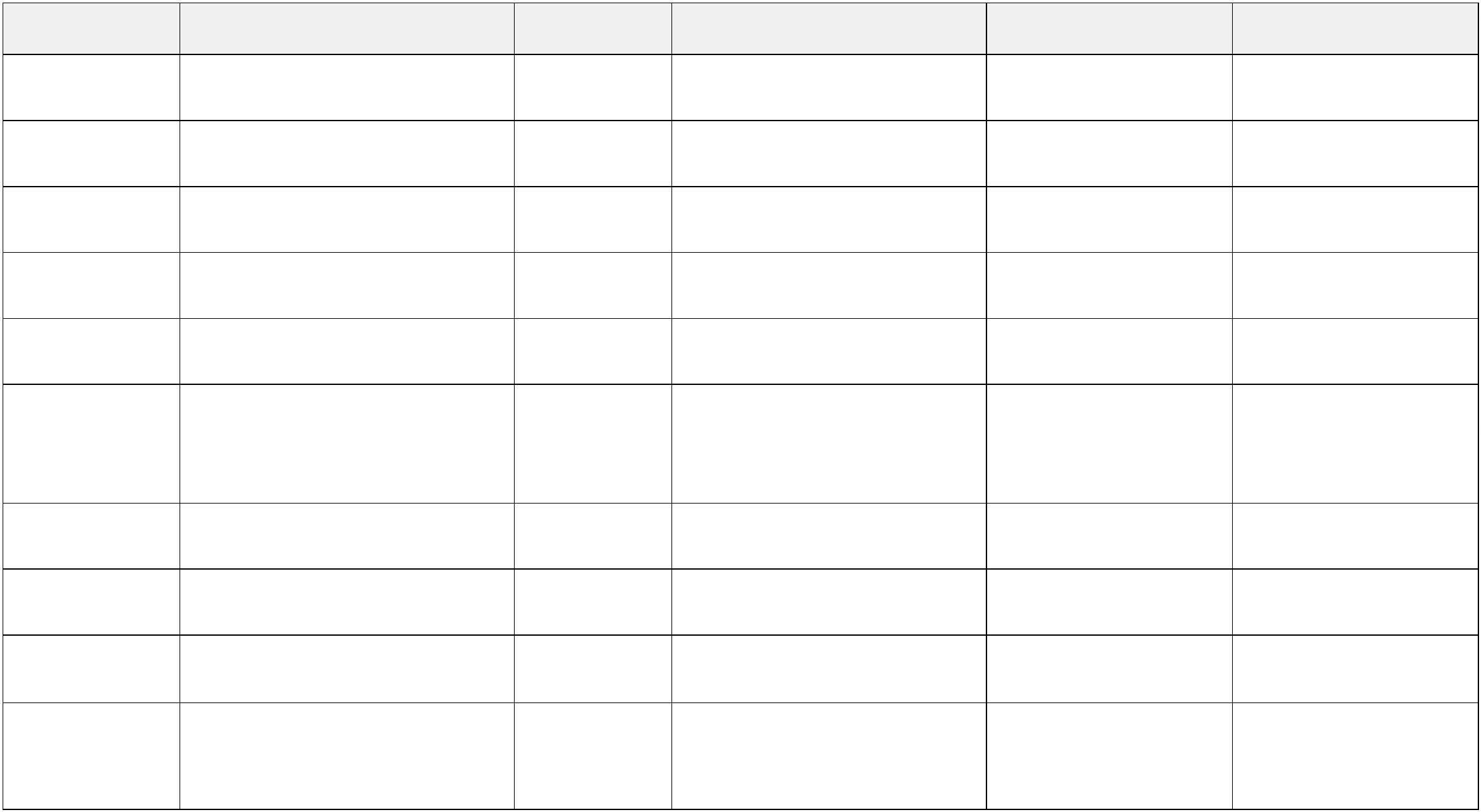
**- Mark Scheme /**



**Question Answer Marks AO Element Notes Guidance**

1 endothermic **1**

2 heat given out / heat evolved **1**

3(a) 4 (NO) **1**

3(b) heat released / heat given out **1**

3(c) oxygen added (to NO) **1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 3(d) |  | acidic oxide  **AND**  nitrogen is a non-metal |  | **1** |

