CHEMISTRY

BOOKS - ARIHANT CHEMISTRY (HINGLISH)

NUCLEAR CHEMISTRY

Practice Exercise

1. The nuclear radius as compared to the atomic radius, is of the order of

A. 10^{-2}

B. 10^{-15}

C. 10^{-4}

D. 10^{-8}

Answer: c

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2. Arrange the following particles in the increasing order of their penetration capacity as the projectiles for artificial transmutation of elements:

Proton $\left(._1 H^1\right)$, alpha particle $\left(._2 He^4\right)$, deuteron $\left(._1 H^2\right)$, neutron $\left(._0 n^1\right)$

A. $._2 He^4 < ._1 H^2 < ._1 H^1 < ._0 n^1$

B. $._1 H^1 < ._1 H^2 > ._0 n^1 < ._2 He^4$

C. $._1 H^1 < ._1 H^2 < ._2 He^1 < ._0 n^1$

D. $._0 n^1 < ._1 H^2 < ._2 He^4 < ._1 H^2$

Answer: a

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3. Which of the following radiations is most easily stopped by air?

A. β-rays

B. α-rays

C. X-rays

D. γ-rays

Answer: b

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4. β-particle is emitted in radioactivity by

A. Conversion of proton into neutron

B. from outermost orbit

C. conversion of neutron into proton

D. β-particle is not emitted

Answer: c

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5. ${}_{7}N^{13}$ changes to ${}_{6}C^{13}$ by the emission of

A. electron

B. neutron

C. position

D. proton

Answer: c

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6. Which of the following processes are feasible?

A. ${}_{1}p^{1} + {}_{0}n^{1} \rightarrow {}_{1}D^{2} + \bar{v}$

B. ${}_{1}H^{1} + {}_{-1}e^{0} \rightarrow {}_{0}n^{1}$

C. ${}_{0}n^{1} \rightarrow {}_{1}p^{1} + {}_{-1}e^{0} + \bar{v}$

D. None of the above

Answer: c

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7. $._{11}Na^{28}$ is a radioactive and it decays to

A. $._{12}Mg^{24}$ and β-particles

B. $._{11}Na^{21}$ and neutron

C. $._{13}F^{24}$ and positron

D. $._{9}F^{20}$ and α-particles

Answer: a

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8. Loss of β-particles is equivalent to

A. decrease of one neutron only

B. increase of one proton only

C. Both (a) and (b)

D. None of the above

Answer: c

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9. Which of the following processes cause the emmision of X-rays?

A. α-emission

B. γ-emisssion

C. Positron emission

D. Electron capture

Answer: d

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10. What will be the product, if $._{92}U^{235}$ emits two α-and one β-particle?

A. $._{87}Ac^{211}$

B. $._{89}Ac^{325}$

C. $._{89}Ac^{225}$

D. $._{89}Ac^{227}$

Answer: d

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11. In the reaction, $Po \xrightarrow{-\alpha} Pb \xrightarrow{-\beta} Bi$, if Bi belongs to group 15, to which group Po belongs?

A. 13

B. 14

C. 15

D. 16

Answer: d

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12. Which of the following tranformation is not correct?

A. $._{33}As^{75} + ._2He^4 \rightarrow ._{35}Br^{76} + ._0n^1$

B. $._3Li^7 + ._1H^1 \rightarrow ._4Be^7 + ._0n^1$

C. $._8O^{16} + ._0n^1 \rightarrow ._6C^{14} + ._2He^4$

D. $._{83}Bi^{209} + ._1H^2 \rightarrow ._{84}Po^{210} + ._0n^1$

Answer: c

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13. For the nuclear reaction, $._0n^1 \rightarrow ._1H^1 + ?$, the missing nuclide is

A. $._{-1}e^{0}$

B. $+._{1}e^{0}$

C. $._{1}H^{2}$

D. $._{2}He^{4}$

Answer: a

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14. The end product of the series, starting with $._{90}Th^{232}$, is

