



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES**

**DEPARTMENT OF NATURAL AND APPLIED SCIENCES**

<b>QUALIFICATION: ALL PROGRAMMES</b>	
<b>QUALIFICATION CODE:</b>	<b>LEVEL: 4</b>
<b>COURSE CODE: BSC410S</b>	<b>COURSE NAME: BASIC SCIENCE</b>
<b>SESSION: NOVEMBER 2022</b>	<b>PAPER: THEORY</b>
<b>DURATION: 3 HOURS</b>	<b>MARKS: 100</b>

<b>FIRST OPPORTUNITY EXAMINATION QUESTION PAPER (FULLTIME)</b>	
<b>EXAMINER(S)</b>	DR. VAINO INDONGO, MR. PERTUS PAULUS AND MR. TUWILIKA TOBIAS
<b>MODERATOR:</b>	DR. EDOSA OMOREGIE

<b>INSTRUCTIONS</b>	
1.	Write all your answers in the answer booklet provided.
2.	Read the whole question before answering.
3.	Begin each question on a new page.
4.	A Periodic Table is attached at the back of this paper.

**PERMISSIBLE MATERIALS**  
Non-programmable Scientific Calculator

**THIS EXAMINATION QUESTION PAPER CONSISTS OF 11 PAGES**

**QUESTION 1:****(20)**

**Question type:** Multiple choices. Read the questions carefully, choose and write the correct letter corresponding to the correct answer. Each question weighs **2 marks**.

1.1 Which statement is not true about viruses? (2)

- A. They can reproduce independently without a host.
- B. They are not included in the six kingdoms of living organism.
- C. They cannot strictly be considers as living organism.
- D. Each contain either DNA or RNA.

1.2 What is a characteristic of living things that sets them apart from the non-living? (2)

- A. They respond to a stimulus.
- B. They grow and reproduce.
- C. Adaptation to a way of life.
- D. All of the above are characteristics of living things.

1.3 The main function of rennet in the manufacture of hard cheese is to \_\_\_\_\_. (2)

- A. make the milk taste better
- B. lower the pH of milk and kill the other lactic acid bacteria
- C. lower the pH of milk and form of curds
- D. enhance removal of whey so that the cheese can be made more efficiently

1.4 An obligatory association between two different species that is beneficial to both populations of organisms is \_\_\_\_\_. (2)

- A. symbiotic.
- B. parasitic.
- C. predatory.
- D. mutualistic.

- 1.5 Saturated fats; (2)
- A. have no double bonds in their fatty acid chains.
  - B. are more common in plants than in animals.
  - C. are associated with lesser health risks than are unsaturated fats.
  - D. are usually liquid at room temperature.
- 1.6 During intraspecific competition is between; (2)
- A. different species.
  - B. abiotic organisms.
  - C. populations.
  - D. the same organisms.
- 1.7 How does water act in most solutions? (2)
- A. It is a universal solute, dissolving mostly ionic or polar covalent substances.
  - B. It is a universal solvent, dissolving mostly ionic or polar covalent substances.
  - C. It is a universal solute, dissolving mostly non-polar covalent substances.
  - D. It is a universal solvent, dissolving mostly non-polar substances.
- 1.8 All of the following are true about fermentation except; (2)
- A. It improves the sensory characteristics of food.
  - B. It is undesirable process in the food industry as it spoils the food.
  - C. It extends the shelf life of food.
  - D. It changes the nutritional value of food for example converting milk into cheese.
- 1.9 A food web is \_\_\_\_\_. (2)
- A. the same as a food chain
  - B. linear, involving one organism at a trophic level
  - C. the grouping of heterotrophs without producers
  - D. the interconnection of food chains involving more than one organism at a trophic level



1.10 A garden pea plant forms flowers that undergo self or cross pollination to produce seeds. These seeds mature in two to three weeks. Which characteristics of living things are being described here? (2)

- A. Cellular organization and use of energy
- B. Reproduction and response to environment
- C. Growth and reproduction
- D. Use of energy and development

**QUESTION 2:** (15)

**Question type:** Structured questions.

2.1 Discuss the importance of the following characteristics of living organisms.

- i) Growth (2)
- ii) Reproduction (2)

2.2 State any two types of shapes used in classifying prokaryotes such as bacteria (2)

2.2 The cow medication, diclofenac, was banned in India because it poisoned and killed as many as 90 percent of that country's vultures. Figure 1 below shows, a white-rumped vulture (*Gyps bengalensis*), which is an Indian vulture, feeding on a cow carcass. Discuss the critical roles that scavengers play to the stability of the ecosystem, food web and environment at large? (4)



Figure 1

2.3 Discuss any three effects of a diet that is in deficiency of proteins? (3)

2.4 For the production of cheese, the optimal temperature for the microorganisms involved is about 30°C. However, after the addition of the starter culture, the temperature was mistakenly set at 300°C for the incubation. Explain the effects of that mistake? (2)

**SECTION B: CHEMISTRY**

**[35]**

**QUESTION 3:**

**(20)**

**Question type:** Multiple choices. Read the questions carefully, choose and write the correct letter corresponding to the correct answer. Each question weighs **2 marks**.

