



THE OPEN UNIVERSITY OF SRI LANKA
B.Sc/B.Ed DEGREE PROGRAMME - 2014/2015
Level 4 - CMU2122/CME4122
INORGANIC CHEMISTRY
ASSIGNMENT TEST II (NBT)

08th March 2015 (Sunday)

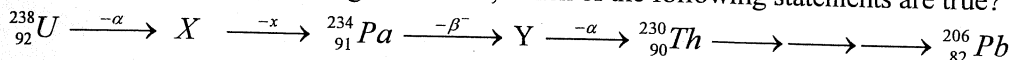
4.00 – 5.00 p.m

Avogadro constant, L	$= 6.023 \times 10^{23} \text{ mol}^{-1}$	Planck's constant, h	$= 6.63 \times 10^{-34} \text{ J s}$
Velocity of light, c	$= 3 \times 10^8 \text{ m s}^{-1}$	Mass of an electron	$= 0.0005 \text{ a.m.u}$
Mass of a proton	$= 1.0073 \text{ a.m.u.}$	Mass of a neutron	$= 1.0089 \text{ a.m.u.}$
1 a.m.u.	$= 1.661 \times 10^{-27} \text{ kg}$	1 MeV	$= 1.6021 \times 10^{-13} \text{ J}$

Answer all questions

Select the most correct answer to each question given below and mark a cross **X** over the answer on the given answer sheet. Any answer with more than one **X** will not be counted.

1. For a part of the decay series given below, which of the following statements are true?



- (i) It is the $(4n+2)$ decay series (ii) X is ${}_{90}^{234}\text{Th}$ (iii) x is β^+ (iv) Y is ${}_{90}^{233}\text{Th}$

The answer is

- 1) (i) and (ii) only 2) (ii) and (iii) only 3) (iii) and (iv) only
4) (i) and (iv) only 5) (i), (ii) and (iii) only

2. A sample to be used for medical imaging is labeled with *fluorine-18* ($t_{1/2} = 110$ min). What percentage of the original activity in the sample remains after 5 hours 30 minutes?

- 1) 75 2) 50 3) 25 4) 12.5 5) 6.25

3. The activity of 1 μg of pure *plutonium-239* ($t_{1/2} = 24000$ y) in Becquerel (Bq) is

- 1) 2.5×10^{10} 2) 2.3×10^5 3) 9.2×10^7 4) 2.5×10^8 5) 2.3×10^7

4. Two of the following nuclides will be expected to be unstable and radioactive.

- (i) ${}_{10}^{20}\text{Ne}$ (ii) ${}_{9}^{22}\text{F}$ (iii) ${}_{8}^{15}\text{O}$ (iv) ${}_{6}^{12}\text{C}$

The answer is

- 1) (i) and (ii) only 2) (ii) and (iii) only 3) (iii) and (iv) only
4) (i) and (iv) only 5) (i), (ii) and (iii) only

5. What is/are the mode(s) of decay that ${}_{9}^{22}\text{F}$ may undergo?

- (a) electron emission (b) positron emission (c) electron capture

The answer is

- 1) (a) only 2) (b) only 3) (c) only
4) (a) and (b) only 5) (b) and (c) only

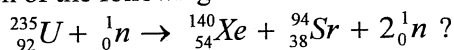
6. What will be the product formed when ${}_{9}^{18}\text{F}$ undergoes positron emission?

- 1) ${}_{10}^{19}\text{Ne}$ 2) ${}_{8}^{17}\text{O}$ 3) ${}_{9}^{17}\text{F}$ 4) ${}_{8}^{18}\text{O}$ 5) ${}_{10}^{18}\text{Ne}$

7. Identify x in the nuclear reaction given by the notation, ${}^{33}_{16}\text{S}(n, x){}^{33}_{15}\text{P}$

- 1) α 2) p 3) β^- 4) β^+ 5) γ

8. Which of the following statements is/are accurate description(s) of the nuclear reaction:



- (i) neutron emission (ii) neutron bombardment (iii) nuclear fission (iv) chain reaction
 1) (i) and (ii) only 2) (ii) and (iii) only 3) (iii) and (iv) only
 4) (i) and (iv) only 5) (i), (ii) and (iii) only

9. What is the area of the body investigated using *iron-59* as a radiotracer?

- 1) eyes 2) thyroid 3) spleen 4) heart 5) lungs

10. Identify the type of nuclear reaction: ${}^3_1\text{H} + ? \rightarrow {}^1_0n + {}^4_2\text{He}$

- 1) electron capture 2) neutron emission 3) fission 4) fusion 5) α decay

11. How does ${}^{40}_{19}\text{K}$ decay to ${}^{40}_{18}\text{Ar}$?

- (i) By positron emission (ii) By electron capture (iii) By electron emission
 (iv) By neutron emission

The answer is

- 1) (i) and (ii) only 2) (ii) and (iii) only 3) (iii) and (iv) only
 4) (i) and (iv) only 5) (i), (ii) and (iii) only

