1 Complete the table using ✓s to show which type of structure the following substances have. (8)

Substance	Monatomic	Simple molecular	Giant covalent	Ionic	Metallic
helium (He)					
nitrogen fluoride (NF_3)					
silicon chloride ($SiCl_4$)					
strontium chloride ($SrCl_2$)					
iron oxide (Fe_2O_3)					
phosphorus (P_4)					
silicon dioxide (SiO_2)					
iridium (Ir)					

2 Give the formula of each of the following ionic substances. (8)

a) potassium bromide ………………………
e) cobalt(II) carbonate ………………………

b) aluminium sulfide ………………………
f) ammonium nitrate ………………………

c) magnesium hydroxide ………………………
g) titanium(IV) oxide ………………………

d) iron(III) nitrate ………………………
h) rubidium sulfate ………………………

3 Write a balanced equation for each of these reactions. (10)

a) potassium oxide + hydrochloric acid

……

b) barium + water

……

c) propane (C_3H_8) + oxygen

……

d) magnesium + nitric acid

……

e) zinc(II) carbonate + sulfuric acid

……

4   Write an ionic equation for each of these reactions.   (3)

   a)   redox reaction between solution of copper(II) sulfate and magnesium metal

        ………

   b)   acid-base reaction between nitric acid and calcium hydroxide

        ………

   c)   precipitation of silver(I) bromide when solutions of potassium bromide and silver(I) nitrate are mixed

        ………

5   Convert these quantities into the units shown.

   a)   25 cm^3 to m^3 …………………………………………………………………………………………….……………………………   (1)

   b)   150 cm^3 to dm^3 …………………………………………………………………………………………..……………………………   (1)

   c)   40 MPa to Pa …………………………………………………………………………….…………………………………………………   (1)

   d)   7.5 mg to g …………………………………………………………………………………….…………………………………………   (1)

6   6.15 g of hydrated magnesium sulfate, $MgSO_4.xH_2O$ decompose to form 3.00 g of anhydrous magnesium sulfate
        on heating. Calculate the formula mass of hydrated magnesium sulfate and the value of x.

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        ……………………………………………………………………………………………………..…………………………………… (4)

7   Determine the limiting reagent and then calculate the mass of titanium produced when 10.00 g of titanium
        chloride react with with 2.00 g of magnesium.

$$TiCl_4 + 2Mg \rightarrow 2MgCl_2 + Ti$$

        ………

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        ………

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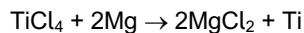
        ……………………………………………………………………………………………………..…………………………………… (4)

8   Describe what each of the following formulae tells you about the substance shown.

a)   Ammonia has the molecular formula NH_3 ....

....

....

.... (2)

b)   Silicon dioxide has the formula SiO_2 ....

....

....

.... (2)

c)   Aluminium oxide has the formula Al_2O_3. ....

....

....

.... (2)

d)   Sulfur has the molecular formula S_8. ....

....

....

.... (2)

9   The element carbon exists in several different forms (allotropes), including diamond, graphite and graphene.

a)   Explain why these forms of carbon all have high melting points.

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....

.... (3)

b)   Explain why graphite and graphene are electrical conductors but diamond is not.

....

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....

.... (3)

c) Buckminsterfullerene is another form of carbon with the formula C_{60}. Explain how the formula C_{60} tells us that this is a molecular substance and not a giant covalent substance.

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………

………

………

…… (2)

Area	Strength	To develop	Area	Strength	To develop	Area	Strength	To develop
Done with care and thoroughness			Write formulae (ionic)			Understands limiting reagents		
Good SPG			Write formulae (other)			What formulas mean		
Shows full working			Write balanced equations			Link structure types to properties		
Explanations are clear			Write ionic equations			Identify structure types of substances		
Convert units			Can work out formula mass					
Work to appropriate sig figs			Find moles from mass (and vice versa)					
Gives units when appropriate			Can do reacting mass calculations					