



GOVERNMENT OF SAMOA

STUDENT EDUCATION NUMBER									

Samoa School Certificate

CHEMISTRY

2023

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 to the appropriate places in this booklet.

NB: Periodic Table is provided on page 20 of the exam paper.

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 – 16	50	28
STRAND 6	PHYSICAL CHEMISTRY	17 – 19	29	16
TOTAL			180	100

Check that this booklet contains pages 2 - 21 in the correct order and that none of these pages are blank.

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

For Question 1, choose and write the LETTER of the correct answer in the box provided.

1. The term **ionic bond** is correctly defined as:

- A. attraction between non-metal atoms.
- B. attraction involving the transfer of electrons.
- C. sharing of electrons between metal and non-metal atoms.
- D. force of attraction between molecules.

SL 1

2. Define the term **covalent bond**.

SL 1

3. Choose from the list below which solid will be insoluble in water, and give a reason in relation to the bonding between the atoms.

NaCl

MgCl₂CO₂KNO₃

SL 2

4. Draw the Lewis structure (electron dot diagram) for the nitrogen molecule N₂.

SL 3

5. Explain why crystals of sodium chloride (NaCl) do not conduct electricity. Relate your answer to the structure and bonding.

SL 3

For Question 6, choose and write the LETTER of the correct answer in the box provided.

6. Which of the following best defines the term mole?

- A. Has the unit grams per mole.
- B. Unit for amount of substance.
- C. Equals to twice the amount 6.02×10^{23} .
- D. Has the unit moles per litre.

SL 1

7. Use the words in the box below to fill in the spaces to define the term **relative molecular mass**.

masses	sum	molecule	elements
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“Relative molecular mass is defined as the _____ of relative atomic _____ of the _____ in a _____ or compound.”

SL 1

8. Define the term **molar mass**.

SL 1

9. How many moles of CO_2 are there in 0.44 g of carbon dioxide?

$$M(\text{C}) = 12 \text{ g/mol}; M(\text{O}) = 16 \text{ g/mol}$$

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SL 2

10. Calculate the concentration of the following solution in grams per litre (g/L) and moles per litre (mol/L).
M(Ca)=40g/mol; M(Cl)=35.5g/mol

2.65 grams of calcium chloride (CaCl₂) in 100 mL of solution.

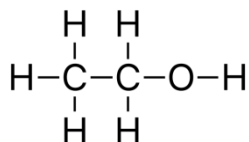
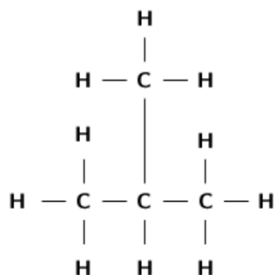
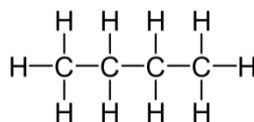
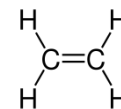
SL 3

11. A compound of nitrogen and oxygen has the composition by mass of 30.43% N and 69.57% O by mass. If the molar mass is 92 g/mol, what is the molecular formula of the compound? M(N)=14g/mol; M(O)=16g/mol

SL 4

Use the structural formula of compounds below to answer Questions 12 to 15.

Write only the letter of the best answer in the box provided.

A**B****C****D**

12. Which structure above represents an unsaturated hydrocarbon?
13. The saturated hydrocarbon with the IUPAC name 2-methyl propane is:
14. Which compound is an isomer of 2-methyl propane?
15. Which compound is not only used as Fuel but also in drinks?
16. Define the term homologous series.

SL 1

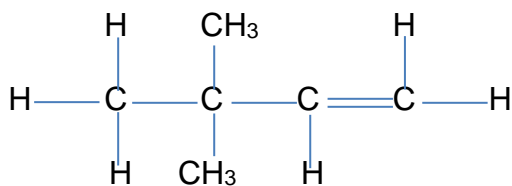
SL 1

SL 1

SL 1

SL 1

17. Write the IUPAC name for the compound below.



SL 1

18. Describe the difference in observation when the test for unsaturation (bromine test) is applied on ethane and ethene gases.

