DPP - Daily Practice Problems

Chapter-wise Sheets

Date : | Start Time : | End Time :

CHEMISTRY CC02

SYLLABUS : Structure of Atom

Max. Marks : 120 **Marking Scheme :** + 4 for correct & (–1) for incorrect **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. Among the following groupings which represents the collection of isoelectronic species?

(a) $NO^+, C_2^{2-}, O_2^-, CO$ (b) N_2, C_2^{2-}, CO, NO

(c) CO, NO^+, CN^-, C_2^{2-} (d) NO, CN^-, N_2, O_2^-

2. The compound in which cation is isoelectronic with anion is :

(a) NaCl (b) CsF

(c) NaI (d) K_2S

3. The de-Broglie wavelength of an electron in the ground state of hydrogen atom is : [K.E. = 13.6 eV; 1eV = 1.602×10^{-19} J]

(a) 33.28 nm (b) 3.328 nm

(c) 0.3328 nm (d) 0.0332 nm

4. The frequency of light emitted for the transition $n = 4$ to $n = 2$ of the He^+ is equal to the transition in H atom corresponding to which of the following ?

(a) $n = 2$ to $n = 1$ (b) $n = 3$ to $n = 2$

(c) $n = 4$ to $n = 3$ (d) $n = 3$ to $n = 1$

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ

Space for Rough Work

5. The first emission line in the atomic spectrum of hydrogen in the Balmer series appears at

(a) $\frac{9R}{400}\text{cm}^{-1}$ (b) $\frac{7R}{144}\text{cm}^{-1}$

(c) $\frac{3R}{4}\text{cm}^{-1}$ (d) $\frac{5R}{36}\text{cm}^{-1}$

6. In hydrogen atomic spectrum, a series limit is found at 12186.3 cm^{-1}. Then it belong to

(a) Lyman series (b) Balmer series

(c) Paschen series (d) Brackett series

7. Two fast moving particles X and Y are associated with de Broglie wavelengths 1 nm and 4 nm respectively. If mass of X in nine times the mass of Y, the ratio of kinetic energies of X and Y would be

(a) 3 : 1 (b) 9 : 1

(c) 5 : 12 (d) 16 : 9

8. The ratio of magnetic moments of Fe(III) and Co(II) is

(a) 7 : 3 (b) 3 : 7

(c) $\sqrt{7} : \sqrt{3}$ (d) $\sqrt{3} : \sqrt{7}$

9. The values of Planck's constant is 6.63×10^{-34} Js. The velocity of light is 3.0×10^{8} m s^{-1}. Which value is closest to the wavelength in nanometres of a quantum of light with frequency of 8×10^{15} s^{-1}?

(a) 5×10^{-18} (b) 4×10^{1}

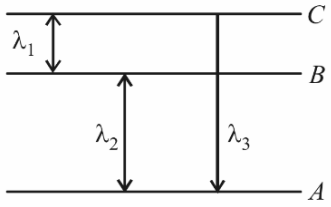
(c) 3×10^{7} (d) 2×10^{-25}

10. Li and a proton are accelerated by the same potential, their de Broglie wavelengths λ_{Li} and λ_p have the ratio (assume $m_{Li} = 9m_p$)

(a) 1 : 2 (b) 1 : 4

(c) 1 : 1 (d) $1 : 3\sqrt{3}$

11. Energy levels, *A, B, C*, of a certain atom correspond to increasing values of energy i.e., $E_A < E_B < E_C$. If $\lambda_1, \lambda_2, \lambda_3$ are the wave lengths of radiations corresponding to the transition from *C* to *B*, *B* to *A* and *C* to *A* respectively, which of the following statements is correct ?



