

Oxides

Question Paper

Level	Pre U
Subject	Chemistry
Exam Board	Cambridge International Examinations
Topic	Oxides-From non-metals to metals (group 14)
Booklet	Question Paper

Time Allowed: 30 minutes

Score: /25

Percentage: /100

Grade Boundaries:

1 Fig. 1.1 shows the structures of two allotropes of carbon.

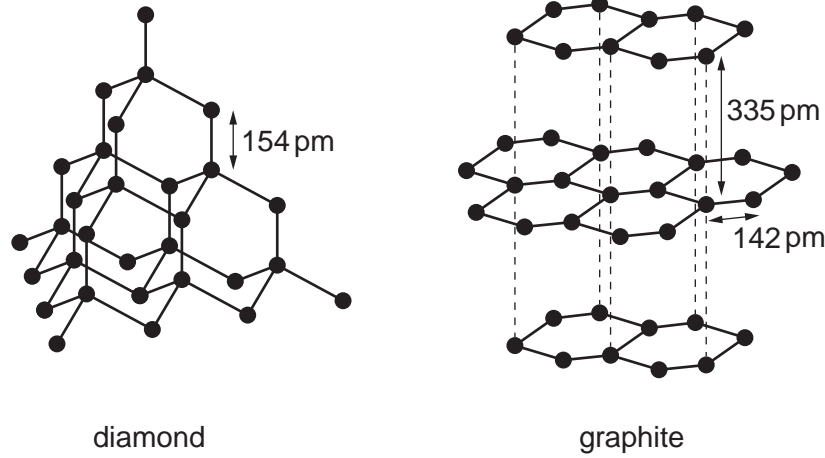


Fig. 1.1

(a) With reference to Fig. 1.1

(i) explain the meaning of the term *allotropes*.

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..... [1]

(ii) describe the bonding in graphite and explain the difference between the two bond lengths shown in its structure.

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..... [3]

- (iii) State how and explain why the hardness and electrical conductivity of each allotrope differ.

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..... [4]

- (b) Group 14 is considered to represent a spectrum of behaviour ranging from non-metal at the top of the Group, through metalloid, to true metal at the bottom.

With reference to

- electrical conductivity of the element
- structure and bonding in the oxides

justify this statement.

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- (c) Tin(IV) oxide, SnO₂, is easily prepared by oxidation of tin but lead(IV) oxide, PbO₂, can only be prepared by the action of very powerful oxidising agents on lead(II) compounds.

PbO₂ decomposes on heating to lead(II) oxide, PbO.

PbO can also be prepared by heating lead in air but SnO is sensitive to oxidation.

Explain this information.

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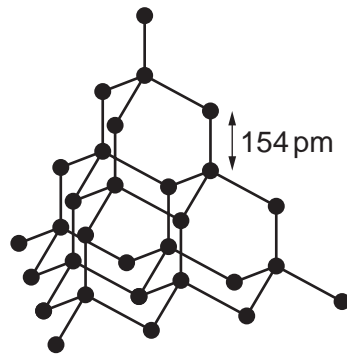
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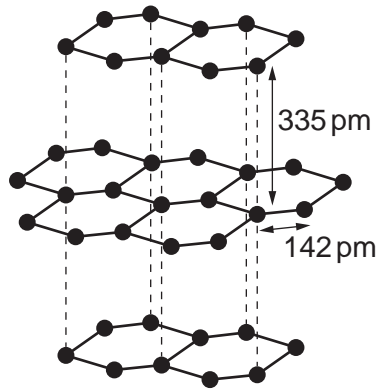
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[Total: 13]

2. The structures of two allotropes of carbon are shown.



diamond



graphite

(a) With reference to these structures

(i) explain the meaning of the term *allotropes*,

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.....[1]

(ii) state how and explain why the hardness and electrical conductivity of these allotropes differ.

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(b) In 2010 the Nobel Prize for Physics was awarded to two researchers from Manchester University for their work on preparing graphene from graphite.

(i) Describe the structure of graphene.

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.....[1]

- (ii) Graphene can be prepared from graphite by using sticky tape. Use your knowledge of the bonding in graphite to explain why it is possible to create graphene by this method.

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.....[1]

- (c) Group 14 is considered to represent a spectrum of behaviour ranging from non-metal at the top of the Group, through metalloid, to true metal at the bottom.

With reference to

- the electrical conductivity of the element,
- the structure and bonding in the oxides,

justify this statement.

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.....[3]

- (d) Here is some information about Group 14 oxides.

Tin(IV) oxide, SnO_2 , is easily prepared by oxidation of tin but lead(IV) oxide, PbO_2 , can only be prepared by the action of very powerful oxidising agents on lead(II) compounds.

PbO_2 decomposes on heating to lead(II) oxide, PbO .

PbO can also be prepared by heating lead in air but SnO is sensitive to oxidation.

Explain this information.

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.....[2]