2 Acids, Bases and Salts

Multiple Choice Questions (MCQs)

DIRECTIONS : *This section contains multiple choice questions. Each question has four choices (a), (b), (c) and (d) out of which only one is correct.*

1. During the preparation of hydrogen chloride gas on a humid day, the gas is usually passed through the guard tube containing calcium chloride. The role of calcium chloride taken in the guard tube is to:

(a) absorb the evolved gas.

(b) moisten the gas.

(c) absorb moisture from the gas.

(d) absorb Cl^- ions from the evolved gas.

2. To protect tooth decay we are advised to brush our teeth regularly. The nature of the tooth paste commonly used is:

(a) Acidic (b) Neutral

(c) Basic (d) Corrosive

3. Which of the following is not a mineral acid?

(a) Hydrochloric acid (b) Citric acid

(c) Sulphuric acid (d) Nitric acid

4. Which of the following acid is present in sour milk ?

(a) glycolic acid (b) lactic acid

(c) citric acid (d) tartaric acid

5. An aqueous solution 'A' turns phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A', the pink colour disappears. The following statement is true for solution 'A' and 'B'.

(a) A is strongly basic and B is a weak base.

(b) A is strongly acidic and B is a weak acid.

(c) A has pH greater than 7 and B has pH less than 7.

(d) A has pH less than 7 and B has pH greater than 7.

6. The product of complete neutralization of H_3PO_3 with NaOH is :

(a) NaH_2PO_3 (b) Na_2HPO_3

(c) Na_3PO_3 (d) $Na_3(HPO_3)_2$

7. Chemical A is used for water softening to remove temporary hardness. 'A' reacts with sodium carbonate to generate caustic soda. What is 'A'?

(a) Gypsum (b) Slaked lime

(c) Quick lime (d) Lime stone

8. An aqueous solution turns red litmus solution blue. Excess addition of which of the following solution would reverse the change?

(a) Baking powder

(b) Lime

(c) Ammonium hydroxide solution

(d) Hydrochloric acid

9. A blue litmus paper was first dipped in dil. HCl and then in dil. NaOH solution. It was observed that the colour of the litmus paper –

(a) changed to red.

(b) changed first to red and then to blue.

(c) changed blue to colourless.

(d) remains blue in both the solutions.

10. The acid used in making vinegar is –

(a) formic acid (b) acetic acid

(c) sulphuric acid (d) nitric acid

11. $CuO + (X) \rightarrow CuSO_4 + H_2O$. Here (X) is –

(a) $CuSO_4$ (b) HCl

(c) H_2SO_4 (d) HNO_3

12. Reaction of an acid with a base is known as –

(a) decomposition (b) combination

(c) redox reaction (d) neutralization

13. When CO_2 is passed through lime water, it turns milky. The milkiness in due to formation of –

(a) $CaCO_3$ (b) $Ca(OH)_2$

(c) H_2O (d) CO_2

14. Antacids contain –

(a) weak base (b) weak acid

(c) strong base (d) strong acid

15. $2NaOH + MgSO_4 \longrightarrow$?

(a) $MgO + Na_2SO_4$ (b) $Mg(OH)_2 + Na_2SO_4$

(c) $Mg(OH)_2 + Na_2O$ (d) $MgO + Na_2O$

16. Bleaching powder gives smell of chlorine because it –

(a) is unstable.

(b) gives chlorine on exposure to atmosphere.

(c) is a mixture of chlorine and slaked lime.

(d) contains excess of chlorine.

