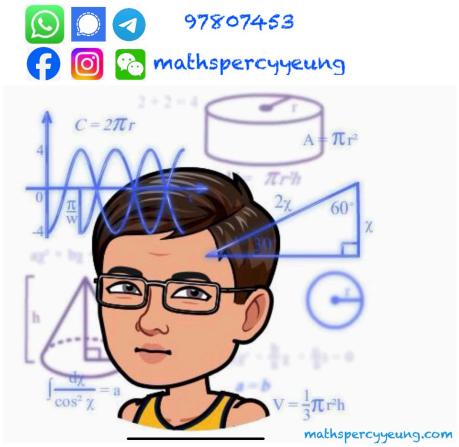
2024-25
S3 Chem
2nd Term
Exam



2024 – 2025 Second Term Examination

S3 Science (Chemistry)

17 June 2025
Time allowed: 1 hour (8:15 – 9:15 am)
This paper must be answered in English
Full Mark = 70

GENERAL INSTRUCTIONS

1. There are TWO sections, A and B, in this Paper.
2. Section A consists of Multiple-choice questions. Section B consists of Structured questions.
3. Answers to Section B should be written in the spaces provided in Answer Sheet. Answers to Section A should be marked on the Multiple-choice Answer Sheet. The Answer Sheets will be collected separately at the end of the test.

INSTRUCTIONS FOR SECTION A (MULTIPLE-CHOICE QUESTIONS)

1. Read carefully the instructions on the Answer Sheet. You should insert the information required in the spaces provided.
2. All questions carry equal marks.
3. ANSWER ALL QUESTIONS. You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.
5. You should mark only ONE answer for each question. If you mark more than one answer, you will receive NO MARKS for that question.
6. No marks will be deducted for wrong answers.

INSTRUCTIONS FOR SECTION B

1. ANSWER ALL QUESTIONS on the Answer Sheet provided.

Section A Multiple-Choice Questions (30 marks)
Put your answers on the multiple-choice answer sheet provided.

1. Silicon has three isotopes. The table below shows the relative abundance of each of these isotopes.

Isotope	Relative abundance (%)
^{28}Si	92.2
^{29}Si	4.7
^{30}Si	3.1

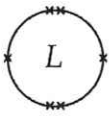
What is the relative atomic mass of silicon?

A. 28.0
B. 28.1
C. 28.2
D. 28.3

2. Which of the following statements concerning a $_8O$ atom and a $_9F$ 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.

3. 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. 8.
B. 14.
C. 18.
D. 20.

4. Which of the following statements about non-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.

5. Elements in the same period of the Periodic Table have
   A. similar chemical properties.
   B. similar physical properties.
   C. the same number of occupied electron shells in their atoms.
   D. the same number of electrons in the outermost shell of their atoms.

6. Which of the following pairs of atoms show similar chemical properties?
   A. ${}^{16}_{8}X$ and ${}^{8}_{4}Y$
   B. ${}^{20}_{10}X$ and ${}^{39}_{20}Y$
   C. ${}^{14}_{7}X$ and ${}^{30}_{15}Y$
   D. ${}^{2}_{1}X$ and ${}^{4}_{2}Y$

7. Which of the following statements about Group I elements are INCORRECT?
   (1) All of them are hard.
   (2) All of them react with water.
   (3) The number of outermost shell electrons increases down the group.
   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

8. Strontium is a Group II element below calcium in the Periodic Table. Which of the following statements about strontium is/are correct?
   (1) It reacts with oxygen to form an ionic compound.
   (2) It reacts with water less vigorously than calcium.
   (3) It is a solid at room temperature and pressure.
   A. (1) only
   B. (2) only
   C. (1) and (3) only
   D. (2) and (3) only

9. In magnesium chloride, Mg^{2+} ion forms by
   A. gaining two protons from the chlorine atoms.
   B. gaining two electrons from the outermost shell of another magnesium atom.
   C. losing two outermost shell electrons from the magnesium ion.
   D. losing two outermost shell electrons from magnesium atom.