SL 2

19. Draw the structural formula for the ester methyl propanoate.

SL 2

20. Write an equation and provide an explanation for the production of ethanol from the hydration of ethene.

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SL 3

21. Provide **ONE** use of ethanol and explain the properties of ethanol that make possible this use.

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SL 3

22. Discuss one physical property and one chemical properties (one each) of the carboxylic acids; name each property and briefly explain them.

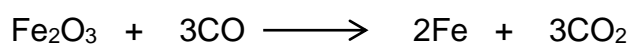
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SL 4

23. Discuss the importance of properties of the alkanes.

SL 4

Consider the following reaction, and use it to answer the Questions 24 to 26.



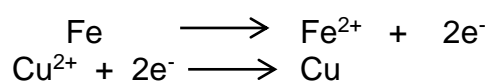
24. Identify the oxidizing agent in the reaction given above.

SL 1

25. State **TWO** reasons for your identification of the oxidizing agent in Question 24 above.

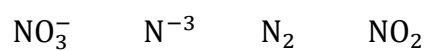
SL 2

26. Combine the two half equations below to give the overall balanced redox equation.



SL 1

27. Rearrange the following in order of increasing oxidation state of Nitrogen.



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SL 3

28. Which of the following substances contains the highest oxidation state of Sulfur?



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SL 3

29. Two solutions containing the cations Ag^+ and Cu^{2+} were each added 3 drops of sodium hydroxide (NaOH) solution. Each solution formed a coloured precipitate. What would be the colour of the precipitate formed by Cu^{2+} ?

SL 1

30. Define the term **alloy**.

SL 1

31. Write the chemical formula of ozone.

SL 1

32. Name **ONE** allotrope of sulfur.

SL 1

33. Name **ONE** physical property of hydrochloric acid, HCl.

SL 1

34. Describe **TWO** physical properties of the copper (Cu) metal.

SL 2

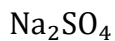
35. Describe **ONE** physical property each of molecular oxygen (O₂) and ozone (O₃)

SL 2

36. Describe how you would test for the cations Mg²⁺ and Fe²⁺ using only the sodium hydroxide (NaOH) solution and test tubes

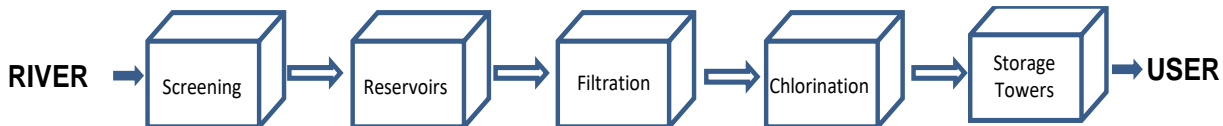
SL 2

37. You are given the three compounds below in powdered form, and your teacher asks you to test the solubility of each compound, by dissolving them in different beakers of water. What would be your predictions based on your knowledge of their solubility in water?



SL 3

38. The diagram below summarizes the steps in water purification. The 5 main steps are listed for you. Briefly explain what happens in the following steps:



Screening:

Filtration:

