FUKIEN SECONDARY SCHOOL

S4 First Term Uniform Test (2021-2022)

Chemistry

(1 hour)

Date: 9th November 2021

Time: 10:15a.m. - 11:15a.m.

Name:	
Class:	No.:

Instructions to Students:

- 1. Write your name, class and class number on both the question paper and the answer sheets.
- 2. Answer ALL questions.
- 3. Write down all the answers on the answer sheets.
- 4. Hand in the question paper and the answer sheets at the end of the examination.
- 5. The total mark of the paper is 60.

I Multiple Choice Questions (20 marks)

1. Refer to the following table:

Element	W	Х	Y	Z
Atomic	4	Q	14	20
number	4	0	14	20

The formula of the compound formed between X and Z is likely to be

A. XZ.

B. XZ_2 .

- C. X_2Z .
- D. X₂Z₃.
- 2. Which of the following groups of ions/atoms has the same number of electrons?
 - A. K^+ and Ca^{2+}
 - B. $Cl^{-}and S$
 - C. H^+ and He
 - D. O^{2-} and Ar

S4 Chemistry

3	X and Y	are elements.	The melting	points of	of their	chlorides	are given	below:
5.	m and 1	are crements.	The menung	points	or mon	cinoriaes		0010 .

	Melting point(°C)
Chloride of X	772
Chloride of Y	-68

Which of the following statements is correct?

- A. Both X and Y are metals.
- B. The chloride of Y is a solid at room temperature.
- C. The chloride of X conducts electricity in the solid state.
- D. The chloride of Y is a covalent compound.
- 4. Which of the following electron diagrams is correct?

Α. ×× ×× ×F × × F ×

- B. $\begin{bmatrix} xx \\ X \\ X \\ xx \end{bmatrix}^{-}$
- C. X N X X N X
- D. He $\stackrel{\times}{\times} \stackrel{\times}{\times}$ He
- 5. The atomic number and mass number of element E are 8 and 17 respectively. What are the number of protons and neutrons in an atom of E?

	Number of protons	Number of neutrons
A.	8	9
B.	8	17
C.	9	8
D.	9	17

-

1 st statement	2 nd statement
Both zinc and molten sodium chloride	Both zinc and molten sodium chloride
conduct electricity.	contain mobile ions.

- A. Both statements are true and the 2nd statement is a correct explanation of the 1st statement.
- B. Both statements are true but the 2nd statement is NOT a correct explanation of the 1st statement.
- C. Only one statement is true while the other is false.
- D. Both statements are false.
- 7. Which of the following methods can be used to extract lead from lead(II) oxide?
 - A. heating lead(II) oxide in the absence of air
 - B. heating lead(II) oxide in the presence of air
 - C. heating lead(II) oxide with copper at high temperature
 - D. heating lead(II) oxide with carbon at high temperature
- 8. Metal X reacts with dilute hydrochloric acid to liberate hydrogen, but metal Y and metal Z have no reaction with the dilute acid. The oxide of metal Y decomposes on heating but the oxide of metal Z does not. Which of the following arrangements represents the order of increasing reactivity of the three metals?
 - A. X < Y < Z
 - B. Y < Z < X
 - C. X < Z < Y
 - D. Z < Y < X
- 9. In which of the following processes will lead be produced?
 - (1) the electrolysis of molten lead(II) bromide
 - (2) heating lead(II) oxide strongly
 - (3) adding magnesium to lead(II) nitrate solution
 - A. (1) only
 - B. (2) only
 - C. (1) and (3) only
 - D. (2) and (3) only

- 10. Which of the following metal oxides can be reduced to the metal when heated with carbon?
 - (1) aluminium oxide
 - (2) lead(II) oxide
 - (3) iron(III) oxide
 - A. (1) only
 - B. (2) only
 - C. (1) and (3) only
 - D. (2) and (3) only
- 11. Consider the following experiment.



During the experiment, a gas is liberated. The gas can burn at the end of the delivery tube. *X* is probably

- A. copper.
- B. lead.
- C. silver.
- D. zinc.