A. Pb-208

B. Pb-206

C. Bi-209

D. Pb-207

Answer: a

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15. The number of α-and β-particles emitted in the nuclear reaction, $_{\cdot 90}Th^{228} \rightarrow {}_{\cdot 83}Bi^{212}$, respectively are

A. 4α and 1β

B. 3α and 7β

C. 8α and 1β

D. 4α and 7β

Answer: a

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16. The radioactive disintegration follows the kinetics of

A. zero order

B. first order

C. second order

D. third order

Answer: b

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17. The amount of substance that give 3.7×10^7 dps is

A. one becquerel

B. one curie

C. one millicurie

D. one rutherford

Answer: c

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18. The weight of 1 curie ${}_{82}Pb^{214}\left(t_{1/2} = 26.8 \text{ min}\right)$ in grams is

A. $3.1 \times 10^{-8} g$

B. $1.55 \times 10^{-8} g$

C. $6.2 \times 10^{-8} g$

D. $3.1 \times 10^{-10} g$

Answer: a

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19. Radium has atomic weight 226 and a half-life of 1600 Yr. The number of disintegrations produced per second from one gram are

A. 4.8×10^{10}

B. 9.2×10^{6}

C. 3.7×10^{10}

D. zero

Answer: c

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20. Only $1/8th$ of the original amount of a radioactive element remains after 96 min. The value of $t_{1/2}$ of this element is

A. 12.0 min

B. 32.0 min

C. 24.0 min

D. 48.0 min

Answer: b

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21. The half-life of radium is 16000 yr, after how much time will 1 g radium be reduced to 125 mg?

A. 800 yr

B. 1600 yr

C. 3200 yr

D. 4800 yr

Answer: d

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22. If one starts with 1 curie of radioactive substance $\left(t_{1/2} = 12h\right)$, the activity left after a period of 1 week will be about

A. 1 curie

B. 129 microcurie

C. 60 microcurie

D. 8 millicurie

Answer: c

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23. 20 mg of C-14 has half-life of 5760 yr. 100 mg of sample containing C-14 is reduced to 25 mg in

A. 57600 yr

B. 1440 yr

C. 17280 yr

D. 11520 yr

Answer: d

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24. In the case of a radioisotope, the value of $t_{1/2}$ and λ are identical in magnitude. The value of $t_{1/2}$ is

A. $1/0.693$

B. $(0.693)^{1/2}$

C. $\frac{0.693}{2}$

D. 0.693

Answer: b

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25. The half-life of a radioactive isotope is 3 h. if the initial mass of the isotope was 300 g, the mass which remained undercayed in 18 h would be

A. 1.17 g

B. 9.36 g

C. 2.34 g

D. 4.68 g

Answer: d

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26. The half-life period of a radioactive element is 140 day. After 560 days, 1 g of the element will reduce to

A. $1/8g$

B. $1/16g$

C. $1/4g$

D. $1/2g$

Answer: b

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27. If 5 g of a radioactive substance has $t_{1/2} = 14h, 10g$ of the same substance will have $t_{1/2}$ equal to

A. 70 h

B. 14 h

C. 28 h

D. 50 h

Answer: b

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28. Choose the incorrect one.

A. 1 curie $= 3.7 \times 10^{10} ds^{-1}$

B. 1 rutherford $= 10^{6} ds^{-1}$

C. 1 becquerel $= 1 ds^{-1}$

D. 1 fermi $= 10^{3} ds^{-1}$

Answer: d

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29. The decay constant of a radioactive sample is λ. The half-life and mean life of the sample respectively are

A. $\frac{1}{\lambda}, \frac{\text{In2}}{\lambda}$

B. $\frac{\text{In2}}{\lambda}, \frac{1}{\lambda}$

C. $\lambda \text{In2}, \frac{1}{\lambda}$

D. $\frac{\lambda}{\text{In2}}, \frac{1}{\lambda}$

Answer: b

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30. Which is the most stable nucleus among these?