12. What will be the product of β^- decay by ${}^{40}_{19}\text{K}$?

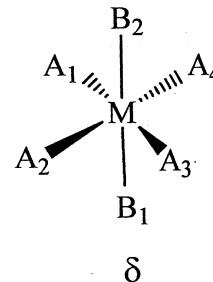
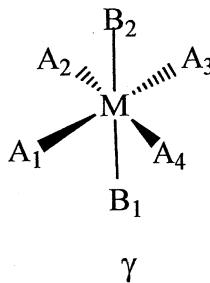
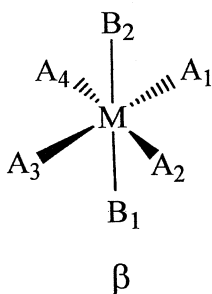
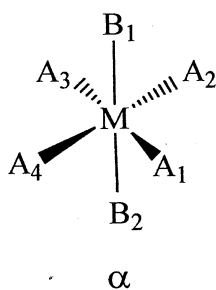
- 1) ${}^{39}_{19}\text{K}$ 2) ${}^{40}_{18}\text{Ar}$ 3) ${}^{40}_{20}\text{Ca}$ 4) ${}^{39}_{20}\text{Ca}$ 5) ${}^{39}_{18}\text{Ar}$

13. A certain rock is found to contain ${}^{238}\text{U} : {}^{206}\text{Pb}$ molar ratio 1.297: 1.000. What is the age of the rock?

($t_{1/2}$ of ${}^{238}\text{U}$ is 4.5×10^9 y).

- 1) 17.6×10^9 y 2) 1.5×10^9 y 3) 1.3×10^9 y 4) 4.5×10^9 y 5) 1.7×10^9 y

In answering the questions 14, 15, 16, 17 and 18, use the following figure, which shows four possible configurations, α , β , γ and δ , of a doubly negatively charged metal complex ion. All M-A bonds are of equal length. Similarly, the two M-B bonds are of equal length. All A-M-A bond angles are of 90° and M and the four A nuclei are on a plane. B-M-B bond angle is 180° and B-M-B axis is perpendicular to the plane of MA_4 .



14. Consider the following four statements about the configurations shown in the figure above.

- (i) Configurations α and β are equivalent.
- (ii) Configurations α and γ are equivalent.
- (iii) Configurations β and δ are identical since the two B nuclei are in identical positions.
- (iv) Configurations γ and δ are identical since the two B nuclei are in identical positions.

The correct statements, out of (i), (ii), (iii) and (iv) above, are

- 1) Only (i) and (ii). 2) Only (i) and (iii). 3) Only (ii) and (iii).
- 4) Only (i) and (iv) 5) All (i), (ii), (iii) and (iv)

15. Consider the following statements about the configurations shown in the figure above.

- (i) Configuration β can be obtained by a rotational operation performed on the configuration α which is a symmetry operation of the molecule.
- (ii) Configuration γ can be obtained by a rotational operation performed on the configuration β which is a symmetry operation of the molecule.
- (iii) Configuration δ can be obtained by an inversion operation performed on the configuration α which is a symmetry operation of the molecule.

The correct statements, out of (i), (ii) and (iii) above, are

- 1) Only (i) and (ii). 2) Only (i) and (iii). 3) Only (ii) and (iii).
- 4) All (i), (ii) and (iii). 5) None of the answers, 1), 2), 3) or 4) is correct.

16. Consider the following statements about the configurations shown in the figure above.

- (i) Rotation of the ion in configuration α by 360° about an axis passing through any of the three MA bonds is an identity operation.
- (ii) Reflection of the ion in configuration γ once through the plane passing through the nuclei M, A_2 , B_1 and B_2 is an identity operation.
- (iii) Rotation of the ion in configuration β by 360° about the axis passing through MB bond is an identity operation.

The correct statements, out of (i), (ii) and (iii) above, are

- 1) Only (i) and (ii). 2) Only (i) and (iii). 3) Only (ii) and (iii).
- 4) All (i), (ii) and (iii). 5) None of the answers, 1), 2), 3) or 4) is correct.

17. Consider the following statements about the configurations shown in the figure above.

- (i) The axis passing through the nuclei M, B_1 and B_2 in configuration α is a C_4 rotational axis of symmetry of the ion.
- (ii) The plane containing the four A nuclei is a plane of symmetry of the ion.
- (iii) The ion does not have a centre of inversion.

The correct statements, out of (i), (ii) and (iii) above, are

- 1) Only (i) and (ii). 2) Only (i) and (iii). 3) Only (ii) and (iii).
- 4) All (i), (ii) and (iii). 5) None of the answers, 1), 2), 3) or 4) is correct.

18. In standard notation, which of the following represent the total set of distinct symmetry operations that can be performed about an axis passing through M and two A nuclei of the ion shown in the above figure.

- 1) $\{E, C_4, C_4^7, C_4^8\}$ 2) $\{E, C_4, C_4^7, C_4^5\}$ 3) $\{E, C_4, C_4^3, C_4^6\}$
- 4) $\{E, C_2^4\}$ 5) $\{E, C_2^3\}$

19. Consider the following statements about CH_3Cl molecule.

- (i) It has 3 symmetry planes.
- (ii) It has a horizontal plane of symmetry (σ_h).
- (iii) The C-Cl bond axis is the principal axis of the molecule and it is of order 3.