3.1 How many significant figures are in 700.400 m? (2)

- A. 3
- B. 4
- C. 5
- D. 6

3.2 The factor  $10^9$  corresponds to which prefix? (2)

- A. Giga
- B. Micro
- C. Milli
- D. Nano

3.3 What is the SI unit for mass? (2)

- A. Newton
- B. Kilogram
- C. Milligram
- D. Hectogram

3.4 Convert 150 000 Picometers to meters (2)

- A.  $1.5 \times 10^{-7}$  meters
- B.  $1.5 \times 10^{17}$  meters
- C. 0.15 meters
- D. 150 meters

3.5 Convert 62.2 Fahrenheit to Kelvin. (2)

- A. 335.4 K
- B. 16.8 K
- C. 289.9 K
- D. 94.2 K

3.6 What is the mass number of Boron? (2)

- A. 26.9815
- B. 10.81
- C. 12.011
- D. 14.0067

3.7 What is common to elements in the same group? (2)

- A. Similar boiling point
- B. Similar freezing point
- C. Similar number of shells
- D. Similar number of valence electron

3.8 Which metal is liquid at room temperature? (2)

- A. Mercury
- B. Magnesium
- C. Copper
- D. Lead

3.9 Which of the following elements is unreactive? (2)

- A. Neon
- B. Carbon
- C. Zinc
- D. Potassium

- 3.10 Which element in Period 3 has both metallic and non-metallic properties? (2)
- A. Na
  - B. Mg
  - C. Si
  - D. Ar

**QUESTION 4:** (15)

**Question type:** Structured questions.

- 4.1 Differentiate between Physical and chemical properties of matter and give an example for each. (4)
- 4.2 Explain the behavioral changes of the 3 states of matter under high temperature. (6)
- 4.3 With an aid of a diagram (Fig. 2), illustrate the electron configuration of Sodium, and indicate its number of electrons and mass number. (3)

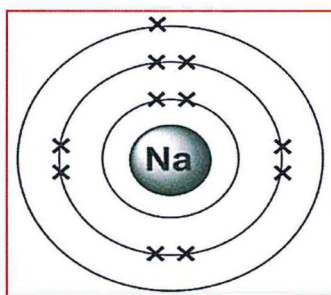


Figure 2

- 4.4 State any 2 features of alkaline earth metals. (2)

**SECTION C: PHYSICIS** [30]

**QUESTION 5:** (20)

**Question type:** Multiple choices. Read the questions carefully, choose and write the correct letter corresponding to the correct answer. Each question weighs **2 marks**.

- 5.1 ..... holds constituents of the nucleus together. (2)
- A. Gravity
  - B. Electromagnetic force
  - C. Strong nuclear force
  - D. Weak nuclear force

5.2 A unit of force called Newton is equivalent to \_\_\_\_\_. (2)

- A.  $\text{g.m/s}^2$
- B.  $\text{kg.ms}^{-1}$
- C.  $\text{c.ms}^{-2}$
- D.  $\text{kg.ms}^{-2}$

5.3 The force of an object due to gravitational acceleration acting on it is known as \_\_\_\_\_. (2)

- A. mass
- B. potential energy
- C. action-reaction
- D. weight

5.4 For a force to be observed, two bodies \_\_\_\_\_ necessarily. (2)

- A. must be in contact.
- B. do not need to be contact
- C. need to have equal forces
- D. must have a uniform velocity.