17. Plaster of paris is made from –

(a) lime stone (b) slaked lime

(c) quick lime (d) gypsum

18. Chemical formula of baking soda is –

(a) $MgSO_4$ (b) Na_2CO_3

(c) $NaHCO_3$ (d) $MgCO_3$

19. Washing soda has the formula –

(a) $Na_2CO_3.7H_2O$ (b) $Na_2CO_3.10H_2O$

(c) $Na_2CO_3.H_2O$ (d) Na_2CO_3

20. Plaster of Paris hardens by –

(a) giving of CO_2

(b) changing into $CaCO_3$

(c) combining with water

(d) giving out water

21. Which of the following is acidic in nature?

(a) apple juice (b) soap solution

(c) slaked lime (d) lime

22. The reaction of metal with acid results in the formation of–

(a) only hydrogen gas

(b) only salt

(c) both salt and hydrogen gas

(d) none of these

23. Which of the following acid does not react with metals?

(a) sulphuric acid (b) phosphoric acid

(c) carbonic acid (d) nitric acid

24. When an oxide of a non–metal reacts with water which of the following is formed?

(a) Acid (b) Base

(c) Salt (d) None of these

25. 'Alum' is an example of –

(a) single salt (b) double salt

(c) acids (d) none of these

26. Which of the following statements is correct about an aqueous solution of an acid and of a base?

(i) Higher the pH, stronger the acid

(ii) Higher the pH, weaker the acid

(iii) Lower the pH, stronger the base

(iv) Lower the pH, weaker the base

(a) (i) and (iii) (b) (ii) and (iii)

(c) (i) and (iv) (d) (ii) and (iv)

27. A sample of soil is mixed with water and allowed to settle. The clear supernatant solution turns the pH paper yellowish-orange. Which of the following would change the colour of this pH paper to greenish-blue?

(a) Lemon juice (b) Vinegar

(c) Common salt (d) An antacid

28. Plaster of paris is obtained –

(a) by adding water to calcium sulphate.

(b) by adding sulphuric acid to calcium hydroxide.

(c) by heating gypsum to a very high temperature.

(d) by heating gypsum to 373 K.

29. What is the term for the positive and negative ions of a compound breaking apart in solution –

(a) Conglomeration (b) Oxidation

(c) Dissociation (d) None of the Above

30. Of the aqueous solutions listed below, which would be the best conductor of an electric current?

(a) HCl (b) H_3PO_4

(c) HOCl (d) CH_3COOH

31. Common salt besides being used in kitchen can also be used as the raw material for making

(i) washing soda (ii) bleaching powder

(iii) baking soda (iv) slaked lime

(a) (i) and (ii) (b) (i), (ii) and (iv)

(c) (i) and (iii) (d) (i), (iii) and (iv)

32. Which salt can be classified as an acid salt?

(a) Na_2SO_4 (b) BiOCl

(c) Pb(OH)Cl (d) Na_2HPO_4

33. An element X reacts with dilute H_2SO_4 as well as with NaOH to produce salt and $H_2(g)$. Hence, it may be concluded that:

I. X is an electropositive element.
II. oxide of X is basic in nature.
III. oxide of X is acidic in nature.
IV. X is an electronegative element.

(a) I, II, III (b) IV, I, II
(c) III, IV, I (d) II, III, IV

34. The turmeric solution will turn red by an aqueous solution of -

(a) potassium acetate (b) copper sulphate
(c) sodium sulphate (d) ferric chloride

35. The correct order of increasing pH values of the aqueous solutions of baking soda, rock salt, washing soda and slaked lime is

(a) Baking Soda < Rock Salt < Washing Soda < Slaked lime
(b) Rock Salt < Baking Soda < Washing Soda <Slaked lime
(c) Slaked lime < Washing Soda < Rock Salt < Baking Soda
(d) Washing Soda < Baking Soda < Rock Salt < Slaked lime

36. You are provided with aqueous solutions of three salts — A, B and C, 2-3 drops of blue litmus solution, red litmus solution and phenolphthalein were added to each of these solution in separate experiments. The change in colours of different indicators were recorded in the following table:

Sample	With blue litmus solution	With red litmus solution	With phenolphtha-lein solution
A	No change	No change	No change
B	Turns red	No change	No change
C	No change	Turns blue	Turns pink

On the basis of above observations, identify A, B, and C from the following options:

(a) A = NH_4Cl, B = NaCl, C = CH_3COONa
(b) A = NH_4Cl, B = CH_3COONa, C = NaCl
(c) A = NaCl, B = NH_4Cl, C = CH_3COONa
(d) A = CH_3COONa, B = NH_4Cl, C = NaCl

37. Aqua regia is the mixture of conc. HCl and conc. HNO_3 in the ratio:

(a) 1 : 3 (b) 2 : 3
(c) 3 : 1 (d) 3 : 2

38. The chemical formula of 'Plaster of Paris' is

(a) $CaSO_4.\frac{1}{2}H_2O$ (b) $CaSO_4.2H_2O$
(c) $CaSO_4.H_2O$ (d) $CaSO_4.\frac{3}{2}H_2O$