10. An element Y has 11 protons and 12 neutrons in its nucleus. Which of the following symbols for an ion of Y is correct?

A. $^{23}_{11}Y^{+}$

B. $^{12}_{11}Y^{+}$

C. $^{12}_{11}Y^{-}$

D. $^{23}_{11}Y^{-}$

11. When sodium atoms and chlorine atoms react to form an ionic compound, which of the following statements is/are correct?

(1) One electron is transferred from chlorine atom to sodium atom.

(2) Electrostatic attraction exists between cations and anions in the ionic compound.

(3) The compound formed is electrically neutral.

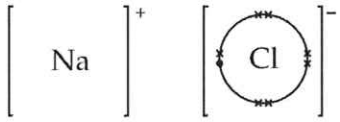
A. (1) only

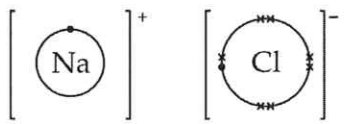
B. (2) only

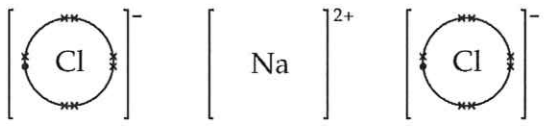
C. (1) and (3) only

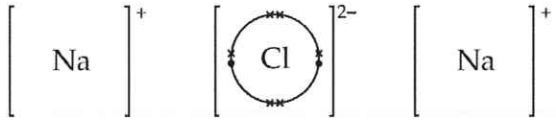
D. (2) and (3) only

12. Which of the following is the electron diagram (showing electrons in the outermost shell only) of sodium chloride?

A. 

B. 

C. 

D. 

13. Which of the following statements about metallic bond is correct?

A. It is the electrostatic attraction between the metal atoms.

B. It is the electrostatic attraction between the metal ions.

C. It is the electrostatic attraction between the metal atoms and delocalized electrons.

D. It is the electrostatic attraction between the metal ions and delocalized electrons.

14. Which of the following combinations is correct?

	Ion	Colour
A.	Copper(II) ion	Reddish brown
B.	Permanganate ion	Orange
C.	Dichromate ion	Yellow
D.	Cobalt(II) ion	Pink

15. The colours of the aqueous solutions of three ionic compounds are shown below.

Compound	Colour of solution
AB	blue
CD	yellow
CB	colourless

Which of the following ions is/are likely colourless?

(1) $C^{2-}(aq)$

(2) $D^{2+}(aq)$

(3) $B^{2+}(aq)$

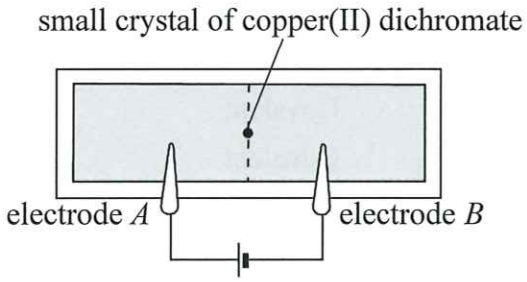
A. (1) only

B. (2) only

C. (1) and (3) only

D. (2) and (3) only

16. Consider the following set-up about the migration of ions.



Which of the following observations is correct?

A. Purple spot moves towards electrode *A*.

B. There is no observable change.

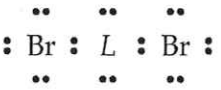
C. Orange spot moves towards electrode *B*.

D. Blue spot moves towards electrode *B*.

17. Which of the following compounds consists of covalent bond only?
    A. NH_4Cl
    B. CO_2
    C. NaOH
    D. K_2CO_3

18. Which of the following combinations can give a covalent compound?
    A. Group II element + Group VII element
    B. Group VI element + Group VII element
    C. Group I element + Group 0 element
    D. Group VI element + Group 0 element

19. The electronic structure of a compound formed between an element L and bromine is shown below (only electrons in the outermost shells are shown):



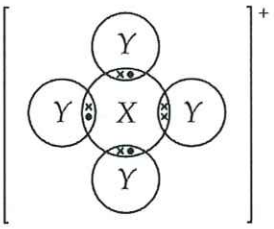
What would be the formula of the compound formed between L and calcium?
    A. CaL
    B. Ca_2L
    C. CaL_2
    D. Ca_3L_2

20. Elements X and Y belong to Group V and VII respectively in the Periodic Table. Which of the following combinations about the compound they form is correct?

