**Basic Science – Semester 1**

**Assignment 2**

**Section A –Biology [35]**

**Question 1 [12]**

* 1. Carbohydrate, Lipids and Protein
  2. Carbohydrates
  3. Protein
  4. Polysaccharides
  5. Because it is a monounsaturated fat with a low melting point.
  6. Vitamin K
  7. Glucose and Fructose
  8. Carbohydrates
  9. Disaccharide is any class of sugars that consists of two monosaccharide units. Some examples are lactose(glucose + galactose) and maltose(glucose + glucose)

**Question 2 [13]**

* 1. Fibrous protein are long and narrow in structure often forming strong fibers and sheets, their role is to provide support and shape to cells and tissues. Globular protein have a more compact and round shape, it tends to be soluble in water and have a more diverse functions such as enzymes, transporters and hormones.
  2. Vitamin D, when the skin is exposed to sunlight the radiation from sun converts a form of cholesterol in the skin into Vitamin D3, this molecule is then converted into the Vitamin D by the liver and kidneys.

Vitamin K, bacteria living in the large intestine of humans produce a form of Vitamin K called menaquinone (MK), which the body absorbs and uses it for other biological functions such as blood clotting and building bone structure.

* 1. Fat-soluble and water soluble vitamins. When these vitamins are consumed in excessive amounts they can interfere with normal physiological functions, especially the fat-soluble vitamin class as these vitamins are stored in the body and not removed by the body in normal functions.
  2. Monounsaturated fats have only one double bond in the chemical properties, while polyunsaturated fats have two or more double bonds.
  3. Complete proteins contain significant amounts of all the essential amino acids, while incomplete proteins lack or have a deficient in one or more essential amino acids.

**Question 3 [10]**

**3.1.1** Fermentation is the process that turns milk into yoghurt, making use of a starter culture of lactic acid bacteria, usually Streptococcus thermophilus and Lactobacillus bulgaricus.

**3.1.2** The two bacteria, Streptococcus thermophilus and Lactobacillus bulgaricus, act on the lactose found in the milk, and converts it into lactic acid. Lactic acid causes the milks pH levels to drop, which gives the milk a sour taste as well as solidifying it, which now is raw yoghurt.

**3.1.3** Yoghurt strengthens your ability to fight off diseases and infections, and yoghurt is rich in calcium which will keep your bones strong and healthy, reducing the risk of developing osteoporosis.

**3.2** The steps involved in the production of gasohol are:

* Grow and harvest sugar cane
* Crush the sugarcane in order to extract the juice.
* Clarify the juice by removing dirt, debris or any other plant matter.
* The clarified juice is then mixed with yeast and other nutrients which convert the sugar into ethanol through fermentation.
* The resulting mixture of ethanol and water is distilled to separate the ethanol from the water.
* The next step is the dehydration of the ethanol to remove any remaining water.
* And finally once the water-free ethanol is produced, it is blended with gasoline in specific ratios to create gasohol.

**Section B – Chemistry [35]**

**Question 4 [18]**

**4.1.1** Refers to the total number of protons and neutrons found in the nucleus of an atom

**4.1.2** Isotopes is a variant of an element which has the same number of protons but different the number of neutrons.

**4.2** Modern periodic tables have elements arranged with an increasing atomic number. It consists of horizontal rows called periods which are labelled 1 to 7 from top to bottom. There vertical columns which are called groups or families and are labelled from 1 to 8.

**4.3** The three main elements classifications are:

* **Metals –** tend to be shiny, solid and good conductors of electricity and heat. They tend to lose electrons easily and form positive ions.
* **Nonmetals –** these are elements that are typically gases and brittle solids and have poor conductivity. They often gain electrons easily and form negative ions.
* **Metalloids –** are elements who show or have the characteristics of both metals and nonmetals. They are semiconductors, meaning they can conduct electricity but only under certain conditions.

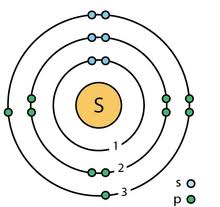
**4.4.1**

**4.4.2**

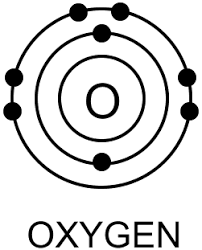
**4.4.3**

**4.4.4**

**4.5.1**



**4.5.2**



**4.6**

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **No. of protons** | **No. of electrons** | **Net charge** |
| 40Ca+2 | 20 | 18 | +2 |
| 10Ne | 10 | 10 | 0 |

**Question 5 [17]**

**5.1** Litmus paper is a type of indicator paper used to test the acidity or basicity of a solution.

**5.2.1** Concentrated acid is a solution of an acid in which a large amount of the acid is dissolved in a small amount of solvent. This means the acid has a high concentration typically greater than 50%.