A. $._2 He^3$

B. $._{11} Na^{24}$

C. $._{83} Bi^{210}$

D. $._{82} Pb^{207}$

Answer: d

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31. Sometimes, the ejection of an α-particle does not completely stabilise the nucleus. In such a case, more α-particles may be emitted. The α-decay

A. raises the n/p ratio and is often followed by β-emission

B. lowers the n/p ratio and is often followed by positron emission

C. raises the n/p ratio and is often followed by neutron emission

D. lower the n/p ratio and is often followed by γ-rays emission

Answer: a

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32. Which of the following nuclear change is incorrect? a) ${}_{20}Ca^{40} + {}_{0}n^{1} \rightarrow {}_{19}K^{40} + {}_{1}H^{1}$ b) ${}_{12}Mg^{24} + \alpha \rightarrow {}_{14}Si^{27} + {}_{0}n^{1}$

c). ${}_{48}Cd^{113} + {}_{0}n^{1} \rightarrow {}_{48}Cd^{112} + {}_{-1}e^{0}$ d)

${}_{20}Co^{43} + \alpha \rightarrow {}_{21}Si^{46} + {}_{1}H^{1}$

A. ${}_{20}Ca^{40} + {}_{0}n^{1} \rightarrow {}_{19}K^{40} + {}_{1}H^{1}$

B. ${}_{12}Mg^{24} + {}_{2}He^{4} \rightarrow {}_{14}Si^{27} + {}_{0}n^{1}$

C. ${}_{48}Cd^{113} + {}_{0}n^{1} \rightarrow {}_{48}Cd^{112} + {}_{-1}e^{0}$

D. ${}_{20}Co^{43} + {}_{2}He^{4} \rightarrow {}_{21}Sc^{46} + {}_{1}H^{1}$

Answer: c

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33. The easily fissionable isotope of uranium is with the number

A. 236

B. 235

C. 237

D. 238

Answer: b

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34. Atom bomb is based on the priniciple of

A. carbon dating

B. nuclear transformation

C. nuclear fission

D. nuclear fusion

Answer: b

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35. The compound used in the enrichment of the uranium in nuclear power plant is

A. Ucl_4

B. $UO_2(NO_3)_2$

C. UF_6

D. U_3O_8

Answer: c

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36. If uranium (mass number = 238 and atomic number = 92) emits an α-particle, the product has mass number and atomic number respectively are

A. 236 and 92

B. 236 and 90

C. 238 and 90

D. 234 and 90

Answer: c

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37. In a nuclear reactor, heavy water is used

A. to provide high speed neutrons

B. to increase the speed of neutrons

C. to capture neutrons produced by nuclear fission

D. to transfer the heat from the nuclear reactor

Answer: d

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38. Which one of the following is an exact example of artificial radioactivity?

A.

$$._0 n^1 + ._{11} Na^{23} \rightarrow ._{11} Na^{24} + \gamma, ._{11} Na^{24} + ._1 H^1 \rightarrow ._{12} Mg^{24} + ._0 n$$

B. $._2 He^4 + ._7 N^{14} \rightarrow ._8 O^{17} + ._1 H^1, ._8 O^{17} + ._0 n^1 \rightarrow ._7 O^{18} + \gamma$

C. $._2 He^4 + ._{13} Al^{27} \rightarrow ._{15} P^{30} + ._0 n^1, ._{15} P^{30} \rightarrow ._{14} Si^{30} + ._1 e^0$

D. $._{89} Ac^{228} \rightarrow ._{90} Th^{228} + \beta, ._{90} Th^{228} \rightarrow ._{88} Ra^{224} + \alpha$

Answer: c

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39. The function of the cadmium rod in a nuclear reactor is

A. to produce rays

B. to produce neutrons

C. to absorb neutrons

D. to speed up neutrons

Answer: c

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40. The nuclear reaction $._1^2 H + ._1^2 H \rightarrow ._2^4 He$ is called

A. fission reaction

B. fusion reaction

C. chain reaction

D. thermal reaction

Answer: b

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41. Which of the following nuclei is not double magic?