	Chemical formula	Type of bonding
A.	X_3Y	Ionic
B.	XY_3	Covalent
C.	X_3Y	Covalent
D.	XY_3	Ionic

21. Which of the following species possess dative covalent bond?
    (1) H_3O^+
    (2) NH_4^+
    (3) CO_2
    A. (1) and (2) only
    B. (1) and (3) only
    C. (2) and (3) only
    D. (1), (2) and (3)

22. The electron diagram (showing electrons in the outermost shells only) of the ion formed by elements X and Y is shown below:

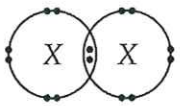


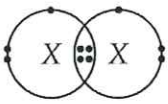
Which of the following statements is/are INCORRECT?

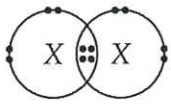
(1) There are five electrons in the outermost shell of an atom X.
(2) There is one lone pair of electrons in the ion.
(3) There is one electron in the outermost shell of an atom Y.

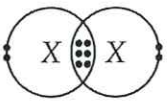
A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

23. Element X is in Group V and exists as molecules, X_2. Which of the following diagrams correctly shows the electronic structure of an X_2 molecule?

A.


B.


C.


D.


24. Which of the following is NOT a common use of aluminium?

A. Making coins
B. Making overhead power cables
C. Making kitchen foil
D. Making aircraft bodies

25. Which of the following metals is most suitable for making water pipes?
    A. Zinc
    B. Iron
    C. Lead
    D. Copper

26. Which of the following metals occurs in free state in nature?
    A. Copper
    B. Zinc
    C. Gold
    D. Iron

27. Which of the following combinations is correct?

	Metal ore	Metal extracted
A.	Bauxite	Silver
B.	Haematite	Iron
C.	Galena	Gold
D.	Calcite	Copper

28. Which of the following gases would be produced in the extraction of lead from lead(II) sulphide by carbon reduction?
    (1) Carbon dioxide
    (2) Oxygen
    (3) Sulphur dioxide
    A. (1) and (2) only
    B. (1) and (3) only
    C. (2) and (3) only
    D. (1), (2) and (3)

29. Which of the following combinations about the uses of metals is correct?

	Metal	Use
A.	Titanium	Making coins
B.	Iron	Making soft drink cans
C.	Mercury	Making thermometers
D.	Silver	Making magnets

30. Which of the following are the consequences of metal recycling?

(1) Fuels are saved.

(2) Metals will run out at a later time in future.

(3) Land used for waste disposal can be reduced.

A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

End of Section A

Section B Structured Questions (40 marks)
Put your answers on the answer sheet provided.

1. Element X has two isotopes, ${}^{75}_{27}X$ and ${}^{y}_{27}X$.

(a) Given that the relative abundance of the two isotopes are both 50% and the relative atomic mass of X is 77.5, calculate the value of y. (2 marks)

(b) ${}^{75}_{28}Z$ is an element with the mass number of 75.

(i) Determine the number of neutrons in ${}^{75}_{28}Z$. (1 mark)

(ii) State and explain whether Z is an isotope of X. (2 marks)

2. Fluorine, chlorine, bromine and iodine belong to Group VII in the Periodic Table.

(a) What are Group VII elements commonly known as? (1 mark)

(b) Which of the above elements is the most reactive? (1 mark)

(c) Fluorine and chlorine are gases at room conditions. Explain why we should NOT distinguish the two gases by smelling them directly. (1 mark)

(d) Astatine is the element below iodine in the Periodic Table.