4(a) 4728 **1**

4(b) 6004 **1**

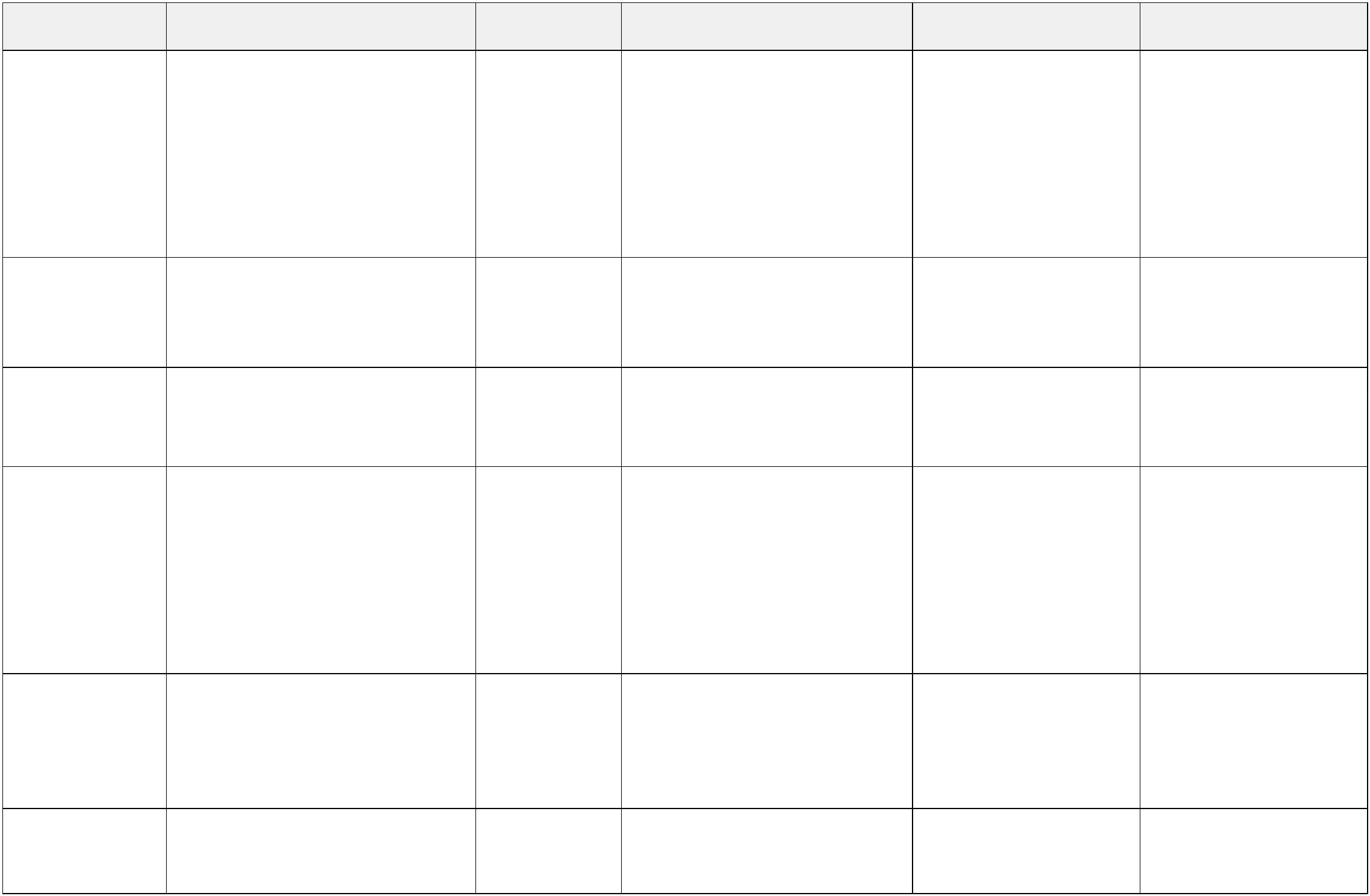
4(c) −1276 **1 ecf (a)** − **(b)**

5(a) Br2 on left (1)

**2**

2 (HBr) (1)

**- Mark Scheme /**



**Question Answer Marks AO Element Notes Guidance**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 5(b) | | |  | | the energy of the reactants is  more than the energy of the  products / energy of the products  is less than the energy of the  reactants / the reactants lose  energy when they form  products | |  | | **1** | |
|  | | 6 |  | | energy (level) of the products is  greater than the energy of the  reactants **ORA** | |  | | **1** | |

