Quiz

1. What is Materials science? What is material science tetrahedron?

2. What is atomic mass unit (amu)?

3. Briefly describe the Bohr atomic model.

4. Find out the Bohr radius for an hydrogen atom (see slide #8).

5. What is wave-particle duality? Briefly explain the wave mechanical model of atomic structure.

6. What is Heisenberg's uncertainty principle?

7. What is Paulis exclusion principle

8. What are Aufbau and Madelung rules?

9. Show that energy of an electron in hydrogen atom $E = 2\pi^2 me^4/n^2 h^2 = -13.6/n^2$ eV

Clue: Refer to slide #8, equate centrifugal force of the electron, mv^2/r to Coulomb force $k_e Ze^2/r^2$ ($k_e = 1/4\varepsilon\pi_o$), Energy is the sum of kinetic energy and the attractive energy.

10. What is stable electron configuration?

11. Why are noble gases inert?

12. What is Lennard-Jones potential?

13. Briefly explain the primary bonds in solids.

14. How do secondary bonds form? What is hydrogen bond?

15. Why is graphite lubricating?

16. Why are ceramics hard and brittle? Why are they not conductive?

17. Why is boiling point of methane (CH_4) lower than water?

18. How many atoms are there in 1 g of copper?

19. Write the electron configuration of tungsten (74)

20. Why is Tungsten (74) much stronger than Aluminium (13) though both are metallic?

21. Calculate the attractive force between two K+ and Br- ions that just touch each other. Atomic radii of K+ and Br- are 0.133 and 0.196 nm respectively.

22. If the attractive force between a pair of Cs+ and I⁻ ions is 2.83×10^{-9} N and the ionic radius of Cs+ is 0.165 nm, what is the ionic radius of I⁻ ion?

23. Calculate the attractive force between a pair of Ba^{2+} and S^{2-} ions which just touch each other. Ionic radius of Ba and S are 0.143 nm and 0.174 nm respectively. ε_o = 8.85 x 10^{-12} $C^2/N.m^2$

24. Does the size of Na and Cl atoms remain same when they react to from NaCl? Give reasons for your answer.

25. If energy of an electron, E = - $13.6/n^2$ eV, find out the energy, wavelength and frequency of the photon emitted for a jump from M to L shell. h = 4.14 x 10^{-15} eV.s