FUKIEN SECONDARY SCHOOL

S3 First Term Uniform Test (2021-2022)

Chemistry

(45 minutes)

Date: 12th November 2021 Name:_____

Time: 9:45a.m. - 10:30a.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 70.

I. Multiple Choice Questions (20 marks)

1. Which of the following elements is a semi-metal?
   - A. Beryllium
   - B. Boron
   - C. Phosphorus
   - D. Chlorine

2. Which of the following statements about metals is correct?
   - A. They are either gases or liquids at room conditions.
   - B. They are poor conductors of electricity.
   - C. They are poor conductors of heat.
   - D. They are malleable.

3. Which of the following statements about subatomic particles is INCORRECT?
   - A. Neutrons are electrically neutral.
   - B. A proton and a neutron have about the same mass.
   - C. All atoms contain protons, neutrons and electrons.
   - D. The mass of an atom is concentrated at the nucleus.

4. Which of the following statements about the structure of an atom is INCORRECT?
   - A. The nucleus is composed of electrons and protons.
   - B. Most of the space in an atom is empty.
   - C. Neutrons and protons are much heavier than electrons.
   - D. Electrons move around the nucleus at a high speed.

5. The atomic number and mass number of an element *L* are 15 and 32 respectively. The atom has
   A. 17 electrons, 17 protons and 15 neutrons.
   B. 15 electrons, 17 protons and 15 neutrons.
   C. 17 electrons, 15 protons and 17 neutrons.
   D. 15 electrons, 15 protons and 17 neutrons.

6. The atomic symbol of a sulphur atom is $^{33}_{16}S$. Which of the following combinations is correct?

	Number of neutrons	Number of protons	Number of electrons
A.	15	16	17
B.	15	15	16
C.	17	16	16
D.	18	17	17

7. Which of the following statements about a ^{1}H atom and a ^{2}H atom are correct?
   (1) They have the same number of protons.
   (2) They have the same number of electrons.
   (3) They have the same chemical properties.
   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

8. Which of the following statements about a ^{12}C atom and a ^{13}C atom is/are correct?
   (1) They have the same number of electrons.
   (2) They have different numbers of protons.
   (3) Both of them burn completely in oxygen to give carbon dioxide.
   A. (1) only
   B. (2) only
   C. (1) and (3) only
   D. (2) and (3) only

9. Chlorine consists of two isotopes: $^{35}_{17}\mathrm{Cl}$ and $^{37}_{17}\mathrm{Cl}$. The relative atomic mass of chlorine is 35.5.

Which of the following statements are correct?

(1) The relative abundances of the two isotopes are both 50%.
(2) The two isotopes have different numbers of neutrons.
(3) The two isotopes have the same number of protons.

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

10. Element *Y* has three isotopes. The number of protons, number of neutrons and the relative abundance of the three isotopes are shown in the following table:

Number of protons	**Number of neutrons**	**Relative abundance (%)**
12	12	78.6
12	13	10.1
12	14	11.3

What is the relative atomic mass of *Y*?

A. 12.0
B. 12.2
C. 24.0
D. 24.3

11. An element *X* has three isotopes: ^{24}X, ^{25}X and ^{26}X. It is known that the relative abundances of ^{25}X and ^{26}X are 10.00% and 11.01% respectively. What is the relative atomic mass of *X* (correct to 2 decimal places)?

A. 24.30
B. 24.32
C. 24.33
D. 24.34

12. Which of the following statements concerning a $_{7}\mathrm{N}$ atom and an $_{8}\mathrm{O}$ atom is correct?

A. They have the same number of occupied electron shells.
B. They have the same number of neutrons.
C. They have the same number of protons.
D. They have the same number of electrons.

13. Which of the following pairs of elements has/have the same number of occupied electron shells in their atoms?

(1) Aluminium and silicon
(2) Silicon and potassium
(3) Boron and oxygen

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

14. The electronic arrangement of an element ${}^{31}_{16}Y$ is

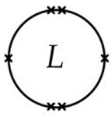
A. 15, 31.
B. 2, 8, 5.
C. 2, 8, 6.
D. 2, 8, 18, 3.

15. Which of the following statements concerning carbon are correct?

(1) The electronic arrangement of carbon is 2, 4.
(2) The relative atomic mass of carbon is exactly 12.
(3) It has six protons.

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

16. The electron diagram of an atom of element *L* is shown below (only electrons in the outermost shell are shown):



The atomic number of *L* is probably

A. 14.
B. 16.
C. 18.
D. 20.

17. The following table shows the number of neutrons, number of electrons and the mass number of four atoms (A, B, C and D).

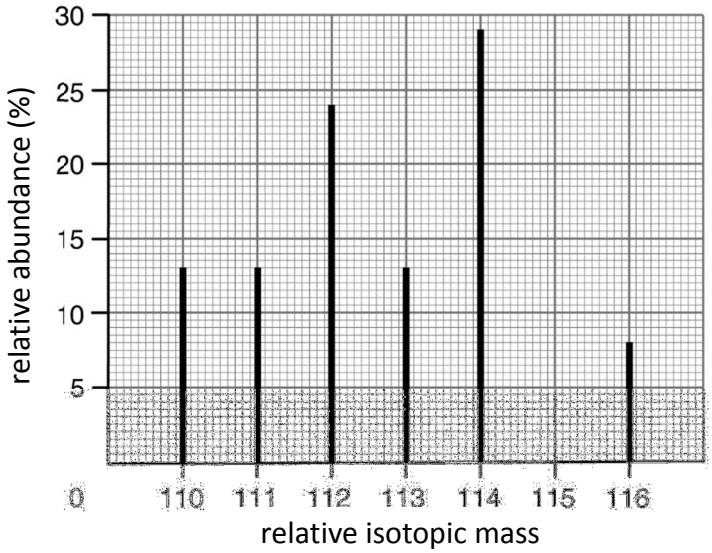
Atom	Number of neutrons	Number of electrons	Mass number
A	8	8	
B	10		20
C		9	19
D	9		17

(The letters A, B, C and D are NOT atomic symbols.)

