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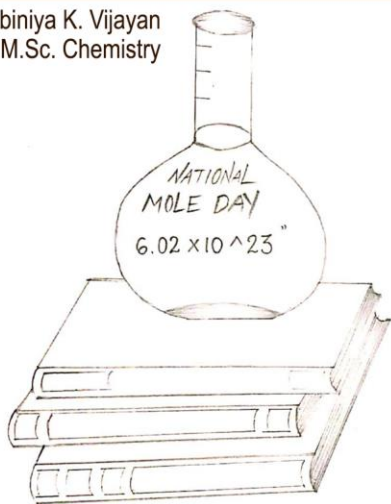
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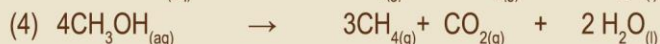
Abiniya K. Vijayan  
II M.Sc. Chemistry



## Methane from Plants

The production of methane from plant residues that are mostly cellulose requires the sequential action of several types of bacteria. In the first stage, hydrolytic and transitional bacteria break up cellulose into mixture of small molecules including hydrogen, carbon dioxide and depending on the bacterial strain, alcohols (methanol, ethanol, and others) or two carboxylic acids: formic and acetic acids.

In the later stages of methane production, the products of the first stage undergo several reactions promoted by the metabolism of methanogenic bacteria that rely on hydrogen and simple organic compounds for energy. These bacteria are quite different from most organisms on Earth that rely on oxygen and more complex organic compounds for energy. Acetic acid is the reactant in reaction 2; formic acid is the reactant in reaction 3. Methane is produced in all four of these reaction;



Significant quantities of  $\text{CO}_{2(g)}$  are also formed in reaction 2,3 and 4 that use starting materials other than hydrogen gas. Notice that the carbon atoms in acetic acid, formic acid and methanol are being both oxidized and reduced in these reactions: the products are the most reduced form of carbon ( $\text{CH}_4$ ) and the most oxidized form ( $\text{CO}_2$ ). The hydrogen and carbon in the starting materials are converted into a hydrocarbon as well as into water and carbon dioxide.

Dr. S. Ginil Mon

Assistant Professor of Chemistry, NMCC

## Alumni's Space

NMCC change my life as a chemist and human, to live for Christ. I was spiritually and mentally groomed in this campus. I am thankful to our Lord Jesus for Nesamony Memorial Christian College. I use this opportunity to remember and thank all those involved in the making of this institution. The support I received from the department staff was enormous. Praise God for all those blessings.

Mr. R. D. Kalai Kumar  
Operation Engineer Development Assignment  
Exxonmobil Chemicals  
Singapore  
(B.Sc. Chemistry 1987-90)



## Staff Corner

## Detection of COVID-19 using Mass Spectrometer

A recent approach by Institute of genomics, Integrative Biology (IGIB) and National Centre for Disease Control (NCDC) have found that mass spectrometer is found to produce 95% sensitive and 100% accurate specificity for results in COVID-19 detection.

The seven peptides of COVID-19 is unique to that of SARS COV2 category virus, only two peptide chains differ for COVID-19. If the signal to noise ratio is 3.3 then sensitivity of the result is 95 %. All these findings are published in the Journal of Proteins and Proteomics.

Using mass spectrometer, the peptides of the virus (which may last for more than 14 days) in recovered patients can also be detected. But in RT-PCR the result may be negative for above mentioned type of patients. The cost may be Rs 100/ per sample.

Dr. S. P. Selvin Pragalath Paul  
Assistant Professor of Chemistry, NMCC

## Campus News

Launch of the NMCC ChemLetter on 28th September, 2020. Released by the Correspondent Adv. L. Rajathurai and received by the Principal Dr. K. Paul Raj.

Inauguration of the Chemistry Associations on 28th September, 2020 through Zoom Platform. Inaugural Address was given by the Principal Dr. K. Paul Raj.

