

of all the gases have equal number of molecules. Dalton defined the atomic weight of an element as the number of times by which one atom of the element is heavier than one atom of hydrogen. In order to determine the atomic weight of nitrogen, the following data are observed by experiments, for a compound containing only nitrogen and hydrogen atoms:

**Data I:** The compound contains 88% nitrogen and 12% hydrogen, by mass.

**Date II:** 10 ml of this gaseous compound exactly gives 10 ml nitrogen and 20 ml hydrogen, on complete decomposition. (All volumes are at the same temperature and pressure)

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|---|---|----------------------------|
| 1. What is the molecular formula of the compound if nitrogen and hydrogen, both are diatomic? | (a) 14  | (b) 14.67                  |
|   | (c) 14.33   | (d) 13.67                  |
| (a) $\text{NH}_3$   | (b) $\text{N}_2\text{H}_4$  |                            |
| (c) $\text{N}_4\text{H}_2$  | (d) $\text{N}_2\text{H}_2$  |                            |
| 2. What is the atomic weight of nitrogen on this hydrogen scale?                              | 3. What would be the molecular formula of the compound if nitrogen were triatomic and hydrogen were diatomic? |                            |
|   | (a) $\text{NH}_3$   | (b) $\text{N}_3\text{H}_4$ |
|   | (c) $\text{N}_4\text{H}_3$  | (d) $\text{N}_3\text{H}_2$ |
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### Comprehension II

A sample of hydrogen fluoride gas (only HF molecules) is collected in a vessel and left for some time. Then, a constant molar mass of the sample is experimentally determined as 34 g/mole. Assume that this abnormal molar mass is due to dimerization as well as trimerization of some HF molecules (no molecules in any other polymeric forms) and the mole ratio of monomeric and trimeric form of hydrogen fluoride molecules present is 4:1.

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|--|---|-----------|
| 4. What percentage of hydrogen fluoride molecules is dimerized?  | (a) 40  | (b) 58.8  |
|  | (c) 76.47   | (d) 17.65 |
| (a) 50   | (b) 58.8  |           |
| (c) 76.47  | (d) 17.65   |           |
| 5. What percentage of hydrogen fluoride molecules is trimerized? | 6. What per cent of total molecules present in the final sample are $\text{H}_2\text{F}_2$ molecules? |           |
|  | (a) 10  | (b) 40    |
|  | (c) 50  | (d) 58.8  |
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### Comprehension III

The vapour density of a gaseous mixture containing only Ar and  $\text{N}_2\text{O}_4$  gases, is 40. When the mixture is left for some time, the vapour density decreased and finally becomes 37.5. It happened due to dissociation of some  $\text{N}_2\text{O}_4$  into  $\text{NO}_2$ . (Ar = 40)

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| 7. What is the degree of dissociation of $\text{N}_2\text{O}_4$ ?    | (a) 1:1   | (b) 3:10   |
|  | (c) 1:3   | (d) 1:5    |
| (a) 0.086  | (b) 0.133   |            |
| (c) 0.067  | (d) 0.0625  |            |
| 8. What is the initial mole ratio of Ar and $\text{N}_2\text{O}_4$ ? | 9. What is the final mole ratio of Ar, $\text{N}_2\text{O}_4$ and $\text{NO}_2$ ? |            |
|  | (a) 1:1:1   | (b) 1:3:11 |
|  | (c) 45:137:26   | (d) 4:13:3 |
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