



Samoa School Certificate

CHEMISTRY

2022

QUESTION and ANSWER BOOKLET

Time allowed: 3 Hours & 10 minutes

INSTRUCTIONS

1. You have 10 minutes to read **before** you start the exam.
2. Write your **Student Education Number (SEN)** in the space provided on the top right hand corner of this page.
3. **Answer ALL QUESTIONS.** Write your answers in the spaces provided in this booklet.
4. If you need more space, ask the Supervisor for extra paper. Write your SEN on all extra sheets used and clearly number the questions. Attach the extra sheets at the appropriate places in this booklet.

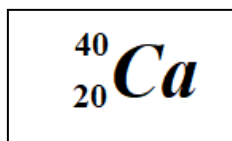
NB: The Periodic Table is inserted as a separate sheet.

STRANDS		Pages	Time (min)	Weighting
STRAND 1	ATOMIC STRUCTURE AND BONDING	2-3	18	10
STRAND 2	QUANTITATIVE CHEMISTRY	4-5	22	12
STRAND 3	ORGANIC CHEMISTRY	6-9	43	24
STRAND 4	OXIDATION AND REDUCTION	10-11	18	10
STRAND 5	INORGANIC CHEMISTRY	12-14	50	28
STRAND 6	PRINCIPLES OF PHYSICAL CHEMISTRY	15-16	29	16
TOTAL			180	100

Check that this booklet contains pages 2-17 in the correct order and that none of these pages are blank.

HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Study the atom given below and use it to answer questions that follow.



1. Write the electron arrangement for the atom above.

SL 1

2. Draw the structure of the calcium ion.

SL 1

3. Describe the melting point of sodium chloride (NaCl) in terms of bonding between the atoms.

SL 2

For Questions 4 - 5, explain the property stated in relation to the substance's structure and bonding.

4. Graphite is the only non-metal that can conduct electricity.

SL 3

5. An iron nail can easily be flattened when beaten with a hammer.

SL 3

For Questions 6 – 8, define the terms

6. Mole

SL 1

7. Relative Molecular Mass

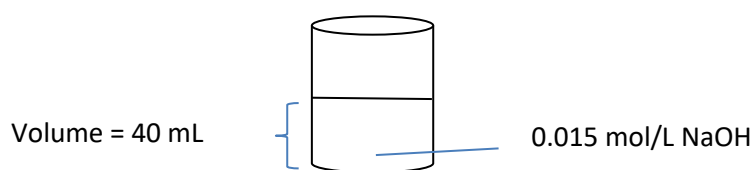
SL 1

8. Molar Mass

SL 1

9. Calculate the mass of NaOH in the solution below:

$M(\text{Na}) = 22.9 \text{ g/mol}$; $M(\text{O}) = 16 \text{ g/mol}$; $M(\text{H}) = 1 \text{ g/mol}$



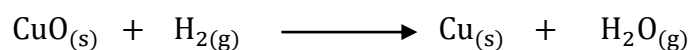
SL 2

10. Which of these compounds has a higher percentage composition of iron?
FeO or Fe₂O₃?

$$M(\text{Fe}) = 55.8 \text{ g/mol}; \quad M(\text{O}) = 16 \text{ g/mol}$$

SL 3

11. In the reaction below, 1.27 grams of copper oxide (CuO), reacted with hydrogen gas (H₂) to produce copper metal (Cu).



Calculate the mass of copper formed. Show all working.
[M(Cu) = 63.5 g/mol; M(O) = 16 g/mol]

SL 4

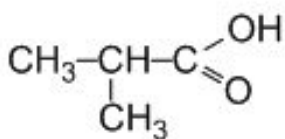
12. Circle the name that corresponds to an unsaturated hydrocarbon.

- A. 2-methyl propane B. 1-butanol
C. 2-butene D. 2-propanone

SL 1

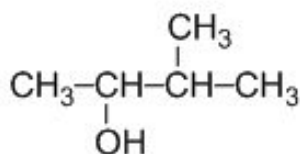
For Questions 13 - 14, state the systematic (IUPAC) names of the compounds.

13.



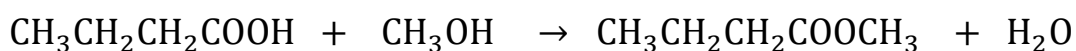
SL 1

14.



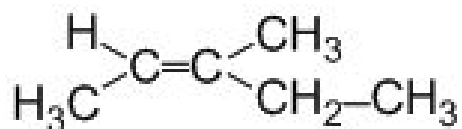
SL 1

15. The reaction of a carboxylic acid and an alcohol results in the formation of an organic product as well as water. Name only the organic product that forms in the reaction below. (You can write the name or formula)



SL 1

Use the compound below to answer Questions 16 - 17.



16. Name the functional group in the compound above.

SL 1

17. Is the compound above a saturated or unsaturated hydrocarbon?

SL 1

18. Write a balanced equation to represent the formation of ethanol from the fermentation of glucose.

SL 2

19. Draw the structural formula for butanoic acid.

SL 2

20. Explain the reaction of ethene in addition polymerization to form polythene. Include the equation and conditions for the reaction, in your explanation.

SL 3

21. Write a balanced equation for the incomplete combustion of propanol (C_3H_7OH) to form carbon monoxide (CO) and water.

SL 3

22. Samples of primary, secondary and tertiary alcohols, were given to a student for testing, to classify them. The student used the Lucas test to differentiate the three alcohols.
Describe the testing procedure and observations the student would note from his testing.

