1. Light of wavelength λ shines on a metal surface with intensity x and the metal emits y electrons per second of average energy, z. What will happen to y and z if x is doubled ?
(A) y will be doubled and z will become half (B) y will remain same and z will be doubled
(C) both y and z will be doubled (D) y will be doubled but z will remains same

2. The ratio of the de Broglie wavelength of the electron (λ_1) and that of the neutron (λ_2) both moving with the same velocity is
(A) 3.4×10^2 (B) 53 (C) 1.76×10^3 (D) none of these

3. How many lines in the spectrum will be observed when electrons return from 7^{th} shell to 2^{nd} shell ?
(A) 10 (B) 15 (C) 21 (D) 30

4. The value of $(n_2 + n_1)$ and $(n_2^2 - n_1^2)$ for He^+ ion in atomic spectrum are 4 and 8 respectively. The wavelength of emitted photon when electron jump from n_2 to n_1 is
(A) $\frac{32}{9}R_H$ (B) $\frac{9}{32}R_H$ (C) $\frac{9}{32R_H}$ (D) $\frac{32}{9R_H}$

5. Calculate the maximum and minimum numbers of electrons, which may have magnetic quantum number m = +1 and spin quantum number S = $+\frac{1}{2}$ in chromium (Cr).
(A) 3, 2 (B) 6, 4 (C) 4, 2 (D) 2, 1

6. Ionization potential of hydrogen atom is 13.6eV. Hydrogen atom in the ground state is excited by monochromatic radiation of photons of energy 12.75eV. The possible number of spectral lines emitted by the hydrogen atom, according to Bohr's theory will be
(A) Ten (B) Six (C) Three (D) One

7. A gas absorbs photon of 300nm and re-emits 2 photons, if one of it has wavelength 450nm; the other has
(A) 750nm (B) 150nm (C) 900nm (D) none

8. H, D and He^+ are all one electron species. The wavelengths of radiations emitted for their downward transitions from 1^{st} excited state to ground state are λ_1, λ_2 and λ_3 respectively. Then approximately:
(A) $4\lambda_1 = 2\lambda_2 = 2\lambda_3$ (B) $\lambda_1 = 2\lambda_2 = 2\sqrt{2}\,\lambda_3$ (C) $\lambda_1 = \lambda_2 = 2\lambda_3$ (D) $\lambda_1 = \lambda_2 = 4\lambda_3$

9. The radius of the nucleus is related to the mass number A by
(A) $R = R_o A^{1/2}$ (B) $R = R_o A$ (C) $R = R_o A^2$ (D) $R = R_o A^{1/3}$

10. The specific charge of proton is $9.6 \times 10^6\, C\,kg^{-1}$ then for an α-particle it will be
(A) $38.4 \times 10^7\, C\,kg^{-1}$ (B) $19.2 \times 10^7\, C\,kg^{-1}$ (C) $2.4 \times 10^7\, C\,kg^{-1}$ (D) $4.8 \times 10^7\, C\,kg^{-1}$

11. Match the following

List – I (Spectral line)	List – II (Wavelength) (in cm)
A H_α - Lyman	1. 225/16R
B. H_α - Balmer	2. 16/3R
C. H_β - Paschen	3. 4/3R
D. H_β - Balmer	4. 36/5R
	5. 9/8R

	A	B	C	D
(A)	1	4	3	2
(C)	1	5	3	2

	A	B	C	D
(B)	3	4	1	2
(D)	3	4	5	1

12. Study the following table

Orbit	1st	2nd	3rd
Radius	$0.132A^0$	$0.529\ A^0$	$1.191\ A^0$

The species is

(A) H (B) He^+ (C) Li^{+2} (D) Be^{+3}

MORE THAN ONE CORRECT ANSWER TYPE

13. Which of the following statement(s) is/are correct?

(A) The ratio of the radii of the first three Bohr orbits of hydrogen atom is 1:8:27.

