M1. (a) electrons transferred from potassium to sulfur

Two potassium atoms each lose one electron

forming $K^+ / 1^+$ ions

Sulfur atoms gain 2 electrons

forming $S^{2-} / 2^-$ ions

(b) there are no gaps / sticks between the potassium ions and sulfide ions

(c) (two) shared pairs between H and S

Rest correct - no additional hydrogen electrons and two non-bonding pairs on sulfur

second mark dependent on first

(d) 342

allow 1 mark for evidence of $(2 \times 27) + 3[32 + (16 \times 4)]$

(e) | Property | Explanation of property |
----|-------------|-------------------------|
    |             |                         |
Page 2

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more than one line drawn from a variable negates the mark

<table>
<thead>
<tr>
<th>Property</th>
<th>Explanation of property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrons are free to move</td>
<td></td>
</tr>
<tr>
<td>There are no charged particles free to move</td>
<td></td>
</tr>
<tr>
<td>Ions are free to move</td>
<td></td>
</tr>
<tr>
<td>Weak intermolecular forces of attraction</td>
<td></td>
</tr>
<tr>
<td>Bonds are weak</td>
<td></td>
</tr>
<tr>
<td>Bonds are strong</td>
<td></td>
</tr>
</tbody>
</table>

more than one line drawn from a variable negates the mark

2
M2.(a) The forces between iodine molecules are stronger

(b) anything in range +30 to +120

(c) Brown

(d) \(2 I^- + Cl_2 \rightarrow I_2 + 2 Cl^-\)

(e) It contains ions which can move

(f) hydrogen iodine

[6]
M3. (a) giant structure / lattice / layers / close packed

*first 3 marks can be obtained from a suitably labelled diagram*

incorrect structure or bonding or particle = max 3

made up of atoms / positive ions

1

with delocalized / free electrons

1

so electrons can move / flow through the metal

accept so electrons can carry charge through the metal

accept so electrons can form a current

1

(b) an alloy (is a metal which) has different types / sizes of atoms

accept converse for pure metal throughout

both marks can be obtained from suitable diagrams

allow made of different metals

allow mixture of metals / atoms / elements

ignore particles

ignore properties

*do not accept compound*

1

alloy has distorted layers

allow layers are unable to slide

1

(c) (i) can return to its original shape

accept shape memory alloy

accept smart alloy

ignore other properties

1

(ii) (pure copper is too) soft

accept converse

accept malleable or bends

accept copper is running out

ignore references to strength and weakness

1
(iii) aluminium oxide
    
    accept alumina
    accept Al₂O₃
    ignore bauxite / aluminium ore

(iv) any one from:
    • different conditions
    • different catalyst
    • different pressure
      allow different concentration
    • different temperature.
      do not accept different monomers

(d) any two from:
    • accurate
    • sensitive
    • rapid
    • small sample.

    both needed for 1 mark
M4.(a)

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place a glowing splint in the tube of the gas</td>
<td>The splint reigns</td>
</tr>
<tr>
<td></td>
<td>The splint goes out</td>
</tr>
<tr>
<td></td>
<td>There is a squeaky pop</td>
</tr>
</tbody>
</table>

*more than one line from test negates the mark*

(b) (i) place a lighted splint at the mouth of the tube

1

there is a squeaky pop

*dependent on correct test*

1

(ii) hydrogen is less reactive than magnesium

*accept converse*

*accept magnesium is too reactive*

1

(c) (i) any one from:

- to improve appearance or make it look nice
- to prevent corrosion
- to make it more durable
- cheaper than solid silver

1
(ii) solution must be silver nitrate or contain silver ions

otherwise copper will be deposited or silver will not be deposited

spoon must be the negative electrode / cathode

because silver ions have a positive charge or go to negative electrode or are discharged at the negative electrode.

(iii) because (plastic is an) insulator or does not conduct electricity

   accept does not contain mobile electrons
M5. (a) (Chromium =) 20

in correct order

(Nickel =) 8
accept Chromium = 8 and Nickel = 20 for 1 mark

(b) (i) (because iron is made up of only) one type of atom

(ii) not strong
allow too soft or too flexible
accept it rusts / corrodes or that it could wear away
accept could change shape / bend
accept layers / atoms could slide (over each other)

(iii) structure is different / distorted / disrupted
accept not in layers or not regular

so it is difficult for layers / atoms / particles to slip / slide (over each other)
accept layers cannot slip / slide
M6.  (a)  
(i)  covalent

two different answers indicated gains 0 marks

(ii)  carbon

two different answers indicated gains 0 marks

(iii)  3

two different answers indicated gains 0 marks

(b)  layers can slide / slip


because there are no bonds between layers

accept because weak forces / bonds between layers

or so (pieces of) graphite rubs / breaks off

or graphite left on the paper


1  [5]
M7.  

(a) • made of layers / rows (atoms / ions / particles)

\[ \text{ignore free / delocalised electrons} \]

1

• which can slide / slip (over each other)

\[ \text{reference to incorrect particles / covalency / intermolecular forces} \]

\[ = \text{max 1} \]

or

particles / ions / atoms can slide over each other

\[ \text{ignore malleable / ductile / weak bonds} \]

1

(b) (i) sulfuric

\[ \text{accept sulphuric} \]

\[ \text{ignore formula} \]

\[ \text{ignore hydrogen sulfate} \]

1

(ii) any two from:

\[ \text{list principle applies for incorrect observations} \]

• (hydrogen) gas produced (or any indication of a gas such as bubbles etc.)

\[ \text{ignore just hydrogen produced} \]

\[ \text{ignore cloudiness / colour changes} \]

• magnesium / solid disappears / goes into solution

\[ \text{accept magnesium / magnesium sulfate / solid / it dissolves} \]

\[ \text{accept forms a liquid / solution} \]

• gets hot

\[ \text{allow exothermic} \]

\[ \text{ignore floats} \]

2
(iii) crystallisation

*accept detailed answers such as: evaporate to half volume and then allow the solution to crystallise.*

*or*

evaporation / heating / boiling / cooling

*ignore any references to filter*