

Dayanand Science College, Latur
Department of Physics
Model Question Paper (MCQ for Practice)

Paper Name: Atomic, molecular and nuclear physics

Paper No.: XIV

SEM-VI

1. According to vector atom model....
 - A. Only the magnitude of orbital angular momentum is quantized
 - B. Both the magnitude and direction of orbital angular momentum and spin angular momentum are quantized**
 - C. The total angular momentum of many electron system has only two values
 - D. The total spin angular momentum of many electron system is always $\frac{\hbar}{2}$
2. For the single electron system....
 - A. All the energy levels are singlet
 - B. All the energy levels are doublets**
 - C. The ground state is singlet and all the other energy levels are doublet
 - D. The ground state is singlet and all the other energy levels are multi-state
3. The maximum number of electron in a shell is
 - A. N
 - B. 2n
 - C. n²
 - D. 2n²**
4. No two electrons in an atom can have the same four quantum numbers is a statement called.....
 - A. Hund's rule
 - B. Bhor's equation
 - C. Pauli exclusion principle**

- D. Dalton 's atomic theory
5. L-S coupling occurs often in
- A. All atoms
 - B. Lighter atoms**
 - C. Heavier atom
 - D. Occurs only in nuclei
6. The splitting of a spectral line in the presence of an electric field is called
- A. Zeeman effect
 - B. Stark effect**
 - C. Paschen-Back effect
 - D. Raman effect
7. The spin quantum number refers to.....
- A. Energy of electron**
 - B. Direction of electron spin
 - C. Sublevel or shape of the orbital
 - D. Orientation of orbital nucleus
8. The excited energy of hydrogen atom is....
- A. 10.2eV
 - B. 7.2eV
 - C. 1.02eV
 - D. 9.18eV**
9. An electron in 'f' subshell can have a principle quantum number...
- A. 1
 - B. 2**
 - C. 3
 - D. 4

10. The selection rule for the normal Zeeman effect is....
- A. $\Delta M_j = 0, \pm 1$
 - B. $\Delta M_l = 0, \pm 1$**
 - C. $\Delta S = 0, \Delta L = 0, \pm 1$
 - D. $\Delta S = 0, \Delta L = 0, \Delta J = 0, \pm 1$
11. Pure vibration spectrums of diatomic molecules are when
- A. It has center of symmetry
 - B. It has a permanent dipole moment**
 - C. It has no magnetic moment
 - D. It exhibits change in polarisability due to electron transition
12. Line broadening is not due to
- A. Doppler effect
 - B. Uncertainty principle
 - C. Rayleigh criterion**
 - D. Pressure
13. Near infrared spectrum of diatomic molecule is known as....
- A. Rotational spectrum
 - B. Vibrational spectrum
 - C. Electronic band spectrum
 - D. Rotational-vibrational spectrum**
14. Which of the following molecules does not exhibits a rotational spectrum?
- A. H_2**
 - B. Co
 - C. HCl
 - D. HBr
15. In Raman spectroscopy, the radiation lies in the....
- A. Microwave region

- B. **Visible region**
- C. UV region
- D. X-ray region
16. X-rays have larger wavelength than
- A. Beta rays
- B. Gamma rays**
- C. Microwave rays
- D. Visible light
17. The experimental liquid used in Raman tube is....
- A. Dichloromethane
- B. Carbon tetrabromide
- C. Carbon tetrachloride**
- D. Carbon tetrafluoride
18. The energy of X-rays depends upon the.....
- A. Acceleration voltage**
- B. Heater current
- C. Anode current
- D. Heater voltage
19. Which type of scattering result in a longer wavelength than the incident light?
- A. Stokes**
- B. Anti-Stokes
- C. Rayleigh
- D. All of the above
20. Which of the following has the maximum penetrating power?