The correct statements, out of (i), (ii) and (iii) above, are

- 1) Only (i) and (ii).
- 2) Only (i) and (iii).
- 3) Only (ii) and (iii).
- 4) All (i), (ii) and (iii).
- 5) None of the answers, 1), 2), 3) or 4) is correct.

20. Out of the following molecules which ones have a C_∞ axis.

- (i) HBr
- (ii) CS_2
- (iii) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_3$
- (iv) $\text{CH}\equiv\text{CH}$
- 1) Only (i), (ii) and (iii).
- 2) Only (i), (ii) and (iv).
- 3) Only (i), (iii) and (iv).
- 4) Only (ii), (iii) and (iv).
- 5) All (i), (ii), (iii) and (iv).

21. Consider the following three symmetry planes.

- (i) σ_v of H_2O
- (ii) σ_h of PtCl_4^{2-}
- (iii) σ_h of eclipsed ethane

The numbers of reflection symmetry operations, which produce distinct outcomes that can be carried out with respect to each of these symmetry planes, respectively, is given by

- 1) 2,2,1.
- 2) 1,2,2.
- 3) 2,1,1.
- 4) 2,2,2.
- 5) 2,1,2.

22. What is the incorrect relationship regarding an inversion symmetry operation in a CO_2 molecule.

- 1) $i^2 = E$
- 2) $i^3 = i^5$
- 3) $i^2 = i^6$
- 4) $i = E$
- 5) $i = i^3$

23. Consider the following four relationships.

- (i) $S_6^2 = S_6^4$
- (ii) $S_6^2 = S_6^8$
- (iii) $S_6^3 = S_6^9$
- (iv) $S_6^{12} = E$

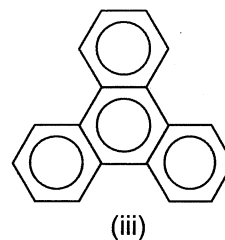
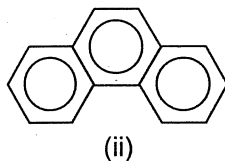
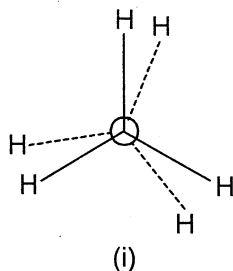
The correct relationships, out of (i), (ii), (iii) and (iv) above, are

- 1) (i) and (ii) only.
- 2) (ii) and (iii) only.
- 3) (iii) and (iv) only.
- 4) (i), (ii) and (iii) only.
- 5) (ii), (iii) and (iv) only.

24. The most complete description of the total set of symmetry planes in a cyclopentadienyl anion is

- 1) σ_v , $4\sigma_d$
- 2) σ_h , σ_v , $4\sigma_d$
- 3) σ_h , $5\sigma_d$
- 4) σ_h , $2\sigma_v$, $3\sigma_d$
- 5) None of the answers 1), 2), 3) or 4), is correct.

25. The number of monobromo substituted compounds that can be prepared from each of the following molecules, (i), (ii) and (iii);



is given, respectively, by

- 1) 2,5,6.
- 2) 1,4,5.
- 3) 2,4,5.
- 4) 1,5,2.
- 5) None of the answers 1), 2), 3) and 4) is correct.

THE OPEN UNIVERSITY OF SRI LANKA
B. Sc DEGREE PROGRAMME 2014/2015
CMU2122/CME4122 – INORGANIC CHEMISTRY- LEVEL 4
ASSIGNMENT TEST-II

MCQ ANSWER SHEET: Mark a cross (X) over the most suitable answer.

Reg. No.

--

For Examiners Use

	Marks
Total (%)	

Marks

Correct Answers		
Wrong Answers		
Total		

- | | | | | | | | | | | | | | | | | | |
|-------------------------------------------------------------------------------------------|---|---|---|---|---|-------------------------------------------------------------------------------------------|---|---|---|---|---|-------------------------------------------------------------------------------------------|---|---|---|---|---|
| 01. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 02. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 03. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 04. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 05. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 06. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 07. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 08. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 09. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 10. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 11. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 12. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 13. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 14. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 15. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 16. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 17. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 18. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 19. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 20. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 21. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 22. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 23. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | 24. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |
| 25. <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> | 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | | | |

The Open University of Sri Lanka
B.Sc. Degree Program 2014/2015
CMU2122/CME4122 – Inorganic Chemistry - Level 4
Answers to Assignment Test-II held on 08-03-2015

MCQ ANSWERS

1. (1)	2. (4)	3. All	4. (2)	5. (1)
6. (4)	7. (2)	8. (3)	9. (3)	10. (4)
11. (1)	12. (3)	13. All	14. (1)	15. (4)
16. (2)	17. (1)	18. (5)	19. (2)	20. (2)
21. (5)	22. (4)	23. (5)	24. (3)	25. (4)