STUDENT EDUCATION NUMBER									

GOVERNMENT OF SAMOA
MINISTRY OF EDUCATION, SPORTS AND CULTURE

Samoa School Certificate

CHEMISTRY

2020

QUESTION and ANSWER BOOKLET

Time allowed: 3 hours and 10 minutes

INSTRUCTIONS:

1. You have 10 minutes to read **before** you start writing.
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 for answers, 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: Periodic Table is inserted as a separate sheet.

Check that this booklet contains pages 2-19 in the correct order and that none of these pages is blank.
HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION

1. Consider the atom with the symbol $^{42}_{20}X$.

(i) What is the mass number for the atom?

_____

SL 2

(ii) How many neutrons does this atom have?

_____

2. Draw the Lewis dot diagram for the CO_2 molecule.

SL 3

3. Write the electron arrangement for the calcium ion.

_____

_____

_____

SL 1

4. P, Q and R are all different atoms.

P has some properties similar to those of Q and R.
P and Q have the same number of neutrons.
P and R have the same number of protons.

This means: *(Circle the correct answer).*

A. Q is an isotope of P but R is not.

B. R is an isotope of P but Q is not.

C. Q and R are both isotopes of P.

D. Neither Q or R is an isotope of P.

SL 1

5. Explain the physical properties of ionic substances in relation to its structure and bonding.

SL 3

6. Calculate the percentage of carbon in acetylene, C_2H_2

M(C) = 12 g/mol M(H) = 1 g/mol

SL 3

7. Calculate the amount (moles) of carbon in 88 g of propane, C_3H_8.

M(C) = 12 g/mol M(H) = 1 g/mol

SL 1

8. State the *Avogadro's constant*.

_____

SL 1

Magnesium burns in air to form magnesium oxide. The equation for the reaction is:

$$2Mg_{(s)} + O_{2(g)} \longrightarrow 2MgO_{(s)}$$

A student weighed out 2.4 g of magnesium and burned it in air.

9. Calculate the mass of magnesium oxide produced in the reaction.

M(Mg) = 24 g/mol M(O) = 16 g/mol

SL 4

10. Define the term *molar mass*.

_____

_____

SL 1

11. Calculate how many grams of NaOH is needed for preparation of 250 mL of 0.25 mol/L solution.

M(Na) = 23 g/mol M(O) = 16 g/mol M(H) = 1 g/mol

SL 2

12. List any TWO physical properties of alkanes.

_____

_____

SL 2

13. Name a functional group.

_____

SL 1

14. Discuss an important observation that would be made when propanol is warmed with methanoic acid in the presence of sulphuric acid.

_____

_____

_____

_____

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SL 4

15. Describe the process of distinguishing between alcohols.

_____

_____

_____

_____

SL 2

16. Define the term *isomerism.*

_____

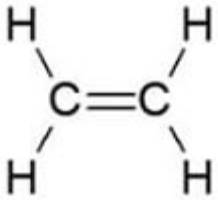
_____

_____

SL 1

For the Key List below select the names for the hydrocarbons in Number 17 to 19.

KEY LIST			
Propane	Ethene	Butanol	Propane
Ethanol	Propanoic acid	Ethanoic acid	Methane

17. 

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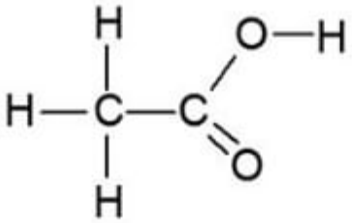
SL 1

18. 

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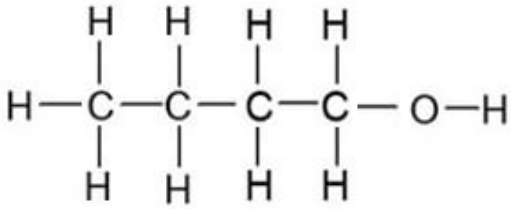
SL 1

19. 

_____

SL 1

20. Using the reactions of ethane and ethyne with chlorine, illustrate the difference between addition and substitution reactions using equations.