12. In each of the four solutions shown below, a strip of zinc is added.



Which of the following combinations is correct?

Tube	Observation
------	-------------

- A. I no change
- B. II brown coating on zinc
- C. III no change
- D. IV grey coating on zinc
- 13. Consider the following chemical equation:

 $Zn + pMnO_2 + qNH_4^{+} \rightarrow Zn^{2+} + xMn_2O_3 + yNH_3 + zH_2O$

Which of the following combinations is correct?

14. Which of the following metal oxides **CANNOT** be reduced by heating with carbon?

- (1) magnesium oxide
- (2) lead(II) oxide
- (3) iron(III) oxide
- A. (1) only
- B. (2) only
- C. (1) and (3) only

- 15. In an experiment, a piece of calcium metal was added to a beaker of water. Which of the following statements concerning the experiment is/are correct?
 - (1) The calcium metal sank to the bottom of the beaker.
 - (2) The calcium metal burnt with brick red flame.
 - (3) At the end of the experiment, an alkaline solution was formed in the beaker.
 - A. (1) only
 - B. (2) only
 - C. (1) and (3) only
 - D. (2) and (3) only

16. The formula of hydrated magnesium sulphate crystals is MgSO₄xH₂O. When 3.80g of the hydrated crystals are heated, 2.00g of anhydrous magnesium sulphate are produced. What is the value of x?

(Relative atomic mass: H=1.0, O=16.0, Mg=24.0, S=32.0)

- A. 3
- B. 4
- C. 5
- D. 6
- 17. Which of the following fertilizers contains the largest percentage by mass of nitrogen?

(Relative atomic masses: H=1.0, N=14.0, O=16.0, Na=23.0, S=32.0, Cl=35.5, K=39.0)

- A. ammonium chloride
- B. ammonium sulphate
- C. potassium nitrate
- D. sodium nitrate

18. The formula for ozone is O_{3} . If one mole of ozone contains x atoms, how many atoms will one mole of oxygen gas contain?

A.
$$\frac{x}{3}$$

B. $\frac{2x}{3}$
C. $\frac{3x}{2}$
D. $3x$

- 19. One mole of calcium bromide contains
 - A. 1 mole of molecules.
 - B. 2 moles of cations.
 - C. 2 moles of anions.
 - D. 3 moles of atoms.
- 20. The compound X₂S contains 58.9 % of X by mass. What is the relative atomic mass of X?

(Relative atomic mass: S = 32.1)

- A. 11.5
- B. 23.0
- C. 39.0
- D. 46.0

II Structured Questions (40 marks)

1. Lithium is a group I element in the Periodic Table. It occurs naturally in two isotopic forms. The relative abundance of the each of these isotopes is shown in the table below:

Isotope	⁶ Li	⁷ Li
Relative abundance(%)	7.4	92.6

(a) What is the meaning of the term 'isotope'?

(2 marks)

(b) Calculate the relative atomic mass of lithium.

(4 marks)

2. Na₂O, MgO, SiO₂ and SO₂ are oxides of Period 3 elements in the Periodic Table. Discuss how the melting pints of these oxides are related to the bonding and structure.

(8 marks)

Metal	Х	Y	Z
Atomic number	12	20	—
Action of cold	No apparent	A colourless gas	No apparent
water	change	slowly evolves	Change
Action of 0.1 M	A colourless gas		No apparent
hydrochloric acid	evolves		Change

3. The table below lists some information about three metals X, Y and Z.

(a) To which group in the Periodic Table does Y belong?

(1 mark)

- (b) (i) Write an equation for the reaction between X and 0.1M hydrochloric acid.(An ionic equation will NOT be accepted for this question.)
 - (ii) Draw electronic structures for the TWO products formed in (i) above, showing electrons in the outermost shell ONLY.

(4 marks)

(c) What would be observed when Y is added to 0.1M hydrochloric acid?

(1 mark)

(d) Based on the results of the reaction given in the above table, arrange the three metals in descending order of reactivity. Explain your answer.