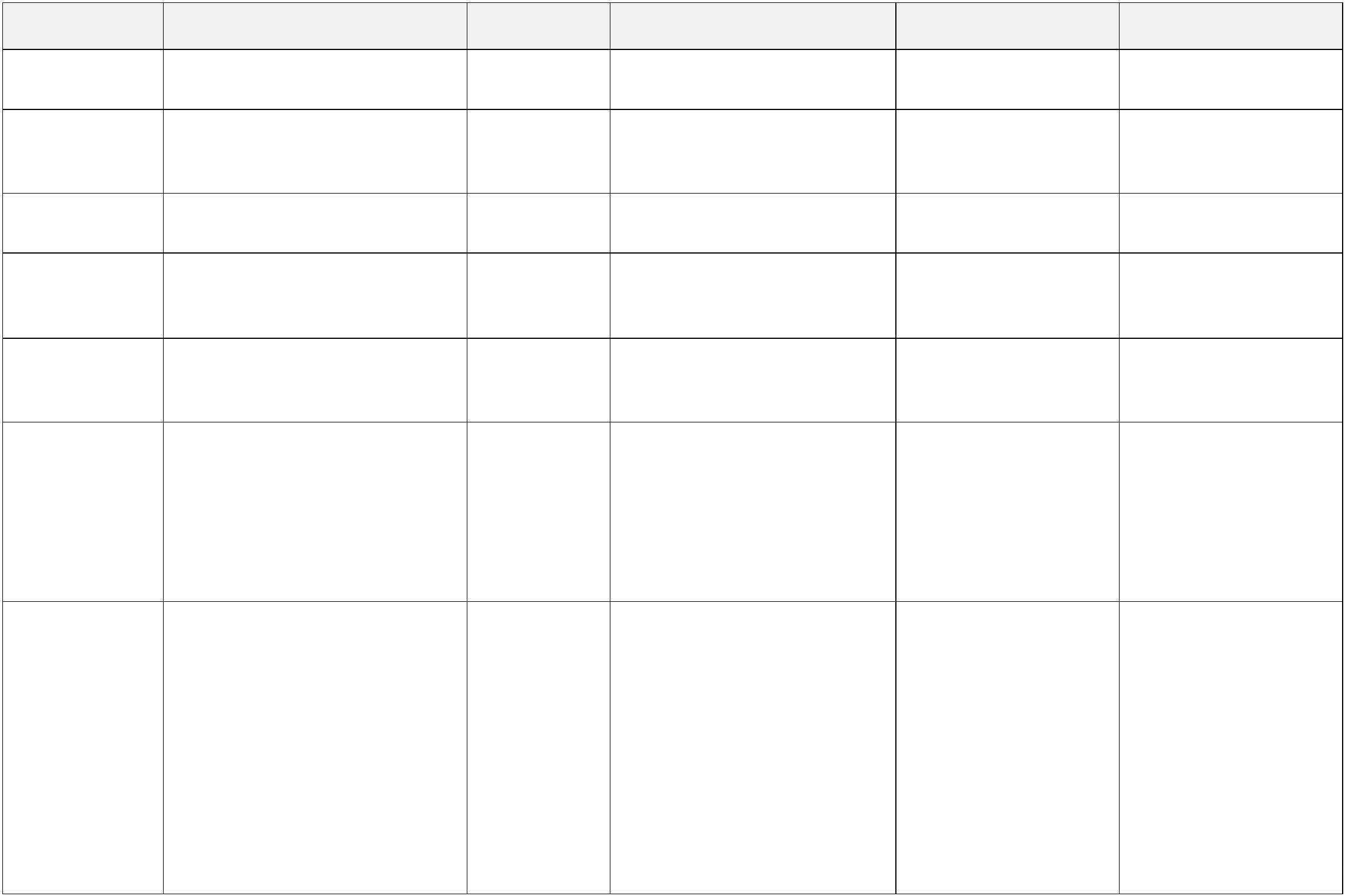
7(a) 2 (Na2S2O3) (1)

**2**

2 (NaI) (1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 7(b) |  | the energy of the reactants is  more than the energy of the  products / the energy of the  products is less than the energy  of the reactants / the reactants  lose energy when they form  products |  | **1** |
|  | 8(a) |  | chromium(III) oxide loses  oxygen / it loses  oxygen / oxidation number of  chromium decreases |  | **1** |
|  | 8(b) |  | energy of reactants greater than  energy of products **ORA** |  | **1** |