39. A solution turns red litmus blue. Its pH is likely to be –

(a) 2 (b) 4
(c) 5 (d) 10

40. A solution reacts with crushed egg-shells to give a gas that turns lime water milky. The solution contains –

(a) NaCl (b) HCl
(c) LiCl (d) KCl

41. 10 mL of a solution of NaOH is found to be completely neutralised by 8 mL of a given solution of HCl. If we take 20 mL of the same solution of NaOH, the amount of HCl solution (the same solution as before) required to neutralise will be –

(a) 4 mL (b) 8 mL
(c) 12 mL (d) 16 mL

42. Which of the following type of medicines is used for treating indigestion ?

(a) Antibiotic (b) Analgesic
(c) Antacid (d) Antiseptic

43. Which of the following reaction does not results in the evolution of H_2 gas?

(a) dilute sulphuric acid reacts with zinc granules.
(b) dilute hydrochloric acid reacts with magnesium ribbon.
(c) dilute sulphuric acid reacts with aluminium powder.
(d) dilute hydrochloric acid with diute sodium hydroxide solution.

Case/Passage Based Questions

DIRECTIONS : *Study the given case/passage and answer the following questions.*

Case/Passage - 1

Marble's popularity began in ancient Rome and Greece, where white and off-white marble were used to construct a variety of structures, from hand-held sculptures to massive pillars and buildings.

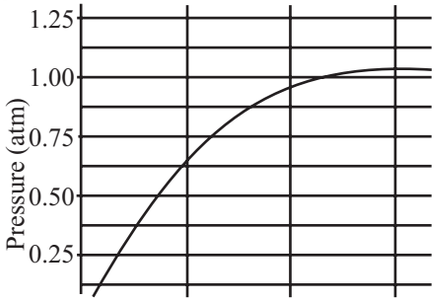
[From CBSE Question Bank-2021]

44. The substance not likely to contain $CaCO_3$ is

(a) Dolomite (b) A marble statue

(c) Calcined gypsum (d) Sea shells.

45. A student added 10g of calcium carbonate in a rigid container, secured it tightly and started to heat it. After some time, an increase in pressure was observed, the pressure reading was then noted at intervals of 5 mins and plotted against time, in a graph as shown below. During which time interval did maximum decomposition took place?



(a) 15-20 min (b) 10-15 min

(c) 5-10 min (d) 0-5 min

46. Gas A, obtained above is a reactant for a very important biochemical process which occurs in the presence of sunlight. Identify the name of the process -

(a) Respiration (b) Photosynthesis

(c) Transpiration (d) Photolysis

47. Marble statues are corroded or stained when they repeatedly come into contact with polluted rain water. Identify the main reason.

(a) decomposition of calcium carbonate to calcium oxide

(b) polluted water is basic in nature hence it reacts with calcium carbonate

(c) polluted water is acidic in nature hence it reacts with calciumcarbonate

(d) calcium carbonate dissolves in water to give calcium hydroxide.

48. Calcium oxide can be reduced to calcium, by heating with sodium metal. Which compound would act as an oxidizing agent in the above process?

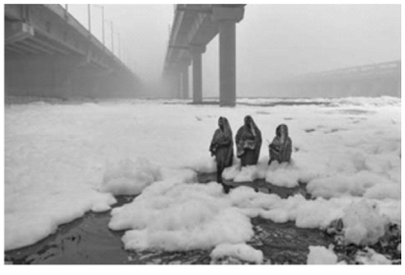
(a) sodium (b) sodium oxide

(c) calcium (d) calcium oxide

Case/Passage - 2

Frothing in Yamuna:

The primary reason behind the formation of the toxic foam is high phosphate content in the wastewater because of detergents used in dyeing industries, dhobi ghats and households. Yamuna's pollution level is so bad that parts of it have been labelled 'dead' as there is no oxygen in it for aquatic life to survive.



[From CBSE Question Bank-2021]

49. Predict the pH value of the water of river Yamuna if the reason for froth is high content of detergents dissolved in it.

