FKS F3 Chem Final 2024-2025

S3 Final Examination (2024-2025)

Chemistry

(1 hour)

Date: 13th June 2025 Name: _____

Time: 8:30a.m. - 9:30a.m. Class: _____ No.: _____

Instructions to students:

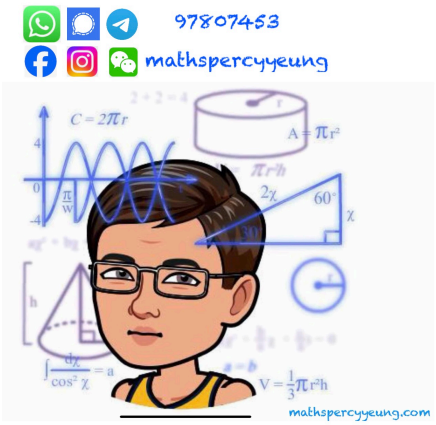
1. Write your name, class and class number on both the question paper and the answer sheets.
2. Answer ALL questions.
3. Write down all the answers on the answer sheets.
4. Hand in the question paper and the answer sheets at the end of the examination.
5. The total mark of the paper is 90.

I. Multiple Choice Questions (20 marks)

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

2. An isotope of mercury, $^{208}_{80}Hg$, was discovered by a Chinese scientist. How many neutrons are there in an atom of this isotope?
   A. 80
   B. 128
   C. 208
   D. 288

3. Which of the following pairs of particles are isotopes?
   A. SO_2 and SO_3
   B. O_2 and O_3
   C. $^{73}_{31}Ga$ and $^{73}_{32}Ge$
   D. $^{63}_{29}Cu$ and $^{65}_{29}Cu$



4. Consider the following information about three particles *P*, *Q* and *R*.

Particle	Number of protons	Number of neutrons	Number of electrons
P	18	22	18
Q	19	20	18
R	19	22	18

Which of the following statements concerning these three particles is/are correct?

(1) *P* has the smallest mass.
(2) *Q* is a charged particle.
(3) *P* and *R* are derived from the same element.

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

5. The relative atomic masses of elements are seldom whole numbers because

A. atoms of the same element have different atomic numbers.
B. atoms of the same element have different masses.
C. atoms of the same element have different numbers of electrons.
D. atoms of some elements can form ions.

6. Chlorine has two naturally occurring isotopes, $^{35}_{17}Cl$ and $^{37}_{17}Cl$. 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 atoms of the two isotopes have different numbers of neutrons.
(3) The atoms of the two isotopes have the same electronic arrangement.

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

7. Element *Y* has three naturally occurring isotopes. The number of protons, number of neutrons and the relative abundances of the three isotopes are shown in the following table.

	Number of protons	**Number of neutrons**	**Relative abundance / %**
Isotope 1	10	10	90.48
Isotope 2	10	11	0.27
Isotope 3	10	12	9.25

What is the relative atomic mass of *Y*?

A. 10.0
B. 10.2
C. 20.0
D. 20.2

8. Which of the following pairs of elements has/have the same number of outermost shell electrons in their atoms?

(1) Sodium and lithium
(2) Calcium and potassium
(3) Oxygen and argon

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

9. Which of the following statements concerning metals and non-metals is correct?

A. All metals are hard.
B. All metals are good thermal conductors.
C. All non-metals are soft.
D. All non-metals are electrical insulators.

10. Which of the following statements concerning an atom ${}^{27}_{13}X$ is correct?

A. The number of protons and the number of neutrons are the same.
B. The relative isotopic mass of ${}^{27}_{13}X$ is 13.
C. *X* is placed in Group III of the Periodic Table.
D. The atom has two occupied electron shells.

11. Strontium is an element below calcium in the Periodic Table. Which of the following statements concerning strontium are correct?
    (1) It reacts with oxygen to form an ionic compound.
    (2) It reacts with water less vigorously than calcium does.
    (3) It is a solid 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)

12. *X* and *Y* are two noble gases in the Periodic Table. If the number of protons in *X* is *a*, the number of protons in *Y* could be
    A. $a - 2$.
    B. $a + 8$.
    C. $a + 10$.
    D. $a - 16$.