SL 3

21. Ethanol can be produced by the hydration of ethene.
Write a chemical reaction that shows this production.

SL 3

22. Draw the structure of a propyne molecule.

SL 1

23. List any TWO industrial uses of ethanol.

_____

_____

SL 1

24. State ONE property or chemical test you could use to distinguish between ethanoic acid and ethanol.

_____

_____

_____

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SL 3

25. The oxidation number of the nitrogen atom in HNO_3 is:
Circle the correct answer.

A. –3
B. 0
C. +3
D. +5

SL 1

26. Define the term oxidising agents.

_____

_____

_____

SL 1

27. For the reaction $Fe + Cu^{2+} \longrightarrow Fe^{2+} + Cu$, identify the oxidant.

Oxidant: _____

SL 1

28. Balance the following half-equation:

$H^+ \longrightarrow H_2$

_____

SL 1

29. Calculate the oxidation number of sulfur in sulfate ion.

SL 3

30. Name the following molecule, $K_2Cr_2O_7$

_____

SL 2

31. Define the term *reduction*.

_____

_____

_____

SL 1

32. Name ONE allotrope of sulfur.

_____

SL 1

33. List any TWO uses of chlorine.

_____

_____

_____

SL 2

34. Describe the properties of nitric acid (HNO_3).

_____

_____

_____

SL 2

35. Decide whether the following compound is soluble or not. If **insoluble**, write down the formula of the solid. If **soluble**, write the formula of the ions present in a solution of the compound.

Potassium carbonate

SL 3

Some sodium carbonate solution is added to magnesium chloride solution. Five minutes later, some dilute hydrochloric acid is added to the solution.

36. Discuss what observations you would expect to see and then write an ionic equation for the reaction.

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_____

_____

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_____

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_____

SL 4

37. Name ONE use of hydrochloric acid.

_____

SL 1

38. Define the term *alloys*.

_____

_____

SL 1

39. Name ONE allotrope of carbon.

_____

SL 1

40. List the activity series of metals in the order of how easily they are oxidized.

SL 2

41. Use your knowledge of the corrosion process to explain why cars often show sign of rusting in area where mud has collected.

SL 3

The reaction of zinc metal with dilute hydrochloric acid gives out heat.

42. Write a balanced equation for the reaction and sketch an energy diagram for the reaction. Label products and reactions on the diagram.

SL 4

43. Write the chemical formula of ozone.

_____

SL1

44. Define the term *chlorination.*

_____

_____

_____

SL 1

45. Name ONE property of the oxides.

_____

SL 1

46. Identify the colour of the $Cu(OH)_2$ precipitate.

_____

SL 1

47. Define *exothermic*.

_____

_____

SL 1

48. Which of the following is an example of an endothermic process?
(Circle the correct answer).

SL 2

A. Zinc metal reacting with dilute hydrochloric acid.

B. Steam condensing to form water.

C. Hydrogen gas burning in air.

D. Ice melting.

49. Which ONE of the following will form a basic solution?
(Circle the correct answer).

SL 1

A. NaCl

B. CH_3COOH

C. NaOH

D. H_2SO_4

50. Which of the following reactions are reversible? Give evidence to support your response. (*Circle the correct answer).*

(i) $Zn_{(s)} + Cu^{2+}_{(aq)} \rightarrow Zn^{2+}_{(aq)} + Cu_{(s)}$

(ii) $CuSO_4.5H_2O \rightarrow CuSO_{4(s)} + 5H_2O_{(l)}$

(iii) $Mg_{(s)} + 2H^{+}_{(aq)} \rightarrow Mg^{2+}_{(aq)} + H_{2(g)}$

_____

_____

_____

_____

SL 2

51. Explain the difference between H_2SO_4 and CH_3COOH.

SL 3

Dilute hydrochloric acid reacts reasonably slowly with granules of zinc metal producing hydrogen gas and zinc chloride solution.

52. Draw the apparatus you would use to prepare and collect the hydrogen gas and discuss the measurements that would be needed to determine the rate of the reaction.

SL 4

53. Complete the table below by filling in the missing information using the key list below.

Key List:

KOH HNO_3 NH_3 CH_3COOH

Strong Acid	Strong Base	Weak Acid	Weak Base

SL 3

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CHEMISTRY

2020

For scorers use only

STRANDS	Weighting	Scores	Check Scorer	Double Entry (AED)
STRAND 1: Atomic Structure and Bonding	10			
STRAND 2: Quantitative Chemistry	12			
STRAND 3: Organic Chemistry	24			
STRAND 4: Oxidation and Reduction	10			
STRAND 5: Inorganic Chemistry	28			
STRAND 6: Principles of Physical Chemistry	16			
TOTAL	**100**			