ASSIGNMENT -1 20161050

Q1) a) Law of Conservation of Mass : Net change in mass of the reactants and products before and after a chemical reaction is zero. Total mass in a chemical reaction remains constant.

Law of Constant Proportion : When a compound is broken, the masses of the constituent elements remain in the same proportion.

Law of Multiple Proportions : When two elements form two or more compounds between them, the ratio of masses of the second element in each compound can be expressed in the form of small whole numbers.

Law of Reciprocal Proportions : Law of reciprocal proportion states that when two different elements combine with the same quantity of the third element, the ratio in which they do so will be the same or a multiple of the proportion in which they combine.

Dalton's atomic theory :
- Atoms are indivisible particles and can neither be created nor destroyed.
- Atoms of different elements combine in the ratio small whole numbers to form compounds.
- The relative number and kinds of atoms in a compound are always constant.

b) * Coulometry - Measure 'F' Faraday Constant and to divide it by the elementary charge 'e'.

* Electron Mass measurement - Limited by accuracy of mass of electron.

* X-ray crystal density methods - Using silicon crystals of high purity and few defects.

* From atomic and molecular dimensions

Q2) Evaporation can occur at any temperature while boiling of a liquid occurs at specific temperature at specific pressure. Evaporation is surface phenomenon while boiling is bulk phenomenon.

Boiling occurs when vapour pressure of liquid becomes equal to the atmospheric pressure. Since the atmospheric pressure keeps increasing in pressure cooker, liquid will boil at a higher temperature.

a) Air molecules trapped inside water starts moving rapidly and expanding.

b) Temperature difference between lower and upper layers of water. Lower level molecules have more kinetic energy.

c) Metal body heats faster than water body so there becomes a bigger gap in temperature.

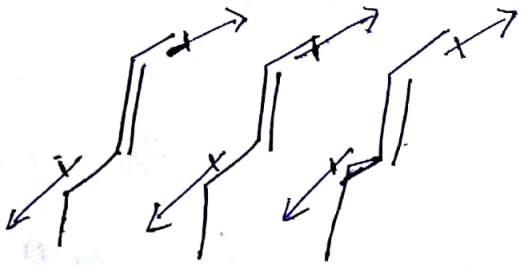
d) Vapour pressure of water becomes equal to the atmospheric pressure.

Q3) a) Pentane has only C–C and C–H bonds which provide more flexibility and are able to get packed better while Cis-2-pentene has a rigid C=C bond and thus poorly packed crystal lattice. ∴ MP(1) > MP(2)

Cis-2-Pentene has a net dipole moment due to the presence of C=C which attributes to its higher boiling point and density than Pentane.

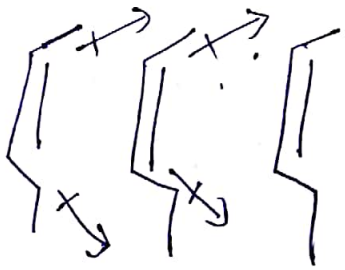
b)

Trans-2-pentene Crystal



Good packing + dipole support

Cis-2-pentene Crystal



less packing + less dipole support

MP : >

In liquid state since the crystal has dismantled, more net dipole moment of Cis-isomer comes into play and

hence BP : <

Density : <

c) Cyclopentane has better crystal packing than hexane so melting point is greater.

Molecular weight of Hexane is higher than cyclopentane hence it takes the lead in boiling point.

Cycloalkanes have better london forces and lesser molecular volume hence greater density.

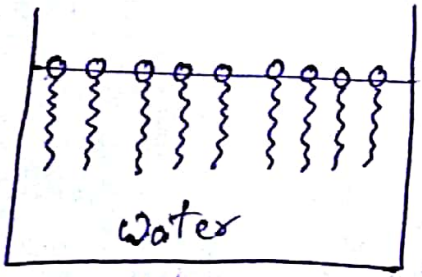
d) Benzene molecules have better packing in solid state; pi-stacking structure but toluene isn't packed that efficiently due to $-CH_3$ group hence lower melting point of toluene.

Whereas in liquid states, intermolecular forces are higher in toluene than in benzene due to net dipole moment and hence, higher boiling point.

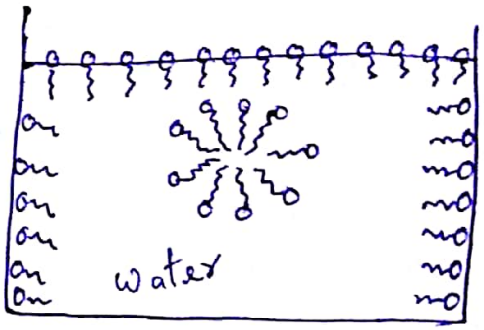
Benzene has less molecular volume and better space utilization than toluene in liquid state too, hence higher density.

(4)

a)



b)



c)