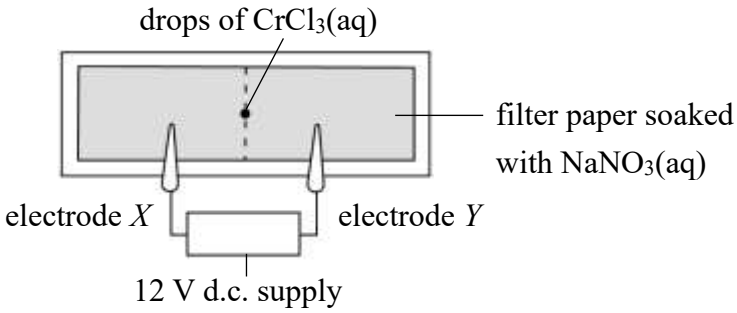
13. Which of the following statements about ionic bonds and metallic bonds are correct?
    (1) They are electrostatic attraction between charged particles.
    (2) They are non-directional.
    (3) Their formations involve the transfer of electrons.
    A. (1) and (2) only
    B. (1) and (3) only
    C. (2) and (3) only
    D. (1), (2) and (3)

14. Which of the following combinations is correct?

	Name	Formula
A.	Magnesium nitrate	$MgNO_3$
B.	Aluminium oxide	Al_2O_3
C.	Ammonium chloride	NH_3Cl
D.	Sodium carbonate	$NaCO_3$

15. Ionic compound *Y* has the formula L_2X, where *L* and *X* represent the cation and anion respectively. If *L* and *X* have the same electronic arrangement, *Y* may be
    A. dichlorine monoxide.
    B. sodium sulphide.
    C. potassium sulphide.
    D. magnesium oxide.

16. Consider the set-up shown in the diagram below.



When the circuit is closed for some time, a coloured spot moves towards electrode *X*. Which of the following statements concerning the experiment are correct?

(1) The filter paper is soaked with $NaNO_3$(aq) to increase its electrical conductivity.
(2) The coloured spot is green in colour.
(3) Electrode *X* is the negative electrode.

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

17. The melting points of some chlorides are given in the table below.

Chloride	NaCl	$SiCl_4$	PCl_3
Melting point / °C	801	–70	–92

Which of the following can be deduced from the above data?

(1) NaCl cannot conduct electricity at 800°C.
(2) $SiCl_4$ is a covalent compound with a simple molecular structure.
(3) PCl_3 is a covalent compound with a giant covalent structure.

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

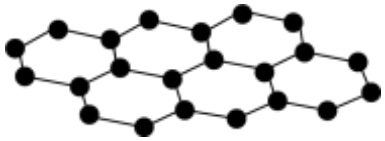
18. *X*, *Y* and *Z* are three elements and the properties of their chlorides are given below.

	Melting point / °C	**Electrical conductivity in the molten state**
Chloride of *X*	4	Poor
Chloride of *Y*	873	Good
Chloride of *Z*	677	Poor

Which of the following statements must be correct?

A. The chloride of *X* is a liquid at room temperature.
B. The chlorides of *Y* and *Z* have the same type of structure.
C. The chloride of *Y* conducts electricity in aqueous solution.
D. *X* is not a metal.

19. Graphene is a single layer of graphite. A part of the structure of graphene is shown below. Each black dot represents a carbon atom.



Which of the following statements concerning graphene is/are correct?

(1) It is soluble in water.
(2) It is a strong material.
(3) It conducts electricity due to the presence of delocalized electrons.

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

20. What types of bonding are present in ammonium carbonate?

(1) Covalent
(2) Dative covalent
(3) Ionic

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

II. Structured Questions (70 marks)

1. Iron has four common isotopes, $^{54}_{26}Fe$, $^{56}_{26}Fe$, $^{57}_{26}Fe$ and $^{58}_{26}Fe$.
   (a) Define the term 'isotopes'. (1 mark)
   (b) Given that the relative atomic mass of iron is 55.91 and the relative abundances of $^{54}_{26}Fe$ and $^{56}_{26}Fe$ are 5.85% and 91.75% respectively. Calculate the relative abundance of $^{57}_{26}Fe$ and $^{58}_{26}Fe$ respectively. (3 marks)
   (c) Explain why the four isotopes cannot be distinguished by simple chemical tests. (1 mark)

2. Draw an electron diagram of the compound formed from each of the following pairs of elements (showing electrons in the outermost shells only).
   (a) potassium and oxygen; (2 marks)
   (b) hydrogen and sulphur; (2 marks)
   (c) sodium and hydrogen; and (2 marks)
   (d) carbon and chlorine. (2 marks)

3. Complete the following table on the answer sheet.

	Cation	Anion	Name of the compound	Formula of the compound	Colour of the solution compound
(a)				$CuSO_4$	
(b)			Calcium hydroxide		colourless
(c)				$Na_2Cr_2O_7$	
(d)	Fe^{2+}	NO_3^-			

(14 marks)

4. Find the relative molecular mass or formula mass for each of the following substances.
   (a) NaOH;
   (b) $C_6H_{12}O_6$;
   (c) $CuSO_4 \bullet 5H_2O$; and
   (d) $(NH_4)_2SO_4$.

