

ULTIMATE KCET CRASH COURSE 2026

CHEMISTRY

DPP: 1

Structure of atom

- Q1** In hydrogen atom, which energy level order is not correct:
 (A) $2p = 2s$ (B) $1s < 2p$
 (C) $2p > 2s$ (D) $2p < 3s$
- Q2** An atom emits energy equal to 4×10^{-12} erg. To which part of electromagnetic spectrum it belongs?
 (A) UV region
 (B) Visible region
 (C) IR region
 (D) Microwave region
- Q3** Unit of wavelength is
 (A) m
 (B) nm
 (C) Å
 (D) All of these
- Q4** The energy of electron in the n th Bohr orbit of H-atom is
 (A) $\frac{-13.6}{n^2} \text{eV}$
 (B) $\frac{-13.6}{n} \text{eV}$
 (C) $\frac{-13.6}{n^4} \text{eV}$
 (D) $\frac{-13.6}{n^3} \text{eV}$
- Q5** Which of the following represents correct set of the four quantum numbers for an electron in a 4d subshell?
 (A) 4, 2, 1, 0
 (B) 4, 2, 1, $-1/2$
 (C) 4, 3, 2, $+1/2$
 (D) 4, 3, -2 , $-1/2$
- Q6** The value of Planck's constant is 6.63×10^{-34} Js. The velocity of light is 3×10^8 m/sec. Which value is closest to the wavelength of a quantum of light with a frequency of $8 \times 10^{15} \text{sec}^{-1}$?
 (A) 5×10^{-18} m
 (B) 3×10^7 m
 (C) 4×10^{-8} m
 (D) 2×10^{-25} m
- Q7** The atomic number of an element represents:
 (A) number of neutrons in the nucleus
 (B) number of protons in the nucleus
 (C) atomic mass of element
 (D) valency of element
- Q8** It is not possible to explain the Pauli's exclusion principle with the help of this atom.
 (A) B (B) Be
 (C) C (D) H
- Q9** The uncertainty in momentum of an electron is 1×10^{-5} kg m/s. the uncertainty in its position will be
 ($h = 6.62 \times 10^{-34}$ kg m^2/s)
 (A) 2.36×10^{-28} m (B) 5.25×10^{-28} m
 (C) 2.27×10^{-30} m (D) 5.27×10^{-30} m
- Q10** Wavenumber of yellow radiations having a wavelength of 5800 Å is:
 (A) $1.72 \times 10 \text{ pm}^{-1}$
 (B) $1.72 \times 10 \text{ mm}^{-1}$
 (C) $1.72 \times 10^6 \text{ m}^{-1}$
 (D) $1.72 \times \times 10 \text{ cm}^{-1}$



- Q11** Calculate the wave number of the microwaves with wavelength 4×10^7 nm.
 (A) 0.25 m^{-1}
 (B) $4 \times 10^{-2} \text{ m}^{-1}$
 (C) 25 m^{-1}
 (D) $25 \times 10^5 \text{ m}^{-1}$
- Q12** The electronic configuration of an atom is $1s^2, 2s^2, sp^3$. The number of unpaired electrons in this atom is:
 (A) 1 (B) Zero
 (C) 3 (D) 5
- Q13** α -particles are represented by:
 (A) Lithium atoms
 (B) Helium nuclei
 (C) Hydrogen nuclei
 (D) None of these
- Q14** Which of the following statements about electromagnetic spectrum is not correct?
 (A) Infrared radiations have larger wavelength than cosmic rays
 (B) The frequency of microwaves is less than that of ultraviolet rays
 (C) X-rays have larger wave number than microwaves
 (D) The velocity of X-rays is more than that of microwaves

- Q15 Assertion (A):** Cathode rays consist of negatively charged particles, called electrons.
Reason (R): In the presence of electrical/magnetic field, the behaviour of cathode rays is similar to the negatively charged particles.
 (A) Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).
 (B) Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).
 (C) Assertion (A) is true and Reason (R) is false.
 (D) Assertion (A) is false and Reason (R) is true.

Q16 Match List-I with List-II.

