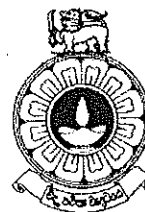


The Open University of Sri Lanka
Faculty of Natural Sciences
B.Sc/ B. Ed Degree Programme



00284

Department	: Department of Chemistry
Level	: 3
Name of the Examination	: Final Examination
Course Title and - Code	: Basic Principles in Chemistry, CMU1220
Academic Year	: 2019/2020
Date	: 07.11.2020
Time	: 9.30 a.m – 12.30 p.m
Duration	: Three (3) hours

General Instructions

- This question paper consists of **two sections**.
 Section I – 30 Multiple Choice Questions (Recommended time is 1 hour).
 Section II – six (6) Essay type Questions (Recommended time is 2 hours).
- Read all instructions carefully before answering the questions.
- Answer **All** questions.
- Answers to Multiple Choice Questions should be marked on the MCQ answer sheet.
 Answer for each question in section II should commence from a new page.
- Clearly state your index number in your answer script. Submit the answer scripts for each section I and section II separately.
- Involvement in any activity that is considered as an exam offense will lead to punishment. You are **NOT allowed** to keep Mobile phones with you during the examination. **Switch off** and leave them in a safe place.

Gas constant(R)	= 8.314 J K ⁻¹ mol ⁻¹	Avogadro constant	= 6.023 × 10 ²³ mol ⁻¹
Faraday constant (F)	= 96,500 C mol ⁻¹	Plancks constant (h)	= 6.63 × 10 ⁻³⁴ J s
Velocity of light (c)	= 3.0 × 10 ⁸ m s ⁻¹	Mass of an electron	= 9.1 × 10 ⁻³¹ kg
Rydberg constant	= 1.097 × 10 ⁷ m ⁻¹	Standard Atmospheric pressure	= 10 ⁵ Pa (N m ⁻²)

Some useful equations $E = \frac{hc}{\lambda}$

$$\left[\begin{array}{l} \Delta G = -nFE \quad I = 0.5 \times \sum_j c_j Z_j^2 \quad \log |\gamma_{\pm}| = -\frac{A |Z_+ Z_-| \sqrt{I}}{1 + aB \sqrt{I}} \quad E = E^{\circ} - \frac{RT}{nF} \ln |Q| \\ \text{Data: } A = 0.509 \text{ dm}^{3/2} \text{ mol}^{-1/2} \quad aB = 1.25 \text{ dm}^{3/2} \text{ mol}^{-1/2} \end{array} \right]$$

Section I- Multiple Choice Questions (Recommended time -1hour)

- Choose the most correct answer to each of the questions and mark this answer with an "X" on the answer sheet.
 - Use a **PEN (not a pencil)** to mark your answers.
 - Any question with more than one answer marked will not be counted for grading.
-

1. Which of the following species contains 21 neutrons and 19 electrons?

- (1) ${}^{41}_{20}\text{Ca}^{2+}$ (2) ${}^{41}_{20}\text{Ca}^{+}$ (3) ${}^{40}_{19}\text{K}^{+}$ (4) ${}^{40}_{21}\text{Sc}^{2+}$ (5) ${}^{38}_{17}\text{Cl}^{-}$

2. The most electropositive element among the following is

- (1) Na (2) Ca (3) K (4) Cs (5) Mg

3. Which of the following is **NOT** an observation/outcome of Rutherford's gold foil experiment?

- (1) There is a positively charged and relatively heavy target particle in the centre of an atom.
 (2) atoms are mostly composed of open space.
 (3) electrons move around stationary orbits.
 (4) Most alpha particles passed straight through the gold foil.
 (5) alpha particles were deflected slightly, suggesting interactions with other positively charged particles within the atom.

4. Which of the following contains a pair of metalloid elements in the periodic table?

- (1) Na and K (2) F and Cl (3) Ca and Mg (4) Ge and Si (5) Fe and Mg

5. The electronic configuration of the Fe^{2+} ion is,

- (1) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^4$
 (2) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$
 (3) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^0 3d^6$
 (4) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^4 4p^2$
 (5) $1s^2 2s^2 2p^6 3s^2 3p^5 3d^6 4s^2 4p^1$

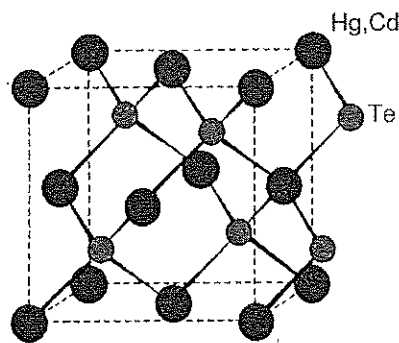
6. Which of the following best describes the most likely pathway for the K^{-} ion to achieve a noble gas configuration?

- (1) Lose two electrons (2) gain two electrons (3) lose one electron
 (4) gain one electron (5) nothing is required it already has a noble gas configuration

7. Which of the following species has tetrahedral geometry?

- (1) ICl_3 (2) PCl_3 (3) SF_4 (4) ICl_5 (5) XeF_4

8. Schematic representation of HgTe and CdTe (zinc blend) structure is given below. The coordination numbers of Hg^{2+} and Te^{2-} ions respectively are



- (1) 4, 8 (2) 4, 6 (3) 4, 4 (4) 4, 2 (5) 6, 4

9. Which of the following statement/s is/are true about PCl_5 molecule?

- (a) It does not obey the octet rule (b) It has a trigonal bipyramidal geometry
(c) Its central atom is sp^3 hybridized (d) Cl-P-Cl bond angle is 90°

The answer is

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

10. Select the correct statement(s) about N_2 molecule.

- (a) Its bond order is 2.5 (b) It is diamagnetic (c) It is isoelectronic with CO
(d) Its molecular orbital electron configuration is
 $\sigma_{1s}^2 \sigma_{1s}^{*2} \sigma_{2s}^2 \sigma_{2s}^{*2} \sigma_{2pz}^2 \pi_{2px}^2 = \pi_{2py}^2 \pi_{2px}^* = \pi_{2py}^*$

The answer is

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

11. Identify the molecule/s that possess/es non-zero dipole moment.

- (a) BF_3 (b) SO_3 (c) NF_3 (d) CHCl_3

The answer is

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

12. The molecule/ion that is isoelectronic with nitric oxide ion, NO^+ is

- (a) N_2 (b) CO (c) CN^- (d) O_2^+

The answer is

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