



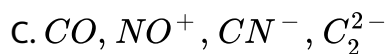
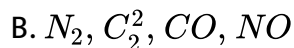
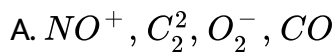
CHEMISTRY

BOOKS - DISHA CHEMISTRY (HINGLISH)

STRUCTURE OF ATOM

Mcqs

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



Answer: C



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2. Rutherford's experiment , which established the nuclear model of the atom , used a beam of

- A. β -particles which impinged on a metal foil and got absorbed
- B. γ - rays which impinged on a metal foil and ejected cloctrons
- C. helium atoms which impinged on a metal foil and got scattered
- D. helium nuclci which impoinged on a metal foil and got scattered

Answer: D



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3. Which of the following levels of H and He^+ have same energy respectively ?

(A) 1, 2 (B) 3, 4 (C) 2, 4 (D) 3, 6

A. A and D

B. A and B

C. C and D

D. A, C and D

Answer: D



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4. A 600 W mercury lamp emits monochromatic radiation of wavelength 331.3 nm. How many photons are emitted from the lamp per second? ($h = 6.626 \times 10^{-34}$ Js, velocity of light = 3×10^8 ms^{-1})

A. 1×10^{39}

B. 1×10^{20}

C. 1×10^{21}

D. 1×10^{23}

Answer: C



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5. 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 excited an electron in an hydrogen atom from level $n = 1$ to $n = 2$ will be

($h = 6.62 \times 10^{-34} Js$ and $c = 3.0 \times 10^8 ms^{-1}$).

A. $1.214 \times 10^{-7} m$

B. $2.816 \times 10^{-7} m$

C. $6.500 \times 10^{-7} m$

D. $8.500 \times 10^{-7} m$

Answer: A

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6. 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

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

A. 594 mm

B. 640 mm

C. 700 mm

D. 494 mm

Answer: D

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

A. $\frac{9R_H}{400}cm^{-1}$

B. $\frac{7R_H}{144}cm^{-1}$

C. $\frac{3R_H}{4}cm^{-1}$

D. $\frac{5R_H}{36}cm^{-1}$

Answer: D



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8. Which one of the following set of quantum numbers is not possible for 4p electron ?

A. $n = 4, l = 1, m = -1, m_s = +\frac{1}{2}$

B. $n = 4, l = 1, m = 0, m_s = +\frac{1}{2}$

C. $n = 4, l = 1, m = 2, m_s = +\frac{1}{2}$

$$D. n = 4, l = 1, m = -1, m_s = -\frac{1}{2}$$

Answer: C



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9. What will be the difference electromagnetic radiation shown in A and B respectively ?



(i) Velocity (ii) Wavelength

(iii) Frequency (iv) Energy

A. (ii) only

B. (ii) and (iv)

C. (ii), (iii) and (iv)

D. (iv) only

Answer: C

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10. Match the columns



A. A-(r)-(ii),B-(s)-(iv),C-(p)-(iii),D-(q)-(i)

B. A-(q)-(i),B-(s)-(iv),C-(p)-(iii),D-(r)-(ii)

C. A-(p)-(iii),B-(s)-(iv),C-(r)-(ii),D-(q)-(i)

D. A-(r)-(ii),B-(p)-(iii),C-(s)-(iv),D-(q)-(i)

Answer: A

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11. The orbital angular momentum for an electron revolving in an orbit is given by $\sqrt{l(l+1)} \frac{h}{2\pi}$. This momentum for an s-electron will be given by

A. zero

B. $\frac{h}{2\pi}$

C. $\sqrt{2} \frac{h}{2\pi}$

D. $+\frac{1}{2} \frac{h}{2\pi}$

Answer: A



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12. The energy of a photon is given as $\Delta E/$ atom $3.03 \times 10^{-19} J_{\text{atom}^{-1}}$. Then the wavelength (λ) of the photon is

A. 65.6nm

B. 65.6nm

C. 0.656 nm

D. 6.56 nm

Answer: B



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13. The electrons, identified by quantum numbers n and l are: (I) $n = 4, l = 1$; (II) $n = 4, l = 0$; (III) $n = 3, l = 2$; (IV) $n = 3, l = 1$. They 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. $(III) < (I) < (IV) < (II)$

Answer: A



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14. For Balmer series in the spectrum of atomic hydrogen, the wave number of each line is given by $v = R_{II} \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$ where R_{II} is a constant and n_1 and n_2 are integers. Which of the following statement (s) is (are) correct ?

