



## DPP – 1 [Early Atomic Models]

### Chapter: Structure of Atom

*"Tum perfect nahi ho? Koi baat nahi. Bas rukna mat. Winners bhi kabhi beginners the"*

#### TYPE 1 : Counting protons/electrons/neutrons

**Q.1** The number of protons, electrons and neutrons respectively in the element  ${}^{237}_{93}\text{Y}$  are [NCERT Pg. 35]

- (1) 93, 93, 93 (3) 93, 93, 144  
(2) 144, 93, 93 (4) 93, 144, 93

**Q.2** In an atom  ${}^{27}_{13}\text{Al}$ , number of proton is (a), electron is (b) and neutron is (c). Hence ratio  $c : b : a$  is

- (1) 13 : 14 : 13 (3) 14 : 13 : 13  
(2) 13 : 13 : 14 (4) 14 : 14 : 13

**Q.3** A and B are two elements which have the same atomic weight and are having atomic number 27 and 30 respectively. If the atomic weight of A is 57, then number of neutrons in B is

- (1) 27 (2) 33 (3) 30 (4) 40

**Q.4** If no. of protons in  $\text{X}^{-2}$  is 16, then no. of electrons in  $\text{X}^{+2}$  will be

- (1) 14 (2) 16 (3) 18 (4) None

**Q.5** A metal in its dipositive state has the electronic configuration 2, 8, 14 and has the atomic weight equal to 56. Number of neutrons in its nucleus would be

- (1) 30 (2) 32 (3) 34 (4) 28

**Q.6** A certain negative ion  $\text{X}^{-2}$  has in its nucleus 18 neutrons and 18 electrons in its extranuclear structure. What is the mass number of the most abundant isotope of X?

- (1) 35.46 (2) 32 (3) 36 (4) 39

**Q.7** For any anion  $\text{X}^{-3}$ , the mass number is 14. If anion has 10 electrons, then number of neutrons in  $\text{X}_2$  nucleus is

(1) 10

(2) 14

(3) 7

(4) 5

**TYPE 2: Effect of Proton/Neutron/Electron Mass Change on Atomic Weight**

**Q.8** Let mass of electron is half, mass of proton is two times and mass of neutron is three-fourth of original masses, then new atomic weight of  $^{16}\text{O}$  atom

(1) Increases by 37.5%

(2) Remains constant

(3) Increases by 12.5%

(4) Decreases by 25%

**Q.9** In  $^{14}_7\text{N}$  if mass attributed to electrons were doubled and the mass attributed to protons were halved, the atomic mass would become approximately

(1) Halved

(2) Doubled

(3) Reduced by 25%

(4) Remain same

**Q.10** If the mass of neutron is doubled and mass of electron is halved, then the new atomic mass of  $^{12}_6\text{C}$  and the percent by which it is increased are

(1) 18 amu and 50%

(2) 15 amu and 25%

(3) 16 amu and 33%

(4) 20 amu and 67%

**Q.11** If mass of neutron is doubled, mass of proton is halved and mass of electron is doubled, then the new atomic weight of  $^{12}_6\text{C}$  and the percentage by which it changes are

(1) 18 amu, increases by 50%

(2) 15 amu, increases by 25%

(3) 12 amu, no change

(4) 10 amu, decreases by 17%

**TYPE 3 : Isoelectronic Species**

**Q.12** Find out the atoms which are isoelectronic

(1)  $^{14}_6\text{C}$ ,  $^{15}_7\text{N}$ ,  $^{17}_9\text{F}$ (2)  $^{12}_6\text{C}$ ,  $^{14}_7\text{N}$ ,  $^{19}_9\text{F}$ (3)  $^{14}_6\text{C}$ ,  $^{14}_7\text{N}$ ,  $^{17}_9\text{F}$ (4)  $^{14}_6\text{C}$ ,  $^{14}_7\text{N}$ ,  $^{19}_9\text{F}$ 

**Q.13** Species which are isoelectronic to one another are

(a)  $\text{CN}^-$  (b)  $\text{OH}^-$  (c)  $\text{CH}_3^+$  (d)  $\text{N}_2$  (e)  $\text{CO}$

Correct answer is

(1) a, b, c

(2) a, c, d

(3) a, d, e

(4) b, c, d

**Q.14** Which of the following pairs are isoelectronic with each other?

- (1)  $\text{Na}^+$ , Ne (3) Ne, O  
(2)  $\text{K}^+$ , O (4)  $\text{Na}^+$ ,  $\text{K}^+$

**Q.15** Isoelectronic species are

- (1) CO,  $\text{CN}^-$ ,  $\text{NO}^+$ ,  $\text{C}_2^{2-}$   
(2)  $\text{CO}^-$ , CN, NO,  $\text{C}_2^-$   
(3)  $\text{CO}^+$ ,  $\text{CN}^+$ ,  $\text{NO}^-$ ,  $\text{C}_2$   
(4) CO, CN, NO,  $\text{C}_2$