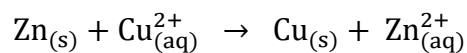
SL 4

23. Discuss the properties of alkanes that contribute to their high use and demand in the fuel industry.

SL 4

Use the equation below to answer Questions 24 – 25.

For the reaction of zinc metal with copper sulfate solution:



24. Write the reduction half equation.

SL 1

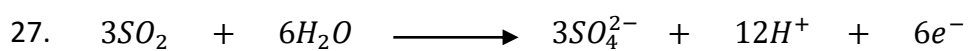
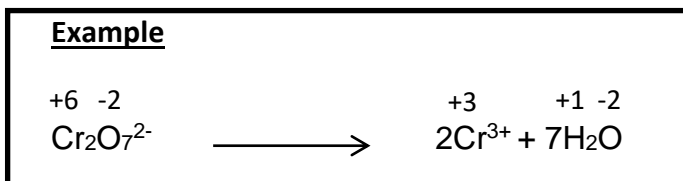
25. Identify the oxidizing agent in the reaction above.

SL 1

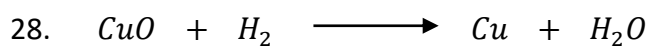
26. Determine the oxidation number of Nitrogen in the compound, ***HNO***₃.
Show all working.

SL 2

For Questions 27 – 28, calculate the oxidation states of each element in each equation. Write the oxidation number of each element above its symbol. An example is provided below.



SL 3



SL 3

29. Define the term deliquescence.

SL 1

30. Name a physical property of chlorine gas.

SL 1

For Questions 31 – 32, identify the colours of the following precipitates.

31. BaSO_4 _____

SL 1

32. $\text{Fe}(\text{OH})_2$ _____

SL 1

33. Name one allotrope of Carbon.

SL 1

34. Briefly outline the process of extraction of sulfur by the Frasch process. (Use words or sketch a diagram).

SL 2

35. A colourless solution formed a white precipitate when barium chloride (BaCl_2) was added. The white precipitate was filtered and hydrochloric acid (HCl) was added to it. No reaction took place. Identify the anion in the colourless solution, and write the formula of the white precipitate.

SL 2

36. Two unlabelled test tubes contained the cations, Cu^{2+} and Mg^{2+} . Describe **TWO** observations noted when sodium hydroxide solution (NaOH) is added to the test tubes.

SL 2

37. Compare the actions of soap in soft and hard water.

SL 3

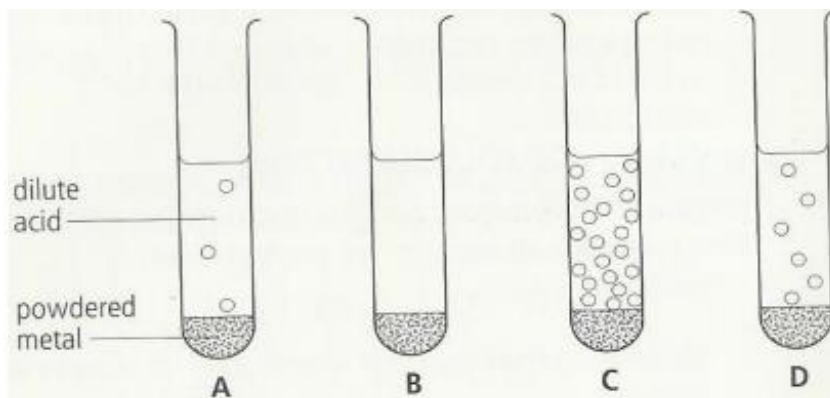
38. Explain in terms of its properties, the use of carbon dioxide in fire extinguishers.

SL 3

39. Explain the effect of CFCs on the ozone layer.

SL 3

40. Four powdered metals A, B, C and D are placed in dilute acid.



Use the information in the diagram above to put the metals A, B, C and D in order of reactivity (most reactive first), and give an explanation for the metal you think is most reactive.

SL 4

41. Discuss **TWO** uses of sulfuric acid (H_2SO_4) in real life with reference to its properties.

SL 4

42. Distinguish between exothermic and endothermic reactions.

SL 1

43. When sodium hydroxide pellets are mixed with hydrochloric acid solution, the temperature of the mixture increases. Is this reaction endothermic or exothermic?

SL 1

44. Describe the features of endothermic reactions.

SL 2

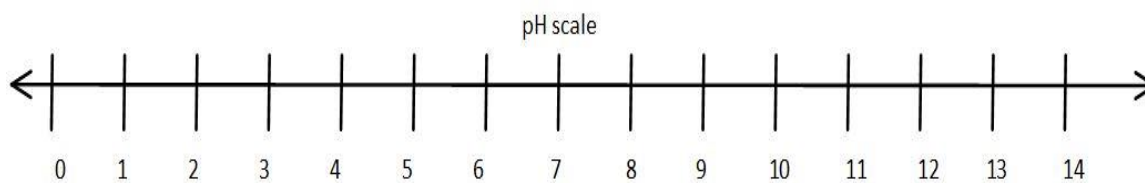
45. A 5cm strip of magnesium ribbon reacts more quickly in 2mol/L sulfuric acid than in 1 mol/L sulfuric acid. Use this information to state the effect of concentration on the rate of reaction.

SL 2

46. Explain the difference between strong and weak acids, using HCl and CH₃COOH as examples.

SL 3

47. On the pH scale below, place the substances in the list where appropriate according to their pH values. You can write your answer on the pH scale.



LIST OF SUBSTANCES:



SL 3

48. Discuss the observations you would see when the solutions of the following substances are tested with the universal indicator.



SL 4

STUDENT EDUCATION NUMBER									

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(For Scorers only)

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