CSP1501
INTRODUCTION TO APPLIED SCIENCES

Duration 2 Hours

EXAMINERS
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Use of a non-programmable pocket calculator is permissible.

Closed book examination

This examination question paper remains the property of the University of South Africa and may not be removed from the examination venue.

This examination question paper consists of 5 pages plus an appendix A (i)

Answer all the questions in the answer book provided.

Start each question on a new page, in other words, QUESTION 1, QUESTION 2 and QUESTION 3 should each start on a new page in the answer book provided.

Where applicable, give all answers in the metric system (SI) units. No marks will be awarded to answers with non-metric units of measurements.

[TURN OVER]
QUESTION 1

1.1 Multiple-choice question

1.1.1 Which of the following elements are noble gases?

1. Fluorine
2. Hydrogen
3. Bromine
4. Helium

1.1.2 Matter can change in its physical state of being a solid, liquid or gas. When water changes from ice (solid) to steam (gas), the process is called:

1. Condensation
2. Evaporation
3. Sublimation
4. Freezing

1.1.3 The formula of water is H₂O. Which of the following statements are correct about the formula 3NH₄?

1. There are 4 molecules of the specific compound as given in the formula above
2. There are 4 hydrogen atoms in the above given formula
3. There are 12 nitrogen atoms in the above given formula
4. None of the above

1.1.4 The use of water or a liquid in very small spaces is known as:

1. adsorption
2. capillarity
3. adhesion
4. none of the above

1.1.5 What is the formula for sodium sulfate?

1. NaSO₂
2. Na (SO) ₂
3. Na₂SO₄
4. Na₂ (SO₂)²
1.2 Define the following terms

1.2.1 A Cell
1.2.2 Tissue
1.2.3 Element
1.2.4 Valence electrons
1.2.5 Valency

1.3 In each case decide whether the property is a physical or chemical property

1.3.1 Oxygen is extremely reactive at high temperatures
1.3.2 The appearance of the product of sulphur is a colourless gas
1.3.3 Sulphur has a blue flame when it burns oxygen
1.3.4 Copper appears as a black solid

1.4 Draw the following table on your answer sheet and fill in the blanks in the table (one column per element).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Be</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of protons</td>
<td>16</td>
</tr>
<tr>
<td>Number of neutrons</td>
<td></td>
</tr>
<tr>
<td>Number of electrons in the neutral atom</td>
<td></td>
</tr>
<tr>
<td>Name of the element</td>
<td>Phosphorus</td>
</tr>
</tbody>
</table>

1.5 In the following reaction, decide which reactant is oxidised and which is reduced. Designate the oxidizing agent and the reducing agent and describe the process that occurs. The symbols in brackets indicate the state the element/compound is in (s) = solid phase, (g) = gas, (l) = liquid.

Si(s) + 2 Cl₂ (g) → SiCl₄ (l)

1.6 Draw the symbolic representation of the electron structure of phosphorus

1.7 Explain the difference between adhesion and cohesion forces and provide an example for each

[TURN OVER]
You visit a friend on his farm. He mentioned that this year his vegetable patch yielded a lot of onions and he was storing them. When you walked with him to his store room, you noticed that he stored most of the onions in galvanised containers and buckets which are similar to the one depicted in figure 1 below. You realised that food should never be stored or prepared in galvanised containers.

![Typical galvanised container/bucket](image)

Figure 1: Typical galvanised container/bucket

Answer the following questions:

181 Explain to your friend why he should not use these buckets to store the onions. (1)

182 Recommend which type of metal containers he may use to store the onions which would not create a similar type of problem. (2)

**QUESTION 2**

2.1 Express the following numbers in scientific notation:

2.1.1 0.215 (1)
2.1.2 23.358 (1)
2.1.3 0.0045 (1)
2.1.4 211 (1)

2.2 A typical laboratory beaker has a volume of 250 ml.

2.2.1 What is its volume in cubic centimetres? (1)
2.2.2 What is this volume in litres? (1)

2.3 Explain the term capillarity and give three examples of the application of capillary force. (5)

2.4 Two equal amounts of solutions, A and B, are separated by a selectively permeable barrier. Over a period of time, the level on side A increases. Which solution initially had the higher concentration of solute? Describe the process that occurs while the level of side A is increasing. (4)

2.5 State the law of conservation of energy (2)

[TURN OVER]
QUESTION 3

3.1 Most of the elements found in human cells are present in the form of compounds, which may be either inorganic or organic. Discuss the inorganic compounds that may be found in cells of the human body. (3)

3.2 Name and explain the eight general functions performed by most cells (8)

3.3 Describe the process of blood clotting. (5)

3.4 Name the different types of muscle tissue and state whether they are voluntary or involuntary (6)

3.5 Give five functions of the kidneys. (5)

3.6 Name three processes which occur in the kidneys, except for filtration. (3)

3.7 Name and describe the main groups of bones that form the axial skeleton (10)

3.8 Write down the reactions that take place when the disaccharide enzymes on the surface of the small intestinal cells, hydrolyze the disaccharides (maltose, sucrose and lactose) to monosaccharides. Include the names of the by-products formed (3)

Total = [100 marks]