CHEMISTRY

BOOKS - V PUBLICATION

THE p - BLOCK ELEMENTS

Question Bank

1. Discuss the pattern of variation of oxidation states of B to Tl

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2. Boron, Aluminium, Gallium, Indium and Thallium belong to group 13 of the periodic table of elements. How can you explain a higher stability of BCI_3 as compared to $TiCI_3$?

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3. Why does boron trifluoride behave as a Lewis acid?

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4. Consider the compounds, BCI_3 and CCl_4.

How will they behave with water?

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5. Is boric acid a protonic acid ? Explain.

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6. Explain what happens when boric acid is heated?

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7. Explain the shapes of BF_3 and BH_4^-. Assign hybridisation of Boron in these species.

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8. Write reactions to justify the amphoteric nature of Al.

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9. What are electron deficient compounds? Are BCl_3 and $SiCl_4$ electron deficient?

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10. Write down the resonance structures of CO_3^{2-} and HCO_3^-

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11. What is the state of hybridisation of carbon in

(a) 'CO_3^(2-)'

(b) diamond

(c) graphite?

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12. Explain the difference in properties of diamond and graphite on the basis of their structures

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13. Rationalise the statements and give chemical reactions. (i) Lead (II) Chloride reacts with Cl_2 to give $PbCl_4$

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14. Suggest a reason why B-F bond length in BF_3 (130 pm) and BF_4^- (143 pm) differ?

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15. If 'B-Cl' bond has a dipole moment, explain why 'BCl_3' molecule has zero alpole indment.

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16. Aluminium trifluoride is insoluble in anhydrous HF but dissolves on addition of NaF. Aluminium trifluoride precipitates out of the resulting solution when gaseous BF_3 is bubbled through. Give reasons.

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17. Carbon monoxide is highly poisonous. Why?

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18. Two important oxides of carbon are carbon monoxide and carbon dioxide.

a) How is CO_2 responsible for global warming?

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19. Borax, orthoboric acid and diborane are some useful compounds of boron. Explain the structure of diborane using a diagram.

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20. What happens when Borax is heated

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21. Explain the reaction Si is heated with methyl chloride at high temperature in prsence of copper

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22. Give reasons (vii) Aluminium wire is used to make transmission cables.

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23. Explain why is there a phenomenal decrease in ionisation enthalpy from carbon to silicon?

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24. How do you explain the lower atomic radius of gallium as compared to aluminium?

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25. Carbon has many allotropes. Write the name of any two allotropic forms of carbon.

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26. Classify the oxides as neutral, acidic amphoteric and basic

$CO, B_2O_3, SiO_2, Al_2O_3, PbO_2, Tl_2O_3$

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27. In some of the reactions, thallium resembles aluminium, whereas in others it resembles with group 1 metals. Support this statement by giving some evidences

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28. When metal 'X' is treated with sodium hydroxide, a white precipitate (A) is obtained, which is soluble in excess of NaOH to give soluble complex (B). Compound (A) is soluble in dilute HCl to form compound (C). The compound (A) when heated strongly gives (D), which is used to extract metal. Identify ('X'), (A), (B), (C) and (D). Write, suitable equations to support their identities.

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29. What do you understand by (a) Inert pair effect (b) allotropy (c) catenation.

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30. A certain salt X gives the following reactions (i) Its aqueous solution is alkaline to litmus

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31. Write balanced equation for

$B_2H_6 + H_2O \rightarrow$

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32. Give one method for industrial preparationi and one for laboratory preparation of 'C O'

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33. The aqueous solution of borax is

A. neutral

B. amphoteric

C. basic

D. acidic

Answer: C

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34. Boric acid is polymeric due to -----

A. Its acidic nature

B. The presence of hydrogen bonds

C. Its monobasic nature

D. Its geometry.

Answer: B

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35. Write the type of hybridisation of each carbon in the compound

$CH_3 - CH = CH - CN$

A. sp

B. 'sp^2'

C. sp^3'

D. dsp^2'.

Answer: C

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36. Thermodynamically most stable allotrope of carbon is_____

A. Diamond

B. Graphite

C. Fullerenes

D. Coal

Answer: B

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37. The Elements of group 14 show ----- oxidation states

A. exhibit oxidation state of '+4' only

B. exhibit oxidation state of '+2' and '+4'

C. form 'M^2' -and 'M^4+' ion

D. form 'M^2+' and 'M^4+' ions.

Answer: B

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38. If the starting material for the manufacture of silicones is 'RSiCl3', write the structure of the product formed.

