Chemical Reactions and Equations

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. The reaction $4Al + 3O_2 \rightarrow 2Al_2O_3$ is an example of:

(a) a decomposition reaction **(b)** a combination reaction
(c) a double displacement reaction **(d)** a displacement reaction

2. Which of these chemical equations is correctly balanced?

(a) $2AgCl \rightarrow 2Ag + 2Cl_2$ **(b)** $2AgCl \rightarrow 3Ag + Cl_2$
(c) $2AgCl \rightarrow 2Ag + Cl_2$ **(d)** $3AgCl \rightarrow 2Ag + Cl_2$

3. A reaction in which heat is given out is called:

(a) decomposition **(b)** endothermic **(c)** displacement **(d)** exothermic

4. In the reaction $ZnO + C \rightarrow Zn + CO$, the substance oxidised is:

(a) C **(b)** Zn **(c)** ZnO **(d)** CO

5. Solutions of iron(II) sulphate ($FeSO_4$) and sodium hydroxide (NaOH) are mixed. The precipitate formed is:

(a) NaOH **(b)** $Fe(OH)_2$ **(c)** Na_2SO_4 **(d)** $FeSO_4$

6. Which of these is an exothermic process?

(a) Respiration
(b) Decomposition of silver chloride in sunlight
(c) Electrolysis of water
(d) Heating of lead nitrate

7. Which gas is given off when zinc granules react with dilute sulphuric acid?

(a) sulphur dioxide **(b)** nitrogen dioxide
(c) hydrogen **(d)** carbon dioxide

8. Assertion (A): In the balanced equation for $Ca(OH)_2 + HCl \rightarrow CaCl_2 + H_2O$, the coefficient of H_2O is 2.
Reason (R): A balanced equation has the same number of atoms of each element on both sides.

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Section B — Short answer — 8 × 2 = 16 marks

9. Balance the equation: $Cl_2 + KBr \rightarrow KCl + Br_2$

10. How many atoms of oxygen are there in $4C_{12}H_{22}O_{11}$?

11. In the reaction $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$, name the oxidising agent and the reducing agent.

12. Why should a magnesium ribbon be cleaned with sandpaper before burning it in air?

13. Write the balanced chemical equation for: barium chloride + sulphuric acid → barium sulphate + hydrochloric acid

14. When 175 g of zinc carbonate is heated strongly, 113.4 g of zinc oxide is left and carbon dioxide escapes. What mass of carbon dioxide is given off? Which law did you use?

15. Find the molecular mass of $ZnSO_4$. (Atomic masses: O = 16 u, S = 32 u, Zn = 65 u)

16. Name the gas given off when calcium carbonate is heated strongly. How would you test for it?

Section C — Word problems — 4 × 4 = 16 marks

17. A shiny brown element X turns black when heated in air. Name X and the black compound, and write the balanced equation.

18. For the reaction $CaO + H_2O \rightarrow Ca(OH)_2$, find the masses of the other substances when 252 g of CaO reacts completely. (Atomic masses: H = 1 u, O = 16 u, Ca = 40 u)

19. Write the balanced chemical equation for each, and name the type of reaction:
(a) sulphuric acid + sodium hydroxide → sodium sulphate + water
(b) hydrogen + oxygen → water

20. Solutions of barium chloride and dilute sulphuric acid are mixed. (a) What do you see? (b) Write the balanced equation. (c) Name the type of reaction.

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Answer key

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Q	Answer	Working
1	**(b) a combination reaction**	two or more substances combine to form one product
2	**(c) $2AgCl \rightarrow 2Ag + Cl_2$**	count each kind of atom on both sides
3	**(d) exothermic**	—
4	**(a) C**	C gains oxygen or loses hydrogen (oxidised); ZnO loses oxygen or gains hydrogen (reduced)
5	**(b) $Fe(OH)_2$**	$Fe(OH)_2$ is insoluble in water
6	**(a) Respiration**	it gives out heat
7	**(c) hydrogen**	it burns with a pop sound when a burning splinter is brought near
8	**(a) Both A and R are true, and R is the correct explanation of A.**	A is true: balanced: $Ca(OH)_2 + 2HCl \rightarrow CaCl_2 + 2H_2O$. R is true and explains A.
9	**$Cl_2 + 2KBr \rightarrow 2KCl + Br_2$**	make the atoms of each element equal on both sides
10	**44**	11 in one unit × 4
11	**Oxidising agent: Fe_2O_3; reducing agent: Al**	Fe_2O_3 is reduced (it oxidises the other); Al is oxidised
12	**To remove the layer of magnesium oxide on its surface, so that the magnesium burns readily.**	—
13	**$BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$**	formulas first, then balance: $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$
14	**61.6 g; the law of conservation of mass**	175 − 113.4
15	**161 u**	1 × 65 + 1 × 32 + 4 × 16
16	**Carbon dioxide: it turns lime water milky**	—
17	**X is copper and the black compound is copper(II) oxide: $2Cu + O_2 \rightarrow 2CuO$.**	—
18	**81 g of H_2O; 333 g of $Ca(OH)_2$**	molar masses CaO = 56, H_2O = 18, $Ca(OH)_2$ = 74; CaO: 252 g is 4.5 mol
19	**(a) $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$ — double displacement; (b) $2H_2 + O_2 \rightarrow 2H_2O$ — combination**	—
20	**(a) A white precipitate of $BaSO_4$. (b) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$. (c) Double displacement (precipitation).**	—

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