Saitech Informatics

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STRUCTURE OF ATOM

Class 11 - Chemistry

Time Allowed: 1 hour and 29 minutes **Maximum Marks: 40**

1. An electron beam on hitting a ZnS screen produces a scintillation on it. What do you conclude? **[1]**
2. What did Einstein explain about photoelectric effect? **[1]**
3. Explain why the uncertainty principle is significant only for the motion of subatomic particles but is negligible for the macroscopic objects? **[1]**
4. What is the nuclear radius of an atom whose mass number is 125? **[1]**
5. How does the intensity of the spectral line vary with wavelength? **[1]**
6. Why did Heisenberg replace the concept of definite orbits by the concept of probability? **[1]**
7. Which two discoveries put a strong challenge to the Bohr model? **[1]**
8. What is value of Planck's constant in S.I. units? **[1]**
9. Why electronic energy is negative? Comment on the spacing between the energy levels? **[1]**
10. What is the most important application of de Broglie concept? **[1]**
11. The effect of uncertainty principle is significant only for motion of microscopic particles within an accuracy of 4% what will be the uncertainty in speed and position? **[3]**
12. Emission transitions in the Paschen series end at orbit n = 3 and start from orbit n and can be represeted as $v = 3.29 \times 10^{15}$ (Hz) $[1/3^2 - 1/n^2]$ Calculate the value of n if the transition is observed at 1285 nm. Find the region of the spectrum. **[3]**
13. Which of the following sets of orbitals are degenerate and why? **[3]**
    1. 1s, 2s and 3s in Mg atom
    2. $2p_x$, $2p_y$ and $2p_z$ in C atom
    3. 3s, $3p_x$ and 3d orbitals in H atom
14. Calculate the wavelength of the spectral line obtained in the spectrum of Li^{2+} ion when the transition takes place between two levels whose sum is 4 and the difference is 2. **[3]**
15. i. The energy associated with first orbit in hydrogen atom is -2.17×10^{-18}. **[3]**
    ii. What is the energy associated with the fifth orbit?
    iii. Calculate the radius of Bohr's fifth orbit for the hydrogen atom.
16. Indicate the number of unpaired electrons in: **[5]**
    i. P
    ii. Si
    iii. Cr
    iv. Fe and
    v. Kr.
17. Find energy of each of the photons which: **[5]**

i. correspond to light of frequency 3×10^{15} Hz.

ii. have wavelength of 0.50 $\mathring{A}$.

18. i. Calculate the total number of electrons present in one mole of methane. **[5]**

ii. Find (a) the total number and (b) the total mass of neutrons in 7 mg of ^{14}C. (Assume that mass of a neutron = 1.675×10^{-27} kg).

iii. Find (a) the total number and (b) the total mass of protons in 34 mg of NH_3 at STP.

Will the answer change if the temperature and pressure are changed?