Assignment 03

Due date: 03 April 2018

Unique assignment number: 752714

Semester period: 01

INSTRUCTIONS

1) Answer this assignment only if you are registered for Semester 1.
2) Read section eight of this tutorial letter before starting this assignment.
3) Carefully study ALL the Study Units in your Study Guide to complete Assignment 03.
4) Remember to refer to the prescribed textbook as referred to in the Study Guide
5) Answer all questions as clearly as possible.
6) Except for definitions, formulate answers in your own words.
7) Now answer the questions that follow.
Question 1

1.1 You need to explain to someone what a solid is. Describe in your own words what characteristics a solid has in terms of its shape, volume, compressibility, motion of particles and arrangement of particles.

- Definite shape [1]
- Definite volume [1]
- Very low compressibility [1]
- The high restricted motion of particles [1]
- The highly ordered arrangement of particles [1]

1.2 Classify the following substances as an element, a compound, a homogenous mixture or heterogeneous mixture:

- Ne-Element
- K- Element
- Pb- Element
- Mn- Element
- Se- Element

1.3 Have a look at the element sodium on the periodic table and answer the questions that follow:

1.3.1 What is the valency of Sodium? 1 [1] (1)

1.3.2 How many valence electrons does Sodium have? 1 [1] (1)

1.3.3 Differentiate between the terms mentioned in 1.3.1 and 1.3.2. (2)

The “valency” of an element is a number that tells us how many electrons an atom must lose, gain or share in order to acquire a noble gas configuration (that is to have eight electrons in the outer energy level) [1]. “Valence electrons” are the electrons in the outer most energy level [1].

1.3.4 Draw the Lewis structures for sodium. (2)

x Na [2]

1.4 What is the difference between oxidation and reduction? (2)

Oxidation
- An electron loss or an increase in oxidation state [1]
- An oxygen gain
- A hydrogen loss

Reduction
- An electron gain or a decrease in oxidation state [1]
- An oxygen loss
- A hydrogen gain
1.5 Explain why soaped white sheets bleached when they are spread out on the grass on a sunny day

Because the oxygen in the air [1] and the oxygen produced by the green grass during photosynthesis oxidised stains [1]. The alkali from the soap speeds up the bleaching process.

1.6 Discuss the uses of salts in humans, laundering and cookery.

Human
Iodine salts are necessary for the proper functioning of the thyroid gland [1]; calcium and phosphorus salts are necessary for the formation of bones and teeth [1]. Regulate the acid-base balance of the body, irritability of nerve and muscle cells and the beating of the heart [1], maintain the proper osmotic pressure of cells [1].

Laundering
Table salt is frequently used to remove stains [1] and also helps to preserve the colour of the fabric [1].

Cookery
Table salt is used to flavour food [1], preservative [1], making chutneys [1], biltong and used for corned beef [1].

1.7 Explain the difference between adhesion and cohesion forces

Adhesion
The force of attraction between molecules of different substances. [1]
The adhesion of water to glass molecules is greater than the cohesion between each water molecules [1]

Cohesion
The force of attraction between molecules of the same substances. [1]
The cohesion between mercury particles is greater than the adhesion between mercury and glass particles [1]

1.8 State the law of conservation of energy.

The law of conservation of energy states that energy can be neither created nor destroyed during a chemical reaction, energy can only be changed from one form to another

1.9 Consider the factors of conduction, convection and radiation and explain why a thermos flask is an efficient way of keeping coffee warm.

Lack of conduction
The glass walls of the thermos flask, the plastic or cork stopper and the vacuum between the
double glass walls are very poor conductor of heat [1].

Lack of convection
Since no gas or liquid can leave a sealed thermos flask, heat cannot spread by convection [1].

Lack of radiation
The double glass walls of the flask are silver on the inside. Since the shiny surface reflects heat back into the flask, very little heat is lost [1].

1.10 Take some raisins and put them in a bowl of water for approximately one hour. Drain the water from the raisins.

1.10.1 What do you observe in connection with the raisins?

The raisins become swollen and increase in size [1].

1.10.2 Explain the phenomenon you have observed in activity 1.10.1.

Water passes through the skin of the fruit and the fruit become swollen with water - osmosis [1].

1.11 Study the factors influencing the rate of evaporation. List factors, which will have an influence on the drying of blankets, give reasons for your answers.

Temperature [1].
An increase in temperature increases the rate of temperature. The rise in temperature causes the kinetic energy of the molecules to increase [1].

Movement of air [1].
Wet washing dries far more quickly on a windy day than on a calm day. The wind removes the molecules that have already evaporated and that surround the washed article [1].

Question 2 [20]

2.1 Express the following numbers in scientific notation:

2.1.1 0.624
2.1.2 32 853
2.1.3 0.00054
2.1.4 5409

2.1.1  0.624: 6.24 x 10^{-1}
2.1.2  32 853: 3.2853 x 10^{4}
2.1.3  32 853: 5.4 x 10^{-4}
2.1.4  5409: 5.409 x 10^{3}

2.2 You want to know how many litres of water a specific container can take. The measurements of the container are as follows: breadth = 30cm, length = 55cm and height = 75cm. Calculate the volume of the container to determine how many litres of water the container can take.
\[ V = L \times B \times H \] 
\[ = 30 \times 55 \times 75 \] 
\[ = 123\,750\,cm^3 \] [1] half marks if the unit of measurement is not provided

\[ 123\,750\,cm^3 = 123\,750\,ml \] [1]

\[ 123\,750\,ml = 123.75\,L \] [1]

2.3 A box of cereal weighs 450 grams. Show your work.

2.3.1 How many kilograms does it weigh? 0.45 kg [1]

2.3.2 How many milligrams does it weigh? 450 000 mg [1]

2.4 When considering osmosis, what will happen to a red blood cell when it is placed for a period of time in the distilled water? Explain why this happens.

