Nuclear Chemistry Assignment - III

1. A radioactive isotope has a $t_{1/2}$ of 10 days. If today 125 *gm* of its is left, what was its weight 40 days earlier

(a) 600 *gm* (b) 1000 *gm* (c) 1250 *gm* (d) 2000 *gm*

2. *C*–14 has a half life of 5760 years. 100 *mg* of a sample containing *C*–14 is reduced to 25 *mg* in

(a) 11520 *years* (b) 2880 *years* (c) 1440 *years* (d) 17280 *years*

3. The half life period of a radioactive material is 15 minutes. What % of radioactivity of that material will remain after 45 minutes

(a) 10% (b) 12.5% (c) 15% (d) 17.5%

4. 1.0 *gm* radioactive sodium on decay becomes 0.25 *gm* in 16 *hours*. How much time 48 *gm* of same radioactive sodium will need to become 3.0 *gm*

(a) 48 *hours* (b) 32 *hours* (c) 20 *hours* (d) 16 *hours*

5. The decay constant of a radioactive element is $3\times10^{-6}\ \text{min}^{-1}$. Its half life is

(a) 2.31×10^{5} *min* (b) 2.31×10^{6} *min* (c) 2.31×10^{-6} *min* (d) 2.31×10^{-7} *min*

6. A radioactive substance has half-life 5760 *yrs*. A sample of 100 *mg* containing the substance is reduced to 25 *mg* in

(a) 280 *yrs* (b) 1440 *yrs* (c) 2880 *yrs* (d) 11520 *yrs*

7. Half-life period of a radioactive element is 10.6 *yrs*. How much time will it take in its 99% decomposition

(a) 7046 *yrs* (b) 7.046 *yrs* (c) 704.6 *yrs* (d) 70.4 *yrs*

8. For radioactive substance with half life period 500 years, the time for complete decay of 100 milligram of it would be

(a) 1000 years (b) 100×500 *years* (c) 500 years (d) Infinite time

9. A radioactive sample has a half life of 1500 years. A sealed tube containing 1 *gm* of the sample will contain after 3000 years

(a) 1 *gm* of the sample (b) 0.5 *gm* of the sample (c) 0.25 *gm* of the sample (d) 0.00 *gm* of the sample

10. Radium has atomic weight 226 and a half life of 1600 years. The number of disintegrations produced per second from 1 *gm* are

(a) 4.8×10^{10} (b) 9.2×10^{6} (c) 3.7×10^{10} (d) Zero

11. The half life of radium (226) is 1620 years. The time taken to convert 10 grams of radium to 1.25 grams is

(a) 810 years (b) 1620 years (c) 3240 years (d) 4860 years

12. Half life for radioactive C^{14} is 5760 years. In how many years 200 *mg* of C^{14} sample will be reduced to 25 *mg*

(a) 11520 years (b) 23040 years (c) 5760 years (d) 17280 years

13. Half-life of 10 *gm* of radioactive substance is 10 days. The half-life of 20 *gm* is

(a) 10 days (b) 20 days (c) 25 days (d) Infinite

14. 87.5% decomposition of a radioactive substance complete in 3 hours. What is the half-life of that substance

(a) 2 *hours* (b) 3 *hours* (c) 90 *minutes* (d) 1 *hour*

15. The radionucleide $^{234}_{90}Th$ undergoes two successive β-decays followed by one α-decay. The atomic number and the mass number respectively of the resulting radionucleide are

(a) 92 and 234 (b) 94 and 230 (c) 90 and 230 (d) 92 and 230

16. The half-life of a radioactive isotope is three hours. If the initial mass of the isotope were 256 *g*, the mass of it remaining undecayed after 18 *hours* would be

(a) 4.0 *g* (b) 8.0 *g* (c) 12.0 *g* (d) 16.0 *g*

17. A radioactive isotope has a half-life of 10 *years*. What percentage of the original amount of it remain after 20 *years*

(a) 0 (b) 12.5 (c) 8 (d) 25

18. A radioactive subtance has $t_{1/2}$ 60 minutes. After 3 *hrs*, what parsentage of radioactive substance will remain

(a) 50% (b) 75% (c) 25% (d) 12.5%

19. The half life period of a radioactive element is 30 minutes. One sixteenth of the original quantity of the element will remain unchanged after

