



## 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 ( ${}_1H^1$ ), alpha particle ( ${}_2He^4$ ), deuteron ( ${}_1H^2$ ), neutron ( ${}_0n^1$ )

A.  ${}_2He^4 < {}_1H^2 < {}_1H^1 < {}_0n^1$

B.  ${}_1H^1 < {}_1H^2 > {}_0n^1 < {}_2He^4$

C.  ${}_1H^1 < {}_1H^2 < {}_2He^1 < {}_0n^1$

D.  ${}_0n^1 < {}_1H^2 < {}_2He^4 < {}_1H^2$

Answer: a



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

A.  $\beta$ -rays

B.  $\alpha$ -rays

C. X-rays

D.  $\gamma$ -rays

**Answer: b**



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4.  $\beta$ -particle is emitted in radioactivity by

A. Conversion of proton into neutron

B. from outermost orbit

C. conversion of neutron into proton

D.  $\beta$ -particle is not emitted

**Answer: c**



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

- A. electron
- B. neutron
- C. positron
- D. proton

Answer: c



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6. Which of the following processes are feasible?

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

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

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

D. None of the above

**Answer: c**

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

A.  ${}_{12}^{24}\text{Mg}$  and  $\beta$ -particles

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

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

D.  ${}_{9}^{20}\text{F}$  and  $\alpha$ -particles

**Answer: a**

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8. Loss of  $\beta$ -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 emission of X-rays?**

A.  $\alpha$ -emission

B.  $\gamma$ -emission

C. Positron emission

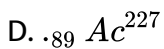
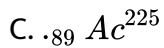
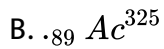
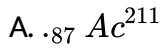
D. Electron capture

**Answer: d**



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



**Answer: d**



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

A. 13

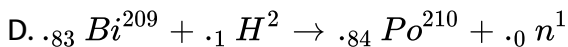
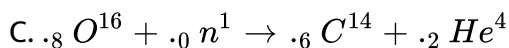
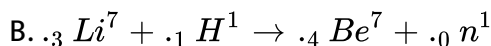
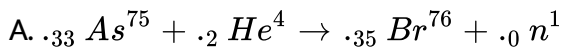
B. 14

C. 15

Answer: d

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12. Which of the following transformation is not correct?

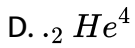
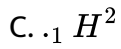
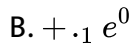
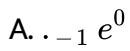


Answer: c

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13. For the nuclear reaction,  ${}_0\text{n}^1 \rightarrow {}_1\text{H}^1 + ?$ , the missing nuclide is





**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  $\alpha$ -and  $\beta$ -particles emitted in the nuclear reaction,

${}_{90}\text{Th}^{228} \rightarrow {}_{83}\text{Bi}^{212}$ , respectively are

A.  $4\alpha$  and  $1\beta$

B.  $3\alpha$  and  $7\beta$

C.  $8\alpha$  and  $1\beta$

D.  $4\alpha$  and  $7\beta$

**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  $3.7 \times 10^7$  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  ${}_{82}\text{Pb}^{214}$  ( $t_{1/2} = 26.8$  min ) 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.  $4.8 \times 10^{10}$

B.  $9.2 \times 10^6$

C.  $3.7 \times 10^{10}$

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 ( $t_{1/2} = 12h$ ), 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  $\lambda$  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.  $1 \text{ curie} = 3.7 \times 10^{10} \text{ ds}^{-1}$

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

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

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

**Answer: d**



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

A.  $\frac{1}{\lambda}, \frac{\ln 2}{\lambda}$

B.  $\frac{\ln 2}{\lambda}, \frac{1}{\lambda}$

C.  $\lambda \ln 2, \frac{1}{\lambda}$

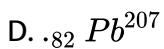
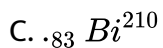
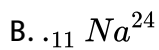
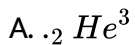
D.  $\frac{\lambda}{\ln 2}, \frac{1}{\lambda}$

Answer: b



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30. Which is the most stable nucleus among these?



**Answer: d**



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

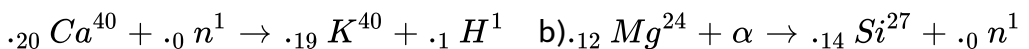
- A. raises the  $n/p$  ratio and is often followed by  $\beta$ -emission
- B. lowers the  $n/p$  ratio and is often followed by positron emission
- C. raises the  $n/p$  ratio and is often followed by neutron emission
- D. lower the  $n/p$  ratio and is often followed by  $\gamma$ -rays emission

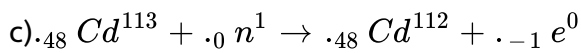
**Answer: a**



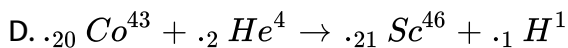
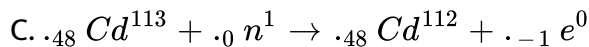
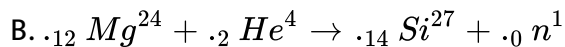
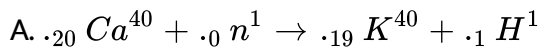
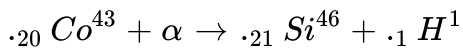
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**32.** Which of the following nuclear change is incorrect? a)





d)



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 principle of

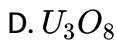
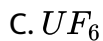
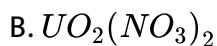
- A. carbon dating
- B. nuclear transformation
- C. nuclear fission
- D. nuclear fusion

**Answer: b**



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



**Answer: c**



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**36.** If uranium (mass number = 238 and atomic number = 92) emits an  $\alpha$ -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**

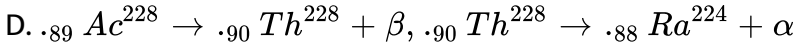
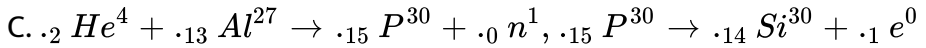
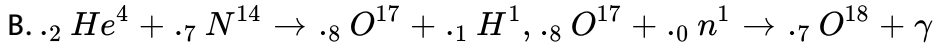
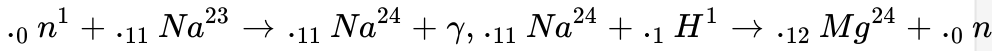


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**38.** Which one of the following is an exact example of artificial radioactivity?



A.



**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  ${}^2_1H + {}^2_1H \rightarrow {}^4_2He$  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.  ${}^4_2He$
- B.  ${}^{16}_8O$
- C.  ${}^{208}_{82}Pb$

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. A is 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.	${}_{88}\text{Ra}^{228}$ and ${}_{89}\text{Ac}^{228}$	
B. Isobar	2.	${}_{18}\text{Ar}^{39}$ and ${}_{19}\text{K}^{40}$	
C. Isotone	3.	${}_{1}\text{H}^2$ and ${}_{1}\text{H}^3$	
D. Isosters	4.	${}_{92}\text{U}^{235}$ and ${}_{90}\text{Th}^{231}$	
E. Isodiaphers	5.	$\text{CO}_2$ and $\text{N}_2\text{O}$	

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

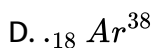
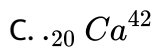
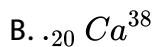
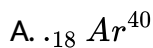
D. 2 5 1 4 3

Answer: b



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



Answer: a



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

A. one  $\alpha$ -particle

B. one  $\beta$ -particle

C. two  $\alpha$  and one  $\beta$ -particle

D. one  $\alpha$  and 2 $\beta$ - 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?



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  ${}_{5}B^{11}$  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 cleveite, monazite 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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