(8 marks)

5. Complete the following table on the answer sheet by stating the structure (Giant covalent, giant ionic, simple molecular and giant metallic) for each substance belongs to. Also, state the type of attraction(s) (ionic bonding, covalent bonding, metallic bonding and Van der Waals' forces) exist(s) between particles. (14 marks)

	Substance	**Type of structure**	**Type of attraction(s) between particles**
e.g.	CO_2	Simple molecular	Van der Waals' forces between CO_2 molecules
			Covalent bonding between C and O atoms
(a)	KCl		
(b)	Cu		
(c)	SiO_2 (Quartz)		
(d)	N_2		

6. Some airbags in cars contain sodium azide (NaN_3).
   (a) Explain why sodium azide has a high melting point in terms of structure and bonding. (3 marks)
   (b) The azide ion has the formula N_3^-. One of the bonds is a dative covalent bond and the other one is a triple bond.
      (i) Is azide ion a simple ion or polyatomic ion? (1 mark)
      (ii) What is the meaning of a 'dative covalent bond'? (2 marks)
      (iii) Draw the electron diagram of azide ion N_3^-, showing electrons in the outermost shells only. (2 marks)

7. Consider Group VII elements.

(a) Suggest why a fluoride ion is more stable than a fluorine atom. (1 mark)

(b) Chlorine reacts with fluorine to form chlorine monofluoride. Draw the electron diagram of chlorine monofluoride, showing electrons in the outermost shells only.

(2 marks)

(c) Astatine is below iodine in Group VII.

(i) The table below shows the states of Group VII elements at room temperature and pressure.

Element	Fluorine	Chlorine	Bromine	Iodine
State	Gas	Gas	Liquid	Solid

Use this formation to deduce the state of astatine at room temperature and pressure.

(1 mark)

(ii) Astatine reacts with sodium to form a compound.

(1) Draw the electron diagram of the compound, showing electrons in the outermost shells only. (2 marks)

(2) Name the compound. (1 mark)

(3) Explain why the compound does NOT conduct electricity until it is heated above its melting point. (2 marks)

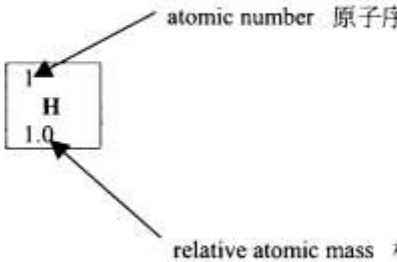
(d) Why iodine is very soluble in non-aqueous solvents but only slightly soluble in water.

(4 marks)

End of Paper

PERIODIC TABLE 週期表

GROUP 族



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)

FUKIEN SECONDARY SCHOOL

S3 Final Examination (2024-2025)

Chemistry

(1 hour)

Answer Sheets

Date: 13th June 2025 Name: _____

Time: 8:30a.m. - 9:30a.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 (70 marks)

1. (a) _____

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(b) _____

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(c)

2. (a)

(b)

(c)

(d)

3.

	Cation	Anion	Name of the compound	Formula of the compound	Colour of the solution compound
(a)				$CuSO_4$	
(b)			Calcium hydroxide		colourless
(c)				$Na_2Cr_2O_7$	
(d)	Fe^{2+}	NO_3^-			

4. (a) _____

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(b) _____

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(c) _____

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(d) _____

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5.

	Substance	Type of structure	Type of attraction(s) between particles
e.g.	CO_2	Simple molecular	Van der Waals' forces between CO_2 molecules Covalent bonding between C and O atoms
(a)	KCl		
(b)	Cu		
(c)	SiO_2 (Quartz)		
(d)	N_2		

6. (a) _____

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6. (b) (i) _____

6. (b) (ii) _____

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(b) (iii)

7. (a) _____

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(b)

(c) (i) _____

(c) (ii) (1)

7. (c) (ii) (2) _____

(c) (ii) (3) _____

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(d) _____

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End of Answer Sheets