- (i) As wavelength decreases, the lines in the series converge.
- (ii) The interger n_1 is equal to 2.
- (iii) The ionization energy of hydrogen can be calculated from the wave number of these lines.
- (iv) The line of longest wavelength corresponds to $n_2 = 3$.

- A. (i), (ii) and (iii)
- B. (ii), (iii) and (iv)
- C. (i), (ii) and (iv)
- D. (ii) and (iv)

Answer: C



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15. The wavelength (in cm) of second line in the Lyman series of hydrogen atomic spectrum is (Rydberg constant = $R\text{cm}^{-1}$)

A. $\frac{8R_H}{9}$

B. $\left(\frac{9}{8R_H}\right)$

C. $\left(\frac{4}{3R_H}\right)$

D. $\left(\frac{3R_H}{4}\right)$

Answer: A



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16. 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. $\sqrt{\frac{2hc}{m}(\lambda_o - \lambda)}$

$$C. \sqrt{\frac{2hc}{m} \left(\frac{\lambda_0 - \lambda}{\lambda\lambda_0} \right)}$$

$$D. \sqrt{\frac{2h}{m} \left(\frac{1}{\lambda_0 - \frac{1}{\lambda}} \right)}$$

Answer: C



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17. If wavelength of photon is $2.2 \times 10^{-11} m$, $h = 6.6 \times 10^{-34} \text{ Js}$, then momentum of photon is

A. $3 \times 10^{23} \text{ kg/s}$

B. $3.33 \times 10^{22} \text{ kg/s}$

C. $1.452 \times 10^{-44} \text{ kg/s}$

D. $6.89 \times 10^{43} \text{ kg/s}$

Answer: A



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18. Which of the following set of quantum numbers belong to highest energy ?

A. $n = 4, l = 0, m = 0, s = +\frac{1}{2}$

B. $n = 3, l = 0, m = 0, s = +\frac{1}{2}$

C. $n = 3, l = 1, m = 1, s = +\frac{1}{2}$

D. $n = 3, l = 2, m = 1, s = +\frac{1}{2}$

Answer: D

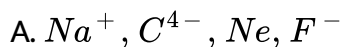


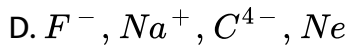
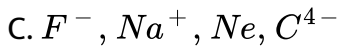
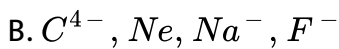
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19. From the data given below A, B, C and D respectively are,

(A) $10e^-$, atomic no. 11 (B) $10e^-$, atomic no. 6

(C) $10e^-$, atomic no. 10 (D) $10e^-$, atomic no. 9





Answer: A

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20. Suppose beam containing all three fundamental subatomic particles are allowed to pass through an electric field as shown in figure. The subatomic particles detected at three points A, B and C on the screen respectively are ?



A. Protons, neutrons, electrons

B. Electrons, neutrons, protons

C. Electrons, protons, neutrons

D. Neutrons, protons, electrons

Answer: B



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21. For a d-electron, the orbital angular momentum is

A. $\sqrt{6}(h/2\pi)$

B. $\sqrt{2}(h/2\pi)$

C. $(h/2\pi)$

D. $2(h/2\pi)$

Answer: A



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22. The uncertainty in the position of an electron (mass = $9.1 \times 10^{-28} \text{ g}$) moving with a velocity of $3.0 \times 10^4 \text{ cm s}^{-1}$ accurate upto 0.011 % will be

A. 1.92 cm

B. 7.68 cm

C. 0.175 cm

D. 3.84 cm

Answer: C



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

A. 5×10^{-18}

B. 4×10^1

C. 3×10^7

D. 2×10^{-25}

Answer: B



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24. The wavelength associated with a golf ball weighing 200 g and moving at a speed of $5m/h$ is of the order

A. $10^{-10}m$

B. $10^{-20}m$

C. $10^{-30}m$

D. $10^{-40}m$

Answer: A



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25. Given that the abundances of isotopes ^{54}Fe , ^{56}Fe and ^{57}Fe 5%, 90% and 5%, respectively, the atomic mass of Fe is

A. 55.85

B. 55.95

C. 55.75

D. 56.05

Answer: B

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26. Based on the equation :

$$\Delta E = -2.0 \times 10^{-18} J \left(\frac{1}{n_2^2} - \frac{1}{n_1^2} \right)$$

the wavelength of the light that must be absorbed to excite hydrogen

electron from level $n = 1$ to level $n = 2$ will be

$$(h = 6.625 \times 10^{-34} \text{ Js}, C = 3 \times 10^8 \text{ ms}^{-1})$$

A. $1.325 \times 10^{-7} \text{ m}$

B. $1.325 \times 10^{-10} \text{ m}$

C. $2.650 \times 10^{-7} \text{ m}$

D. $5.300 \times 10^{-10} \text{ m}$

Answer: A



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27. 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. $\sqrt{\frac{h}{\pi}}$