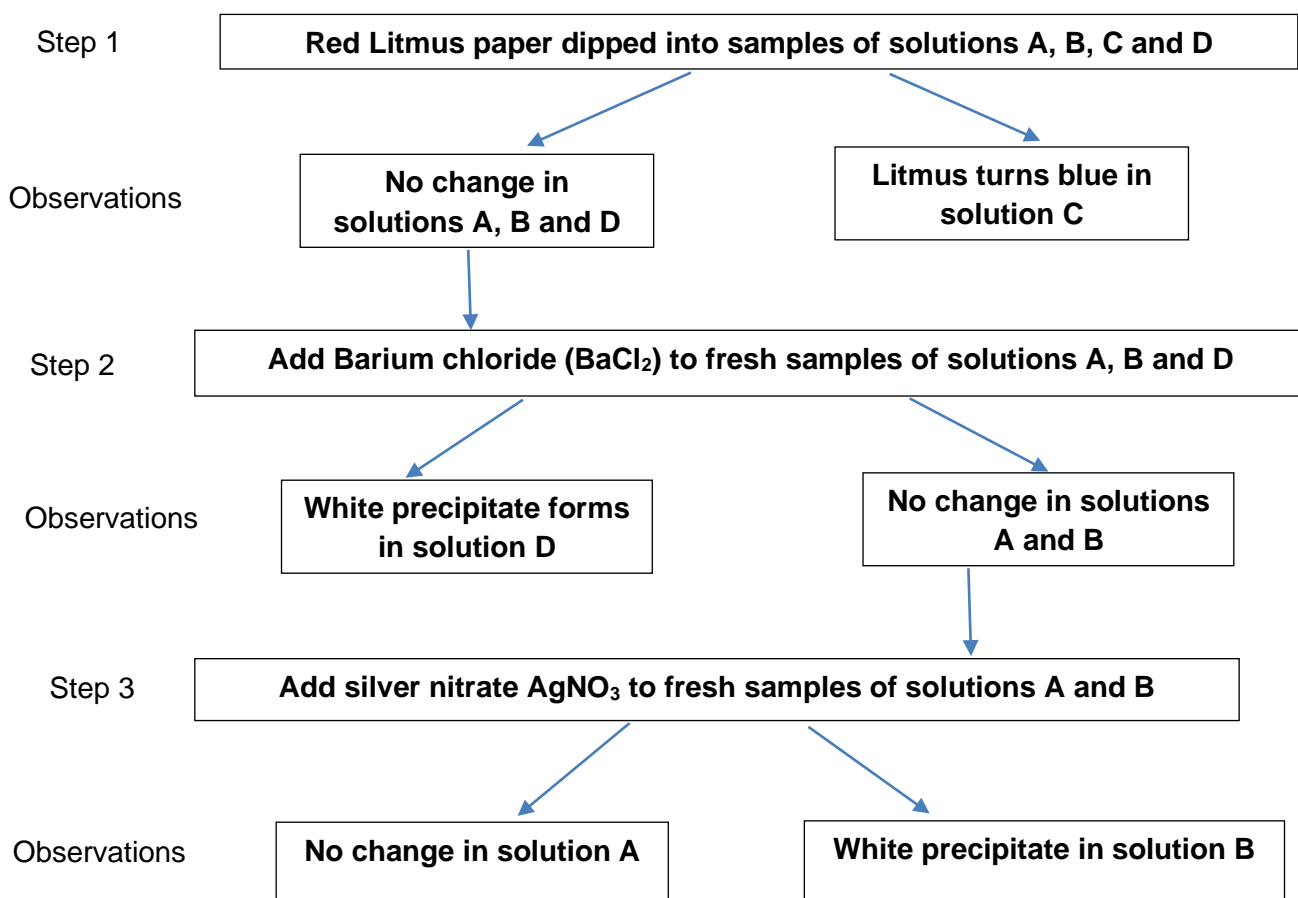
Chlorination:

SL 3

39. Explain the causes of greenhouse effect and its effect on climate.

SL 3

40. A practical investigation was carried out to identify anions in solutions A, B, C and D. The following flow chart summarizes the steps and observations of the testing procedure. The anions tested were: Cl^- ; SO_4^{2-} ; CO_3^{2-} ; NO_3^- . Identify which anion is in which test tube (of solutions A, B, C, D).



A:

B:

C:

D:

SL 4

41. Discuss the importance of the ozone layer to the earth.

SL 4

42. State the definition of the term **acid**.

SL 1

43. Define the term **amphoteric**.

SL 1

44. Describe simple tests to identify hydrochloric acid and sodium hydroxide solutions using phenolphthalein indicator.

SL 2

45. Describe any **TWO** physical properties of bases.

SL 2

46. Both hydrochloric acid (HCl), and acetic acid, (CH₃COOH), react with water to release H₃O⁺ ions. Identify which acid is the strong acid and explain the difference in their pH values.