5.5 The gravitational accelerations of the moon and the earth are \_\_\_\_\_. (2)

- A. The same
- B. Different
- C.  $6.78 \text{ m/s}^2$
- D.  $8.91 \text{ m/s}^2$

5.6 An electron and a proton are two \_\_\_\_\_ particles. (2)

- A. nucleons
- B. positively charged
- C. negatively charged
- D. unlike charged



5.7 If a coin is dropped towards a magnet, the magnet pulls on the coin just as hard as the coin pulls on the magnet. Which law applies to this concept? (2)

- A. The law of gravity
- B. Inertia
- C. Action-Reaction
- D.  $F_{\text{NET}} = ma$

5.8 Protons and neutrons are found in the following except on; (2)

- A. electronic shells
- B. atom
- C. nucleus
- D. both B and C

5.9 The SI unit for electrical current is; (2)

- A. Amps
- B. Coulomb
- C. Ohms
- D. Volts

5.10 The flow of electrical charges in a closed circuit is known as; (2)

- A. acceleration
- B. voltage
- C. resistance
- D. electricity

**QUESTION 6:** [10]

**Question type:** Structured questions.

6.1 Differentiate between a vector and scalar quantity (2)

6.2 Suppose a force of 20 N is exerted on a brick and an acceleration of 2.5 m/s/s is observed. What is the mass of the brick? (2)

6.2 Briefly discuss how electricity is generated from nuclear energy, i.e. uranium. (2)

6.3 A student with a mass of 48 kg stands at the top of a hill of height 0.4 km (Position A), as shown in the diagram (Figure 3) below. *Note: Answer should be in SI units.*

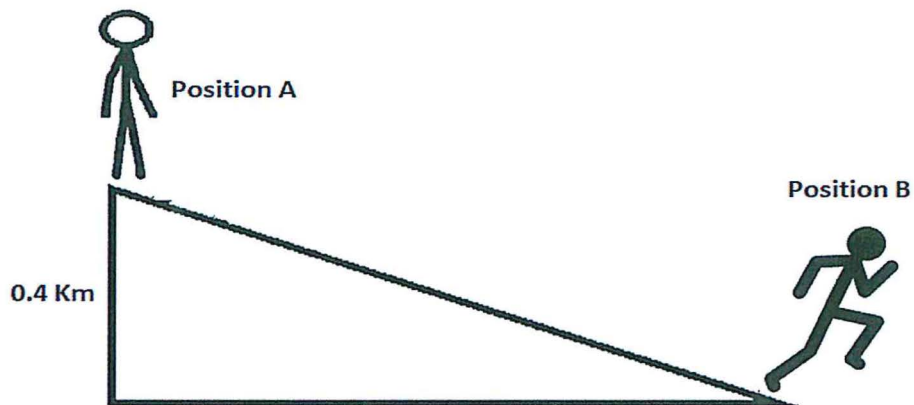


Figure 3.

What is the student's gravitational potential energy at the top of the hill? (2)

*Note: Gravitational acceleration ( $g$ ) =  $10 \text{ m.s}^{-2}$*

6.4 Study the closed circuit below (Fig.4) with appropriate electrical components below:

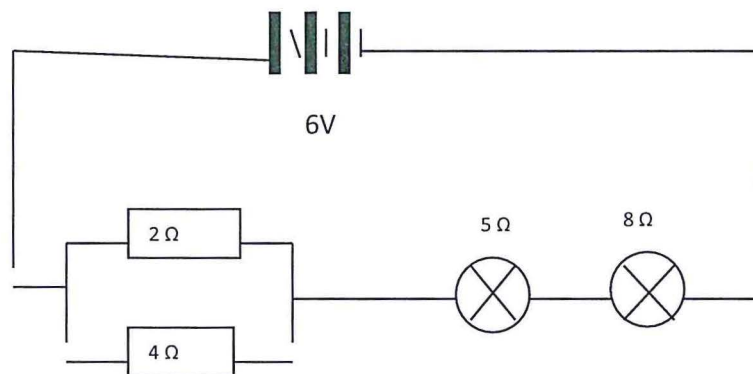


Figure 4.

Determine:

(i) the resistance in parallel only. (2)

(ii) resistance in series only. (2)

