FUKIEN SECONDARY SCHOOL

S4 First Term Uniform Test (2020-2021)

Chemistry

(1 hour)

Date: 21st October 2020 Name:_____

Time: 10:30a.m. - 11:30a.m. 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. Which of the following elements does NOT conduct electricity?
   A. Bromine
   B. Graphite
   C. Mercury
   D. Gold

2. Consider the following properties of three elements, X, Y and Z.

Element	Melting point (°C)	Boiling point (°C)	Electrical conductivity
X	959	2 850	good conductor
Y	–7	58	non-conductor
Z	–210	–196	non-conductor

Which of the following statements are correct?

(1) Element X is a metal.
(2) Element Y is a non-metal.
(3) Element Z is a gas at room temperature and pressure.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

3. Consider the elements in the second period of the periodic table, from lithium to fluorine. Which of the following statements is correct?
   A. They show a gradual increase in atomic size.
   B. They show a gradual decrease in melting point.
   C. They show a gradual increase in the number of occupied electron shells in their atoms.
   D. They show a gradual change from having metallic property to having non-metallic property.

4. Elements in the same group of the periodic table
   A. have the same electronic arrangement in their atoms.
   B. have similar chemical properties.
   C. have the same physical properties.
   D. have the same number of occupied electron shells in their atoms.

5. In which of the following compounds do both ions have the same electronic arrangement as an argon atom?
   A. Calcium sulphide
   B. Magnesium iodide
   C. Potassium fluoride
   D. Sodium chloride

6. Which of the following statements about metallic bonding is / are correct?
   (1) This type of bonding involves metal atoms sharing their outermost shell electrons.
   (2) This type of bonding involves metal ions attracted by mobile electrons.
   (3) This type of bonding exists in tungsten.
   A. (1) only
   B. (2) only
   C. (1) and (3) only
   D. (2) and (3) only

7. Which of the following statements concerning a carbon dioxide molecule is / are correct?
   (1) The number of bonding electrons contributed by the carbon atom in the molecule is 2.
   (2) The number of bonding electrons contributed by each oxygen atom in the molecule is 2.
   (3) The total number of electrons in the molecule is 16.
   A. (1) only
   B. (2) only
   C. (1) and (3) only
   D. (2) and (3) only

8. Consider the following table.

Element	Atomic number	Relative atomic mass
X	15	31.0
Y	17	35.5

   The relative molecular mass of the compound formed between X and Y is
   A. 97.5.
   B. 102.0.
   C. 137.5.
   D. 173.0.

9. Which of the following substances have giant covalent structures?
   (1) Dry ice
   (2) Diamond
   (3) Silicon
   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

10. Consider the information listed below.

	Substance	Attraction between particles in substance
(1)	Argon	van der Waals' forces
(2)	Quartz	covalent bond
(3)	Silver	metallic bond

Which of the following combinations is correct?

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

11. Aluminium is used to make foils in food packaging because

(1) it is impermeable to gases.
(2) it is non-poisonous.
(3) it is the most abundant metallic element in the Earth's crust.

Which of the above statements are correct?

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

12. Which of the following statements concerning magnesium is / are correct?

(1) It exists as a sulphide in magnesite.
(2) It can be obtained from sea water.
(3) It can be extracted by heating its ore with carbon.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

13. Three metals, X, Y and Z were discovered in A.D.1807, B.C. 3500 and A.D. 1746 respectively. The order of increasing ease of extraction is probably

A. X, Y, Z.
B. X, Z, Y.
C. Y, X, Z.
D. Y, Z, X.

14. Which of the following metals was NOT discovered in ancient times?

A. Beryllium
B. Copper
C. Gold
D. Tin

15. Which of the following statements concerning the recycling of metals is INCORRECT?
    A. Recycling used metals consumes less energy than extracting metals from their ores.
    B. It is difficult to sort out metals from household waste for recycling.
    C. All products made by recycled metals have bad quality.
    D. Recycling is important because metal resources are limited.

16. Which of the following pairs of chemicals do NOT give hydrogen when mixed?
    A. Aluminium and steam
    B. Calcium and water
    C. Silver and dilute hydrochloric acid
    D. Zinc and dilute sulphuric acid

17. Different metals are dropped into water or dilute hydrochloric acid. Assuming that the experimental conditions are the same, which of the following comparisons concerning the initial rates of hydrogen formation is correct?