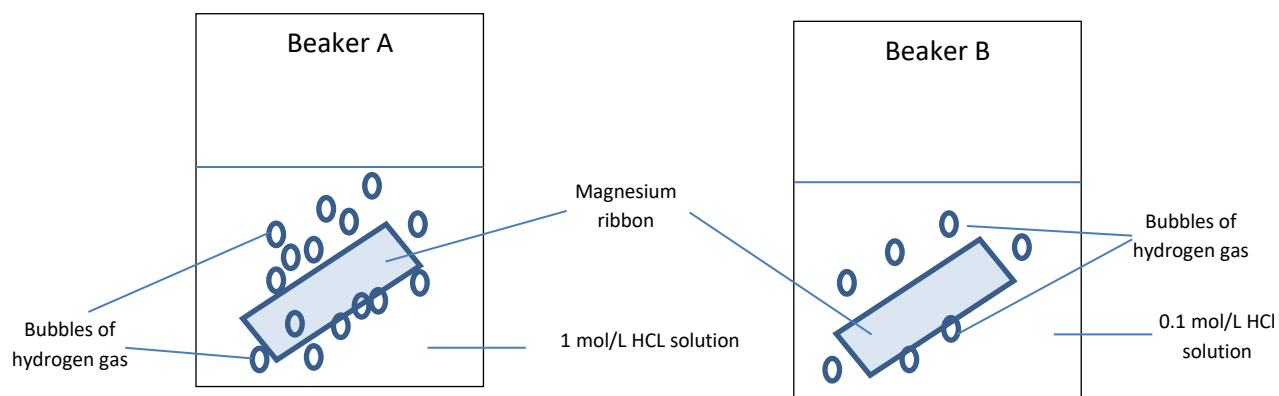
SL 3

47. Classify the following compounds as a weak base, strong base, or neutral on the pH scale.

Sodium chloride (NaCl)
Potassium hydroxide (KOH)
Ammonia (NH₃)

SL 3

48. Use the reaction set up below, to discuss how concentration of acid affects the rate of reaction.



**2 grams Magnesium ribbon in
1.0 mol/L hydrochloric acid
(HCl)**

**2 grams Magnesium ribbon in
0.1 mol/L hydrochloric acid
(HCl)**

SL 4

Periodic Table of the Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18												
1 H 1.01	2 He 4.00	3 Li 6.94	4 Be 9.01	5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18	11 Na 22.99	12 Mg 24.31	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95												
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 51.99	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.63	33 As 74.92	34 Se 78.97	35 Br 79.90	36 Kr 83.80												
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.95	43 Tc 98.91	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.6	53 I 126.90	54 Xe 131.29												
55 Cs 132.91	56 Ba 137.33	57-71	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.09	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po [208.98]	85 At 209.99	86 Rn 222.02												
87 Fr 223.02	88 Ra 226.03	89-103	104 Rf [261]	105 Db [262]	106 Sg [266]	107 Bh [264]	108 Hs [269]	109 Mt [278]	110 Ds [281]	111 Rg [280]	112 Cn [285]	113 Nh [286]	114 Fl [289]	115 Mc [289]	116 Lv [293]	117 Ts [294]	118 Og [294]												
57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm 144.91	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.06	71 Lu 174.97	89 Ac 227.03	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu 244.06	95 Am 243.06	96 Cm 247.07	97 Bk 247.07	98 Cf 251.08	99 Es [254]	100 Fm 257.10	101 Md 258.1	102 No 259.10	103 Lr [262]

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SSC CHEMISTRY

2023

(For Scorers only)

STRANDS		Weighting	Scores	Check Scorer	AED Check
STRAND 1	ATOMIC STRUCTURE AND BONDING	10			
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