

CARBON AND ITS COMPOUNDS MARKING SCHEME

1. 1989 Q12 P1

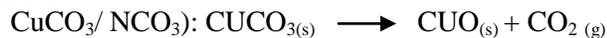
Copper II carbonate

S = Copper (II) oxide

2. 1991 Q10 P1

- (i) Movement of electrons / static electrons
- (ii) Movement of ions / mobile ions / free ions

3. 1991 Q22 P1



4. 1994 Q17 P1

It does not support combustion and is denser than air

5. 1994 Q27 P1

An allotropy refers to an element that exist in two or more forms in the same state
e.g Sulphur/ carbon/ phosphorous/ oxygen

6. 1995 Q27 P1

Ca (OH) ₂ (aq) forms white precipitate (¹/₂) with CO₂ Can be observed NaOH (¹/₂) (aq) does not form a precipitate. (1 mark)

7. 1996 Q8 P1

Sulphur (IV) oxide, it reacts with limewater being an acid gas

8. 1996 Q23 P1

Dissolve in water, filter to remove lead carbonate as a residue, evaporate filter to saturation and allow to cool. Crystallization to take place. Filter the crystals and dry. Evaporate to dryness.

9. 1997 Q2 P1

- Kerosene floats on water therefore it continues to burn
- Carbon dioxide blanket covers the flame OR cuts off the supply of oxygen

10. 1997 Q4 P1

- K⁺, / Na⁺ / (Lit) and CO₃²⁻

11. 1998 Q20 P1

- I. C(s) + O₂ (s) → CO₂ (g)
- II 2CO (g) + O₂ (g) → 2CO₂ (g)

12. 1999 Q23 P1

- (a) PbO(s) + CO → Pb(s) + CO₂ (g)
- (b) Silver white or gray metal / shiny gray metal (I)
- (c) Hydrogen gas / Ammonia gas

13. 2000 Q3 P1

- a) Ammonia gas
- b) Filtration/precipitation/Crystallization
- c) 2NaHCO₃ (s) → Na₂CO_{3(s)} + CO_{2(g)} + H₂O (g)

14. **2000 Q10 P1**
 a) H- CaCO_3 / calcium carbonate / limestone/manila chips J CaO/Calcium oxide/quick lime
 b) As a fertilizer/for liming living furnaces / raising soil pH/ Manufacture of CaC_2 / $\text{Ca}(\text{HSO}_3)_2$ / $\text{Ca}(\text{OH})_2$ /Absolute alcohol.
15. **2000 Q6b P2**
 (b) (i) $\text{C}_{(g)} + \text{CO}_2(g) \longrightarrow 2\text{CO}_{(g)}$
 (ii) Potassium hydroxide (KOH) or Calcium hydroxide $\text{Ca}(\text{OH})_2(g)$
 (iii) Pass the gas through limewater ($\text{Ca}(\text{OH})_2(aq)$); CO_2 forms a white precipitate but CO does not give a change or CO burns with blue flame while CO_2 does not burn
 (iv) -Fuel in water gas and produces gas/synthetic petrol
 -Extraction of metals
 -Manufacture of methanol
16. **2001 Q14 P1**
 (a) Electrolysis of fused or molten oxide
 (b) JCH || J, carbon, H
17. **2001 Q21 P1**
 (a) Reddish brown // Brown solid formed
 (b) $\text{CuO}_{(s)} + \text{CO}(g) \rightarrow \text{Cu}(s) + \text{CO}_2(g)$
 (c) it is poisonous // harmful // dangerous// toxic // pollutant
18. **2002 Q15 P1**
 (a) $\text{Ca}(\text{OH})_2(aq) + \text{CO}_2(g) \rightarrow \text{CaCO}_3(s) + \text{H}_2\text{O}(l)$
 (b) White ppt dissolves (l) because the insoluble CaCO_3 ($\frac{1}{2}$) is changed into soluble calcium hydrogen carbonate. ($\frac{1}{2}$)
19. **2002 Q5 P2**
 (a) (i) Hydrogen // H
 (ii) carbon //C
 (b) (i) Extinguishes // put off // goes off // want out // Die; CO_2 and Water vapour, which do not support combustion, accumulates around the supply of oxygen
 (ii) Mass increases; water vapour reacts with CaO and forms $\text{Ca}(\text{OH})_2$
 $\text{Ca}(\text{OH})_2$ reacts with CO_2 to produce CaCO_3
 $\text{CaO}(s) + \text{H}_2\text{O}(l) \rightarrow \text{Ca}(\text{OH})_2(s) \rightarrow \text{CaO}$ reacts with moist CO_2
 $\text{Ca}(\text{OH})_2 + \text{CO}_2(g) \rightarrow \text{CaCO}_3(s) + \text{H}_2\text{O}$
 (iii) Oxygen and Nitrogen Helium, Neon argon; Accept a name of inert gas
 (iv) To absorb excess water vapour // moisture
 (v) Sodalime // NaOH and CaO // KOH // Caustic potash // caustic soda
20. **2003 Q12 P1**
 a) $\text{H}_2\text{O}(g) + \text{C}(s) \longrightarrow \text{CO}(g) + \text{H}_2$
 b) Reducing agents, Fuel / methanol, synthetic petrol.
21. **2004 Q1 P1**
 Burning involves use of oxygen (1) the products include the mass of candle and oxygen. Oxidation increase in mass combined with oxygen (2 marks)