(a) $\lambda_3 = \lambda_1 + \lambda_2$ (b) $\lambda_3 = \frac{\lambda_1\lambda_2}{\lambda_1 + \lambda_2}$

(c) $\lambda_1 + \lambda_2 + \lambda_3 = 0$ (d) $\lambda_3^2 = \lambda_1^2 + \lambda_2^2$

12. If uncertainty in position and momentum are equal, then uncertainty in velocity is :

(a) $\frac{1}{2m}\sqrt{\frac{h}{\pi}}$ (b) $\sqrt{\frac{h}{2\pi}}$

(c) $\frac{1}{m}\sqrt{\frac{h}{\pi}}$ (d) $\sqrt{\frac{h}{\pi}}$

13. The electrons, identified by quantum numbers n and *l* (i) n = 4, l = 1 (ii) n = 4, l = 0 (iii) n = 3, l = 2 (iv) n = 3, l = 1 can be placed in order of increasing energy, from the lowest to highest, as

(a) (iv) < (ii) < (iii) < (i) (b) (ii) < (iv) < (i) < (iii)

(c) (i) < (iii) < (ii) < (iv) (d) (iii) < (i) < (iv) < (ii)

14. Ionisation energy of He^+ is 19.6×10^{-18} J $atom^{-1}$. The energy of the first stationary state ($n = 1$) of Li^{2+} is

(a) 4.41×10^{-16} J $atom^{-1}$ (b) -4.41×10^{-17} J $atom^{-1}$

(c) -2.2×10^{-15} J $atom^{-1}$ (d) 8.82×10^{-17} J $atom^{-1}$

RESPONSE GRID					
	5. (a)(b)(c)(d)	**6.** (a)(b)(c)(d)	**7.** (a)(b)(c)(d)	**8.** (a)(b)(c)(d)	**9.** (a)(b)(c)(d)
	10. (a)(b)(c)(d)	**11.** (a)(b)(c)(d)	**12.** (a)(b)(c)(d)	**13.** (a)(b)(c)(d)	**14.** (a)(b)(c)(d)

Space for Rough Work

15. The kinetic energy of an electron in the second Bohr orbit of a hydrogen atom is [a_0 is Bohr radius] :

(a) $\frac{h^2}{4\pi^2 m a_0^2}$ (b) $\frac{h^2}{16\pi^2 m a_0^2}$

(c) $\frac{h^2}{32\pi^2 m a_0^2}$ (d) $\frac{h^2}{64\pi^2 m a_0^2}$

16. Energy of an electron is given by $E = -2.178 \times 10^{-18}\ J\left(\frac{Z^2}{n^2}\right)$.

Wavelength of light required to excite an electron in an hydrogen atom from level n = 1 to n = 2 will be :

(h = 6.62×10^{-34} Js and c = 3.0×10^8 ms^{-1})

(a) 1.214×10^{-7} m (b) $2.816 \times 10.^{-7}$ m

(c) 6.500×10^{-7} m (d) 8.500×10^{-7} m

17. If the nitrogen atom had electronic configuration $1s^7$ it would have energy lower than that of the normal ground state configuration $1s^2\ 2s^2\ 2p^3$ because the electrons would be closer to the nucleus. Yet $1s^7$ is not observed. It violates

(a) Heisenberg's uncertainty principle

(b) Hund's rule

(c) Pauli exclusion principle

(d) Bohr postulate of stationary orbits

18. In a hydrogen atom, if energy of an electron in ground state is 13.6. ev, then that in the 2nd excited state is

(a) 1.51 eV (b) 3.4 eV

(c) 6.04 eV (d) 13.6 eV.

19. Of the following sets which one does NOT contain isoelectronic species?

(a) BO_3^{3-}, CO_3^{2-}, NO_3^-

(b) SO_3^{2-}, CO_3^{2-}, NO_3^-

(c) CN^-, N_2, C_2^{2-}

(d) PO_4^{3-}, SO_4^{2-}, ClO_4^-

20. The ionization enthalpy of hydrogen atom is 1.312×10^6 J mol^{-1}. The energy required to excite the electron in the atom from n = 1 to n = 2 is

(a) 8.51×10^5 J mol^{-1} (b) 6.56×10^5 J mol^{-1}

(c) 7.56×10^5 J mol^{-1} (d) 9.84×10^5 J mol^{-1}

21. The limiting line in Balmer series will have a frequency of (Rydberg constant, $R_\infty = 3.29 \times 10^{15}$ cycles/s)

(a) 8.22×10^{14} s^{-1} (b) 3.29×10^{15} s^{-1}

(c) 3.65×10^{14} s^{-1} (d) 5.26×10^{13} s^{-1}

22. The energy required to break one mole of Cl – Cl bonds in Cl_2 is 242 kJ mol^{-1}. The longest wavelength of light capable of breaking a single Cl – Cl bond is

($c = 3 \times 10^8$ ms^{-1} and $N_A = 6.02 \times 10^{23}$ mol^{-1}).