List-I (Orbitals)		List-II (No. of radial nodes and angular nodes respectively)	
(A)	1s	(I)	1, 1
(B)	3p	(II)	0, 0
(C)	4d	(III)	2, 3
(D)	6f	(IV)	1, 2

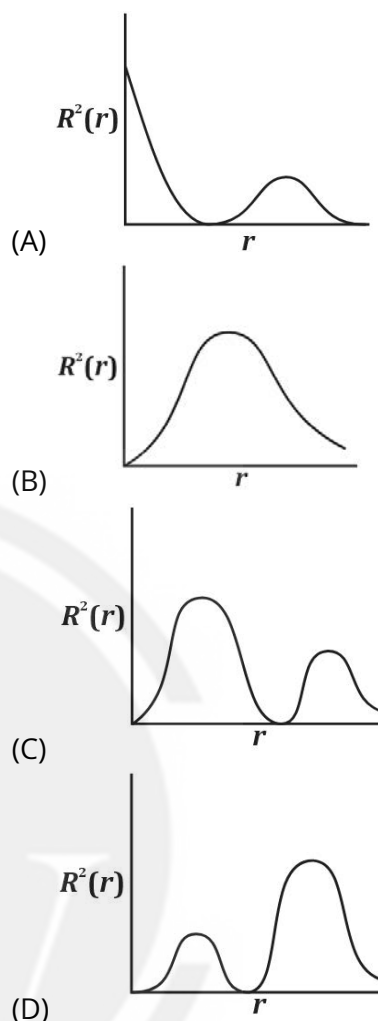
Choose the **correct** answer from the options given below.

- (A) A-III, B-I, C-IV, D-II
 (B) A-IV, B-I, C-II, D-III
 (C) A-I, B- , C- , D-IV
 (D) A-II, B-I, C-IV, D-III
- Q17** For a d-electron, the orbital angular momentum is
 (A) $\sqrt{2}\left(\frac{h}{2\pi}\right)$ (B) $\sqrt{6}\left(\frac{h}{2\pi}\right)$
 (C) $\left(\frac{h}{2\pi}\right)$ (D) $2\left(\frac{h}{2\pi}\right)$



- Q18** Charge of an electron
 (A) $-1.6022 \times 10^{-19} \text{ C}$
 (B) $1.6022 \times 10^{-19} \text{ C}$
 (C) $1.6022 \times 10^{19} \text{ C}$
 (D) $+1.6022 \times 10^{23} \text{ C}$
- Q19** An electron travels with a velocity of 'x' ms^{-1} . For a proton having the same de-Broglie wavelength, then velocity will be approximately equal to:
 (A) $\frac{1840}{x}$ (B) $\frac{x}{1840}$
 (C) $1840x$ (D) x
- Q20** Uncertainty in position of an electron (mass = $9.1 \times 10^{-28} \text{ g}$) moving with a velocity of $3 \times 10^4 \text{ cm/s}$ accurate upto 0.001% will be (use $h/4\pi$ in uncertainty expression where $h = 6.626 \times 10^{-27} \text{ erg-second}$).
 (A) 1.93 cm (B) 3.84 cm
 (C) 5.76 cm (D) 7.68 cm
- Q21** The number of photons emitted per second by a 60 watt source of monochromatic light of wavelength 663 nm is ($h = 6.63 \times 10^{-34} \text{ Js}$)
 (A) 4×10^{-20}
 (B) 1.5×10^{20}
 (C) 3×10^{-20}
 (D) 2×10^{20}
- Q22** In an atom how many orbital(s) will have the quantum numbers; $n = 3$, $l = 2$ and $m_l = +2$?
 (A) 1 (B) 7
 (C) 3 (D) 5

- Q23** The variation of radial probability density $R^2(r)$ as a function of distance r of the electron from the nucleus for $3p$ -orbital :



Q24 Given below are two statements:

Statement I: Positive ions are formed from their neutral parent atom by the loss of electrons.

Statement II: Cathode rays move from positive electrode to negative electrode.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (A) Statement I is correct but Statement II is incorrect.
- (B) Statement I is incorrect but Statement II is correct.
- (C) Both Statement I and Statement II are correct.
- (D) Both Statement I and Statement II are incorrect

Q25 The IUPAC name and symbol for the element with atomic number 121 respectively are:

- (A) Biennbium and Beb.
- (B) Unennunium and Ueu.
- (C) Unbiunium and Ubu.
- (D) Biunbium and Bub

Q26 Electronic configuration of Cr is $[\text{Ar}]3d^54s^1$ in place of $[\text{Ar}]3d^44s^2$ it is due to:

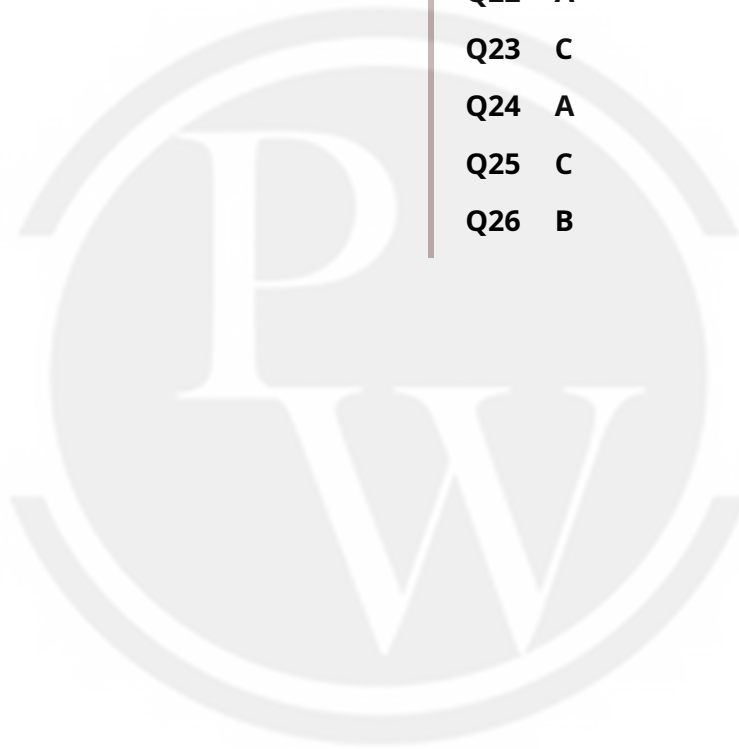
- (A) stability of fully filled orbital.
- (B) stability of half filled orbital.
- (C) unstability of half filled orbital.
- (D) heisenberg's uncertainty principle.



Answer Key

Q1 C
Q2 B
Q3 D
Q4 A
Q5 B
Q6 C
Q7 B
Q8 D
Q9 D
Q10 C
Q11 C
Q12 C
Q13 B

Q14 D
Q15 A
Q16 D
Q17 B
Q18 A
Q19 B
Q20 A
Q21 D
Q22 A
Q23 C
Q24 A
Q25 C
Q26 B



Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

In H atom subshells of a shell possess same energy level.

Video Solution:



Q2 Text Solution:

visible region

Video Solution:



Q3 Text Solution:

All of these

Video Solution:



Q4 Text Solution:

$$\frac{-13.6}{n^2} \text{eV}$$

Video Solution:



Q5 Text Solution:

For 4d orbitals, $n = 4$, $l = -2$, $m = -2, -1, 0, +1$ or $+2$

$$s = +\frac{1}{2} \text{ and } -\frac{1}{2}$$

Thus choice b having $n = 4$, $l = 2$, $m = 1$ and $s = \frac{-1}{2}$ is correct.

Video Solution:



Q6 Text Solution:

According to Planck's quantum theory:

$$E = h\nu = hc/\lambda$$

$$\nu = \frac{c}{\lambda}$$

E = energy

h = Planck's constant

c = speed of light

ν = frequency

λ = wave length

thus $\lambda = c/\nu$

given: $\nu = 8 \times 10^{15} \text{ s}^{-1}$ and $c = 3 \times 10^8 \text{ m/s}$

$$\lambda = \frac{3 \times 10^8}{8 \times 10^{15}} \text{ m}$$

$$\lambda = 3.75 \times 10^{-8} \text{ m}$$

$$\cong 4 \times 10^{-8} \text{ m}$$

Hence, option C ($4 \times 10^{-8} \text{ m}$) is correct.

Video Solution:



Q7 Text Solution:

atomic number = number of protons

Video Solution:**Q8 Text Solution:**

Pauli's exclusion principle states that 2 electrons of same atom cannot have all the 4 quantum numbers same.

Hydrogen has only 1 electron and hence cannot be used to explain Pauli's exclusion principle.

Video Solution:**Q9 Text Solution:**

$$\Delta x \cdot \Delta P = \frac{h}{4\pi}$$

$$\Delta x = \frac{6.63 \times 10^{-34}}{4 \times 3.14 \times 10^{-5}}$$

$$= \frac{5.27 \times 10^{-35}}{1 \times 10^{-5}}$$

$$= 5.27 \times 10^{-30} \text{ m}$$

Video Solution:**Q10 Text Solution:**

Wavenumber is defined as the reciprocal of a wavelength.

$$\bar{\nu} = \frac{1}{\lambda}$$

where, λ = wavelength = $5800 \text{ \AA} = 5.8 \times 10^{-7} \text{ m}$

$$\text{So, } \bar{\nu} = \frac{1}{5.8 \times 10^{-7}} = 1.72 \times 10^6 \text{ m}^{-1}.$$