(a) 60 minutes (b) 120 minutes (c) 70 minutes (d) 75 minutes

20. The activity of carbon –14 in a piece of an ancient wood is only 12.5%. If the half-life period of carbon –14 is 5760 years, the age of the piece of wood will be (log 2 = 0.3010)

(a) 17.281×10^{2} *years* (b) 172.81×10^{2} *years* (c) 1728.1×10^{2} *years* (d) 17281×10^{2} *years*

21. After the emission of one α-particle followed by one β-particle from the atom of $_{92}X^{238}$, the number of neutrons in the atom will be

(a) 142 (b) 146 (c) 144 (d) 143

22. The nucleus of an atom is made up of X protons and Y neutrons. For the most stable and abundant nuclei

(a) X and Y both are even (b) X and Y both are odd (c) X is even and Y is odd (d) X is odd and Y is even

23. In the nuclear reaction $_{92}U^{238} \longrightarrow {}_{82}Pb^{206}$, the number of alpha and beta particles decayed are

(a) $4\alpha, 3\beta$ (b) $8\alpha, 6\beta$ (c) $6\alpha, 4\beta$ (d) $7\alpha, 5\beta$

24. The missing particle in the reaction $^{235}_{92}U + {}^{1}_{0}n \rightarrow {}_{56}Ba^{146} + ... + 3{}^{1}_{0}n$ is

(a) $^{87}_{32}Ge$ (b) $^{89}_{35}Br$ (c) $^{87}_{36}Kr$ (d) $^{86}_{35}Br$

25. In the decay process $A \xrightarrow{-\alpha} B \xrightarrow{-\beta} C \xrightarrow{-\beta} D$

(a) A and B are isobars (b) A and D are isotopes (c) B, C and D are isobars (d) A and C are isotones

26. In the radioactive decay $^{232}_{92}X \longrightarrow {}^{220}_{89}Y$, how many α and β-particles are ejected from X and Y

(a) 5α and 5β (b) 3α and 3β (c) 3α and 5β (d) 5α and 5β

27. During the transformation of $^{a}_{c}X$ to $^{b}_{d}Y$, the number of β-particles emitted is

(a) $\frac{a-b}{4}$ (b) $d + \frac{a-b}{2} + c$ (c) $d + \left[\frac{a-b}{2}\right] - c$ (d) $2c - d + a - b$

28. The atomic weight of thorium is 232 and atomic number 90. At the end of disintegration, we obtain an isotope of lead (at. wt. 208, at. no 82). The number of emitted α and β-particles are

(a) $\alpha = 6$, $\beta = 4$ (b) $\alpha = 3$, $\beta = 3$ (c) $\alpha = 6$, $\beta = 0$ (d) $\alpha = 4$, $\beta = 6$

29. If uranium (mass no. 238 and atomic no. 92) emits an α-particle, the product has mass number and atomic number

(a) 234, 90 (b) 236, 92 (c) 238, 90 (d) 236, 90

30. An isotope $_{Y}A^{X}$ undergoes a series of m alpha and n beta disintegration to form a stable isotope $_{Y-10}B^{X-32}$. The values of m and n are respectively

(a) 6 and 8 (b) 8 and 10 (c) 5 and 8 (d) 8 and 6

31. The element with atomic number 84 and mass number 218 change to other element with atomic number 84 and mass number 214. The number of α and β-particles emitted are respectively

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

32. After losing a number of α and β-particles, $_{92}U^{238}$ is changed to $_{82}Pb^{206}$. The total number of α-particles lost in this process is

(a) 10 (b) 5 (c) 8 (d) 32

33. The nuclides (A nuclide is the general name for any nuclear species) $_{6}C^{12}$, $_{26}Fe^{56}$ and $_{92}U^{238}$ have 12, 56 and 238 nucleons repectively in the nuclei. The total nubmer of nucleons in a nucleus is equal to

(a) The total number of neutrons in the nucleus (b) The total number of neutrons in the atom

(c) The total number of protons in the nucleus (d) The total number of protons and neutrons in the nucleus

34. In the thorium series, $_{90}Th^{232}$ loses total of 6α-prticles and 4β-particles in ten stages. The final isotope produced in the series is

(a) $_{82}Pb^{209}$ (b) $_{83}Bi^{209}$ (c) $_{82}Pb^{208}$ (d) $_{82}Pb^{206}$

35. On bombarding $_{7}N^{14}$ with α-particles, the nuclei of the product formed after the release of a proton will be **or** In nuclear reaction $_{7}N^{14} + {}_{2}He^{4} \rightarrow {}_{Z}X^{A} + {}_{1}H^{1}$, the term $_{Z}X^{A}$ represents

