**- Mark Scheme /**

**Question Answer Marks AO Element Notes Guidance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1 |  | 2nd box down ticked (potassiumphosphate) |  | **1** |
|  | 2 |  | water purification / swimmingpools |  | **1** |
|  | 3 |  | anhydrous copper(II) sulfateturns blue (2) IF: 2 marks not scored 1 mark for anhydrous copper sulfate **or**copper sulfate turns blue**OR** anhydrous cobalt(II) chlorideturns pink / red (2)IF: 2 marks not scored 1 markfor anhydrous cobalt chloride **or** cobalt chloride turns pink |  | **2** |
|  | 4(a) |  | speeds up rate of reaction /makes reaction faster |  | **1** |
|  | 4(b) |  | any suitable source, e.g. fromcar engines / lightning / hightemperature furnaces |  | **1** |
|  | 4(c) |  | irritates eyes / nose / mouth /skin / airways / lungs |  | **1** |

5 ammonium nitrate **1**

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|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 6 |  | irritates eyes / nose / mouth /skin / airways / lungs |  | **1** |

7(a) (anhydrous) cobalt chloride **1**

7(b) graphite **1**

7(c) calcium oxide **1**

7(d) aluminium **1**

7(e) ceramic **1**

8(a) carbon monoxide **1**

8(b) propene **1**

8(c) carbon dioxide **1**

8(d) chlorine **1**

8(e) sulfur dioxide **1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 9 |  | (thermal) decomposition ofcarbonates (1) |  | **2** |

respiration (1)

10 1.5 (%) **1**

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11 26.7 (%) **1**

12 6.0 / 6 (%) **1**

13 nitrogen (1) **3**

phosphorus (1)

potassium (1)

14(a) (it causes) acid rain **1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 14(b) |  | test – (aqueous) potassiummanganate(VII) (1) |  | **2** |

(purple to) colourless (1)

15 water and oxygen / air **1**

16 **A** photosynthesis (1) **2**

**B** respiration (1)

17(a) 78 (%) **1**

17(b) fractional (1) **2**

distillation (1)

17(c) acid rain **1**

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**Question Answer Marks AO Element Notes Guidance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 17(d) |  | nitrogen and oxygen (from theair) react (in the engine) (1) |  | **2** |

(due to) high temperatures (1)

17(e) nitrogen (1) **3**

carbon dioxide (1)

platinum (1)

|  |  |
| --- | --- |
|  | 17(f) CH4 + 1½O2 → CO + 2H2O **2** |

CO and H2O as products andmethane as reactant (1)

rest of the equation (1)

18 H2O **and** CO **or** C formed (1)

**2**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  2C4H10 + 9O2 → 8CO + 10H2O(1) |  | **allow** correctlybalanced alternativeswith CO and/or Cformed |

19(a) carbon dioxide **1**

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|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 19(b) |  | anhydrous copper(II)sulfate / white copper(II) sulfate (1) |  | **2** |

turns blue (1)

**OR**

 anhydrous cobalt(II) chloride / blue cobalt(II) chloride(1)

turns pink / red (1)

20 carbon monoxide **1**

21(a) (combustion of) leaded petrol **1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 21(b) |  | brain damage (inchildren) / damage to nervoussystem |  | **1** |

22(a) C + O2 → CO2 (2)

**2**

if two marks **not** scored: 1 mark for C + 2O → CO2

22(b) acidic oxide (1) **2**

sulfur is a non-metal (oxide)(1)

23(a) methane **1**

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**Question Answer Marks AO Element Notes Guidance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 23(b) |  | global warming / more extremeweather / ice caps melting / sealevel rising / glaciersmelting / corals die / seaacidified |  | **1** |

24 any **two** from: **2**

• oxygen

• steam

• acid

25 **B** / sulfur dioxide / SO2

**1**

26(a) arrow under the ceramic boat **1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 26(b) |  | direct change from solid to gas(without any liquid stateforming) |  | **1** |

26(c) any **two** from: **2**

• (hot iron(III) chloride is a) vapour / gas

• flask is cooler

• so iron(III) chloride goes from vapour to solid (where flask cooler)

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**Question Answer Marks AO Element Notes Guidance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 26(d) |  | idea of one substance formingtwo or more substances |  | **1** |
|  | 27(a) |  | burning fossilfuels / volcanoes / heating(sulfide) ores |  | **1** |
|  | 27(b) |  | substance which speeds up areaction / substance whichincreases the rate of reaction |  | **1** |

27(c) pH 4 **1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 27(d) |  | erodes buildings (made ofcarbonate rocks) / wears awaybuildings (made of carbonaterocks) / reacts withmortar / corrodes ironwork / corrodes metal |  | **1** |

28 oxygen **1**

29 oxygen **1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 30(a) |  | *any two from:*diamond / graphite / graphene |  | **1** |

30(b) carbon monoxide **1**

31 methane **1**

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**Question Answer Marks AO Element Notes Guidance**

32(a) **anhydrous** copper(II) sulfate **1**

32(b) white (1) **2**

blue (1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 33(a) |  | water / naturalgas / hydrocarbons |  | **1** |
|  | 33(b) effect on the effect on therate equilibriumof the reverse yield ofreactionCH3OH(g) |  | **4** |

**M1** increases

**M3** decreases

**M2** decreases **M4** decreases

34 **1**

potassium chloride

**1**

sodium phosphate

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 35(a) |  | from car engines / lightning / hightemperature furnaces |  | **1** |
|  | 35(b) |  | irritateseyes / nose / mouth / skin / lungs |  | **1** |

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**Question Answer Marks AO Element Notes Guidance**

35(c) carbon dioxide / methane **1**

36(a) chlorine / argon **1**

36(b) sodium **1**

36(c) argon **1**

36(d) sulfur **1**

36(e) aluminium **1**

36(f) silicon **1**

36(g) chlorine **1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 37(a) |  | Fe2O3 + 2H3PO4→ 2FePO4 + 3H2O |  | **2** |

**M1** FePO4 anywhere

**M2** whole equation correct

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 37(b) |  | iron(III) phosphate acts as abarrier which prevents contactbetween iron and water orair / oxygen |  | **1** |

38(a) fractional distillation **1**

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**Question Answer Marks AO Element Notes Guidance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 38(b) |  | carbon monoxide istoxic / poisonous |  | **1** |

39 from blue(1) to pink(1) **2**

40(a) **M1** oxygen **2**

**M2** water

40(b) zinc / Zn **1**

[Total: 105]