(i) Predict the physical state of astatine at room conditions. (1 mark)

(ii) Compare the reactivity of astatine with iodine. (1 mark)

3. The electronic arrangement of selenium (Se) is 2, 8, 18, 6.

(a) Which group of the Periodic Table does selenium belong to? (1 mark)

(b) State whether selenium is a metal, semi-metal or non-metal. (1 mark)

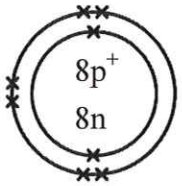
(c) Selenium reacts with aluminium to form compound X.

(i) Name the type of bonding in X. (1 mark)

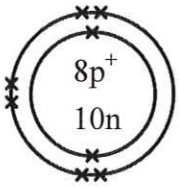
(ii) Write the chemical formula of X. (1 mark)

(iii) Draw the electron diagram of X, showing electrons in the outermost shells only. (1 mark)

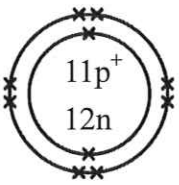
4. The following diagrams show the atomic structure of three particles:



X



Y



Z

p^+ = proton; n = neutron

(a) Name the particles *X* and *Z*. (2 marks)

(b) Which Period does *Z* belong to? (1 mark)

(c) *X* forms a compound with the element form of *Z*. Draw the electron diagram of the compound formed. (1 mark)

5. A part of the Periodic Table is shown below.

	Group							
Period	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**0**
2	*A*							*B*
3	*C*			*D*		*E*	*F*	
4		*G*						

(a) Which element can be found as monoatomic molecule in nature? Why this molecule usually has little or no reaction with other elements? (2 marks)

(b) Which element(s) is/are semi-metal(s)? (1 mark)

(c) Explain why elements *C*, *D*, *E* and *F* are put in the same period. (1 mark)

(d) Which element, *A* or *C*, is more reactive? Explain your answer. (2 marks)

6. Carbon disulphide (CS_2) is a colourless liquid at room conditions.

(a) Draw an electron diagram of carbon disulphide, showing electrons in the outermost shells only. (1 mark)

(b) State the atomicity of carbon disulphide. (1 mark)

(c) Calculate the relative molecular mass of carbon disulphide. (1 mark)

(d) Complete the table on the answer sheet. (2 marks)

7. Chemical methods are commonly used in extracting metals from their ores.

(a) Propose a method of extraction for each of the following metals. Write the word equation(s) for the reaction(s) involved in each case.

(i) Mercury from cinnabar which contains mainly mercury(II) sulphide. (2 marks)

(ii) Sodium from rock salt which contains mainly sodium chloride. (2 marks)

(b) Mercury was discovered earlier than sodium in history. Explain briefly. (1 mark)

8. Consider the following five metals:

copper, aluminium, titanium, silver, iron

(a) State and explain which of the above metals is most suitable for making

(i) bridges. (2 marks)

(ii) supersonic aircraft bodies. (2 marks)

(b) Write a word equation for extracting silver by heating silver oxide. (1 mark)

End of Section B

End of Paper

Name: _____

S3 Science (Chemistry)
2024-2025 Second Term Examination
Date: 17 June 2025

Class: _____ ( )

Section A	Section B	Total
/30	/40	/70

Answer Sheet

Section A (30 marks)
Please mark your answers on the MC answer sheet.

Section B (40 marks)

1. (a) _____

_____

_____

(b) (i) _____

(ii) _____

_____

2. (a) _____

(b) _____

(c) _____

(d) (i) _____

(ii) _____

3. (a) _____

(b) _____

(c) (i) _____

(ii) _____

(iii)

4. (a) _____

_____

(b) _____

(c)

5. (a) _____

_____

(b) _____

(c) _____

(d) _____

_____

6. (a)

(b) _____

(c) _____

_____

(d)

Component atoms		Formula of the compound formed	Name of the compound formed
H	Br		

7. (a) (i) _____

_____

_____

(ii) _____

_____

_____

(b) _____

_____

8. (a) (i) _____

_____

_____

(ii) _____

_____

_____

(b) _____

End