**- Mark Scheme /**



**Question Answer Marks AO Element Notes Guidance**

9 absorbs heat / takes in heat **1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 10 |  | endothermic **AND**  heating / absorbs heat |  | **1** |

11(a) oxygen / O2

**1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 11(b) | | |  | carbon + oxygen  → carbon dioxide |  | **1** |
|  | | 11(c) | |  | reactants on the left and product  on the right (both required) |  | **1** |
|  | | | 12 |  | energy level of reactants above  energy level of products / the  arrow is going  downwards / energy (level) goes  down / product has less energy  than reactants |  | **1** |

13 One mark each for any **2** of: **2**

• distance of flame from can

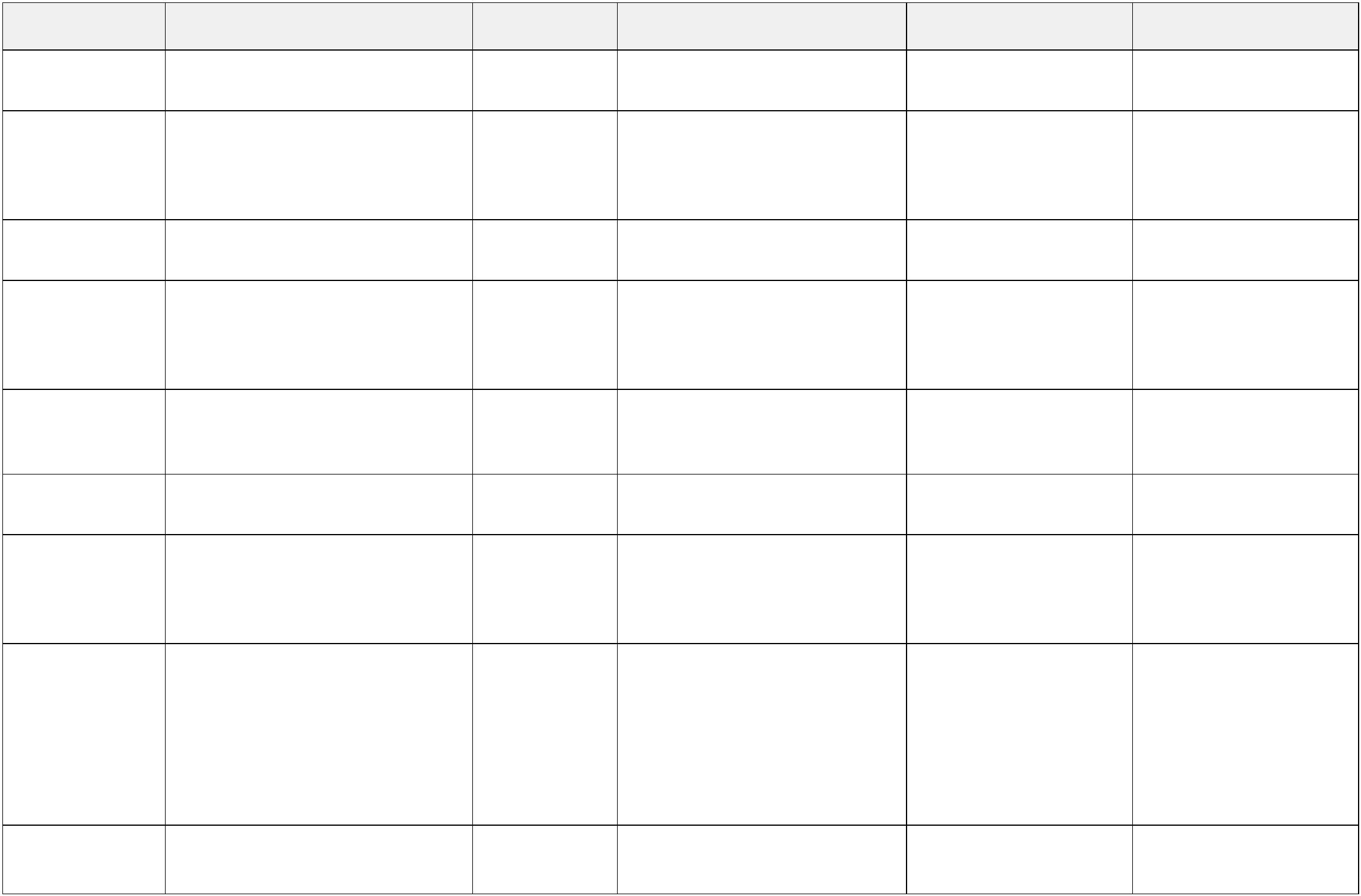
• length of wick

• same can

• volume of water (used) / massof water (used)