Answer: A



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28. The radius of an atomic nucleus is of the order of :

A. 10^{-10} cm

B. 10^{-13} cm

C. 10^{-15} cm

D. 10^{-8} cm

Answer: B



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29. In Cu. (At. No. 29)

- A. 13 electrons have spin in one direction and 16 electrons in other direction
- B. 14 electrons have spin in one direction and 15 electrons in other direction
- C. one electron can have spin only in the clockwise direction
- D. None of the above is correct.

Answer: B



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30. The correct order of increasing energy of atomic orbitals is

- A. $5p < 4f < 6s < 5d$
- B. $5p < 6 < 4f < 5d$
- C. $5p < 5d < 4f < 6s$
- D. none of these

Answer: B



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31. What does negative sign in the electronic energy for hydrogen atom convey.

- A. Energy of electron when $n = \infty$
- B. The energy of electron in the atom is lower than the energy of a free electron in motion
- C. The energy of electron in the atom is lower than the energy of a free electron of rest
- D. The energy of electron decreases as it moves away from nucleus

Answer: C



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32. 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

Answer: C



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33. If $n=6$, the correct sequence for filling of electrons will be :

- A. $ns \rightarrow (n - 2)f \rightarrow (n - 1)d \rightarrow np$
- B. $ns \rightarrow (n - 1)d \rightarrow (n - 2)f \rightarrow np$

$$C. ns \rightarrow (n - 2)f \rightarrow np \rightarrow (n - 1)d$$

$$D. ns \rightarrow np \rightarrow (n - 1)d \rightarrow (n - 2)f$$

Answer: A

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34. What is the expression of frequency (ν) associated with absorption spectra of the photon.

$$A. \nu = \frac{R_H}{h} \left(\frac{1}{n_i^2} - \frac{1}{n_f^2} \right) n_i > n_f$$

$$B. \nu = \frac{R_H}{h} \left(\frac{1}{n_i^2} - \frac{1}{n_f^2} \right) n_f > n_i$$

$$C. \nu = - \frac{R_H}{h} \left(\frac{1}{n_i^2} - \frac{1}{n_f^2} \right) n_f > n_i$$

D. All the above are correct

Answer: B

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35. Chlorine exists in two isotopic forms, Cl-37 and Cl-35 but its atomic mass is 35.5. This indicates the ratio of Cl-37 and Cl-35 is approximately

A. 1 : 2

B. 1 : 1

C. 1 : 3

D. 3 : 1

Answer: C



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36. 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. $-\frac{1}{2} \frac{e^2}{r}$

Answer: D



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37. An electron, e_1 is moving in the fifth stationary state, and another electron e_2 is moving in the fourth stationary state. The radius of orbit of electron e_1 is five times the radius of orbit of electron e_2 calculate the ratio of velocity of electron $e_1(v_1)$ to the velocity of electron $e_2(v_2)$.

A. 5: 1

B. 4: 1

C. 1: 5

D. 1 : 4

Answer: D

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

A. $5, 0, 0, \pm \frac{1}{2}$

B. $5, 1, 0, + \frac{1}{2}$

C. $5, 1, 1, + \frac{1}{2}$

D. $5, 0, 1, + \frac{1}{2}$

Answer: A

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39. Among species H , Li^{2+} , He^+ , Be^{3+} and Al^{3+} Bohr's model was able to explain the spectra of

A. all of these

B. none of these

C. all other species except Be^{3+}

D. all other species except Al^{3+}

Answer: D

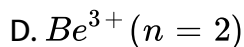
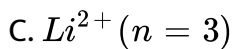


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40. The radius of which of the following orbit is same as that of the first Bohr's orbit of hydrogen atom ?

A. He^+ ($n = 2$)

B. Li^{2+} ($n = 2$)



Answer: D



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41. The average life of an excited state of hydrogen atom is of the order 10^{-8} s. The number of revolutions made by an electron when it is in state $n=2$ and before it suffers a transition to state $n=1$ are

A. 8.23×10^6

B. 2.82×10^6

C. 22.8×10^6

D. 2.28×10^6

Answer: A



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42. 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

Answer: B



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43. If the radius of first orbit of H-atom is a_0 , then de-Broglie wavelength of electron in 4^{th} orbit is

A. $8\pi a_0$

B. $\frac{a_0}{4}$

C. $16a_0$

D. $2\pi a_0$

Answer: A



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