(a) 10-11 (b) 5-7

(c) 2-5 (d) 7

50. Which of the following statements is correct for the water with detergents dissolved in it?

(a) low concentration of hydroxide ion (OH^-)and high concentration of hydronium ion (H_3O^+)

(b) high concentration of hydroxide ion (OH^-)and low concentration of hydronium ion (H_3O^+)

(c) high concentration of hydroxide ion (OH^-) as well as hydronium ion (H_3O^+)

(d) equal concentration of both hydroxide ion (OH^-) and hydronium ion (H_3O^+).

The table provides the pH value of four solutions P, Q, R and S

Solution	pH value
P	2
Q	9
R	5
S	11

51. Which of the following correctly represents the solutions in increasing order of their hydronium ion concentration?

(a) P > Q > R > S (b) P > S > Q > R

(c) S < Q < R < P (d) S < P < Q < R

52. High content of phosphate ion in river Yamuna may lead to:

(a) decreased level of dissolved oxygen and increased growth of algae

(b) decreased level of dissolved oxygen and no effect of growth of algae

(c) increased level of dissolved oxygen and increased growth of algae
(d) decreased level of dissolved oxygen and decreased growth of algae

53. If a sample of water containing detergents is provided to you, which of the following methods will you adopt to neutralize it?
(a) Treating the water with baking soda
(b) Treating the water with vinegar
(c) Treating the water with caustic soda
(d) Treating the water with washing soda

Assertion & Reason

DIRECTIONS : *Each of these questions contains an assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.*

(a) If both **Assertion** and **Reason** are **correct** and Reason is the **correct explanation** of Assertion.
(b) If both **Assertion** and **Reason** are correct, but Reason is **not the correct explanation** of Assertion.
(c) If **Assertion** is **correct** but **Reason** is **incorrect**.
(d) If **Assertion** is **incorrect** but **Reason** is **correct**.

54. **Assertion :** Aqueous solution of ammonium nitrate turns blue litmus red.

Reason : Ammonium nitrate is salt of strong acid and strong base.

55. **Assertion :** All alkalis are bases but all bases are not alkali.

Reason : Water soluble bases are alkali.

56. **Assertion :** Magnesium hydroxide is used as antacid.

Reason : Magnesium hydroxide is a strong base.

57. **Assertion :** Dry HCl gas does not change the colour of blue litmus paper to red.

Reason : Dry HCl gas is strongly basic.

58. **Assertion :** Sodium hydrogen carbonate is used in fire extinguisher.

Reason : Sodium hydrogen carbonate is a mild base.

59. **Assertion :** H_2CO_3 is a strong acid.

Reason : A strong acid dissociates completely or almost completely in water.

60. **Assertion :** Salts are the products of an acid-base reaction.

Reason : Salt may be acidic or basic.

61. **Assertion :** On adding H_2SO_4 to water the resulting aqueous solution get corrosive.

Reason : Hydronium ions are responsible for corrosive action.

Match the Following

DIRECTIONS : *Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in column I have to be matched with statements (p, q, r, s) in column II.*

62. Column II gives nature of acids and bases mention in column I, match them correctly.

Column I	**Column II**
(A) HCl	(p) Strong acid
(B) HCN	(q) Weak acid
(C) NaOH	(r) Weak base
(D) NH_4OH	(s) Strong base

63. Match the salts given in column I with the corresponding acid and base given in column II.

Column I	**Column II**
(A) KNO_3	(p) Nitric acid, Silver hydroxide
(B) $AgNO_3$	(q) Hydrochloric acid, Magnesium hydroxide
(C) $MgCl_2$	(r) Carbonic acid, Ammonium hydroxide
(D) $(NH_4)_2CO_3$	(s) Nitric acid, Potassium hydroxide

64.

Column I	**Column II**
(A) $NaHCO_3$	(p) Baking soda
(B) NaOH	(q) Alkaline
(C) $KHSO_4$	(r) Acidic salt
(D) $Ca(OH)_2$	(s) Bitter taste

Fill in the Blanks

DIRECTIONS : *Complete the following statements with an appropriate word / term to be filled in the blank space(s).*

65. Oxy acids contains ..... atoms in addition to hydrogen atom.

66. An acid that contains more than one acidic hydrogen atom is called a ..... .

67. When an acid reacts with a metal, ... gas is evolved and a corresponding ..... is formed.

68. When an acid reacts with a metal carbonate or metal hydrogen carbonate, it gives the corresponding salt, ... gas and ..... .

