor is a hybrid type capacitors, which combines lithium ion battery and Electric Double Layer Capacitor (EDLC) supercapacitor. It is one of the new inventions of EDLC supercapacitor. In general, EDLCs with symmetrical high surface area of activated carbon (AC) is a potential energy storage device as they are capable of delivering high power in short periods of time. However, the limitation of these EDLCs is that their they have low energy storage or delivery capability compared to Lithium-Ion Battery [6].

The approaching method to overcome this limitation of EDLCs is by replace the negative AC electrode with battery electrode which is why it is known as the hybrid electrochemical capacitors. This new device contains large energy density, high power density and stable performance. The first lithium ion capacitor was developed by G.G Amatucci [2] using a Li-intercalation negative electrode based on nanostructured $Li_4Ti_5O_{12}$ and activated carbon as electrical double layer positive electrode. After that, other lithium-ion capacitors use carbonaceous material as negative electrode, for example graphite/AC [7].

As hybrid supercapacitor, they function according to the principle of operations of EDLC capacitor in the positive electrodes and Lithium-Ion Battery at their negative electrode as shown in **Figure 1**.

In Figure 1(c), the adsorption and desorption of charge-carrying ion occurs across an extremely thin electrical double layer that forms on the surface of the electrodes at positive electrode, while the negative electrodes employ layered graphite and store energy through adsorption of lithium ions into the layers [4].

When lithium ion capacitor is charged, lithium ion is intercalated further at the negative electrode and the anions are physically adsorbed at the positive electrode. However, when the lithium-ion capacitor is discharged, the lithium ion de-intercalates from the negative electrode and intercalate at the precise location on the positive electrode from which the anion has been desorb. As seen here, the lithium-ion capacitor exhibits a different mechanism to the other power storage devices. The positive electrodes adopt the same physical adsorption mechanism as for the EDLC and negative electrode is accompanied by the chemical reaction involving lithium-ion pre-dope/discharged just as for the negative electrode material of the lithium-ion battery[5].

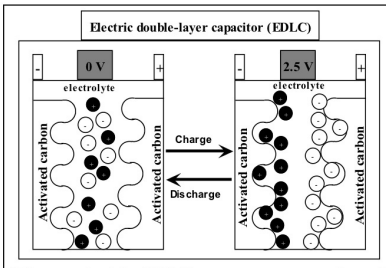

Figure 1 (a) EDLC use porous activated carbon in their electrodes same material at positive electrode of LIC and adsorb and desorb charge-carrying ions across extremely thin electrical double layer that form at the electrodes.

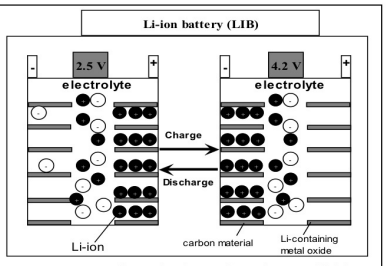

Figure 1(b) When the batteries charge, lithium ions are drawn out of the crystal structures of the positive electrodes and inserted into the graphite layers of the negative electrodes.

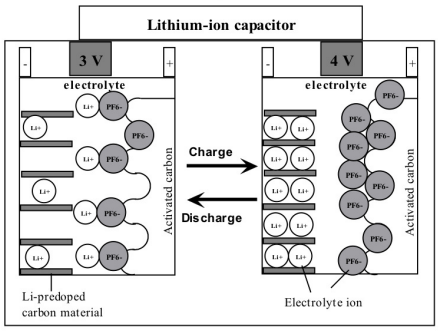

Figure 1 (c) structure and principle of operation of Lithium-ion capacitor

Figure 1: Operating Principle of the Lithium-ion capacitor (from General Paper: Development of high-power lithium-ion capacitor)

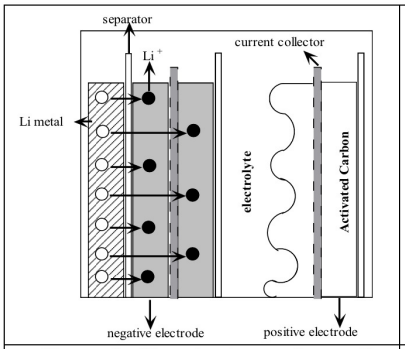

Figure 2: The structure and operating principle for conventional lithium ion capacitor

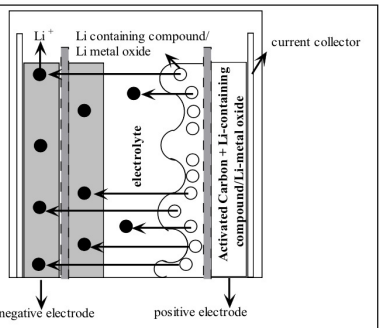

Figure 3: The Schematic diagram of the lithium pre-doping method

In the conventional lithium-ion capacitor, metallic lithium is incorporated to the cell package as in **Figure 2**. During the charging process, lithium ions can be intercalated into negative electrode. This preliminary treatment of negative electrode is also called pre-doping. During the doping process, metallic lithium is oxidised to release lithium ion at the surface of the negative electrode. In this way, it would be difficult to load the amount of desired lithium precisely because the loaded metallic lithium cannot be fully inserted into the negative electrode material [3].

This Li-pre doping process will also reduce the potential of negative electrode and improve the working voltage of lithium ion capacitor but letting the metallic lithium remains in the lithium ion capacitor complicates the production technology, increases potential safety problems and leads to the shrinking of energy density because of the increase of weight. It also overcome the safety problem because absence of lithium metal. This is because, the pre-doping can be easily controlled amount of Li^+ ions because the inserted amount of lithium is proportional to the amount of the Li-containing compound/ Li metal oxide included in the positive electrode.

This method will overcome the problem that occurs in conventional LIC that have led researchers looking forward at the potential of this new method. Currently, many studies have been done in LIC as it has wide potential of application in hybrid electric vehicles and electric vehicle due to its ability to both energy density and high-power density. This ability will overcome the weakness in Lithium-Ion Battery. Moreover, the more automotive companies that will want to produce green technology electric vehicles. Lithium-Ion Capacity may be the potential alternative for next generation of chemical energy storage equipment especially involving green technology vehicle.

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