END

# PERIODIC TABLE OF THE ELEMENTS

1																	18
<b>1</b> <b>H</b> 1.00794																	<b>2</b> <b>He</b> 4.00260
	2											13	14	15	16	17	18
<b>3</b> <b>Li</b> 6.941	<b>4</b> <b>Be</b> 9.01218											<b>5</b> <b>B</b> 10.81	<b>6</b> <b>C</b> 12.011	<b>7</b> <b>N</b> 14.0067	<b>8</b> <b>O</b> 15.9994	<b>9</b> <b>F</b> 18.9984	<b>10</b> <b>Ne</b> 20.179
<b>11</b> <b>Na</b> 22.9898	<b>12</b> <b>Mg</b> 24.305											<b>13</b> <b>Al</b> 26.9815	<b>14</b> <b>Si</b> 28.0855	<b>15</b> <b>P</b> 30.9738	<b>16</b> <b>S</b> 32.06	<b>17</b> <b>Cl</b> 35.453	<b>18</b> <b>Ar</b> 39.948
<b>19</b> <b>K</b> 39.0983	<b>20</b> <b>Ca</b> 40.08	<b>21</b> <b>Sc</b> 44.9559	<b>22</b> <b>Ti</b> 47.88	<b>23</b> <b>V</b> 50.9415	<b>24</b> <b>Cr</b> 51.996	<b>25</b> <b>Mn</b> 54.9380	<b>26</b> <b>Fe</b> 55.847	<b>27</b> <b>Co</b> 58.9332	<b>28</b> <b>Ni</b> 58.69	<b>29</b> <b>Cu</b> 63.546	<b>30</b> <b>Zn</b> 65.38	<b>31</b> <b>Ga</b> 69.72	<b>32</b> <b>Ge</b> 72.59	<b>33</b> <b>As</b> 74.9216	<b>34</b> <b>Se</b> 78.96	<b>35</b> <b>Br</b> 79.904	<b>36</b> <b>Kr</b> 83.8
<b>37</b> <b>Rb</b> 85.4678	<b>38</b> <b>Sr</b> 87.62	<b>39</b> <b>Y</b> 88.9059	<b>40</b> <b>Zr</b> 91.22	<b>41</b> <b>Nb</b> 92.9064	<b>42</b> <b>Mo</b> 95.94	<b>43</b> <b>Tc</b> (98)	<b>44</b> <b>Ru</b> 101.07	<b>45</b> <b>Rh</b> 102.906	<b>46</b> <b>Pd</b> 106.42	<b>47</b> <b>Ag</b> 107.868	<b>48</b> <b>Cd</b> 112.41	<b>49</b> <b>In</b> 114.82	<b>50</b> <b>Sn</b> 118.69	<b>51</b> <b>Sb</b> 121.75	<b>52</b> <b>Te</b> 127.6	<b>53</b> <b>I</b> 126.9	<b>54</b> <b>Xe</b> 131.29
<b>55</b> <b>Cs</b> 132.905	<b>56</b> <b>Ba</b> 137.33	<b>71</b> <b>Lu</b> 174.967	<b>72</b> <b>Hf</b> 178.49	<b>73</b> <b>Ta</b> 180.948	<b>74</b> <b>W</b> 183.85	<b>75</b> <b>Re</b> 186.207	<b>76</b> <b>Os</b> 190.2	<b>77</b> <b>Ir</b> 192.22	<b>78</b> <b>Pt</b> 195.08	<b>79</b> <b>Au</b> 196.967	<b>80</b> <b>Hg</b> 200.59	<b>81</b> <b>Tl</b> 204.383	<b>82</b> <b>Pb</b> 207.2	<b>83</b> <b>Bi</b> 208.908	<b>84</b> <b>Po</b> (209)	<b>85</b> <b>At</b> (210)	<b>86</b> <b>Rn</b> (222)
<b>87</b> <b>Fr</b> (223)	<b>88</b> <b>Ra</b> 226.025	<b>103</b> <b>Lr</b> (260)	<b>104</b> <b>Rf</b> (261)	<b>105</b> <b>Db</b> (262)	<b>106</b> <b>Sg</b> (263)	<b>107</b> <b>Bh</b> (264)	<b>108</b> <b>Hs</b> (265)	<b>109</b> <b>Mt</b> (268)	<b>110</b> <b>Uun</b> (269)	<b>111</b> <b>Uuu</b> (272)	<b>112</b> <b>Uub</b> (269)		<b>114</b> <b>Uuq</b>		<b>116</b> <b>Uuh</b>		<b>118</b> <b>Uuo</b>

**Lanthanides:**

57	58	59	60	61	62	63	64	65	66	67	68	69	70
<b>La</b>	<b>Ce</b>	<b>Pr</b>	<b>Nd</b>	<b>Pm</b>	<b>Sm</b>	<b>Eu</b>	<b>Gd</b>	<b>Tb</b>	<b>Dy</b>	<b>Ho</b>	<b>Er</b>	<b>Tm</b>	<b>Yb</b>
138.906	140.12	140.908	144.24	(145)	150.36	151.96	157.25	158.925	162.50	161.930	167.26	166.934	173.04

**Actinides:**

89	90	91	92	93	94	95	96	97	98	99	100	101	102
<b>Ac</b>	<b>Th</b>	<b>Pa</b>	<b>U</b>	<b>Np</b>	<b>Pu</b>	<b>Am</b>	<b>Cm</b>	<b>Bk</b>	<b>Cf</b>	<b>Es</b>	<b>Fm</b>	<b>Md</b>	<b>No</b>
227.028	232.038	231.036	238.029	237.048	(244)	(243)	(247)	(247)	(251)	(252)	(257)	(258)	(259)