A. $._2 He^4$

B. $._8 O^{16}$

C. $._{82} Pb^{208}$

D. ${}_{92}U^{238}$

Answer: d

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42. Atom A possesses higher values of packing fraction than atom B. The relative stabilities of A and B are

A. Ais more stable than B

B. B is more stable than A

C. A and B both are equally stable

D. Stability does not depend on packing fraction

Answer: b

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43. Match the column I and column II and pick the correct matching from the codes given below.

	Column I		Column II
A.	Isotope	1.	$_{88}Ra^{228}$ and $_{89}Ac^{228}$
B.	Isobar	2.	$_{18}Ar^{39}$ and $_{19}K^{40}$
C.	Isotone	3.	$_{1}H^{2}$ and $_{1}H^{3}$
D.	Isosters	4.	$_{92}U^{235}$ and $_{90}Th^{231}$
E.	Isodiaphers	5.	CO_2 and N_2O

The correct matching is

A. $\begin{matrix} A & B & C & D & E \\ 5 & 4 & 1 & 2 & 3 \end{matrix}$

B. 3 1 2 5 4

C. 2 1 4 5 3

D. 2 5 1 4 3

Answer: b

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44. An isobar of $._{20}Ca^{40}$ is

A. $._{18}Ar^{40}$

B. $._{20}Ca^{38}$

C. $._{20}Ca^{42}$

D. $._{18}Ar^{38}$

Answer: a

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45. An isotope of $._{90}Th^{231}$ can be converted into $._{90}Th^{227}$ by the emission of

A. one α-particle

B. one β-particle

C. two α and one β-particle

D. one α and 2β- particles

Answer: d

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46. Nuclides having the same difference in mass number and atomic number, are known as

A. isotopes

B. isobars

C. isotones

D. isomers

Answer: c

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47. Which of the following statement is wrong?

A. P^{32} is used in the treatment of leukemia

B. I^{31} is used the treatment of thyroid gland cancer

C. Co^{59} cannot be used in the treatment of cancer

D. Excessive use radioactive elements is responsible of cancerous growth

Answer: c

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48. The isotope of carbon used in radiocarbon dating is

A. ${}_6C^{12}$

B. ${}_6C^{13}$

C. ${}_6C^{14}$

D. ${}_6C^{15}$

Answer: c

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49. Which one of the following radioisotopes is used in the treatment of blood cancer?

A. Na^{24}

B. I_{131}

C. Co^{62}

D. P^{32}

Answer: c

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50. The proper rays for radio carbon dating are

A. cosmic rays

B. X - rays

C. UV rays

D. IR rays

Answer: a

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1. 1 g of U-235 is converted into UF_6. The radioactivity of UF_6 thus obtained is

A. zero

B. less than that of 1 g of U-235

C. more than that of 1 g of U-235

D. same as that of 1 g of U-235

Answer: d

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2. A sample of radioactive substance shows an intensity of 2.3 millicurie at a time t and an intensity of 1.62 millicurie after 600 s. The half-life period of the radioactive metal is

A. 1000 s

B. 1187 s

C. 1200 s

D. 1500 s

Answer: b

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3. If the mass defect of ${}_5B^{11}$ is 0.081 u, its average binding energy (in MeV) is

A. 8.60

B. 6.85

C. 5.60

D. 5.86

Answer: b

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4. When radioactive minerals like clevelte, monozite and pitch blende are heated to 1273 K in vacuo the noble gas obtained is

A. Rn

B. Kr

C. He

D. Ne

Answer: c

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