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. The magnitude of spin quantum number is always….

   A. **1/2**

   B. -1

   C. 1

   D. None of these

2. m_j can have only …… values from –j to j, excluding zero.

   A. j(j+1)

   B. **2j+1**

   C. Both (A) & (B)

   D. None of these

3. The maximum number of electron in a shell is ….

   A. N

   B. **$2n^2$**

   C. $3n^2$

   D. 2n

4. In the spectra of alkali metals, the doublet separation decreases with ……..

   A. Increase in atomic number

   B. Decrease in orbital number

   C. **Increase in principal quantum number**

   D. Dalton ‘s atomic theory

5. When the atom is placed in external weak magnetic field, then we observe…….

A. Stark effect

B. **Anomalous Zeeman effect**

C. Normal Zeeman effect

D. None of these

6. The effect of external magnetic field on spectral lines is known as ……..

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. In strong field star effect for n = 2, the degeneracy in fine structure is lifted to ….. levels.

A. 1

B. 2

C. 3

D. 4

9. An electron is in 'f' subshell can have a principle quantum number…

A. 0

B. 2

C. 1

D. 3

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. The molecular system can be stable if the total energy possessed by the molecule is……

A. Zero

B. Minimum

C. Maximum

D. None of these

12. The rotational kinetic energy of a diatomic molecule for j = 0 is ….

A. 2 B

B. 6 B

C. 0 B

D. 12 B

13. A pure rotational spectrum occurs in……. region.

A. Ultraviolet

B. Infra-red

C. x-ray

D. Microwave

14. An electronic spectrum of diatomic molecules occurs in …….. region.

A. Uv-vis

B. Infra-red

C. x-ray

D. Microwave

15. Raman shift occurs in …….. region.

A. Microwave

B. **Infra-red**

C. UV region

D. X-ray region

16. To observe Raman effect, molecules must be .....

A. Polar

B. Non-polar

C. Both (A) and (B)

D. None of these

17. The intensity of Rayleigh's line is….. as compared to Raman lines.

A. Zero

B. Very low

C. Very high

D. None of these

18. The zero point energy of a molecule is ……

A. ½ $h\nu_0$

B. **$h\nu_0$**

C. Zero

D. None of these

19. Which type of scattering result in a longer wavelength than the incident light?

A. Anti-Stokes

B. 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. Light nucleus splitting

B. Heavy nucleus combining

C. Heavy nucleus splitting

D. Light nucleus combining

22. The average energy of a neutron produced in fission of Uranium 235 isotope is ……

A. 3MeV

B. 1MeV

C. 2MeV

D. 10MeV

23. Which isotope of Uranium has the capacity to sustain the chain reaction?

A. U-235

B. U-230

C. U-231

D. U-245

24. The energy we get in nuclear reaction comes from…….

A. The mass of the fuel

B. The sun

C. Water

D. None of these

25. The Q-value of fission reaction is of the order …….

A. 200MeV

B. 1MeV

C. 300MeV

D. None of these

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. Positron

B. Electron

C. Proton

D. Neutron

28. A typical beta (β) decay chain is…..

A. $^{140}_{54}Xe \rightarrow {}^{140}_{55}Cs \rightarrow {}^{140}_{56}Ba \rightarrow {}^{140}_{57}La \rightarrow {}^{140}_{58}Ce\ (Stable)$

B. $^{140}_{54}Xe \rightarrow {}^{140}_{55}Cs \rightarrow {}^{140}_{56}Ba \rightarrow {}^{140}_{57}La \rightarrow {}^{140}_{58}Ce\ (Unstable)$

C. $^{140}_{54}Xe \rightarrow {}^{141}_{54}Cs \rightarrow {}^{142}_{54}Ba \rightarrow {}^{143}_{54}La \rightarrow {}^{144}_{54}Ce\ (Stable)$

D. $^{140}_{54}Xe \rightarrow {}^{141}_{54}Cs \rightarrow {}^{142}_{54}Ba \rightarrow {}^{143}_{54}La \rightarrow {}^{144}_{54}Ce\ (Unstable)$

29. The safety-rods present to shut down the reactor are made up of……

A. Cadmium

B. Calcium

C. Carbon

D. **None of these**

30. Which of the following is not used as a moderator in a nuclear reactor?

A. H_2O

B. D_2O

C. C

D. Al

31. The nuclear reaction $4\ {}_1H^1 \rightarrow {}_2He^4 + 2\ {}_{-1}e^0 + 26MeV$ represent;

A. ϒ-decay

B. Fission

C. Fusion

D. None of these

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 $e^+ + p^- \rightarrow v_e + \pi^-$ 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….

A. Conservation of charge

B. Conservation of energy

C. Conservation of linear momentum

D. Conservation of angular momentum

37. Nuclear energy can be made available;

I. By the fission of certain heavy nuclei

II. By the fusion of very light nuclei

A. Only (I)

B. Only (II)

C. Bothe (I) and (II)

D. None of these

38. Which of the following is correct:

A. ΔS = 0 for the reaction;
$\Sigma^+ \rightarrow \Lambda^0 + e^+ + \nu_e$

B. Strangeness for Σ is -2

C. Strangeness zero for nucleons and non-zero for hyperon

D. All of the above

39. Isospin numbers are associated with…..

A. Leptons

B. Mesons

C. Hadron

D. All of the above

40. Which of the following decay is forbidden?

A. $\mu^- \rightarrow e^- + \nu_\mu + \bar{\nu}_e$

B. $\mu^- \rightarrow e^+ + e^- + e^-$

C. $\pi^+ \rightarrow e^- + \nu_e$

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