• same amount of stirring of thewater

**- Mark Scheme /**



**Question Answer Marks AO Element Notes Guidance**

14 releases heat / heat given out **1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 15(a) |  | correct structure of ethane  showing all of the atoms and all  of the bonds |  | **1** |

15(b) 3 (H2)

**1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 15(c) | |  | takes in heat (from  surroundings)/absorbs  heat / absorbs thermal energy |  | **1** |
|  | | 16 2H2 + O2 → 2H2O  **1** | | | | | |  | **allow** multiples or  fractions |

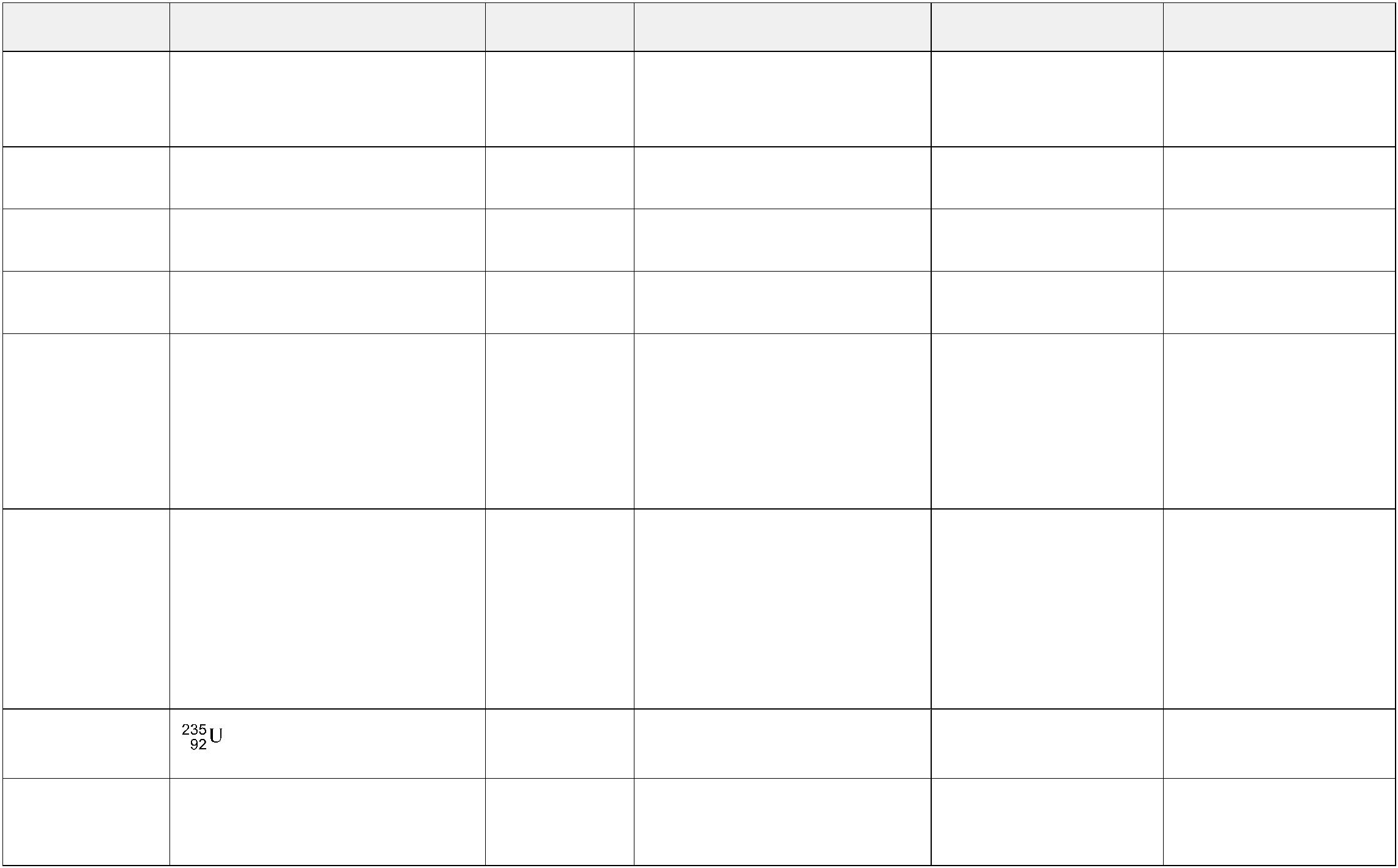
17(a) (zinc oxide) loses oxygen **1**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 17(b) | |  | | reactant level below product  level / reactants have less  energy than products **ORA** | |  | | **1** | |
|  | | 18 | |  | | the energy of the reactants is  greater than the energy of the  products / the product has less  energy than the reactants / the  arrow is going down (from  reactants to product) | |  | | **1** | |