	Initial rate of hydrogen formation		Initial rate of hydrogen formation
A.	Ca and H_2O	>	Ba and HCl
B.	Cs and H_2O	>	Ca and H_2O
C.	Na and H_2O	>	Cs and H_2O
D.	Zn and HCl	>	Na and H_2O

18. In which of the following cases will a reaction take place?
    (1) Mixing aluminium with cold water
    (2) Mixing iron with dilute hydrochloric acid
    (3) Mixing copper(II) oxide with carbon
    A. (1) only
    B. (2) only
    C. (1) and (3) only
    D. (2) and (3) only

19. Consider the following chemical equation:
    $Na_2S_2O_3(aq) + 2HCl(aq) \rightarrow 2NaCl(x) + SO_2(aq) + H_2O(y) + S(z)$
    Which of the following combinations is correct?

	x	y	z
A.	l	aq	s
B.	l	aq	aq
C.	aq	l	aq
D.	aq	l	s

20. A copper wire is put into silver nitrate solution in a test tube. What will be observed after a few minutes?

	Colour change of solution	Copper
A.	Blue to pale blue	A brown solid formed on the copper surface
B.	Blue to pale blue	A grey solid formed on the copper surface
C.	Remains unchanged	A solid with metallic lustre formed on top of the solution
D.	Colourless to blue	A grey solid formed on the copper surface

II Structured questions (40 marks)

1. Boron occurs naturally in two isotopes: ^{10}B and ^{11}B.

(a) The relative atomic mass of boron is 10.8.

(i) What is the meaning of the term 'relative atomic mass'?

(1 mark)

(ii) Calculate the relative abundance of ^{10}B in boron.

(2 marks)

(b) $^{10}BF_3$ and $^{11}BF_3$ are compounds formed respectively from the two isotopes of boron with fluorine. $^{10}BF_3$ reacts with water to give steamy fumes. State, with explanation, the expected observation when $^{11}BF_3$ reacts with water.

(1 mark)

(c) A solid is formed when gaseous BF_3 and NH_3 react.

(i) In terms of the electrons involved, explain how the bond between BF_3 and NH_3 molecules is formed.

(2 marks)

(ii) Name the type of bond formed in the reaction.

(1 mark)

(d) One form of boron nitride is as hard as diamond. The table gives information of some properties of two boron compounds.

Compound	Melting point (°C)	Electrical conductivity
Boron nitride	3 300	non-conductor
Boron trichloride	–107	non-conductor

(i) What type of structure does boron nitride have? Explain your answer.

(2 marks)

(ii) What type of structure does boron trichloride have? Explain your answer.

(2 marks)

2. The atomic numbers of five elements are shown in the following table.

Element	A	B	C	D	E
Atomic number	7	9	11	17	18

(a) Which TWO elements show similar chemical properties? Explain your answer.

(2 marks)

(b) (i) Compound X is formed by elements A and C. Draw an electron diagram of X, showing electrons in the *outermost shells* only.

(1 mark)

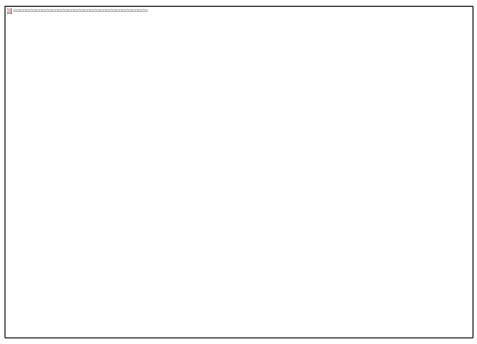
(ii) Compound Y is formed by elements B and D. Draw an electron diagram of Y, showing electrons in the *outermost shells* only.

(1 mark)

(iii) Explain whether X or Y has a higher melting point in terms of the forces between particles.

(3 marks)

(c) Element E is a gas at room temperature and pressure. It is used to fill the electric light bulb shown below. When electricity is passed through the tungsten filament, it gets very hot and gives out light.



(i) What reaction would take place if the hot tungsten was surrounded by air?