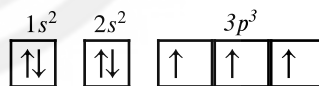
Video Solution:**Q11 Text Solution:**

$$\text{Wavelength } (\lambda) = 4 \times 10^7 \text{ nm} = 4 \times 10^{-2} \text{ m}$$

$$(1 \text{ nm} = 10^{-9} \text{ m})$$

$$\text{Wave number } (\bar{\nu}) = \frac{1}{\lambda} = \frac{1}{4 \times 10^{-2} \text{ m}}$$

$$\bar{\nu} = 25 \text{ m}^{-1}$$

Video Solution:**Q12 Text Solution:****Video Solution:**

Q13 Text Solution:

Alpha particles are helium nuclei

Video Solution:**Q14 Text Solution:**

The order of frequency of radiation is given as
g-rays > X-rays > UV rays > Visible > IR >
Microwave > Radio wave

All EM waves travel with same velocity.

Video Solution:**Q15 Text Solution:**

Characteristics of Cathode Rays:

- They start from the cathode and move towards the anode.
- These rays are not visible to naked eyes but can be viewed under a phosphorescent material such as zinc sulphide, e.g. Tube light.
- Their behaviour is similar to that of negatively charged particles in presence of electric and magnetic fields.
- In absence of electric and magnetic fields, these rays travel in the straight line.
- The characteristics of cathode rays don't depend on the material of electrodes and the nature of the gas present in them.

Thus, both the assertion and reason are correct and reason is the correct explanation of assertion.

Video Solution:**Q16 Text Solution:**

Radial nodes = $n - l - 1$

Angular nodes = l

Video Solution:

Q17 Text Solution:

The orbital angular momentum

$$(L) = \sqrt{l(l+1)} \frac{h}{2\pi}$$

$$\sqrt{6} \left(\frac{h}{2\pi} \right) \quad (l = 2 \text{ for d-orbital})$$

Video Solution:**Q18 Text Solution:**

$$-1.6022 \times 10^{-19} \text{ C}$$

Video Solution:**Q19 Text Solution:**

$$\lambda_e = \lambda_p$$

(where λ_e = wavelength of electron

λ_p = wavelength of proton)

$$\frac{h}{m_e v} = \frac{h}{m_p v}$$

$$\frac{h}{m_e v} = \frac{h}{1840 m_e v} \quad (\because m_p = 1840 m_e)$$

$$\text{Hence, } v = \frac{v}{1840}$$

Video Solution:**Q20 Text Solution:**

$$\text{Accuracy in velocity} = 0.001\% = \frac{0.001}{100};$$

Actual velocity of the electron

$$(\Delta v) = 3 \times 10^4 \times \frac{0.001}{100} = 0.3 \text{ cm/s}$$

Planck's constant (h) = 6.626×10^{-27} erg-sec.

\therefore Uncertainty in the position of the electron

$$(\Delta x) = \frac{h}{4\pi m \Delta v} = \frac{6.626 \times 10^{-27} \times 7}{4 \times 22 \times (9.1 \times 10^{-28}) \times 0.3}$$

$$= 1.93 \text{ cm.}$$

Video Solution:**Q21 Text Solution:**

Power = Energy per second

$$\therefore 60\text{W} = 60\text{J per sec} \Rightarrow E = 60 \text{ J,}$$

$$\lambda = 663 \text{ nm} = 663 \times 10^{-9} \text{ m, } c = 3 \times 10^8$$

$$\text{m s}^{-1}$$

$E = \frac{nhc}{\lambda}$ (where n = no. of photons emitted per second)

$$\therefore 60 = \frac{n \times 6.63 \times 10^{-34} \times 3 \times 10^8}{663 \times 10^{-9}} \Rightarrow n$$

$$= \frac{60 \times 663 \times 10^{-9}}{6.63 \times 10^{-34} \times 3 \times 10^8}$$

$$\Rightarrow n = 2000 \times 10^{17} \text{ or } 2 \times 10^{20}$$

Video Solution:

Q22 Text Solution:

$n = 3, l = 2$ means 3d orbital

$+2$	$+1$	0	-1	-2

i.e. in an atom only one orbital can have the value $m_l = +2$

Video Solution:**Q23 Video Solution:****Q24 Text Solution:**

Cathode rays move from the negative electrode (cathode) to the positive electrode (anode).

Video Solution:**Q25 Text Solution:**

The roots for 1 and 2 are un and bi respectively. Hence, the symbol for the element with $Z = 121$ is Ubu and name is Unbiunium.

Video Solution:**Q26 Text Solution:**

According to Hund's rule, Pairing of electrons in the orbitals belonging to the same subshell (p, d or f) does not take place until each orbital belonging to that subshell has got one electron each i.e. it is singly occupied.

Video Solution:

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