19 **1**

C - The reaction is endothermic.

**- Mark Scheme /**



**Question Answer Marks AO Element Notes Guidance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 20 |  | C - calcium carbonate  decomposing when heated |  | **1** |

21 B **1**

22 B **1**

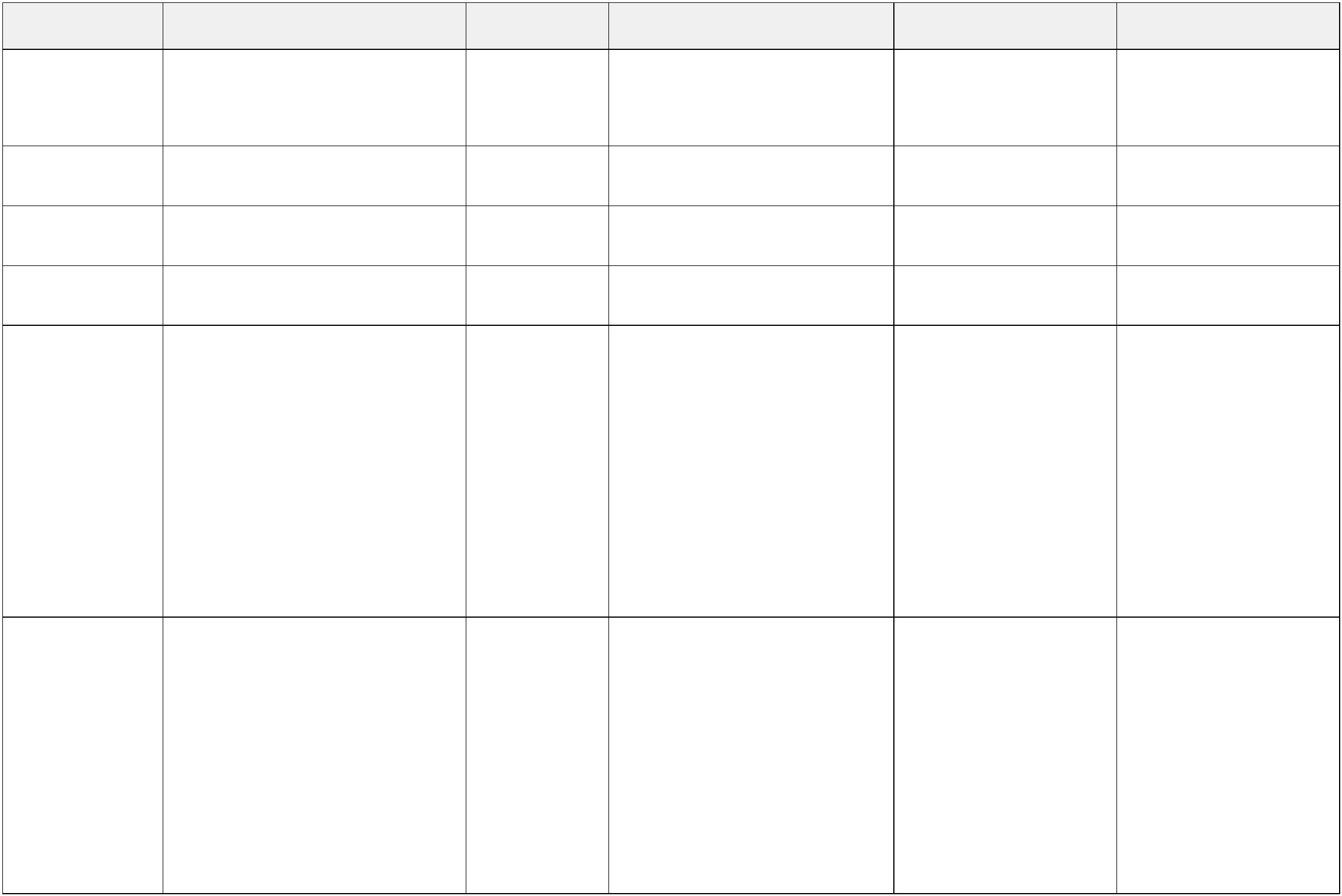
23 **Q 1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 24 |  | make sure temperature change  is the same throughout / make  sure that there are no hot spots  / no local heating |  | **1** |
|  | 25 |  | any two from:  - same amount of solid / same  mass of solid  - same volume of water  - same amount of stirring |  | **2** |