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39. How is carbon monoxide important in metallurgy?

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40. What is the biological importance of H_2CO_3 / HCO_3^- equilibrium?

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41. Give reasons:

a. Silicon form compounds with coordination number of 5 and 6.

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42. Why does elemental silicon not form a graphite - like structure, whereas carbon does?

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43. Silianes get easily hydrolysed whereas alkanes do not. Give reasons.

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44. Diborane is an important hydride of Boron

a. During a class room discussion, a student argues that there is a covalent bond between boron atoms in diborane. What is your opinion. Give justification.

b. Boron halides can act as Lewis acids. Give reason.

c. Arrange the following Lewis acids in the increasing order of acidic strength. Substantiate your answer?

'BF_3 BCl_3, BBr_3'

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45. Carbon has śeveral allotropic forms.

b. Prepare a short note on fullerenes.

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46. Why does not silicon form an analogue of graphite? OR Why does elemental silicon not form graphite like structure as carbon does? Explain.

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47. Why carbon forms covalent compounds whereas lead forms ionic compounds.

48. Carbon exhibits catenation, whereas silicon does not. Explain.

49. $SiCl_4$ forms $[SiCl_6]^{2-}$ while CCl_4 does not form $[CCl_6]^{2-}$ Explain.

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50. when 'CCl_4' is mixed with 'H_2 O', they become immiscible. Explain.

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51. The substance which can accept electrons is a Lewis acid. 'BCl_3, BF_3' and 'BBr_3' are Lewis acids.

a. Arrange the above Lewis acids in the increasing,order of their acid strength.

b. Give reason for this order of acidic strength,

c. The chemistry of boron is different from that of other members of the same group. Mention any two differences and give reason.

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52. CO 2 is a gas but SiO_2 is a solid. Give reason.

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53. Briefly describe the structure of diborane.

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54. Starting from borax how will you prepare boric acid? (Write the chemical equation).

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55. Boron, Aluminium, Gallium, Indium and Thallium belong to group 13 of the periodic table of elements. How can you explain a higher stability of BCI_3 as compared to $TiCI_3$?

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56. Diborane is an important hydride of Boron

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'BF_3 BCl_3, BBr_3'

57. What is dry ice?

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58. Say TRUE or FALSE. Boron in aqueous solution forms B^{3+} ion.

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59. How does sodium hydride react with diborane?

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60. What is the maximum covalency of silicon in its compounds?

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61. Account for the following.

(i) PbX_2 is more stable than $PbX_4 (X = Cl, Br)$

(ii) $PbCl_4$ is less stable than $SnCl_4$ but $PbCl_2$ is more stable than $SnCl_2$

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62. C O_2' can be represented by the structure 'O=C=O' comment.

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63. Diamond is hard and non conducting while graphite is soft and conducting. Why?

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64. Give reason for

(i) diamond is a covalent compound yet its melting point is very high

(ii) Diamond is used as a precious stoke.

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65. Give a labouratory method to prepare diaborance and ist some properties of

diborance.

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66. Why would high pressure be an expected condition for the transformation of graphite to a more dense diamond.

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67. What are fullerences? How are they prepared?

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68. Gallium has higher ionisation enthalpy than aluminium. Explain why?

