

CG-11-2020

WINTER EXAM 2020

Subject Name : RB-25_PHYSICS - Atomic Molecular & Nuclear Physics- XIV (CBCS)_VI_18-03-2021

Date : 18/03/2021

Duration : 60 min. |

Instruction / सूचना / :-

* Follow the detail instructions given on OMR Sheet

* ओ एम आर वरील सर्व सूचनांचे पालन करावे.

Q.1	114	114	114
Sommerfeld model could not predict the correct number of the _____			
A) Fine structure lines		C) Number of orbits in an atom	
B) Electrons in an orbit		D) Splitting of spectral lines	
Q.2	114	114	114
The Stern-Gerlach experiment provided an excellent proof of the _____			
A) Spinning electron		C) Compton effect	
B) Space Quantisation of atom		D) Stark effect	
Q.3	114	114	114
The total magnetic moment of an atom should be the vector sum of the _____			
A) orbital magnetic moments only		C) orbital and spin magnetic moments	
B) spin magnetic moments only		D) None of these	
Q.4	114	114	114
The serial number of the shells starting from the innermost is designated as its _____			
A) Angular momentum Quantum number		C) Principal Quantum number	
B) orbital Quantum number		D) Spin Quantum number	
Q.5	114	114	114
The spin Quantum number has the value _____			
A) 0		C) 0.5	
B) 1		D) 1	
Q.6	114	114	114
For an electron the orbital Quantum number = 0 is called as			
A) p electron		C) s electron	
B) d electron		D) f electron	
Q.7	114	114	114
In L-S coupling There is combination of _____			
A) Orbital angular momentum		C) Magnetic and electric field	
B) Spin angular momentum		D) Both A and B	
Q.8	114	114	114
Total angular momentum of an atom (J) is given by _____			
A) $J = L + S$			
B) $J = L - S$			
C) $J = \sqrt{L^2 + S^2}$			
D) $J = \sqrt{L^2 - S^2}$			
Q.9	114	114	114
When $L < S$, then J can have value _____			
A) $(2S + 1)$		C) $(2P + 1)$	
B) $(2L + 1)$		D) $(2P - 1)$	
Q.10	114	114	114
To determine the state of an electron completely we require the Quantum numbers as			
A) n, l, m_l			
B) n, m_l, m_s			
C) n, m_l, s			
D) n, l, m_l and m_s			
Q.11	114	114	114
The unit of energy used for expressing the splitting of the energy levels in magnetic field is called as			
A) Coulomb unit		C) Lorentz unit	
B) Bell unit		D) None of these	
Q.12	114	114	114

The selection rule for J is

- A) $\Delta L = \pm 1$
 B) $\Delta J = \pm 1$ or 0
 C) $\Delta L = 0$ only
 D) $\Delta J = 0$ only

Q.13

The molecule remains in its ground state level of

- A) Electronic energies
 B) vibrational energies
 C) Electronic and vibrational energies
 D) Rotational energies

Q.14

The rotational kinetic energy of a diatomic molecule is given by

- A) $EJ = \frac{J(J+1)\hbar^2}{2I}$
 B) $EJ = \frac{J(J-1)\hbar^2}{2I}$
 C) $EJ = \frac{J(2J+1)\hbar^2}{2I}$
 D) $EJ = \frac{J(2J-1)\hbar^2}{2I}$

Q.15

The angular momentum of the rotating diatomic molecule is Quantised according to $L = \sqrt{J(J+1)} \hbar$ for J taking values from

- A) $J = 0, 2, 4, 6, \dots$
 B) $J = 0, 1, 3, 5, \dots$
 C) $J = 0, 1, 2, 3, \dots$
 D) $J = 0, \pm 1, \pm 2, \pm 3, \dots$

Q.16

The angular velocity ω of the rotating molecule is given by

- A) $\omega = \frac{5m_r \hbar}{3\pi I}$
 B) $\omega = \frac{m_r \hbar}{7\pi I}$
 C) $\omega = \frac{2m_r \hbar}{3\pi I}$
 D) $\omega = \frac{m_r \hbar}{2\pi I}$

Q.17

According to wave mechanics the vibrational energy is given by

- A) $E_v = \frac{2m_v + 1/2}{h\nu_0}$
 B) $E_v = \frac{m_v + 1/2}{h\nu_0}$
 C) $E_v = (m_v + \frac{1}{2})h\nu_0$
 D) $E_v = (2m_v + \frac{1}{2})h\nu_0$

Q.18

In case of harmonic oscillator frequency is

- A) Independent of the amplitude
 B) Dependent of the amplitude
 C) Inversely proportional to mass of molecule
 D) Directly proportional to mass of molecule

Q.19

The wavelength of mercury blue line in Roman effect is

- A) 2358 Å
 B) 4358 Å
 C) 3358 Å
 D) 5358 Å

Q.20

In Roman effect the lines which has wave lengths greater than that of incident wavelength are called as