26 **1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 27 |  | exothermic and heat released /  heat given out |  | **1** |

**- Mark Scheme /**



**Question Answer Marks AO Element Notes Guidance**

28 temperature rises **1**

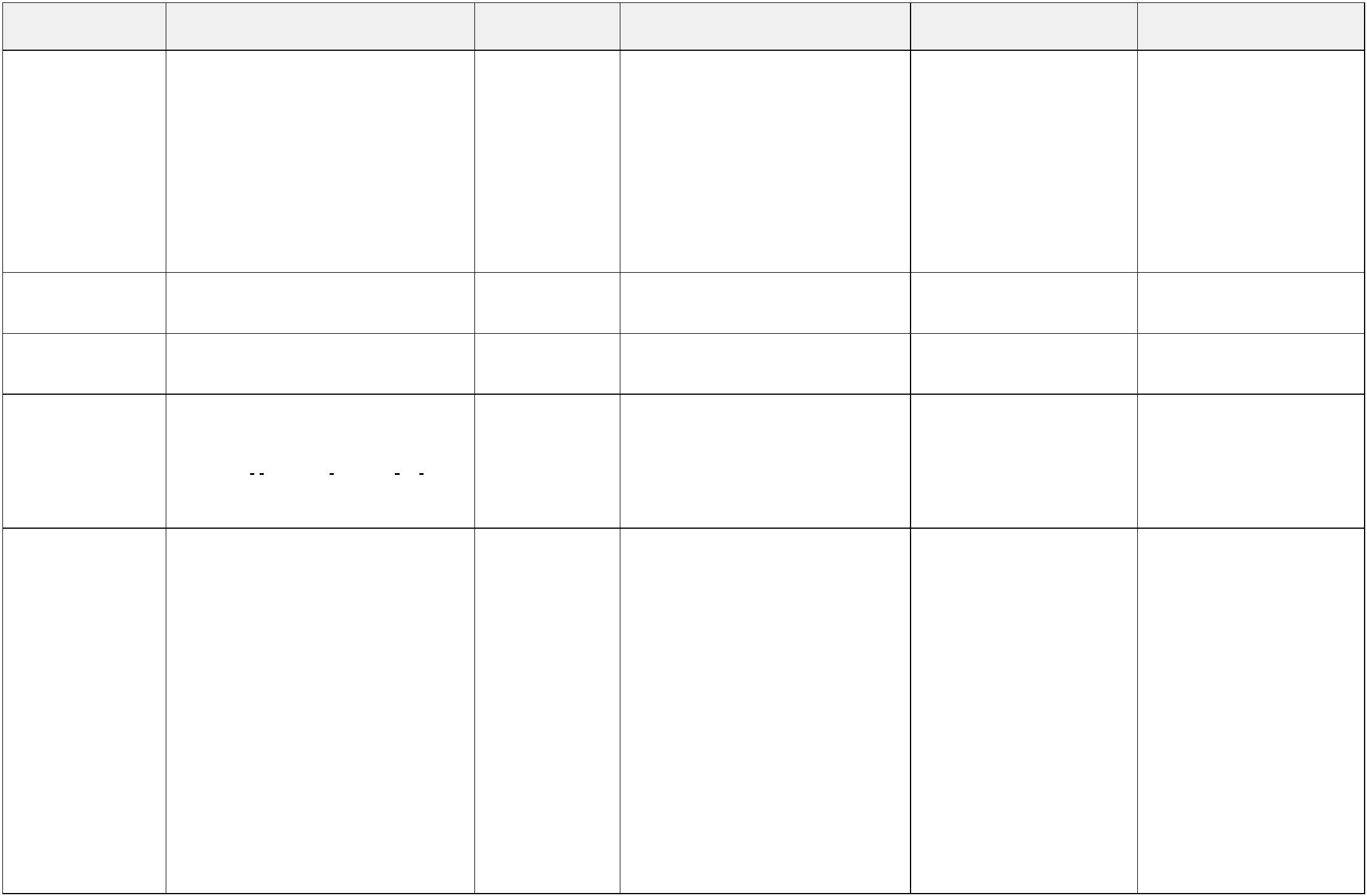
29 B **1**

30 exothermic **1**

31(a) thermometer **1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 31(b) | |  | | Any **two** from:  • same volume of water in can | |  | | **2** | |  | | • **allow**: same  temperature of water  at start | |
|  | | | | | • same height of burner (from  can)  • wick same height | | | | | |  | | • **allow**: same amount  of fuels burnt / same  temperature rise | | | |
|  | | | | | • same rate / amount of stirring  of water | | | | | |  | | • **allow**: same type of  can | | |
|  | | 31(c) | |  | | so same temperature throughout  the water / to stop differences in  temperature in the different parts  of the water / otherwise the  temperature will be higher at the  bottom (of the water) / so not  hotter in one place | |  | | **1** | |  | | **ignore**: to mix the  water / so there are no  convection currents | | | |