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69. Borax gets hydrolysed to give

A. basic medium

B. actdic medium

C. neutral medium

D. may be acidic or neutral

Answer: A

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70. Orthoboric acid on strong heating to red hot gives. metaboric acid borax boron tri oxide tetraboric acid

A. metaboric acid

B. borax

C. boron tri oxide

D. tetraboric acid

Answer: A

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71. The aqueous solution of borax is

A. bleaching agent

B. alkaline

C. acidic

D. neutral

Answer: C

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72. Carborundum is

A. Calcium carbide

B. boroncarbide

C. Aluminium carbide

D. silicon carbide

Answer: D

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73. The high temperature polymers of silicon are called silicates silicon halides . silanes silicones

A. silicates

B. silicon halides .

C. silanes

D. silicones

Answer: D

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74. Which of the following is not the form of silica? cassiterite, cristobalite, Tridymite, quartz

A. cassiterite

B. cristobalite

C. Tridymite

D. quartz

Answer: A

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75. The element having maximum abundance in earths crust is

A. Si

B. N

C. O

D. Cl

Answer: A

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76. Hybridisation of boron in B_2H_6 is -----

A. sp

B. sp^2'

C. sp^3'

D. dsp^2'

Answer: C

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77. Boric acid is polymeric due to -----

A. its acidic nature

B. the presence of hydrogen bonds

C. Its monomeric nature

D. its geometry

Answer: B

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78. The Elements of group 14 show ----- oxidation states

A. exhibit oxidation state of '+4' only

B. exhibit oxidation state of '+2' and '+4'

C. form 'M^(2-)' and 'M^(+4)' ions

D. form 'M^(+2)' and 'M^(4 -)' ions

Answer: B

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79. Boron is a : metal, non-metal, metalloid, alloy

A. metal

B. non-metal

C. metalloid

D. alloy

Answer: B

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80. Explain the action of heat on boric acid.

A. metaboric acid

B. tetraboric acid

C. boric oxide

D. pyroboric acid

Answer: A

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81. The compounds of boron with hydrogen are called : borides, boranes, diborane, orthoborate

A. borides

B. boranes

C. diborane

D. orthoborate

Answer: B

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82. Orthoboric acid on strong heating to red hot gives. metaboric acid borax boron tri oxide tetraboric acid

A. boron

B. boric oxide

C. pyroboric acid

D. raboric acid

Answer: D

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83. Glass is best described as a,: solid, liquid, supercooled liquid, colloid

A. solid

B. liquid

C. supercooled liquid

D. colloid

Answer: C

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84. The aqueous solution of borax is

A. acidic

B. basic

C. neutral

D. may be acidicor neutral

Answer: B

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85. The allotropic form of carbon which is used for making lead of pencil is,(1)Lamp black (2)Charcoal (3)Graphite (4)Gascarbon

A. lamp black

B. charcoal

C. graphite

D. gascarbon

Answer: C

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86. The gas which combines with haemoglobin to damage is oxygen- carrying capacity is

A. CO_2(g)'

B. CO(g)'

C. 'N_2(g)'.

D. O_2(g)'

Answer: B

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87. The carbide which is used as abrasive is,

(1)WC (2)CaC2 (3)Al4 C3 (4)SiC

A. WC

B. CaC_2'

C. Al_4 C_3'

D. SiC'

Answer: D

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88. Pyrosilicates are the silicates in which two tetrahedral units are linked at (a)one point (b)two points (c)three points (d)None

A. one point

B. two points

C. three points

D. None

Answer: A

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89. A $I^{(3+)}$ is not isoelectronic with (1)Ne (2)Na^{+} (3)F^{-} (4)Ca^{2+}

A. Ne

B. Na^{+}

C. F^{-}

D. $Ca^{(+2)}$

Answer: D

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90. Which one of the following elements has the highest melting point? (1)Boron (2)Aluminium (3)Gallium (4)Thallium

A. boron

B. aluminium

C. gallium

D. thallium

Answer: B

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91. Orthoboric acid, H_3BO_3 is a