The cell will burst (haemolyse) [1]. The distilled water is hypotonic with reference to the Red blood cells and water will move into the cells* [1] (from the higher water concentration to a lower water concentration through a semi-permeable membrane - osmosis) [1]. This will cause the cell to swell and burst. *(Note that the salts cannot move out through the membrane of the cell, therefore, the water moving in).

2.5 Explain all of the types of heat transfer, which occur when heating soup, in a stainless steel pan with plastic handles, on the stove.

Convection [1]: soup is heated in the pan by convection. As the hot soup rises, the cool soup falls to take the hot soup’s place [1].

Conduction [1]: the plastic handle of the pan is an insulator as does not conduct heat very well. The stainless steel metal is a good conductor of heat and therefore, heat travels quickly from the stove top to the soup [1].

2.6 List four sources of heat and in each case give an example of how these sources generate heat.

The sun [½] - natural heat [½]
Electricity [½] - electric appliances [½]
Food [½] - eating increases metabolism [½]
Friction [½] [1] - rub hands together [½]
Burning fuels [½] - gas stove [½]

Question 3

3.1 What are the four general functions of the cutaneous membrane?

To help in the maintenance of normal fluid and electronic balance [1]
To help in regulating body temperature [1]
To protect against the entry of micro-organisms [1]
To protect against injury of underlying structures [1]
To bar entry of excess sunlight, most chemicals and even water [1]

3.2 Name the three organic compounds found in a cell and explain the role of each. (3)

Proteins ½ - main structural components of the cell, and play an important role in certain vital cell functions ½.

Carbohydrates ½ - main source and store of energy, the form structural components of certain parts of the cell ½.

Fats ½ - supply energy and are part of certain structural units ½.

3.3 There are different ways of movement of particles through the cell membrane. Differentiate between passive and active transport (6)

Passive transport

Passive process equalise the concentration of the substance on both sides of the cell membrane
Passive process use kinetic energy
Passive processes occur through living and nonliving membranes.

Active transport

Active processes increase the concentration of a substance on one side of a cell membrane
Active transport use chemical energy
Active processes occur only through living membranes

3.4 Match the type of body tissue provided in column A with the correct function provided in column B. Write down the correct letter next to the number provided in column A on your answer sheet, for example: 3.4.1 G. Kindly note that it is possible that you may use each of the letters (A to F) more than once. (4)

<table>
<thead>
<tr>
<th>Column A: GI secretions</th>
<th>Column B: Function/action</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5.1 Nervous tissue</td>
<td>A. Provides support and protection</td>
</tr>
<tr>
<td>3.5.2 Smooth muscle tissue</td>
<td>B. Responsible for pumping blood through the heart chambers</td>
</tr>
<tr>
<td>3.5.3 Epithelial tissue</td>
<td>C. It provides a protective barrier</td>
</tr>
<tr>
<td>3.5.4 Cartilage</td>
<td>D. Conducts impulses to the brain</td>
</tr>
<tr>
<td></td>
<td>E. Responsible for the movement that constricts blood vessels</td>
</tr>
<tr>
<td></td>
<td>F. Serves as an attachment for muscles</td>
</tr>
</tbody>
</table>
3.5 Re-draw and complete the following table (in your answer book) regarding the seven body systems as discussed in the study guide: (21)

<table>
<thead>
<tr>
<th>System</th>
<th>Main Function</th>
<th>Main Organs/ Components (name one)</th>
</tr>
</thead>
</table>

3.6 Discuss the factors influencing normal urine excretion.

In a hot climate, more water is lost through perspiration and therefore the volume of urine produced decreases [1]. The quantity of liquid that an individual drink in a day affects the amount of urine [1].
When large amounts of water are lost through vomiting, diarrhoea or haemorrhage, the amount of urine produced decreases [1]. The amount of urine excreted by children in a day is great in proportion to their body mass. Therefore, the fluid intake of children must be watched closely to ensure that it is adequate [1].

Question 4

The liver is essential for the functioning of the digestive system. The end-stage liver disease is liver cirrhosis. Search information on liver cirrhosis and then explain in the form of a concise literature review with a maximum of 500 words what liver cirrhosis is, what will be the effect of liver cirrhosis on the normal functioning of the liver and what would you recommend in order to prevent liver cirrhosis. Techniques to search for reputable information resources are explained in Tutorial letter 301, section 6 and correct referencing techniques in section 7. Add one of your sources referred to, to the assignment.

You will be assessed as follows:

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>MARK ALLOCATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTENT</td>
<td>12</td>
</tr>
<tr>
<td>Introduction</td>
<td>2</td>
</tr>
<tr>
<td>Insight into the functions and the effect of liver cirrhosis on the digestive system</td>
<td>4</td>
</tr>
<tr>
<td>Insight into the prevention of liver cirrhosis</td>
<td>4</td>
</tr>
<tr>
<td>Conclusion</td>
<td>2</td>
</tr>
<tr>
<td>TECHNICALITIES</td>
<td>8</td>
</tr>
<tr>
<td>Spelling and grammar</td>
<td>2</td>
</tr>
<tr>
<td>Word count</td>
<td>2</td>
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<tr>
<td>Scientifically written</td>
<td>2</td>
</tr>
<tr>
<td>Article correctly referenced</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>20</td>
</tr>
</tbody>
</table>

The goal of this question is simply to give students exposure to scientific writing and searching and referencing peer-reviewed scientific articles. The essay had to be presented in a logical manner, with good spelling and grammar in general.