

## Multiple Choice Questions

## Sub-atomic Particles, Atom, Atomic mass, Isotopes, Isobars and Isotones.

[MHT-CET 2022]

1. Which among the following statements is TRUE about isotones ?
  - a) These are nuclides having the same number of neutrons but different number of protons and hence different mass numbers.
  - b) These occupy same position in the modern periodic table.
  - c) These have different number of neutrons and same number of protons.
  - d) These have same chemical properties.
2. What is the number of nucleons present in an atom having 29 electrons and 34 neutrons in it ?
  - a) 29
  - b) 63
  - c) 05
  - d) 34
3. Which among the following statement is NOT true regarding isotopes ?
  - a) These have different number of neutrons
  - b) These have same number of protons.
  - c) These have same chemical properties
  - d) These occupy different positions in the modern periodic table.
4. Which among the following statements is TRUE regarding isobars ?
  - a) These are of same elements.
  - b) These have same chemical properties
  - c) These have different atomic numbers
  - d) These occupy same position in the modern periodic table.
5. Identify the term used for species having same number of electrons.
  - a) Isotopes
  - b) Isobars
  - c) Isoelectronic
  - d) Isotones

Wave, Particle Duality of Electromagnetic Radiation,  
Particle Nature of Electromagnetic Radiation

[MHT-CET 2021]

6. The value of Rydberg constant in Joule is
  - a)  $2.18 \times 10^{-18}$
  - b)  $2.0 \times 10^{-19}$
  - c) 8.314
  - d) 0.082
7. What is the number of radiations having frequency  $4 \times 10^{11}$  kHz ?
  - a)  $1.33 \times 10^6 \text{ m}^{-1}$
  - b)  $3.33 \times 10^6 \text{ m}^{-1}$
  - c)  $1.2 \times 10^6 \text{ m}^{-1}$
  - d)  $2.33 \times 10^6 \text{ m}^{-1}$
8. What is the frequency of red light having wavelength 750 nm ?
  - a)  $4 \times 10^{14} \text{ Hz}$
  - b)  $7.50 \times 10^{14} \text{ Hz}$
  - c)  $1.83 \times 10^{14} \text{ Hz}$
  - d)  $3 \times 10^{14} \text{ Hz}$
9. The wavelength of blue light is 480 nm. What is the frequency of this light ?
  - a)  $4.8 \times 10^9 \text{ Hz}$
  - b)  $2.25 \times 10^{14} \text{ Hz}$
  - c)  $6.25 \times 10^{14} \text{ Hz}$
  - d)  $5.25 \times 10^9 \text{ Hz}$
10. What is the frequency of yellow light having wavelength 580 nm ?
  - a)  $193 \times 10^{-9} \text{ Hz}$
  - b)  $517 \times 10^{-14} \text{ Hz}$
  - c)  $5.17 \times 10^{14} \text{ Hz}$
  - d)  $580 \times 10^{-9} \text{ Hz}$

## Structure of atom

11. The wavelength of spectral line of cesium is 460 nm. What is the frequency of the spectral line ?  
 a)  $4.5 \times 10^8$  Hz  
 b)  $6.5 \times 10^{14}$  Hz  
 c)  $3 \times 10^9$  Hz  
 d)  $5.6 \times 10^{14}$  Hz
12. What is the wavelength for a wave having frequency 50 Hz ?  
 a)  $1.6 \times 10^6$  m  
 b)  $6 \times 10^{-2}$  m  
 c)  $6 \times 10^6$  m  
 d)  $15 \times 10^2$  m

## Line Emission spectrum of Hydrogen

[MHT-CET 2021]

13. What is the energy of an electron in its ground state ?  
 a)  $5.2 \times 10^{-18}$  J  
 b)  $1.903 \times 10^{-10}$  J  
 c)  $-2.18 \times 10^{-18}$  J  
 d)  $-3.142 \times 10^{-19}$  J
14. What is the energy of an electron in stationary state corresponding to  $n = 2$  ?  
 a)  $-1.45 \times 10^{-18}$  J  
 b)  $-0.545 \times 10^{-18}$  J  
 c)  $-3.45 \times 10^{-18}$  J  
 d)  $-2.5 \times 10^{-18}$  J

[MHT-CET 2022]

15. What is the relation between radius, order of orbit and nuclear charge for hydrogen like species ?

$$\text{a) } r_n = \frac{a_0 n^2}{Z^2} \text{ pm} \quad \text{b) } r_n = \frac{a_0 Z}{n^2} \text{ pm} \quad \text{c) } r_n = \frac{a_0 n^2}{Z} \text{ pm} \quad \text{d) } r_n = \frac{a_0 n}{Z} \text{ pm}$$

16. Calculate the wave number of photon emitted during the transition from the orbit  $n = 2$  to  $n = 1$  in hydrogen atom ( $R_H = 109677 \text{ cm}^{-1}$ )

$$\text{a) } 72740 \text{ cm}^{-1} \quad \text{b) } 83560 \text{ cm}^{-1} \quad \text{c) } 82258 \text{ cm}^{-1} \quad \text{d) } 92820 \text{ cm}^{-1}$$

17. What is the energy associated with first orbit of  $\text{Li}^{2+}$  ? ( $R_H = 2.18 \times 10^{-18} \text{ J}$ )

$$\text{a) } -8.72 \times 10^{-18} \text{ J} \quad \text{b) } -19.62 \times 10^{-18} \text{ J} \\ \text{c) } -34.88 \times 10^{-18} \text{ J} \quad \text{d) } -2.18 \times 10^{-18} \text{ J}$$

