

20. Sodium bicarbonate, NaHCO_3 , can be purified by dissolving it in hot water (60°C), filtering to remove insoluble impurities, cooling to 0°C to precipitate solid NaHCO_3 , and then filtering to remove the solid, leaving soluble impurities in solution. Any NaHCO_3 that remains in the solution is not recovered. The solubility of NaHCO_3 in hot water at 60°C is 164 g/litre and is 69 g/litre in cold water at 0°C . What is the percentage yield of NaHCO_3 , when it is purified by this method?
- (a) 55.34% (b) 42.07%
(c) 69% (d) 31%
21. The mineral haematite is Fe_2O_3 . Haematite ore contains unwanted material called gangue in addition to Fe_2O_3 . If 5 kg of ore contains 2.78 kg of Fe, what percentage of ore is gangue? (Fe = 56)
- (a) 55.6% (b) 44.4%
(c) 20.6% (d) 79.4%
22. A sample of iron ore, weighing 0.700 g, is dissolved in nitric acid. The solution is then diluted with water, following with sufficient concentrated aqueous ammonia, to quantitative precipitation the iron as $\text{Fe}(\text{OH})_3$. The precipitate is filtered, ignited and weighed as Fe_2O_3 . If the mass of the ignited and dried precipitate is 0.541 g, what is the mass per cent of iron in the original iron ore sample? (Fe = 56)
- (a) 27.0% (b) 48.1%
(c) 54.1% (d) 81.1%
23. The empirical formula of a compound is CH_2O . If 0.0833 moles of the compound contains 1.0 g of hydrogen, its molecular formula should be
- (a) $\text{C}_6\text{H}_{12}\text{O}_6$ (b) $\text{C}_5\text{H}_{10}\text{O}_5$
(c) $\text{C}_4\text{H}_8\text{O}_4$ (d) $\text{C}_3\text{H}_6\text{O}_3$
24. A hydrocarbon C_nH_{2n} yields $\text{C}_n\text{H}_{2n+2}$ by reduction. In this process, the molar mass of the compound is raised by 2.38%. The value of n is
- (a) 8
(b) 4
(c) 6
(d) 5
25. A certain vitamin extracted from plant sources has carbon and hydrogen in 8:1 mass ratio. The percentage of oxygen is nearly 7.3. The compound gave no test for nitrogen or sulphur or any other element. What should be the empirical formula of the compound?
- (a) $\text{C}_{30}\text{H}_{45}\text{O}_2$
(b) $\text{C}_{15}\text{H}_{23}\text{O}$
(c) $\text{C}_{29}\text{H}_{45}\text{O}_3$
(d) $\text{C}_{10}\text{H}_{15}\text{O}$
26. An unknown oxide of manganese is reacted with carbon to form manganese metal and CO_2 . Exactly 31.6 g of the oxide, Mn_xO_y , yielded 13.2 g of CO_2 . The simplest formula of the oxide is (Mn = 55)
- (a) MnO
(b) MnO_2
(c) Mn_2O_3
(d) Mn_4O_6
27. Assume that the atomic mass of oxygen is 7. A sample of 11 g of an oxide of uranium contains 10 g of uranium. Which of the following formula for the oxide is compatible with the data?
- (a) Uranium oxide is UO and the atomic mass of U is 70.
(b) Uranium oxide is U_3O_8 and the atomic mass of U is 240.
(c) Uranium oxide is UO_2 and the atomic mass of U is 105.
(d) Uranium oxide is U_2O_3 and the atomic mass of U is 105.