While dilute acids are only able to dissolve a small amount of acid in a solvent, meaning the acid has a low concentration typically less than 10%.

* + 1. **Agriculture –** pH level plays a role in soil fertility and plant growth. The pH level of the soil effects the solubility of various essential elements like nitrogen, phosphorus, potassium and calcium. The availability of these nutrients to plants is directly proportional to the pH level of the soil.
    2. **Medicine –** pH level plays a role in drug development and formulation. pH levels affect the stability, solubility and bioavailability of the drugs. Additionally, pH levels in drugs can influence the effectiveness of certain drug delivery methods like nasal sprays, inhalers, etc.
  1. Hydrochloric acid (HCI) and Sulfuric acid (H2SO4)
  2. Sodium Chloride (NaCI), which is known as table salt and Sodium bicarbonate (NaHCO03) known as baking soda.
  3. Beaker A contains an acidic solution, and beaker B contains a basic solution.

**5.7.1** H+(aq) + Cl-(aq

**5.7.2** Ag2SO4(s) + H2(g)

**5.7.3** NaCl(aq) + H2O(l)

**5.8**

|  |  |
| --- | --- |
| **Uses of ammonia** | **Uses of baking soda** |
| Ammonia is a key component in the production of fertilizers. | Baking soda can be used as a natural deodorant, toothpaste and exfoliant for the skin. |
| Used as a cleaning agent, especially for cleaning windows and other glass surface. | Can also be used for medical purposes, such as to treat heartburn and indigestion. |

**Section C – Physics [30]**

**Question 6 [12]**

**6.1** Because both are isotypes of uranium and have the same number of protons (92), but a different number of neutrons in their nuclei.

**6.2** Mass number and atomic mass.

**6.3** Z represents the atomic number of an element, which is the number of protons in the nucleus of an atom. In turn the atomic number determines the identity of the element.

**6.4** Smoke detectors in corporate buildings, radioactive isotypes are found medical imaging such as x-rays. Certain luminous watches and clocks may contain small amounts of radioactive material.

**6.5** Because the nucleus contain an excess of either protons, neutrons or both. This imbalance makes it energetically unstable.

**6.6** Alpha particles consist of the largest particles, an alpha particle is composed of two protons and two neutrons. This makes the mass of an alpha particle approximately four times greater than a beta particle or gamma ray.

**6.7** Gamma rays will not be affected by electronic fields as the particles in gamma rays are not charged.

**Question 7 [10]**

**7.1** A spring balance measures the weight of an object by determining the amount of force required to stretch a spring. On the other hand, a balance scale will measure mass by comparing the weight of an object to a set of known masses.

**7.2**

|  |  |
| --- | --- |
| **Everyday examples of push forces** | **Everyday examples of pull forces** |
| Pushing a door to open it | Pulling a draw to open it |
| Pushing a shopping cart at a shopping mall | Pulling a chair away from a table |

**7.3** A force-extension graph that has a gradient with a straight line indicates the spring constant of the object being stretched.

**7.4** Represent each force as a vector having its own magnitude and direction, group vectors with similar directions i.e. group all forces acting in the east direction and group all forces acting in the west direction. From their find the sum of the forces acting in the same direction. And then find the difference between the east and west forces, subtracting the west force from the east force.

**7.5** Resultant force =

= -2

**Question 8 [8]**

**8.1** Within a longitudinal wave, the direction of wave travel is parallel to the direction of vibration of the particles in the medium. On the other hand, in a transverse wave, the direction of wave travel is perpendicular to the direction of vibration of the particles in the medium, meaning the particles vibrate at right angles to the direction of its propagation.

**8.2** Frequency refers to the number of wave cycles that occur in a given time interval, typically one second and measured in hertz (Hz). In contrast, period looks at the time it takes for one complete cycle of a wave to occur, period is the inverse of frequency

**8.3**

Blue line= Wave A

Red line=Wave B

**----------------------------------End of Assignment 2---------------------------------**

**References:**

1. Basic Science – BSC410S. (n.d.). Retrieved February 24, 2023, from <https://online.fliphtml5.com/mjraa/uqef/index.html#p=22>