69. ..... is the fixed number of water molecules chemically attached to each formula unit of a salt in its crystalline form.

70. ENO contains ..... and is ..... in nature.

71. Anhydrous sodium carbonate is commonly known as ..... .

72. Soda–acid fire extinguisher contains a solution of sodium hydrogen carbonate and ..... .

73. An alkali reacts with ammonium salts to produce corresponding salt, water and evolve ..... .

74. $Zn(OH)_2$ is a ..... base.

True / False

DIRECTIONS : *Read the following statements and write your answer as true or false.*

75. Acidic nature of a substance is due to the formation of $H^+(aq)$ ions in solution.

76. Mixing concentrated acids or bases with water is a highly endothermic process.

77. Acids and bases neutralise each other to form corresponding salts and water.

78. The colour of caustic soda turns pink when phenolphthalein is added.

79. Hydrogen chloride gas turns the blue litmus red.

80. Sodium hydrogen carbonate is used in fire extinguisher.

81. Washing soda on strong heating gives sodium oxide and carbon dioxide.

82. Plaster of paris is obtained by heating gypsum at 373 K in a kiln.

83. Bleaching powder is used for disinfecting drinking water.

84. Solution of sodium hydrogen carbonate is alkaline in nature.

ANSWER KEY & SOLUTIONS

1. (c) Calcium chloride is good dehydrating agent so it is used to absorb moisture from the hydrogen chloride gas.

2. (c) The tooth paste commonly used is basic which help in neutralisation of the extra acid formed during tooth decay.

3. (b) Citric acid is an example of organic acid or edible acid while HCl, H_2SO_4 and HNO_3 are mineral acids.

4. (b) Lactic acid is present in sour milk.

5. (c) Aqueous solution of A is basic while that of B is acidic. Therefore A has pH greater than 7 and B has pH less than 7.

6. (b) H_3PO_3 is a dibasic acid.

$$H_3PO_3 \rightleftharpoons H^+ + H_2PO_3^-$$

$$H_2PO_3 \rightleftharpoons H^+ + HPO_3^{2-}$$

7. (b) Chemical 'A' is calcium hydroxide (slaked lime).

$$Ca(OH)_2 + Na_2CO_3 \longrightarrow 2NaOH + CaCO_3 \downarrow$$

8. (d) The given solution is basic in nature when excess of HCl is added, it becomes acidic.

9. (b) In acid, blue litmus changes to red and in basic solution red litmus changes to blue. Hence blue litmus first changes its color to red and then to blue.

10. (b) 6 - 12% acetic acid is known as vinegar.

11. (c) $CuO + H_2SO_4 \longrightarrow CuSO_4 + H_2O$

12. (d)

13. (a) $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$

14. (a) Antacids are weak bases which are given when a patient is suffering from acidity. These antacids neutralise the acid and give relief to patient.

15. (b) $2NaOH + MgSO_4 \longrightarrow Mg(OH)_2 + Na_2SO_4$

16. (b) **17. (d)** **18. (c)** **19. (b)**

20. (c) **21. (a)** **22. (c)**

23. (c) Carbonic acid is a weak and so it does not react with metal.

24. (a) A non metal oxide forms acid on treatment with water. *e.g.,*

$$CO_2 + H_2O \longrightarrow \underset{\text{(Carbonic acid)}}{H_2CO_3}$$

25. (b) **26. (d)** **27. (d)** **28. (d)**

29. (c) Acids and bases go through a process of dissociation when they are put into solution. They break apart into positively and negatively charged particles.

30. (a) HCl is a strong acid.

31. (c)

32. (d) Because it can furnish H^+ ions in solution.

33. (a) Element X can react with both acid and base. It shows that element X is amphoteric in nature and is an electropositive element.

34. (a) $CH_3COOK + H_2O \longrightarrow \underset{\text{Strong base}}{KOH} + CH_3COOH$

The solution will be basic in nature so it turns turmeric to red.