18. Which of the following is not hydrogen like species ?

$$\text{a) } \text{Li}^{2+} \quad \text{b) } \text{Be}^{3+} \quad \text{c) } \text{He} \quad \text{d) } \text{He}^+$$

19. Calculate the radius of first orbit of  $\text{Li}^{2+}$  (Bohr radius = 52.9 pm)

$$\text{a) } 17.63 \text{ pm} \quad \text{b) } 52.9 \text{ pm} \quad \text{c) } 26.45 \text{ pm} \quad \text{d) } 13.23 \text{ pm}$$

## Bohr's atomic model for hydrogen atom, de Broglie's equation, Heisenberg uncertainty principle

[MHT-CET 2021]

20. What is the radius of Bohr's first stationary state ?

$$\text{a) } 52.9 \text{ pm} \quad \text{b) } 19.1 \text{ pm} \quad \text{c) } 32.4 \text{ pm} \quad \text{d) } 41.3 \text{ pm}$$

## Structure

21. Wh  
sta

a)

22. W

a)

23. W

(1  
a

24.

25.

26.

27.

28.

29.

30

31



21. What is the value of frequency of radiation when transition occurs between two stationary states that differ in energy by  $\Delta E$  ?

a)  $\nu = \frac{2\pi}{h}$

b)  $\nu = \frac{h}{\Delta E}$

c)  $\nu = \frac{\Delta E}{h}$

d)  $\nu = \frac{h}{2\pi}$

[MHT-CET 2022]

22. What is the correct mathematical expression of Heisenberg uncertainty principle ?

a)  $\Delta x \times \Delta v < \frac{h}{4\pi}$

b)  $\Delta x \times \Delta v = \frac{h}{2\pi}$

c)  $\Delta x \times \Delta v \geq \frac{h}{4\pi}$

d)  $\Delta x \times \Delta v < \frac{2h}{\pi}$

23. What will be the wavelength of a ball of mass 0.1 kg moving with velocity of  $10 \text{ ms}^{-1}$ ? ( $h = 6.6 \times 10^{-34} \text{ J}$ )

a)  $9.9 \times 10^{-34} \text{ m}$

b)  $3.3 \times 10^{-34} \text{ m}$

c)  $6.6 \times 10^{-34} \text{ m}$

d)  $1.28 \times 10^{-34} \text{ m}$

**Quantum mechanics and Quantum numbers**

[MHT-CET 2021]

24. Maximum number of electrons in a subshell is given by expression.

a)  $2l + 1$

b)  $2(2l + 1)$

c)  $4l - 2$

d)  $2n^2$

25. The correct set of first three quantum numbers for the unpaired electron of chlorine atom is (At. no. of Cl = 17)

a)  $n = 2, l = 1, m = 0$

b)  $n = 3, l = 1, m = +1$

c)  $n = 2, l = 1, m = +1$

d)  $n = 3, l = 0, m = 0$

26. Identify an orbital with quantum numbers  $n = 4, l = 3, m = 0$ .

a) 4f

b) 4p

c) 4s

d) 4d

27. Two electrons occupying the same orbital are distinguished by

a) Principal quantum number

b) Azimuthal quantum number

c) Magnetic quantum number

d) Spin quantum number

28. How many values of magnetic quantum number are possible for each value of Azimuthal quantum number ?

a)  $nl$

b)  $2l + 2$

c)  $n - l$

d)  $2l$

29. What is the maximum number of electrons accommodated in a subshell having Azimuthal quantum number,  $l = 2$  ?

a) 10

b) 12

c) 14

d) 18

30. Which of the following elements do not follow Aufbau principle ?

a) Cr and Cu

b) Co and Cr

c) Zn and Cu

d) Co and Mn

31. Which of the following laws will represent the pairing of electrons in a subshell after each orbital is filled with one electron ?

a) Pauli's exclusive principle

b) Hund's rule

c) Heisenberg's uncertainty principle

d) Hess's law

## Structure

- d) 4

- Match the following pairs.
- | species |           | number of electrons |    |
|---------|-----------|---------------------|----|
| a)      | $O^{2-}$  | i)                  | 18 |
| b)      | $Li^{2+}$ | ii)                 | 2  |
| c)      | He        | iii)                | 10 |
| d)      | $Ca^{++}$ | iv)                 | 1  |

- b) (a) - iii (b) - iv (c) - ii (d) - i

- d) (a) - i (b) - ii (c) - iv (d) - iii

45. V

- 46.

- 47.

- 48.

- 49.

- 50.

- b) 3

- c) 6

- d) 5

- 51

- b) Pauli's exclusive principle

- d) Aufbau principle

- 52

- b) 5

- c) 3

- d) 7

- 5

- b)  $n = 4$  to  $n = 2$

- c)  $n = 6$  to  $n = 2$

- d)  $n = 5$  to  $n = 3$

- a) 3

- b) 6

- c) 9

- d) 10

- a)  ${}^1_6\text{C}$ ,  ${}^{13}_6\text{C}$ ,  ${}^{14}_6\text{C}$

- b)  $^{40}_{18}\text{Ar}$ ,  $^{42}_{20}\text{Ca}$ ,  $^{43}_{21}\text{Sc}$

- c)  ${}^{40}_{18}\text{Ar}$ ,  ${}^{40}_{20}\text{Ca}$ ,  ${}^{41}_{21}\text{Sc}$

- d)  ${}^{14}_7\text{N}$ ,  ${}^{16}_8\text{O}$ ,  ${}^{16}_9\text{F}$