(4 marks)

- 4. Rubidium(Rb) and potassium belong to the same group in the Periodic Table.
- The relative atomic mass of rubidium is larger than that of potassium.
- (a) Explain whether rubidium is more reactive than potassium.
- (b) Write a chemical equation for the reaction between rubidium and water.(State symbols should be given.)

(c) Suggest how rubidium can be stored safely in the laboratory.

(1 mark)

(2 marks)

(1 mark)

(d) Suggest ONE safety precaution for handling rubidium in the laboratory.

(1 mark)

5. The following experiment set-up was used to determine the empirical formula of an oxide of copper.



In the experiment, 8.58 g of an oxide of copper, after complete reaction, produced 7.62g of copper. (Relative atomic masses : Cu=63.5, O=16.0)

(a) Deduce the empirical formula of the oxide of copper.

(6 marks)

(b) Write an equation for the reaction that occurred in the combustion tube. (State symbols should be given.)

(2 marks)

(c) State ONE potential hazard associated with this experiment and suggest a safety precaution for this hazard.

(2 marks)

(d) At the end of the reaction, heating was stopped. However, it was necessary to continue passing the town gas through the combustion tube until the tube had cooled down. Explain why.

(1 mark)

End of paper

0	2 1	не 4.0	10	Ne	20.2	18	Ar	40.0	36	Kr	83.8	54	Xe	131.3	86	Rn	(222)									
		ΠΛ	6	H	0.61	17	C	35.5	35	Br	6.67	53	Ι	126.9	35	At	(210)									
		Ν	5	0	6.0	6]	S	2.1	4	Se	0.6	2	Te	27.6	4 8	$\mathbf{P_0}$	209) (Lu	75.0	03	Lr	260)
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		,	2		14	15		31	33	4	74	51		7 12	83	_	2 20				70) 17	10	-	(2)
		VI	9	C	12.0	14	S	28.1	32	g	72.6	50	Sn	118.	82	Pb	207.2				69	Tm	168.9	101	Md	(258)
		Ш	5	B	10.8	13	AI	27.0	31	Ga	69.7	49	In	114.8	81	II	204.4				89	Er	167.3	100	Fm	(257)
									30	Zn	65.4	48	Cd	112.4	80	Hg	200.6				67	Ho	164.9	66	Es	(252)
									29	Си	63.5	47	Ag	107.9	79	Au	197.0				99	Dy	162.5	98	Cf	(251)
						「質量			28	Ni	58.7	46	Pd	106.4	78	Pt	195.1				65	$\mathbf{T}\mathbf{b}$	158.9	97	Bk	(247)
						相對原子			27	Co	58.9	45	Rh	102.9	77	Ir	192.2				64	Gd	157.3	96	Cm	(247)
ber 原子)						nic mass			26	Fe	55.8	44	Ru	101.1	92	0s	190.2				63	Eu	152.0	95	Am	(243)
mic numb						ative ator			25	Mn	54.9	43	Tc	(98)	75	Re	186.2				62	Sm	150.4	94	Pu	(244)
ato			_	/	/	, rel			24	\mathbf{Cr}	52.0	42	M_0	95.9	74	M	183.9				61	Pm	(145)	93	Np	(237)
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			-						22	Ti	47.9	40	\mathbf{Zr}	91.2	72	Hf	178.5	104	Rf	(261)	59	Pr	140.9	91	Pa	(231)
									21	Sc	45.0	39	Υ	88.9	57 *	La	138.9	89 **	Ac	(227)	58	Ce	140.1	90	$\mathbf{T}\mathbf{h}$	232.0
X		Π	4	Be	9.0	12	Mg	24.3	20	Ca	40.1	38	Sr [.]	87.6	56	Ba	137.3	88	Ra	(226)	*			*		
		Ι	3	Li	6.9	11	Na	23.0	19	K	39.1	37	Rb	85.5	55	C	132.9	87	Fr	(223)						

PERIODIC TABLE 周期表

GROUP 族