(1 mark)

(ii) Suggest why element E is used to fill the light bulb. Explain your answer in terms of the electronic structure of an atom of E.

(2 marks)

3. For each of the following experiments, state ONE observable change and write a chemical equation for the reaction involved.

   (a) Zinc is put into dilute hydrochloric acid.

   (2 marks)

   (b) Sodium is heated in a Bunsen flame.

   (2 marks)

   (c) Copper(II) oxide is heated with carbon powder.

   (2 marks)

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

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

   (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.

   (1 mark)

   (ii) Draw electronic structures for the TWO products formed in (i) above, showing electrons in the *outermost shells* only.

   (2 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.

   (3 marks)

5. Calcium reacts with cold water to give a colourless gas.

   (a) Write a chemical equation for the reaction.

   (1 mark)

   (b) In a practical lesson, a student added a few pieces of calcium granules into a beaker of cold water. Draw a labelled diagram to show how the student could collect the gas produced.

   (2 marks)

   (c) Potassium also reacts with cold water. State TWO differences in observation when potassium and calcium are added separately to cold water.

   (2 marks)

End of paper

PERIODIC TABLE 周期表

GROUP 族

atomic number 原子序

relative atomic mass 相對原子質量

I	II											III	IV	V	VI	VII	0
					1 **H** 1.0												2 **He** 4.0
3 **Li** 6.9	4 **Be** 9.0											5 **B** 10.8	6 **C** 12.0	7 **N** 14.0	8 **O** 16.0	9 **F** 19.0	10 **Ne** 20.2
11 **Na** 23.0	12 **Mg** 24.3											13 **Al** 27.0	14 **Si** 28.1	15 **P** 31.0	16 **S** 32.1	17 **Cl** 35.5	18 **Ar** 40.0
19 **K** 39.1	20 **Ca** 40.1	21 **Sc** 45.0	22 **Ti** 47.9	23 **V** 50.9	24 **Cr** 52.0	25 **Mn** 54.9	26 **Fe** 55.8	27 **Co** 58.9	28 **Ni** 58.7	29 **Cu** 63.5	30 **Zn** 65.4	31 **Ga** 69.7	32 **Ge** 72.6	33 **As** 74.9	34 **Se** 79.0	35 **Br** 79.9	36 **Kr** 83.8
37 **Rb** 85.5	38 **Sr** 87.6	39 **Y** 88.9	40 **Zr** 91.2	41 **Nb** 92.9	42 **Mo** 95.9	43 **Tc** (98)	44 **Ru** 101.1	45 **Rh** 102.9	46 **Pd** 106.4	47 **Ag** 107.9	48 **Cd** 112.4	49 **In** 114.8	50 **Sn** 118.7	51 **Sb** 121.8	52 **Te** 127.6	53 **I** 126.9	54 **Xe** 131.3
55 **Cs** 132.9	56 **Ba** 137.3	57 * **La** 138.9	72 **Hf** 178.5	73 **Ta** 180.9	74 **W** 183.9	75 **Re** 186.2	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 195.1	79 **Au** 197.0	80 **Hg** 200.6	81 **Tl** 204.4	82 **Pb** 207.2	83 **Bi** 209.0	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** (226)	89 ** **Ac** (227)	104 **Rf** (261)	105 **Db** (262)													

*	58 **Ce** 140.1	59 **Pr** 140.9	60 **Nd** 144.2	61 **Pm** (145)	62 **Sm** 150.4	63 **Eu** 152.0	64 **Gd** 157.3	65 **Tb** 158.9	66 **Dy** 162.5	67 **Ho** 164.9	68 **Er** 167.3	69 **Tm** 168.9	70 **Yb** 173.0	71 **Lu** 175.0
**	90 **Th** 232.0	91 **Pa** (231)	92 **U** 238.0	93 **Np** (237)	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (260)

FUKIEN SECONDARY SCHOOL

S4 First Term Uniform Test (2020-2021)

Chemistry

(1 hour)

Answer Sheets

Date: 21st October 2020 Name:_____

Time: 10:30a.m. - 11:30a.m. Class: _____ No.: _____

I. Multiple Choice Questions (20 marks)

Please put a tick in the appropriate box below.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A																				
B																				
C																				
D																				

II. Structured Questions (40 marks)

End of Answer Sheets