(a) $_{8}O^{17}$ (b) $_{9}F^{18}$ (c) $_{9}F^{17}$ (d) $_{8}O^{18}$

36. The number of neutrons accompanying the formation of $^{139}_{54}Xe$ and $^{94}_{38}Sr$ from the absorption of a slow neutron by $^{235}_{92}U$, followed by nuclear fission is

(a) 0 (b) 2 (c) 1 (d) 3

37. Positron emission results from the transformation of one nuclear proton into neutron. The isotope thus produced possesses

(a) Same mass number (b) Higher nuclear charge (c) Intense radioactivity (d) No radioactivity

38. The number of neutrons in the parent nucleus which gives N^{14} on β-emission and the parent nucleus is

(a) 8, C^{14} (b) 6, C^{12} (c) 4, C^{13} (d) None of these

39. Artificial elements have been prepared by bombardment reactions in high energy acelerators. What is the mass number of the element X produced in the following nuclear reaction $^{249}_{95}Cf + ^{15}_{7}N \longrightarrow {}_{105}X + 4^{1}_{0}n$

(a) 261 (b) 264 (c) 260 (d) 257

40. If an isotope of hydrogen has two neutrons in its atom, its atomic number and atomic mass number will respectively be

(a) 2 and 1 (b) 3 and 1 (c) 1 and 1 (d) 1 and 3

41. An isotone of $^{76}_{32}Ge$ is

(a) $^{77}_{32}Ge$ (b) $^{77}_{33}As$ (c) $^{77}_{34}Se$ (d) $^{78}_{34}Se$

42. A radium ${}_{88}Ra^{224}$ isotope, on emission of an α-particle gives rise to a new element whose mass number and atomic number will be

(a) 220 and 86 (b) 225 and 87 (c) 228 and 88 (d) 224 and 86

43. A radioactive isotope having a half life of 3 days was received after 12 days. It was found that there were 3 *gm* of the isotope in the container. The initial weight of the isotope when packed was

(a) 12 *gm* (b) 24 *gm* (c) 36 *gm* (d) 48 *g*

44. If a radioactive isotope with atomic number *A* and mass number *M* emits an α-particle, the atomic number and mass number of that new isotope will become

(a) $A-2, M-4$ (b) $A-2, M$ (c) $A, M-2$ (d) $A-4, M-2$

45. A radioactive isotope has a half life of 20 days. If 100 *gm* of the substance is taken, the weight of the isotope remaining after 40 days is

(a) 25 *gm* (b) 2.5 *gm* (c) 60 *gm* (d) 40 *gm*

46. Atomic weights of carbon, nitrogen and oxygen are 12, 14 and 16 respectively. An atom of atomic weight 14 and nuclear charge +6 is an isotope of

(a) Oxygen (b) Carbon (c) Nitrogen (d) None of these

47. To determine the masses of the isotopes of an element which of the following techniques is useful

(a) The acceleration of charged atoms by an electric field and their subsequent deflection by a variable magnetic field

(b) The spectroscopic examination of the light emitted by vaporised elements subjected to electric discharge

(c) The photographing of the diffraction patterns which arise when *X*-rays are passed through crystals

(d) The bombardment of metal foil with alpha particles

48. The atomic number of bromine is 35 and its atomic weight is 79. Two isotopes of bromine are present in equal amounts. Which of the following statements represents the correct number of neutrons

	First isotope	Second isotope
(a)	34	36
(b)	44	46
(c)	45	47
(d)	79	81

49. $X \xrightarrow{-\alpha} Y \xrightarrow{-\beta} Z \xrightarrow{-\beta} W$ in the above sequence of reaction, the elements which are isotopes of each other are

(a) *X* and *W* (b) *Y* and *Z* (c) *X* and *Z* (d) None of these

50. For the fission reaction ${}_{92}U^{235} + {}_{0}n^{1} \rightarrow {}_{56}Ba^{140} + {}_{y}E^{x} + 2{}_{0}n^{1}$, the value of *x* and *y* will be

(a) $x = 93$ and $y = 34$ (b) $x = 92$ and $y = 35$ (c) $x = 89$ and $y = 44$ (d) $x = 94$ and $y = 36$