## MCQs

- Which of the following pairs of gases contains the same number of molecules?
  - 16 g of O<sub>2</sub> and 14 g of N<sub>2</sub>
  - 8 g of O<sub>2</sub> and 22 g of CO<sub>2</sub>
  - 28 g of N<sub>2</sub> and 22 g of CO<sub>2</sub>
  - 32 g of O<sub>2</sub> and 32 g of N<sub>2</sub>
- Helium atom is two times heavier than a hydrogen molecule at 298 K. The average kinetic energy of helium is
  - Two times that of hydrogen molecule
  - Same as that of hydrogen molecule
  - Four times that of hydrogen molecule
  - Half that of hydrogen molecule
- The radii of an atom and atomic nucleus is of the order of
  - 10<sup>-12</sup> m and 10<sup>-10</sup> m
  - 10<sup>-10</sup> cm and 10<sup>-8</sup> cm
  - 10<sup>-10</sup> m and 10<sup>-15</sup> m
  - 10<sup>-15</sup> m and 10<sup>-10</sup> m
- The % ionic character in Cs-Cl bond present in CsCl molecule will be, if the electronegativities values for Cs and Cl are 0.8 and 3.0 respectively.
  - 62.9%
  - 60%
  - 75%
  - 52.14%
- A gaseous mixture contains Oxygen and Nitrogen in the ratio 1:4 by weight. Therefore, the ratio of their number of molecules is
  - 1:4
  - 1:8
  - 7:32
  - 3:16
- 1 mole of an ideal gas at 300 K is expanded isothermally from an initial volume of 1 L to 10 L. The ΔE for this process is (R= 2 cal K<sup>-1</sup>mol<sup>-1</sup>)
  - 270 cal
  - Zero
  - 10 L atm
  - 181.7 cal
- The heat of combustion of carbon to CO<sub>2</sub> is -393.5 kJ/mol. The heat released upon formation of 35.2 g of CO<sub>2</sub> from carbon and oxygen gas is
  - +315 kJ
  - 31.5 kJ
  - 315 kJ
  - +31.5 kJ
- 25 mL of a solution of barium hydroxide on titration with 0.1 molar solution of hydrochloric acid gave a titre value of 35 mL. The molarity of barium hydroxide solution will be
  - 0.07
  - 0.14
  - 0.28
  - 0.35
- In a chemical reaction, the rate constant for the backward reaction is 7.5 x 10<sup>-4</sup> and the equilibrium constant is 1.5. The rate constant for the forward reaction is
  - 5 x 10<sup>-4</sup>
  - 2 x 10<sup>-3</sup>
  - 1.125 x 10<sup>-3</sup>
  - 9.0 x 10<sup>-4</sup>
- The conjugate base of H<sub>2</sub>PO<sub>4</sub><sup>-</sup> is
  - PO<sub>4</sub><sup>3-</sup>
  - P<sub>2</sub>O<sub>5</sub>
  - H<sub>3</sub>PO<sub>4</sub>
  - HPO<sub>4</sub><sup>2-</sup>
- The enthalpies of elements in their standard states are taken as zero. The enthalpy of formation of a compound
  - is always negative
  - is always positive
  - may be positive or negative
  - is never negative
- Which of the following is not a reducing agent?
  - SO<sub>2</sub>
  - H<sub>2</sub>O<sub>2</sub>
  - CO<sub>2</sub>
  - NO<sub>2</sub>
- In the electrolytic cell, flow of electrons is from
  - Cathode to anode in solution
  - Cathode to anode through external supply
  - Cathode to anode through internal supply
  - Anode to cathode through internal supply

