

New  
Specification



*Rewarding Learning*

**General Certificate of Secondary Education  
2012**

---

**Science: Chemistry**

Unit C1

Foundation Tier

**[GCH11]**

**TUESDAY 12 JUNE MORNING**

---

**MARK  
SCHEME**

## **General Marking Instructions and Mark Grids**

### ***Introduction***

Mark schemes are intended to ensure that the GCSE examination is marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria that they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these marking instructions.

### ***Quality of candidates' responses***

In marking the examination papers, examiners should be looking for a quality response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

### ***Flexibility in marking***

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

### ***Positive marking***

Examiners must be positive in their marking, giving appropriate credit for description, explanation and analysis, using knowledge and understanding and for the appropriate use of evidence and reasoned argument to express and evaluate personal responses, informed insights and differing viewpoints. Examiners should make use of the whole of the available mark range of any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

### ***Awarding zero marks***

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

### ***Types of mark scheme***

Mark schemes for questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

			AVAILABLE MARKS	
1	(a)	(i) A = evaporating basin/dish [1] B = filter funnel [1] C = (Liebig) condenser [1]	[3]	10
		(ii) Method 2/filtration/filtering	[1]	
		(iii) copper sulfate is soluble	[1]	
		(iv) D = filtrate [1] E = distillate [1]	[2]	
	(b)	(i) blue (ink)	[1]	
		(ii) blue (ink)	[1]	
		(iii) yellow and blue (inks)	[1]	

2 (a) (i)

	magnesium	oxygen
Electronic configuration before bonding	2,8,2 [1]	2,6 [1]
Electronic configuration after bonding	2,8 [1]	2,8 [1]

[4]

(ii) magnesium ion: 2+ [1]  
oxide ion: 2- [1]

[2]

(iii) strong bonds [1]  
substantial energy required to break [1]

[2]

(b) (i) sharing of electrons [1]  
idea of a pair of electrons [1]

[2]

(ii)



[1] for shared pair shown as × and ●  
[1] for 1 electron in outer shell of H atom  
[1] for 7 electrons in outer shell of Cl atom  
second and third marks only awarded if first mark awarded for correct sharing of electrons

[3]

award 2 marks for correct bonding diagram if not dot and cross

AVAILABLE  
MARKS

13

- 3 (a) (i) a substance which consists of only one type of atom [1]  
 (ii) 7 [1]  
 (iii) metal [1]

(b) (i)

Group number	Name of group	Number of electrons in outer shell of atom
1	alkali metals [1]	1 [1]
2	alkaline earth metals [1]	2 [1]

[4]

(ii) under oil [1]

(iii) small piece of potassium [1]  
 safety screen [1]  
 tongs for lifting potassium [1] maximum [2]

- (c) Indicative content
- both groups give same products with water
  - hydrogen and (metal) hydroxide
  - Group 1 are more reactive (with water) than Group 2
  - all of the Group 1 elements react/not all Group 2 react (Be)
  - idea that both groups have same trend in reactivity down group
  - statement of trend in reactivity

Accept alternative appropriate responses

Response	Mark
Candidates must use appropriate specialist terms throughout to compare and contrast the reaction of Group 1 elements with water with the reaction of Group 2 elements with water (at least 5 points from above). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates use some appropriate specialist terms to compare and contrast the reaction of Group 1 elements with water with the reaction of Group 2 elements with water (at least 3 points from above). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates attempt to compare and contrast the reaction of Group 1 elements with water with the reaction of Group 2 elements with water (at least 1 point from above). They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1]–[2]
Response not worthy of credit	[0]

[6]

AVAILABLE  
MARKS

16

4 (a) (i)

Solid	Formula	Relative formula mass
sodium hexametaphosphate	$\text{Na}_6\text{P}_6\text{O}_{18}$	612 [1]
sodium chloride	$\text{NaCl}$ [1]	58.5

[2]

(ii)  $\text{NaPO}_3$

[1]

(b) (i) RFM  $\text{MgSO}_4 = 120$  [1]

$0.05 \times 120 = 6$  [1] g

[2]

(ii) RFM  $\text{MgCO}_3 = 84$  [1]

number of moles =  $\frac{6.3}{84} = 0.075$  [1]

[2]

(c) (i) water which is (chemically) bonded [1]  
into the crystal structure [1]

[2]

(ii) 246

[1]

(iii) % water =  $\frac{126 [1]}{246} \times 100 = 51.2$  [1] %

[2]

AVAILABLE  
MARKS

12

5 (a) (i) Indicative content

- place hydrochloric acid in a suitable container
- add calcium carbonate
- stir/swirl/heat/warm
- until no further reaction occurs/no more reacts/no more fizzing/**excess** solid remaining
- filter (the reaction mixture)
- remove excess calcium carbonate/  
filtrate is calcium chloride solution

Accept alternative appropriate responses

Response	Mark
Candidates must use appropriate specialist terms throughout to discuss fully the preparation of a solution of calcium chloride from calcium carbonate and hydrochloric acid in a logical sequence (5–6 points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates use some appropriate specialist terms to discuss the preparation of a solution of calcium chloride from calcium carbonate and hydrochloric acid in a logical sequence (3-4 points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates describe the preparation of a solution of calcium chloride from calcium carbonate and hydrochloric acid which may not be in a logical sequence (1–2 points). They use limited spelling, punctuation and grammar and form and style are of a limited standard.	[1]–[2]
Response not worthy of credit	[0]

[6]

- (ii)  $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$   
 [1] for correct formulae of reactants  
 [1] for correct formulae of products  
 [1] for correct balancing (only awarded if all formulae correct) [3]

- (iii) heat to concentrate/to half volume [1]  
 allow to (cool and) crystallise [1]  
 filter the crystals [1]  
 dry between two sheets of filter paper/in a desiccator/in a low temperature oven [1] maximum [3]

AVAILABLE  
MARKS

- (b) (i) soluble base [1]
- (ii)  $\text{Ca(OH)}_2 + 2\text{HCl} \rightarrow \text{CaCl}_2 + 2\text{H}_2\text{O}$   
 [1] for correct formulae of reactants  
 [1] for correct formulae of products  
 [1] for correct balancing (only awarded if all formulae correct) [3]
- (iii) limewater [1]
- (iv) carbon dioxide/ $\text{CO}_2$  [1]
- (c) (i) compare to a colour chart [1]
- (ii) red litmus is red with neutral solutions [1]
- (iii) pH metre/pH = 1.82 and a pH range of 0–2 means a strong acid [1]  
 red with universal indicator red indicates a strong acid [1] [2]

AVAILABLE  
MARKS

22

- 6 (a) mass of solute [1] which will saturate [1] 100 g of water [1]  
 at a given temperature [1]  
 allow idea of **maximum which dissolves** for saturate
- (b) (i) as temperature increases, solubility increases
- (ii) 40 (°C)
- (iii) 94 [1] g/100 g water

[4]  
 [1]  
 [1]  
 [1]

**Total**

AVAILABLE MARKS	
	7
	<b>80</b>