- A) Rayleigh lines
 B) Anti-stokes lines
 C) X-ray
 D) Stokes lines

Q.21

The process of breaking up of the nucleus of a heavy atom into two more or less equal fragments with the release of high energy is known as

- A) Fusion
 B) Fission
 C) Cohesion
 D) Adhesion

Q.22

Slow neutrons can cause fission of A) U^{235} B) U^{238} C) U^{236} D) U^{239}	114	114	114
Q.23 When the excitation energy is high then unstable nucleus approaches stability by ejection of one or more A) Protons B) Electrons C) Neutrons D) Mesons	114	114	114
Q.24 The compound nucleus of uranium has neutrons. A) 140 B) 142 C) 146 D) 144	114	114	114
Q.25 The yield product in fission of U^{235} is called light group product due to mass numbers in the range A) 80 to 100 B) 85 to 104 C) 82 to 108 D) 80 to 110	114	114	114
Q.26 The energy released in fission process is about A) 200 MeV B) 300 MeV C) 400 MeV D) 500 MeV	114	114	114
Q.27 The transmutation of nitrogen nucleus by α - particles is given by the reaction A) $5^{B^{10}} + 2^{He^4} \rightarrow (7^{N^{14}})^* \rightarrow 6^{C^{12}} + 1^{H^1} + 4.04 \text{ MeV}$ B) $5^{B^{10}} + 2^{He^4} \rightarrow (7^{N^{14}})^* \rightarrow 6^{CO^{13}} + 1^{H^1} + 4.04 \text{ MeV}$ C) $5^{B^{10}} + 2^{He^4} \rightarrow (7^{N^{14}})^* \rightarrow 6^{Na^{13}} + 1^{H^1} + 4.04 \text{ MeV}$ D) $5^{B^{10}} + 2^{He^4} \rightarrow (7^{N^{14}})^* \rightarrow 6^{Ne^{13}} + 1^{H^1} + 4.04 \text{ MeV}$	114	114	114
Q.28 According to law of conservation of charge the total electric charge of the products must be equal to the A) Total electric charge of constituent particle B) Total electric charge of yield particle C) Total electric charge of initial particles D) Total electric charge of bombarding particles	114	114	114
Q.29 In a nuclear reaction there is conservation of A) Energy only B) Momentum only C) Both A and B D) None of these	114	114	114
Q.30 For a nuclear reaction when Q is positive then the reaction is said to be A) Endoergic B) Exoergic C) Both A and B D) None of these	114	114	114
Q.31 The formation of heavy nucleus due to combination of light nuclei is called as nuclear A) Transmutation B) Fusion C) Fission D) Spontaneous fission	114	114	114
Q.32 In stars the release of great amount of energy due to A) α - decay B) β - decay C) Nuclear fission D) Nuclear fusion	114	114	114
Q.33 Proton - proton chain reaction can be given by A) $B_e^8 \rightarrow H_e^4 + H_e^4$ B) $B_e^8 \rightarrow L_1^7 + 1^{H^1}$ C) $B_e^8 \rightarrow H_e^4 + H_e^3 + \gamma$ D) $B_e^8 \rightarrow B_e^7 + 1^{H^1} + \gamma$	114	114	114
Q.34			

Hydrogen bomb is an example of

- A] Nuclear fission
B] Thermonuclear fission

- C] Nuclear fusion
D] None of these

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Q.35

In thermal nuclear reactor the fission of U^{235} emit

- A) Protons
B) Neutrons
C) Electrons
D) α - rays

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Q.36

The value of fast fission factor (ϵ) is close to unity in

- A) heterogeneous reactor
B) homogeneous reactor
C) Pressurised reactor
D) Gas cooled reactor

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Q.37

The number of thermal neutrons that escape in fission of U^{235} is equal to

- A) $v\epsilon(1 + l_f)pl_t$
B) $v\epsilon(2 + l_f)pl_t$
C) $v\epsilon(1 - l_f)pl_t$
D) $v\epsilon(1 - l_f)pl_f$

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Q.38

For fission of U^{235} the multiplication factor K is given by

- A) $K = \eta\epsilon pf(1 + l_f)(1 - l_c)$
B) $K = \eta\epsilon pf(1 - 2l_f)(1 - l_c)$
C) $K = \eta\epsilon pf(1 + 2l_f)(1 - l_c)$
D) $K = \eta\epsilon pf(1 - l_f)(1 - l_c)$

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Q.39

The sun can have a reasonably long life due to

- A] Extremely slow p-p chain reaction
B] Fast p-p chain reaction
C] Slow n-n chain reaction
D] Fast n-n chain reaction

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Q.40

In D-D reaction deuterium can react with tritium to give an α - particle and a

- A) Electron
B) Proton
C) Neutron
D) γ ray

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