14. Consider a reaction  $aG + bH \rightarrow \text{products}$ , when concentration of both the reagents G and H is doubled, the rate increases by eight times. However, when concentration of G is doubled keeping the concentration of H fixed, the rate is doubled. The overall order of the reaction is  
 a) 0                      b) 1                      c) 2                      d) 3
15. Which one of the following characteristic is not correct for physical adsorption?  
 a) Adsorption on solids is reversible  
 b) Adsorption increases with increase in temperature  
 c) Adsorption is spontaneous  
 d) Both enthalpy and entropy of adsorption are negative
16. Fog is a colloidal solution of  
 a) Liquid particles dispersed in a gas  
 b) Gaseous particles dispersed in a liquid  
 c) Solid particles dispersed in a liquid  
 d) Solid particles dispersed in a gas
17. Blood contains  
 a) Positively charged particles                      b) Negatively charged particles  
 c) Neutral particles                                      d) Any of the above
18. The incorrect statement among the following is  
 a) The first ionization potential of Al is less than the first ionization potential of Mg.  
 b) The second ionization potential of Mg is greater than the second ionization potential of Na.  
 c) The first ionization potential of Na is less than the first ionization potential of Mg.  
 d) The third ionization potential of Mg is greater than the third ionization potential of Al.
19. Aluminothermic process is used for metallurgy of  
 a) Pb                      b) Ag                      c) Al                      d) None of these
20. The metal, which gives hydrogen on treatment with acid as well as sodium hydroxide is  
 a) Fe                      b) Zn                      c) Cu                      d) None of these
21. The reducing power of a metal depends on various factors. Suggest the factor which makes Li, the strongest reducing agent in aqueous solution.  
 a) Sublimation energy                                      b) Ionization energy  
 c) Hydration energy                                        d) Electron gain enthalpy
22. Carborundum is obtained when silica is heated at high temperature with  
 a) Carbon    b) Carbon monoxide  
 c) Carbon dioxide                                        d) Calcium carbonate
23. Atomic number of an element is 26. The element shows  
 a) Ferromagnetism                                        b) Diamagnetism  
 c) Paramagnetism                                         d) None of these
24. According to EAN rule, how many CO groups should be attached to Fe?  
 a) 4                      b) 5                      c) 6                      d) 8
25. Heating the pyrites in air for oxidation of sulphur is called  
 a) Slagging                      b) Smelting                      c) Roasting                      d) None of these

### Student's Corner

#### FACTS ABOUT PERIODIC TABLE

We may remember the Periodic Table of Elements as a dreary chart in Our Classrooms. The table has served Chemistry Students since 1869. Let's see about some of its interesting facts.

#### 1. Scientists Used Battery Polarity to Weigh the Elements :-

In order to determine the weight of the 63 known elements at that time, scientists passed currents through several solutions to break them up into the atoms of specific elements. Batteries were used to separate atoms. The atoms were collected in several containers and weighed.

#### 2. Creator's Love For Card Games :-

Mendeleev wrote the weight for each element on a separate index card and sorted them in Solitaire. Elements with similar properties form a "suit" and were placed in columns ordered by ascending Atomic weight.

#### 3. Bombardment Of Elements :-

Beyond the edge, atoms with atomic numbers higher than 92 do not exist naturally, but they can be created by Bombarding the specific elements with other elements.

#### 4. Atomic Love :-

Take a Modern Periodic Table, cut out the complicated middle columns, and fold it on along the middle of the Group-4 elements. The Groups that kiss have Complementary electron structures and will combine with each other.

#### 5. Molecule Of Life :-

Carbon Atoms bond in long Chains and Sugars. The Chemical flexibility on Carbon is what it makes it 'The Key Molecule of Life'.

#### 6. Outer Limit of the Table :-

Physicist Richard Feynman once predicted the atomic number 137 defines the Table' outer limit with which adding any more protons would produce an energy that could be quantified only by an imaginary number. i.e. The 137<sup>th</sup> electrons would orbit at the speed of light. So for the elements with atomic number greater than 137, the electrons would orbit faster than the speed of light, making it impossible in given today' atomic knowledge.

Stephy John J  
I M.Sc. Chemistry



## Answers - September 2020 Issue

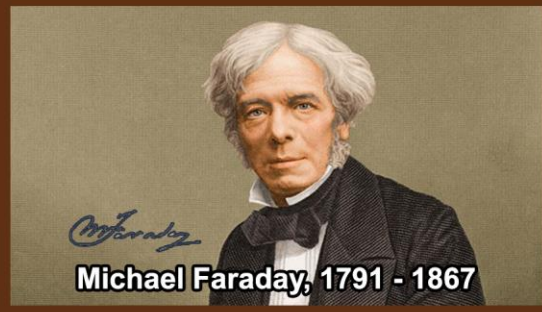
- |       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 1) b  | 2) b  | 3) d  | 4) a  | 5) d  |
| 6) a  | 7) b  | 8) b  | 9) d  | 10) b |
| 11) d | 12) b | 13) b | 14) c | 15) a |
| 16) b | 17) d | 18) a | 19) c | 20) d |
| 21) a | 22) a | 23) a | 24) b | 25) d |