A. Arrhenius acid

B. Bronsted - Lewis acid

C. Lewis acid

D. all correct

Answer: C

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92. The hybridisation of boron in 'B F_3' and 'BF_4' respectively is sp^2, sp^3' sp^3, sp^3' s p^3, s p^3 d'. sp^2, sp^2'

A. sp^2, sp^3'

B. sp^3, sp^3'

C. s p^3, s p^3 d'.

D. sp^2, sp^2'

Answer: A

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93. Amorphous form of silica is : tridynite, cristobalite, fumed silica, asbestos

A. tridynite

B. cristobalite

C. fused silica

D. asbestos

Answer: C

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94. In silicon dioxide : each siliçon atom is surrunded by four oxygen atoms and each oxygen atoms is bonded to two silicon atoms, silicon atom is bonded to two oxygen atoms , there are double bond between silica and oxygen atoms, silicon atom is bonded to five oxygen atoms

A. each siliçon atom is surrunded by four oxygen atoms and each oxygen atoms is bonded to two silicon atoms.

B. silicon atom is bonded to two oxygen atoms

C. there are double between silica and oxygen atoms

D. silicon atom is bonded to five oxygen atoms

Answer: A

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95. Carborundum is

A. SiC'

B. AlCl_3'

C. Al_2(SO_4)_3'

D. Al_2 O_3 . 2 H_2 O'

Answer: A

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96. Which of the following statement about boric acid is false. : It acts as a monobasic acid , it is formed by the hydrolysis of boron halides , it has planar structure , It act as a tribasic acid

A. It acts as a monobasic acid

B. it is formed by the hydrolysis of boron halides

C. it has planes strecture

D. It act as a tribasic acid

Answer: D

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97. Which of the following statement about boric acid is false. : It acts as a monobasic acid , it is formed by the hydrolysis of boron halides , it has planar structure , It act as a tribasic acid

A. It acts as a monobasic acid

B. it is formed by the hydrolysis of boron halides

C. it has planes strecture

D. It act as a tribasic acid

Answer: D

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98. Boron trioxide can be reduced with.....to get boron Carbon Hydrogen Magnesium Copper

A. Carbon

B. Hydrogen

C. Magnesium

D. Copper

Answer: C

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99. When boron burns in air it forms:

A. B_2O_3'

B. BN'

C. H_3 BO_3'

D. B_2 O_3 & BN'

Answer: D

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100. Which compound among the following is an antiseptic? BCl_3' H_3 BO_3' BF_3' B_2 O_3'

A. BCl_3'

B. H_3BO_3'

C. BF_3'

D. B_2O_3'

Answer: B

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101. The boron compound which is formed whena solution of borax is acidified? Boricacid Boron nitride Boron trioxide Sodium meta borase

A. Boricacid

B. Boron nitride

C. Boron trioxide

D. Sodium meta borase

Answer: A

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102. Which of the following shows a tendency of dimerisation:?BCl_3 BF_3 BBr_3 BH_3

A. BCl_3'

B. 'BF_3'

C. BBr_3'

D. BH_3'

Answer: D

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103. Which of the following is untrue regarding BF_3 ? It is a Lewis acid , It is a

planar molecule, It has a dipole moment, It forms a compound with NH_3

A. It is a Lewis acid.

B. It is a planar molecule

C. It has a dipole moment

D. It forms a compound with 'NH_3'

Answer: C

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104. Hardest compound of boron is

A. Boron nitride

B. Boron carbide

C. Boron silicide

D. Magnesiumboride

Answer: B

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105. Which of the following is an acid anhydride.

A. CO'

B. CO_2'

C. 'CaO'

D. Al_2O_3'

Answer: B

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106. Producer gas is a mixture of

A. $CO+N_2'$

B. $CO+H_2'$

C. $CO_2,+H_2'$

D. $C O+H_2+N_2'$

Answer: A

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107. Which is supposed to be the purest form of carbon? Fullerence Charcoal Graphite Diamond

A. Fullerence

B. Charcoal

C. Graphite

D. Diamond

Answer: A

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