- A. Radio waves
 - B. Microwaves
 - C. Infrared rays
 - D. Gamma rays**
21. Nuclear fission is the phenomenon of
- A. **Heavy nucleus splitting**
 - B. Heavy nucleus combining
 - C. Light nucleus splitting
 - D. Light nucleus combining
22. The average energy of a neutron produced in fission of Uranium 235 isotope is
- A. 1MeV
 - B. 2MeV**
 - C. 10MeV
 - D. 100MeV
23. Which isotope of Uranium has the capacity to sustain the chain reaction?
- A. U-230
 - B. U-235**
 - C. U-245
 - D. U-225
24. The energy we get in nuclear reaction comes from.....
- A. Water
 - B. The sun
 - C. The mass of the fuel**
 - D. Energy we put into the reactor
25. The Q-value of fission reaction is of the order
- A. 10MeV

- B. 100MeV
 C. **200MeV**
 D. 500MeV
26. Name the moderator used in the nuclear reactor?
- A. Plutonium
 B. **Thorium**
 C. Graphite
 D. Berilium
27. A nucleus of medium mass with excess of neutrons may decay with the emission of...
- A. **Neutron**
 B. Electron
 C. Proton
 D. Positron
28. A typical beta (β) decay chain is.....
- A. ${}^{140}_{54}\text{Xe} \rightarrow {}^{140}_{55}\text{Cs} \rightarrow {}^{140}_{56}\text{Ba} \rightarrow {}^{140}_{57}\text{La} \rightarrow {}^{140}_{58}\text{Ce (Stable)}$
 B. ${}^{140}_{54}\text{Xe} \rightarrow {}^{140}_{55}\text{Cs} \rightarrow {}^{140}_{56}\text{Ba} \rightarrow {}^{140}_{57}\text{La} \rightarrow {}^{140}_{58}\text{Ce (Unstable)}$
 C. ${}^{140}_{54}\text{Xe} \rightarrow {}^{141}_{54}\text{Cs} \rightarrow {}^{142}_{54}\text{Ba} \rightarrow {}^{143}_{54}\text{La} \rightarrow {}^{144}_{54}\text{Ce (Stable)}$
 D. ${}^{140}_{54}\text{Xe} \rightarrow {}^{141}_{54}\text{Cs} \rightarrow {}^{142}_{54}\text{Ba} \rightarrow {}^{143}_{54}\text{La} \rightarrow {}^{144}_{54}\text{Ce (Unstable)}$
29. The safety-rods present to shut down the reactor are made up of.....
- A. Copper
 B. Calcium
 C. Carbon
 D. **Cadmium**
30. Which of the following is not used as a moderator in a nuclear reactor?
- A. H₂O
 B. D₂O
 C. C

- D. Al**
31. The nuclear reaction $4\text{}^1_1\text{H} \rightarrow \text{}^4_2\text{He} + 2\text{}^0_{-1}\text{e} + 26\text{MeV}$ represent;
- A. **Fusion**
- B. Fission
- C. β -decay
- D. γ -decay
32. Nuclear fusion required high temperature because.....
- A. All nuclear reactions absorb heat
- B. The mass deficit must be supplied
- C. The binding energy must be supplied from an external source
- D. The particles cannot come closer unless they are moving rapidly**
33. The method of carbon dating works because.....
- A. C^{14} has higher atomic weight than C^{12}
- B. C^{14} is a stable isotope**
- C. C^{14} content of the dead body increases with time because of cosmic ray bombardment
- D. None of the above
34. The reaction $e^+ + p^- \rightarrow \nu_e + \pi^-$ forbidden because of.....
- A. Law of electron number conservation
- B. Law of baryon number conservation**
- C. Law of momentum energy conservation
- D. Law of muon number conservation
35. The quarks are supposed to exist in following number of flavours...
- A. Two
- B. Four
- C. Six
- D. Eight

36. Suppose that a neutron at rest in free space decays into a proton and electron. This process would violate....
- Conservation of charge
 - Conservation of energy
 - Conservation of linear momentum**
 - Conservation of angular momentum
37. Nuclear energy can be made available;
- By the fission of certain heavy nuclei
 - By the fusion of very light nuclei
- Only (I)
 - Only (II)
 - Bothe (I) and (II)**
 - None of this
38. Which of the following is correct:
- $\Delta S = 0$ for the reaction;
 $\Sigma^+ \rightarrow \Lambda^0 + e^+ + \nu_e$
 - Strangeness for Σ is -2
 - Strangeness zero for nucleons and non-zero for hyperon
 - All of the above**
39. Isospin numbers are associated with.....
- Hadron**
 - Leptons
 - Mesons
 - All of the above
40. Which of the following decay is forbidden?
- $\mu^- \rightarrow e^- + \nu_\mu + \bar{\nu}_e$
 - $\mu^- \rightarrow e^+ + e^- + e^-$
 - $\pi^+ \rightarrow e^- + \nu_e$

D. $\pi^+ \rightarrow \mu^+ + \nu_\mu$