## Student's Corner

## Hydrogen fuel cell bus :

Hydrogen fuel cell bus is a zero emissions vehicle best suited for intercity transportations. Here the chemical energy of hydrogen converts into electrical energy. Hydrogen is stored in compressed tanks, typically on roof of the bus, while the fuel cell and electric engine are located at the back of the bus. Hydrogen fuel cell bus produce no tail pipe emission and is closed on zero emissions cable. Hydrogen can be produced from a variety of methods including from fossil fuel based industrial process to electrolysis of water using renewable electricity. The main advantage, its an ecofriendly and it have disadvantages such as highly flammable, difficult to store, etc....

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To submit this quiz  
online  
**Scan the QR  
Code**  
Or  
**Use the Link  
Below**

<https://forms.gle/ttZMo6sQSXWAW>

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## Scientist &amp; Discovery

## Michael Faraday

Faraday was a British chemist and physicist who contributed significantly to the study of electromagnetism and electrochemistry.

Michael Faraday was born on 22 September 1791 in south London. His family was not well off and Faraday received only a basic formal education. When he was 14, he was apprenticed to a local bookbinder and during the next seven years, educated himself by reading books on a wide range of scientific subjects. In 1812, Faraday attended four lectures given by the chemist Humphry Davy at the Royal Institution. Faraday subsequently wrote to Davy asking for a job as his assistant. Davy turned him down but in 1813 appointed him to the job of chemical assistant at the Royal Institution.

A year later, Faraday was invited to accompany Davy and his wife on an 18 month European tour, taking in France, Switzerland, Italy and Belgium and meeting many influential scientists. On their return in 1815, Faraday continued to work at the Royal Institution, helping with experiments for Davy and other scientists. In 1821 he published his work on electromagnetic rotation (the principle behind the electric motor). He was able to carry out little further research in the 1820s, busy as he was with other projects. In 1826, he founded the Royal Institution's Friday Evening Discourses and in the same year the Christmas Lectures, both of which continue to this day. He himself gave many lectures, establishing his reputation as the outstanding scientific lecturer of his time.

In 1831, Faraday discovered electromagnetic induction, the principle behind the electric transformer and generator. This discovery was crucial in allowing electricity to be transformed from a curiosity into a powerful new technology. During the remainder of the decade he worked on developing his ideas about electricity. He was partly responsible for coining many familiar words including 'electrode', 'cathode' and 'ion'. Faraday's scientific knowledge was harnessed for practical use through various official appointments, including scientific adviser to Trinity House (1836-1865) and Professor of Chemistry at the Royal Military Academy in Woolwich (1830-1851).

However, in the early 1840s, Faraday's health began to deteriorate and he did less research. He died on 25 August 1867 at Hampton Court, where he had been given official lodgings in recognition of his contribution to science. He gave his name to the 'farad', originally describing a unit of electrical charge but later a unit of electrical capacitance.



## Student Corner

'Mole Day' is an unofficial holiday celebrated among Chemists, Chemistry students and Chemistry enthusiasts on October 23, between 6:02 AM and 6:02 PM, making the date 6:02 10/23 in the American style of writing dates. The time and date are derived from the Avogadro number, which is approximately  $6.02 \times 10^{23}$ , defining the number of particles (atoms or molecules) in one mole (mol) of substance, one of the seven base SI units.

Mole Day originated in an article in "The Science Teacher" in the early 1980s. Inspired by this article, Maurice Oehler, now a retired high school Chemistry teacher from Prairie Du Chien, Wisconsin, founded the National Mole Day Foundation (NMDF) on May 15, 1991.

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## Instructions

Kindly use the link given to submit this quiz online on or before 30th of October, 2020

Regular participants can enter the yearly quiz fest which will have participants from all regions. Winners will move forward to compete for Universal Trophies organized by the MAP International.

The Publisher's decision will be final.

The Editorial Board

## The Editorial Board

All issues regarding the contents of this newsletter can be entertained through: The Department of Chemistry, Nesamony Memorial Christian College, Marthandam, Kanniyakumari District, Tamilnadu, India

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