(B) The ratio of magnitude of total energy : kinetic energy : potential energy for electron in any orbit of hydrogen atom is 1:1:2.

(C) The frequency of a green light is 6×10^{14} Hz , then its wavelength is 500 nm.

(D) The ratio of de-Broglie wavelength of a H–atom, He – atom and CH_4 molecule moving with equal kinetic energy is 4:2:1.

14. Which is/ are correct statement for following $Mn^{+4}, Cr^{+2}, Ni^{+2}, Zn^{2+}$

(A) Cr^{+2} have maximum magnetic moment (B) Only Zn^{2+} is diamagnetic

(C) Mn^{+4} have maximum magnetic moment (D) Ni^{2+} have minimum exchange energy.

15. Which of the following is/are NOT correctly matched ?

	2s	2p	
(A)	↑	↑ ↑ ↑	No rule is violated
(B)	↑	↑↑ ↓ ↑	All the three rules Aufbau, Pauli and Hund's rules are
(C)	↑↓	↑↓ ↓ ↑	Pauli and Hund's rules are violated
(D)	↑	↑↑ ↑ ↑	Aufbau and Hund's rule are violated

INTEGER

16. In hydrogen atom an electron is revolving at a distance of $2.116\ A^0$ from the nucleus. The angular momentum of the electron is 'y'. Then $\frac{\pi y}{h}$ is

17. In the third principal quantum number, the total number of orbitals are :

18. Depict number of nodal planes for ψ_{320}.

19. When an electron transits from '2E' to 'E' energy level (where 'E' is the energy value measured in eV) the wavelength of photon produced is λ_1. If electronic transition involves '$\frac{4E}{3}$' to 'E' level, then wavelength of resultant photon is 'λ_2'. Then value of $\frac{\lambda_2}{\lambda_1}$ is

20. Find the quantum numbers of excited state of electron in He^+ ion which on transition to ground state and first excited state emit two photons of wavelength, 30.4 nm and 108.5 nm respectively. $\left(R_H = 1.09678\times10^7 m^{-1}\right)$

21. What electron transition in a hydrogen atom, starting from the orbit $n=7$, will produce infrared light of wavelength 2170 nm? ($R_H = 1.09677\times10^7 m^{-1}$)

COMPREHENSION TYPE

In the Rutherford's experiment, α-particles were bombarded towards the copper atoms so as to arrive at a distance of 10^{-13} metre from the nucleus of copper and then getting either deflected or traversing back. The α-particles did not move further closer

22. The velocity of the α-particles must be
(A) 8.32×10^{8}cm/sec (B) 6.32×10^{8} cm/sec (C) 6.32×10^{8} m/sec (D) 6.32×10^{8}km/sec

23. From Rutherford's α-particles scattering, it can be concluded that
(A) $N \alpha \sin^4\frac{\theta}{2}$ (B) $N \alpha \frac{1}{\sin^4\theta}$ (C) $N \alpha \frac{1}{\sin^4\frac{\theta}{2}}$ (D) $N = \sin\frac{\theta}{2}$

MATRIX MATCH TYPE

24. Match the following

Column I		**Column II**	
(A)	Time period	(p)	Proportional to $\frac{n^3}{z^2}$
(B)	Velocity of electron	(q)	Inversely proportional to n
(C)	Energy of electron	(r)	Proportional to n^2
(D)	Radius of n^{th} orbit	(s)	Inversely proportional to n^2

KEY

1.	D	2.	C	3.	B	4.	C	5.	A
6.	B	7.	C	8.	D	9.	D	10.	B
11.	B	12.	A	13.	BCD	14.	AB	15.	ACD
16.	1	17.	9	18.	0	19.	3	20.	5
21.	4	22.	B	23.	B	24.	**A $\rightarrow$ p; B $\rightarrow$ q; C $\rightarrow$ s ; D $\rightarrow$ r**		