22. 2004 Q18 P1

a) solid changes from brown to grey(l) or Brown solid to black
Original colour must be stated (1 mark)

b) $\text{Fe}_2\text{O}_3 + \text{CO}_{(g)} \longrightarrow 2\text{FeO}_{(s)} + \text{CO}_{2(g)}$
The colour of the soil disappears and Q disappears/reduces (2 marks)

23. 2004 Q7a P2

a) add aqueous sodium carbonate to precipitate calcium carbonate and magnesium carbonate and filter.

24. 2005 Q27 P1

- a) Reduction
b) i) Removal of oxygen from a substance is a reduction
ii) Lead ion has gained electrons to become lead metal gain of electron(s) is a reduction.
c) Hydrogen sulphide

25. 2005 Q28 P1

Products	CO_2	H_2O
Formula mass	44	18
No. of moles	Mass	Mass
	R.F.M	R.F.M
	<u>4.2</u>	<u>1.71</u>
	44	18
	0.095	0.095

Mole ratio = 1 : 1

The masses of carbon and hydrogen in CO_2 and H_2O formed

Products	Carbon (CO_2)	Hydrogen (H_2O)
	<u>12</u> x 4.2	<u>2</u> x 1.71
	44	18
	1.145	0.19
No. of moles	<u>1.145</u> = 0.095	<u>0.19</u> = 0.19
	12	1
Mole ratio	<u>0.095</u> = 1	<u>0.19</u> = 2
	0.95	0.095

Therefore the empirical formula is CH_2

26. 2006 Q22 P1

- a) Oxalic acid and Conc. H_2SO_4 (1 mark)
b) $2\text{KOH}_{(aq)} + \text{CO}_{2(g)} \longrightarrow \text{K}_2\text{CO}_{3(aq)} + \text{H}_2\text{O}_{(l)}$ (1 mark)
c) CO is odourless
CO is colourless (1 mark)

27. 2007 Q1 P1

- (a) Carbon (IV) oxide
(b) Blue flame, carbon (II) oxide is burning

28. **2007 Q11 P1**
 It is denser than air
 It will react calcium oxide since CO_2 is acidic and CaO is basic.
29. **2007 Q5d P2**
 (i) Allotropes
 (ii) Add salt to methylbenzene, fullerene dissolves. Filter the mixture to remove the residue.
 Heat the Filtrate to make it concentrated cool the solution slowly to get crystals.
 (iii) $12n = 720$: $n = \frac{720}{12} = 60$

