

# Atomic Structure

## DPP-1



**Ashish Bibyan**

B.Tech (IIT Delhi)

**Referral Code: ABSIRLIVE**

- What is the number of electrons in  ${}^{40}_{19}\text{K}^+$ ?
- An atom has a net charge of  $-1$ . It has 18 electrons and 20 neutrons. Give :
  - its isotopic symbol
  - its atomic number
  - its mass number
  - the charge on its nucleus
  - the number of protons
- (a) For the ion  ${}^{39}_{19}\text{K}^+$ , state how many electrons, how many protons, and how many neutrons are present. (b) Which of these particles—electron, proton, neutron—has the smallest mass?
- (a) What is the atomic number of sodium?  
 (b) How many protons are there in the sodium nucleus?  
 (c) How many protons are there in the sodium atom?
- Complete the following table.

isotopic symbol	atomic number	mass number	number of protons	number of neutrons	number of electrons	charge
${}^{15}\text{N}$	19		1	20 2	0	1+

- At one time there was a chemical atomic weight scale based on the assignment of the value 16.0000 to naturally occurring oxygen. What would have been the atomic weight, on such a table, of silver, if current information had been available? The atomic weights of oxygen and silver on the present table are 15.9994 and 107.868.
- Naturally occurring argon consists of three isotopes, the atoms of which occur in the following abundances: 0.34%  ${}^{36}\text{Ar}$  (At. Mass = 35.9676), 0.07%  ${}^{38}\text{Ar}$  (At. Mass = 37.9627), and 99.59%  ${}^{40}\text{Ar}$  (At. Mass = 39.9624). Calculate the atomic weight of argon from these data.
- Find the wavelength  $\lambda$  in the indicated units for light of the following frequencies:
  - 55 MHz ( $\lambda$  in m)
  - 1000 Hz ( $\lambda$  in cm)
  - $7.5 \times 10^{15}$  Hz ( $\lambda$  in Å)
- Calculate the number of electrons which will together weigh one gram.
  - Calculate the mass and charge of one mole of electrons. **(NCERT Problem)**
- Calculate the total number of electrons present in one mole of methane.
  - Find (a) the total number and (b) the total mass of neutrons in 7 mg of  ${}^{14}\text{C}$ . (Assume that mass of a neutron =  $1.675 \times 10^{-27}$  kg).
  - Find (a) the total number and (b) the total mass of protons in 34 mg of  $\text{NH}_3$  at STP. **(NCERT Problem)**
- Calculate the wavelength, frequency and wavenumber of a light wave whose period is  $2.0 \times 10^{-10}$  s. **(NCERT Problem)**
- The mass number of an atom is equal to
  - $n + p$
  - $n - p$
  - $n$
  - $p$

- 13.** When  $\alpha$ -particles are sent through a thin metal foil most of them go straight through the foil because
- $\alpha$ -particles are more heavier than electrons
  - $\alpha$ -particles are positively charged
  - most part of atom is empty space
  - $\alpha$ -particles move with high velocity
- 14.**  $X^{-2}$  has 56 electrons, the atomic number x is
- 56
  - 58
  - 28
  - 54
- 15.** The ratio of specific charge ( $e/m$ ) of a proton and that of an  $\alpha$ -particle is
- 2 : 1
  - 1 : 2
  - 1 : 4
  - 1 : 1
- 16.** Rutherford's scattering experiment is related to the size of the
- nucleus
  - atom
  - electron
  - neutron
- 17.** Cathode rays are
- electromagnetic waves
  - a stream of  $\alpha$ -particles
  - a stream of electrons
  - a stream of positrons
- 18.** The number of electrons in  $Al^{3+}$  is
- 13
  - 16
  - 10
  - 19
- 19.** The triad of nuclei that is isotonic is
- ${}_6C^{14}, {}_7N^{15}, {}_9F^{17}$
  - ${}_6C^{12}, {}_7N^{14}, {}_9F^{19}$
  - ${}_6C^{14}, {}_7N^{14}, {}_9F^{17}$
  - ${}_6C^{14}, {}_7N^{14}, {}_9F^{19}$
- 20.** Which of the following electromagnetic radiations has the minimum value of wavelength ?
- Gamma radiation
  - X-ray
  - Cosmic ray
  - Radio wave
- 21.** Which of the following types of electromagnetic radiations has the maximum wavelength ?
- Ultraviolet radiation
  - Radio wave
  - X-ray
  - Infrared radiation

## ANSWERS

1. 18

2. (a)  $^{37}_{17}\text{Cl}^-$ , (b) 17, (c) 37, (d) 17+ (e) 17

3. (a) 18 electrons, 19 protons, 20 neutrons, (b) electron

4. (a) 11, (b) 11, (c) 11

5.

Isotopic symbol	atomic number	mass number	number of protons	number of neutrons	number of electrons	charge
$^{15}\text{N}$	7	15	7	8	7	0
$^{39}\text{K}^+$	19	39	19	20	18	1+
$^3\text{H}^+$	1	3	1	2	0	1+

6. 107.872                      7. 39.95 u.                      8. (a) 5.5 m, (b)  $3.0 \times 10^7$  cm, (c) 400 Å,

9. (i)  $1.099 \times 10^{27}$  electrons (ii)  $5.48 \times 10^{-7}$  kg, -96320C

10. (i)  $6.022 \times 10^{24}$  electrons, (ii) (a)  $2.4088 \times 10^{21}$  neutrons (b)  $4.035 \times 10^{-6}$  kg

(iii) (a)  $1.2044 \times 10^{22}$  protons (b)  $2.015 \times 10^{-5}$  kg

11.  $3.14 \times 10^{10}$ ;  $9.55 \times 10^{-3}$ ;  $104.712 \text{ m}^{-1}$

12. (a)

13. (c)

14. (d)

15. (a)

16. (c)

17. (c)

18. (c)

19. (a)

20. (c)

21. (b)