**Q.16** The ion that is isoelectronic with CO is

- (1)  $\text{CN}^-$  (2)  $\text{N}_2^+$  (3)  $\text{O}_2^-$  (4)  $\text{N}_2^-$

**Q.17** Which of the following pairs of ions are isoelectronic and isostructural?

- (1)  $\text{ClO}_3^-$ ,  $\text{CO}_3^{2-}$  (3)  $\text{ClO}_3^-$ ,  $\text{SO}_3^{2-}$   
(2)  $\text{SO}_3^{2-}$ ,  $\text{NO}_3^-$  (4)  $\text{CO}_3^{2-}$ ,  $\text{SO}_3^{2-}$

**Q.18** Select isoelectronic set

- (a)  $\text{Na}^+$ ,  $\text{H}_3\text{O}^+$ ,  $\text{NH}_4^+$   
(b)  $\text{CO}_3^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{H}_2\text{CO}_3$   
(c)  $\text{P}^{3-}$ , HCl,  $\text{C}_2\text{H}_5^-$ ,  $\text{PH}_3$   
(d)  $\text{F}^-$ , Ne,  $\text{Na}^+$

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

#### TYPE 4 : Isotopes, Isobars, Isotones & Isodiaphers

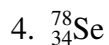
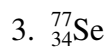
**Q.19** Isobars have

[NCERT Pg. 35]

- (1) Same number of protons  
(2) Same number of neutrons  
(3) Same number of nucleons  
(4) Same number of electrons

**Q.20** An isotone of  $^{76}_{32}\text{Ge}$  is

1.  $^{77}_{32}\text{Ge}$   
2.  $^{77}_{33}\text{As}$



1. (ii) &amp; (iii)

2. (i) &amp; (ii)

3. (ii) &amp; (iv)

4. (ii), (iii) &amp; (iv)

**Q.21 Which of the following pairs is correctly matched?**(1) Isotopes  ${}^{40}_{20}\text{Ca}$ ,  ${}^{40}_{19}\text{K}$ (2) Isotones  ${}^{30}_{14}\text{Si}$ ,  ${}^{31}_{15}\text{P}$ ,  ${}^{32}_{16}\text{S}$ (3) Isobars  ${}^{16}_8\text{O}$ ,  ${}^{17}_8\text{O}$ ,  ${}^{18}_8\text{O}$ (4) Isoelectronic  $\text{N}^{-3}$ ,  $\text{O}^{-2}$ ,  $\text{Cr}^{+3}$ **Q.22 The atom A, B, C have the configuration** $A \rightarrow [Z(90) + n(146)]$ ,  $B \rightarrow [Z(92) + n(146)]$ ,  $C \rightarrow [Z(90) + n(148)]$ **The wrong statements are**

1. A and C – Isotones

2. A and C – Isotopes

3. A and B – Isobars

4. B and C – Isobars

5. B and C – Isotopes

1. b only

2. c, d, e only

3. a, c, d only

4. a, c, e only

**Q.23 Match the following correctly:**(i)  ${}^{54}_{26}\text{Fe}$ ,  ${}^{56}_{26}\text{Fe}$ ,  ${}^{57}_{26}\text{Fe}$ ,  ${}^{58}_{26}\text{Fe}$  (a) Isotopes(ii)  ${}^3_1\text{H}$ ,  ${}^2_1\text{He}$  (b) Isotones(iii)  ${}^{76}_{32}\text{Ge}$ ,  ${}^{77}_{33}\text{As}$  (c) Isodiaphers(iv)  ${}^{235}_{92}\text{U}$ ,  ${}^{231}_{90}\text{Th}$  (d) Isobars(v)  ${}^1_1\text{H}$ ,  ${}^2_1\text{D}$ ,  ${}^3_1\text{T}$

- (1) (i)–a, (ii)–d, (iii)–b, (iv)–c, (v)–a  
(2) (i)–a, (ii)–d, (iii)–d, (iv)–c, (v)–a  
(3) (v)–a, (iv)–c, (iii)–d, (ii)–b, (i)–a  
(4) None of them

**Q.24** Atoms  $^{13}_6\text{C}$  and  $^{17}_8\text{O}$  are related to each other as

- (1) Isotones (3) Isodiaphers  
(2) Isoelectronic (4) Isosters

**Q.25** Choose the false statement about deuterium

- (1) It is an isotope of hydrogen  
(2) It contains [(1 e) + (1 p) + (1 n)]  
(3) It contains only [(1 p) + (1 n)]  
(4)  $\text{D}_2\text{O}$  is called as heavy water

#### TYPE 5 : Average Atomic Mass

**Q.26** The relative abundance of two rubidium isotopes of atomic weights 85 and 87 are 75% and 25% respectively. The average atomic weight of rubidium is

- (1) 75.5 (2) 85.5 (3) 86.5 (4) 87.5

**Q.27** An element has three isotopes and their isotopic weights are 11, 12, 13 unit and their percentage of occurrence in nature is 85, 10, 5 respectively. The average atomic weight of element is

