



Attempt questions first; check the separate key afterward. Use atomic masses H 1, C 12, N 14, O 16, Na 23, Mg 24, Al 27, S 32, Cl 35.5, Ca 40; $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$.

A. Very short answers - 1 mark each

1. State the law of conservation of mass.
2. In a closed reaction, 12 g carbon combines with 32 g oxygen. Find product mass.
3. State the law of constant proportions.
4. Water has hydrogen:oxygen mass ratio 1:8. Find oxygen combining with 3 g hydrogen.
5. Write symbols for sodium, potassium and iron.
6. Write names for Cu, Ag and Pb.
7. What is a molecule?
8. Distinguish molecules of elements and compounds with examples.

B. Short answers / practice - 2 marks each

9. Write the formula of aluminium oxide.
10. Write the formula of calcium chloride.
11. Write the formula of magnesium hydroxide.
12. Write the formula of ammonium sulphate.
13. State the charge on sulphate and nitrate ions.
14. Explain why parentheses are used in $\text{Ca}(\text{NO}_3)_2$.
15. Find molecular mass of H_2O .
16. Find molecular mass of CO_2 .
17. Find formula-unit mass of NaCl.
18. Find formula-unit mass of CaCO_3 .
19. How many particles are in one mole?
20. Find moles in 18 g water.

C. Application / reasoning - 3 marks each

21. Find moles in 44 g CO_2 .

22. Find mass of 0.5 mol CO_2 .
23. Find number of molecules in 0.25 mol water.
24. Find number of hydrogen atoms in 1 mol water.
25. Find molar mass of H_2SO_4 .
26. Find mass of 2 mol H_2SO_4 .
27. Find molar mass of $\text{Ca}(\text{OH})_2$.
28. Find moles in 11 g CO_2 .
29. Find mass of 0.2 mol NaCl.
30. Write formulae for aluminium chloride and sodium carbonate.
31. Find the number of oxygen atoms in 0.5 mol O_2 .

D. Extended practice - 5 marks per pair

32. Is NaCl best described by discrete molecules in its crystal?
33. Distinguish molecular mass and formula-unit mass.
34. A sample has 4 g hydrogen and 32 g oxygen combined. What mass of water is formed?
35. Explain Dalton's atomic theory and identify two ideas modified by later discoveries.

ANSWER KEY - Numerical / closed questions

2) 44 g. 4) 24 g. 5) Na, K, Fe. 6) Copper, silver, lead. 9) Al_2O_3 . 10) CaCl_2 . 11) $\text{Mg}(\text{OH})_2$. 12) $(\text{NH}_4)_2\text{SO}_4$. 13) SO_4^{2-} ; NO_3^- . 15) 18 u. 16) 44 u. 17) 58.5 u. 18) 100 u. 19) About 6.022×10^{23} . 20) 1 mol. 21) 1 mol. 22) 22 g. 23) 1.5055×10^{23} . 24) 1.2044×10^{24} . 25) 98 g/mol. 26) 196 g. 27) 74 g/mol. 28) 0.25 mol. 29) 11.7 g. 30) AlCl_3 ; Na_2CO_3 . 31) 6.022×10^{23} . 32) No; ionic lattice. 34) 36 g.