

**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034****M.Sc. DEGREE EXAMINATION – CHEMISTRY****THIRD SEMESTER – APRIL 2024****PCH3MC01 – MAIN GROUP ELEMENTS AND NUCLEAR CHEMISTRY**

Date: 02-04-2024

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

SECTION A – K1 (CO1)**Answer ALL the questions****(5 x 1 = 5)****1 Answer the following**

- Write a synthesis of borane.
- Write the molecular formula for phospham.
- Mention the preferable oxidation number of Mo and W in iso- and heteropoly acids.
- Provide an example for spallation.
- Write any two sequestering agents for radioisotopes.

SECTION A – K2 (CO1)**Answer ALL the questions****(5 x 1 = 5)****2 Answer the following**

- Write the biological role of ionophores.
- Which is known as blue asbestos?
- Draw the structure of xenon oxytetrafluoride.
- Define nuclear cross-section.
- Name any two isotopes used in isotopic dilution analysis.

SECTION B – K3 (CO2)**Answer any THREE of the following****(3 x 10 = 30)**

- Explain the prediction of STYX number of framework of electron in higher boranes using any three examples.
- Describe the structural characteristics and reactivity of Buckminsterfullerene.
- Write the synthesis and characteristic properties of xenon di- and tetrafluoride.
- Explain the terms isobars, isotones, isodiapheres, mirror-nuclei and nuclear isomers.
- Discuss in detail the radiolysis of water.

SECTION C – K4 (CO3)**Answer any TWO of the following****(2 x 12.5 = 25)**

- Write a note on hydroboration and hydrosilylation with suitable example.
- Describe the synthesis, reactivity, and applications of NF_3 , N_2F_4 , and N_2F_2 .
- Explain the structural features of pyroxene and amphibole minerals.
 - Describe the uses of any six radiopharmaceuticals.(6+6.5)
- Explain any four natural radioactive series.

SECTION D – K5 (CO4)**Answer any ONE of the following****(1 x 15 = 15)**

- 12** a) Explain the uses of phase transfer catalysts with two examples.
b) Classify and explain the different types of carbides.
c) How are the nitrogen fluorides synthesized?
(4+7+4)
- 13** a) Write a note on atom bomb and hydrogen bomb.
b) Describe the components of scintillation counter
(8+7)

SECTION E – K6 (CO5)**Answer any ONE of the following****(1 x 20 = 20)**

- 14** a) Explain the synthesis of metallocarboranes.
b) Describe the synthesis and structural features of zeolite.
(10+10)
- 15** a) Illustrate the synthesis and the structure of P_4O_{10} .
b) Explain Hart Boag experiment of pulse radiolysis.
c) The ratio by weight ${}_{82}Pb^{206}$ and ${}_{92}U^{238}$ in a uranium mineral is 0.2. If $t_{1/2}$ of ${}^{238}U$ is 4.5×10^9 years, calculate the age of the mineral.
(4+10+6)