- (1) 11.2 (2) 12.0 (3) 11.5 (4) 10.8

**Q.28** Average atomic weight of an element M is 51.7. If two isotopes of M are  $^{50}\text{M}$  and  $^{52}\text{M}$ , then the percentage occurrence of  $^{50}\text{M}$  in nature is

- (1) 85% (2) 15% (3) 25% (4) 75%

**Q.29** Atomic weight of Ne is 20.2. Ne is a mixture of  $^{20}\text{Ne}$  and  $^{22}\text{Ne}$ . The relative abundance of the heavier isotope is

- (1) 90 (2) 20 (3) 40 (4) 10

#### TYPE 6 : Atomic Mass Scale Conversion

**Q.30** If the table of atomic masses is established with the oxygen atom and assigned value of 200, then the mass of carbon atom would be, approximately

- (1) 24                                      (2) 150                                      (3) 50                                      (4) 112

**Q.31** If the table of atomic masses were established with the oxygen atom and assigned value of 100, then the mass of carbon atom would be, approximately

- (1) 24                                      (2) 75                                      (3) 50                                      (4) 112

**Q.32** Assuming that atomic weight of  $^{12}\text{C}$  is 150 units from atomic table, then according to this assumption, the weight of  $^{16}\text{O}$  will be

- (1) 100 units                              (2) 150 units                              (3) 200 units                              (4) 250 units

### TYPE 7 : Thomson's & Rutherford's Atomic Model

**Q.33** The statement, "an atom possesses a spherical shape in which the positive charge is uniformly distributed and the electrons are embedded into it in such a manner so as to give stable arrangement," was given by

- (1) Thomson's atomic model                                      (3) Bohr's atomic model  
(2) Rutherford's atomic model                                      (4) Chadwick's atomic model

**Q.34** When atoms are bombarded with  $\alpha$ -particles, only a few in million suffer deflection, others pass out undeflected. This is because [NCERT Pg. 34]

- (1) The force of repulsion on the moving  $\alpha$ -particle is small  
(2) The force of attraction on the  $\alpha$ -particle to the oppositely charged electron is very small  
(3) There is only one nucleus and large number of electrons  
(4) The nucleus occupies much smaller volume compared to the volume of the atom

**Q.35** When  $\alpha$ -rays strike a thin gold foil then

- (1) Most of the  $\alpha$ -rays do not pass through the gold foil  
(2) Most of the  $\alpha$ -rays get deflected back  
(3) Most of the  $\alpha$ -rays get deflected through small angles  
(4) Most of the  $\alpha$ -rays pass through without any deviation

**Q.36** Rutherford's  $\alpha$ -particle scattering experiment proved that atom has

- (1) Electrons                              (2) Neutrons                              (3) Nucleus                              (4) Orbitals

**Q.37** Rutherford's scattering experiment is related to the size of the [NCERT Pg. 34]

- (1) Nucleus                              (2) Atom                              (3) Neutron                              (4) Electron

**TYPE 8 : Charge-to-Mass Ratio (e/m)**

**Q.38** The charge to mass ratio of electron was found to be

- (1)  $1.6022 \times 10^{-19} \text{ C kg}^{-1}$  (3)  $1.758 \times 10^{11} \text{ C kg}^{-1}$   
(2)  $1.925 \times 10^{12} \text{ C kg}^{-1}$  (4)  $1.869 \times 10^{13} \text{ C kg}^{-1}$

**Q.39** The ratio of specific charge of a proton and an  $\alpha$ -particle is

- (1) 2 : 1 (2) 1 : 2 (3) 1 : 4 (4) 1 : 1

**Q.40** The e/m ratio is maximum for

- (1)  $\text{D}^+$  (2)  $\text{He}^+$  (3)  $\text{H}^+$  (4)  $\text{He}^{2+}$

**Q.41** The ratio of “charge to mass (e/m)” would be greater for

[NCERT Pg. 36]

- (1) Proton (2) Electron (3) Neutron (4) Alpha particle

**Q.42** Which of the following pairs have identical value of e/m?

- (1) A proton and a neutron  
(2) A proton and a deuteron  
(3) Deuteron and an  $\alpha$ -particle  
(4) An electron and  $\gamma$ -rays

**TYPE 9 : Nuclear Radius & Density**

**Q.43** The radius of nucleus  ${}_{13}^{27}\text{Al}$  will be

(Note:  $r = R_0 A^{1/3}$ ,  $R_0 = 1.4 \times 10^{-15} \text{ m}$ )

- (1)  $1.2 \times 10^{-15} \text{ m}$  (3)  $10.8 \times 10^{-15} \text{ m}$   
(2)  $2.7 \times 10^{-15} \text{ m}$  (4)  $4 \times 10^{-15} \text{ m}$

**Q.44** Which of the following elements has maximum density of nucleus?

- (1)  ${}_{14}^{30}\text{Si}$  (3)  ${}_{8}^{16}\text{O}$   
(2)  ${}_{15}^{31}\text{P}$  (4) All have same density

— End of DPP —