35. (b) Rock Salt (NaCl) < Baking Soda ($NaHCO_3$) < Washing Soda (Na_2CO_3) < Slaked lime ($CaCO_3$)

36. (c) A neutral salt brings no change with blue litmus solution, red litmus solution and with phenolphthalein solution. An acidic salt turns blue litmus to red and brings no change in red litmus solution as well as in phenolphthalein solution.

Basic salt turns red litmus to blue and also turns phenolphthalein solution pink.

Sample	Solution	With blue litmus solution	With red litmus solution	With phenol-phthalein solution
A	Neutral salt (NaCl)	No change	No change	No change
B	Acidic salt (NH_4Cl)	Turns red	No change	No change
C	Basic salt (CH_3COONa)	No change	Turns blue	Turns pink

37. (c) Aqua-regia is 3 part conc. HCl and 1 part conc. HNO_3.

38. (a) Plaster of paris is calcium sulphate hemihydrate.

39. (d) The red litmus solution turns blue in basic solution. The pH of basic solution is more than 7.

40. **(b)** Since the gas produced turns lime water milky so the gas is CO_2. The egg-shell is made of $CaCO_3$ which reacts with an acid (dil. HCl) to produce CO_2.

$CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2\uparrow$

41. **(d)** Since 10 mL of NaOH requires HCl = 8mL

20 mL of NaOH will require HCl $= \frac{8}{10} \times 20$ mL

= 16 mL

42. **(c)** We use antacids for treating indigestion.

43. **(d)** Zinc + Sulphuric acid $\longrightarrow$ Zinc sulphate + Hydrogen

$Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(aq) + H_2(g)$

(b) Magnesium + Hydrochloric acid $\longrightarrow$ Magnesium chloride + Hydrogen

$Mg(s) + 2HCl(aq) \longrightarrow MgCl_2(aq) + H_2(g)$

(c) Aluminium + Sulphuric acid $\longrightarrow$ Aluminium sulphate + Hydrogen

$2Al(s) + 3H_2SO_4(aq) \longrightarrow Al_2(SO_4)_3(aq) + 3H_2(g)$

(d) dilute Hydrochloric acid + dilute sodium hydroxide $\longrightarrow$ sodiumchloride + water

$2HCl + 2NaOH \longrightarrow 2NaCHl + 2H_2O$

44. **(c)** Calcined gypsum is $CaSO_4 \cdot -H_2O$

45. **(d)** 0-5 min

46. **(b)** Gas is CO_2 which is a important reactant in photosynthesis process.

47. **(c)** polluted water is acidic in nature hence it reacts with calcium carbonate

48. **(d)** calcium oxide

49. **(a)**

50. **(b)**

51. **(c)**

52. **(a)**

53. **(b)**

54. **(c)** Ammonium nitrate is salt of strong acid and weak base.

55. **(a)** Bases generate hydroxide ions in water hence water soluble bases are called alkalis.

56. **(c)** Magnesium hydroxide is a mild base and neutralise the excess acid in the stomach.

57. **(c)** Dry HCl gas does not show acidic character in absence of water. Therefore do not change the colour of blue litmus in dry condition.

58. **(b)** Sodium hydrogen carbonate react with acid present in fire extinguisher to produce carbon dioxide gas.

59. **(d)** H_2CO_3 (carbonic acid) is a weak acid.

60. **(b)**

61. **(a)** Because H_2SO_4 is a strong acid, it readily forms hydronium ions when dissolved in water which are responsible for its corrosive action.

62. A $\rightarrow$ (p); B $\rightarrow$ (q); C $\rightarrow$ (s); D $\rightarrow$ (r)

63. A $\rightarrow$ (s); B $\rightarrow$ (p); C $\rightarrow$ (q); D $\rightarrow$ (r)

64. A $\rightarrow$ (p, q, r); B $\rightarrow$ (q, s); C $\rightarrow$ (q, r); D $\rightarrow$ (q, s)

65. Oxygen **66.** Polyprotic acid

67. Hydrogen, salt **68.** Carbon dioxide, water

69. Water of crystallisation

70. Sodium hydrogen carbonate, basic

71. Soda ash **72.** Sulphuric acid

73. Ammonia **74.** Diacidic

75. True **76.** False **77.** True **78.** True

79. False **80.** True **81.** False **82.** True

83. True **84.** True