**- Mark Scheme /**



**Question Answer Marks AO Element Notes Guidance**

31(d) decreases / goes down **2 allow**: gases formed

|  |  |  |  |
| --- | --- | --- | --- |
|  | idea of liquid or fuel turning to  vapour / gas |  | **ignore**: fuels  evaporate |

**note**: 2nd mark dependent on first

31(e) F **1**

32 A **1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 33(a) |  | substance / material / compound  / element / mixture (burnt) to  produce / release energy **or** heat |  | **1** |

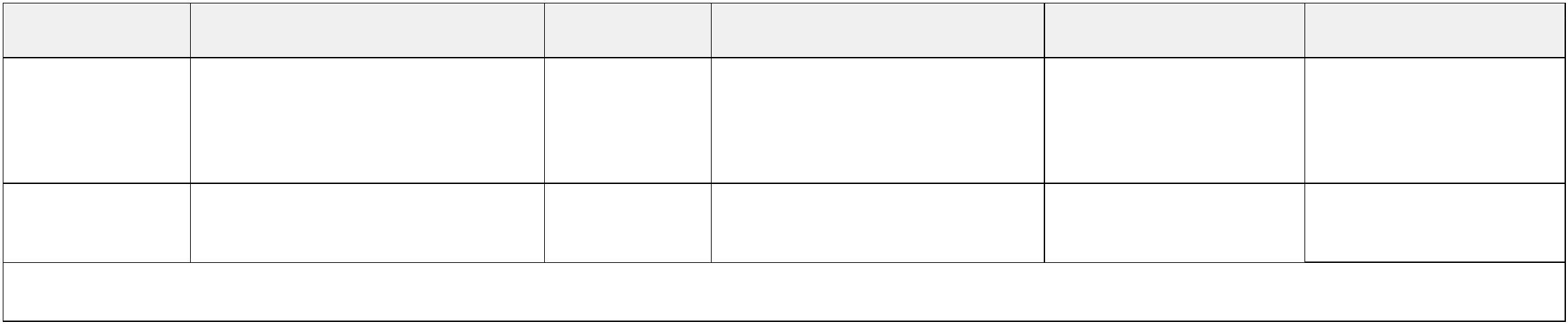
33(b) Any **two** from: **2**

coal coke peat

petroleum / crude oilrefinery gas / LPGgasoline / petrolnaptha

kerosene / paraffindiesel (oil) / gas oilfuel oil propane butane

**- Mark Scheme /**



**Question Answer Marks AO Element Notes Guidance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 33(c) |  | wood / charcoal / animal dung /  biomass / Uranium / U /  plutonium / Pu |  | **1** |

34 **1**

C - The beaker feels warmer.

[Total: 60]