Which of the following pairs of atoms are isotopes?

A. C and D
B. B and C
C. A and D
D. A and B

18. Element *A* has six isotopes, ^{110}A, ^{111}A, ^{112}A, ^{113}A, ^{114}A and ^{116}A. The graph below shows the relative abundance of the isotopes.



What is the relative atomic mass of *A*?

A. 112.6
B. 112.7
C. 112.8
D. 113.8

19. Which of the following pairs of elements would have the same number of outermost shell electrons?

A. ${}^{12}_{5}X$ and ${}^{32}_{16}Y$

B. ${}^{7}_{3}X$ and ${}^{16}_{8}Y$

C. ${}^{10}_{5}X$ and ${}^{25}_{13}Y$

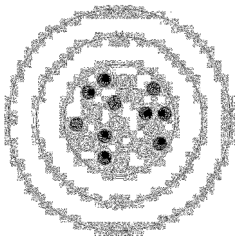
D. ${}^{10}_{5}X$ and ${}^{35}_{17}Y$

20. Rhenium, which has the relative atomic mass of 186.2, has two naturally occurring isotopes, ^{185}Re and ^{187}Re. What is the ratio of ^{185}Re to ^{187}Re in natural rhenium?

A. 1 : 2
B. 2 : 1
C. 2 : 3
D. 3 : 2

II. Structured Questions (50 marks)

1. The diagram below shows the structure of an atom of element Y. The crosses, black dots and white dots represent three different kinds of subatomic particles.



(a) (i) What subatomic particle is represented by the white dot? (1 mark)

(ii) State the charge of the white dot. (1 mark)

(b) Determine the atomic number and the mass number of Y. (2 marks)

(c) Hence, write the full atomic symbol of Y. (1 mark)

2. Element *Y* has two isotopes, $^{63}_{30}Y$ and $^{66}_{30}Y$.

(a) Determine the relative isotopic mass of $^{63}_{30}Y$. (1 mark)

(b) If the percentage abundances of $^{63}_{30}Y$ and $^{66}_{30}Y$ are 45% and 55% respectively, calculate the relative atomic mass of *Y*. (3 marks)

(c) A student stated that both isotopes of *Y* have the same physical properties as they belong to the same element. Comment on the statement. (2 marks)

(d) Explain why the two isotopes have the same chemical properties. (2 marks)

3. Neon exists in three isotopic forms, ^{20}Ne, ^{21}Ne and ^{22}Ne, with relative abundance of 90.52%, 0.31% and 9.17% respectively.

(a) State the meaning of the term 'isotopes'. (2 marks)

(b) Calculate the relative atomic mass of Neon. (3 marks)

(c) ^{64}Zn reacts with steam to give a colourless gas.

(i) Suggest a test to show that the gas is hydrogen. (2 marks)

(ii) State and explain what would happen when ^{66}Zn reacts with steam. (3 marks)

4. The atomic number and mass number of a sodium atom are 11 and 23 respectively.

(a) What is meant by 'atomic number' of an atom? (1 mark)

(b) Write the full atomic symbol of a sodium atom. (1 mark)

(c) Draw an electron diagram to represent a sodium atom. (2 marks)

(d) Potassium is an element below sodium in the Periodic Table. Write the electronic arrangement of potassium. (1 mark)

5. Gallium (Ga) is a metal.

(a) ^{69}Ga and ^{71}Ga are the two naturally occurring isotopes of gallium.

(i) Write down the number of protons, number of electrons and number of neutrons of ^{69}Ga. (3 marks)

(ii) Given that the relative atomic mass of Ga is 69.7. Calculate the relative abundance of ^{71}Ga. (3 marks)

(b) Write down two properties of metals and non-metals respectively. (4 marks)

6. Write the electronic arrangements and draw electron diagrams for the following atoms:

(a) Sulphur (3 marks)

(b) Lithium (3 marks)

(c) Silicon (3 marks)

(d) Phosphorus (3 marks)

End of paper

PERIODIC TABLE 週期表

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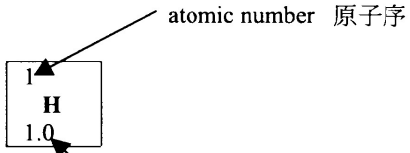

I	II											III	IV	V	VI	VII	0
																	2 **He** 4.0
3 **Li** 6.9	4 **Be** 9.0											5 **B** 10.8	6 **C** 12.0	7 **N** 14.0	8 **O** 16.0	9 **F** 19.0	10 **Ne** 20.2
11 **Na** 23.0	12 **Mg** 24.3											13 **Al** 27.0	14 **Si** 28.1	15 **P** 31.0	16 **S** 32.1	17 **Cl** 35.5	18 **Ar** 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)