$$\text{M.f} = \text{C}_{60}$$
30. **2008 Q13 P1**
 Pass product over anhydrous copper (II) sulphate (I) which turns from white to blue (I) turns to blue or anhydrous copper (II) sulphate or use Cobalt Chloride (anhydrous which turns from blue to pink).
31. **2008 Q26 P1**
 (a) I Pb^{2+}
 II CO_3^{2-}
 (b) $\text{PbO}(\text{s}) + 2\text{H}^+(\text{aq}) \rightarrow \text{Pb}^{2+}(\text{aq}) + \text{H}_2\text{O}(\text{l})$
32. **2008 Q31 P1**
 (a) Neutralization
 (b)(i) Calcium hydrogen carbonate
 (ii) Drying agent
 Extraction of sodium metal
33. **2009 Q15 P1**
 (a) The gas burns with a blue flame (1)
 (b) (i) The iron is less reactive than magnesium (1)
 (ii) Heat the iron powder (1) (3 marks)
34. **2009 Q24 P2**
 (a) (i) Channel / pump sea water into shallow ponds. Evaporation of water occurs at the ponds sodium chloride crystallizes out.
 (ii) 1. $\text{NH}_3(\text{g}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{w}) \rightarrow \text{NH}_4\text{HCO}_3(\text{aq})$
 2. $\text{NH}_4\text{HCO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \rightarrow \text{NaHCO}_3(\text{s}) + \text{NH}_4\text{Cl}(\text{aq})$
 (iii)
 1. Filtration
 2. Heating
 3.
 (iv) I. $\text{Na}_2\text{CO}_3(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{Na}_2\text{SO}_4(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$

$$\text{Moles of H}_2\text{SO}_4 = \frac{40 \times 0.5}{1,000}$$

$$= 0.02$$

$$\text{Moles of Na}_2\text{CO}_3 = \text{Moles of H}_2\text{SO}_4 = 0.02$$

$$\text{Mass of Na}_2\text{CO}_3 = 0.02 \times 106$$

$$= 2.12 \text{ (g)}$$

$$\text{Percentage purity} = \frac{2.12 \times 100}{2.15} \%$$

$$= 98.6\%$$

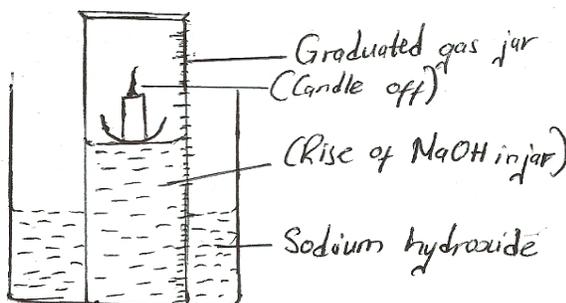
$$\begin{aligned} \text{II. Mass of Na}_2\text{CO}_3 &= 0.02 \times 106 \\ &= 2.12 \text{ g} \\ \text{Percentage purity} &= \frac{2.12 \times 100\%}{2.15} \\ &= 98.6\% \end{aligned}$$

- b.
- | | |
|------------------------------|--------------------------|
| - Used in textile industries | - used in photography |
| - Manufacture of glass | - Making anti acid drugs |
| - Softening hard water | - In paper industries |
| - Making of detergents | - As a food additive |

35. 2010 Q15 P1

- Gas has no colour or smell / odourless
- Have high affinity for iron in the haemoglobin in the blood

36. 2010 Q26 P1



37. 2011 Q11 P1

- (a) Carbon (II) oxide is formed when, fuel burns under limited oxygen / incomplete combustion of fuel
- (b)
- Carbon (IV) oxide / CO_2 – sulphur (VI) oxide / SO_3
 - Nitrogen (IV) oxide / NO_2
 - Sulphur (IV) oxide / SO_2

38. 2011 Q21 P1

- (a) Sulphur/ phosphorus / oxygen
- (b)
- Carbon atoms in graphite are arranged in layers of hexagon which are held by weak vander waals forces
 - The layer slide over each other when force is applied/ slippery

39. 2012 Q23 P1

1. Weigh CuCO_3
2. Heat/decompose CuCO_3 to a constant mass / add acid
3. Reduce CuO using H_2/NH_3 or Cu
4. Reweigh the copper
5. % $\text{Cu} = \frac{\text{mass of Cu}}{\text{Mass of CuCO}_3} \times 100$