(a) 594 nm (b) 640 nm

(c) 700 nm (d) 494 nm

23. The de Broglie wavelength of a car of mass 1000 kg and velocity 36 km/hr is :

(a) $6.626 \times l0^{-34}$ m (b) 6.626×10^{-38} m

(c) 6.626×10^{-31} m (d) 6.626×10^{-30} m

24. If the radius of first orbit of H atom is a_0, the de-Broglie wavelength of an electron in the third orbit is

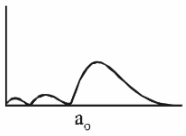
(a) $4\pi a_0$ (b) $8\pi a_0$

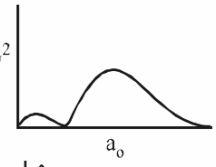
(c) $6\pi a_0$ (d) $2\pi a_0$

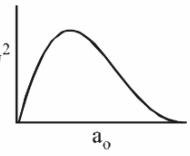
RESPONSE GRID					
	15. ⓐⓑⓒⓓ	**16.** ⓐⓑⓒⓓ	**17.** ⓐⓑⓒⓓ	**18.** ⓐⓑⓒⓓ	**19.** ⓐⓑⓒⓓ
	20. ⓐⓑⓒⓓ	**21.** ⓐⓑⓒⓓ	**22.** ⓐⓑⓒⓓ	**23.** ⓐⓑⓒⓓ	**24.** ⓐⓑⓒⓓ

Space for Rough Work

25. Which of the following radial distribution graphs correspond to $\ell = 2$ for the H atom ?

(a) 

(b) 

(c) 

(d) 

26. If the kinetic energy of an electron is increased four times, the wavelength of the de-Broglie wave associated with it would become

(a) one fourth (b) half

(c) four times (d) two times

27. The correct set of four quantum numbers for the valence electrons of rubidium atom ($Z = 37$) is:

(a) $5, 0, 0, +\frac{1}{2}$ (b) $5, 1, 0, +\frac{1}{2}$

(c) $5, 1, 1, +\frac{1}{2}$ (d) $5, 0, 1, +\frac{1}{2}$

28. If λ_o and λ be threshold wavelength and wavelength of incident light, the velocity of photoelectron ejected from the metal surface is:

(a) $\sqrt{\frac{2h}{m}(\lambda_o - \lambda)}$ (b) $\sqrt{\frac{2hc}{m}(\lambda_o - \lambda)}$

(c) $\sqrt{\frac{2hc}{m}\left(\frac{\lambda_o - \lambda}{\lambda\lambda_o}\right)}$ (d) $\sqrt{\frac{2h}{m}\left(\frac{1}{\lambda_o} - \frac{1}{\lambda}\right)}$

29. If m and e are the mass and charge of the revolving electron in the orbit of radius r for hydrogen atom, the total energy of the revolving electron will be:

(a) $\frac{1}{2}\frac{e^2}{r}$ (b) $-\frac{e^2}{r}$

(c) $\frac{me^2}{r}$ (d) $-\frac{1}{2}\frac{e^2}{r}$

30. The dissociation energy of H_2 is 430.53 KJ mol^{-1}. If hydrogen is dissociated by illumination with radiation of wavelength 253.7 nm the fraction of the radiant energy which will be converted into kinetic energy is given by

(a) 100% (b) 8.76%

(c) 2.22% (d) 1.22%

RESPONSE GRID	25. ⓐⓑⓒⓓ 26. ⓐⓑⓒⓓ 27. ⓐⓑⓒⓓ 28. ⓐⓑⓒⓓ 29. ⓐⓑⓒⓓ 30. ⓐⓑⓒⓓ

DAILY PRACTICE PROBLEM DPP CHAPTERWISE 2 - CHEMISTRY			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	37	Qualifying Score	51
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work