

# TS POLYCET - 2017

Time: 2 Hours

Total Marks: 120

## Mathematics

1. If  $\sin(A + B) = \frac{1}{\sqrt{2}}$  and  $\cos(A - B) = \frac{1}{\sqrt{2}}$ , then  $\angle B =$

- A.  $60^\circ$
- B.  $45^\circ$
- C.  $30^\circ$
- D.  $0^\circ$

2. If  $\sin \theta + \cos \theta = \sqrt{2}$  then  $\theta =$

- A.  $0^\circ$
- B.  $30^\circ$
- C.  $45^\circ$
- D.  $60^\circ$

3.  $\frac{1 - \tan^2 30^\circ}{1 + \tan^2 30^\circ} =$

- A.  $\frac{1}{2}$
- B.  $\frac{1}{\sqrt{2}}$

C.  $\frac{\sqrt{3}}{2}$

D. 1

4.  $\cos^4\theta - \sin^4\theta =$

A.  $\cos^2\theta - \sin^2\theta$

B.  $2\cos^2\theta - 1$

C.  $1 - 2\sin^2\theta$

D. None

5. The angle of elevation of the top of the cliff from a point 300 m from its foot is  $60^\circ$ . Then the height of the cliff is

A.  $200\sqrt{3}$

B.  $\frac{200}{\sqrt{3}}$

C.  $300\sqrt{3}$

D.  $\frac{300}{\sqrt{3}}$

6. The angle of elevations of the top of a tower from the top and foot of a pole of height 10 m are  $30^\circ$  and  $60^\circ$ . Then the height of the tower is

A. 5m

B. 10 m

C. 15 m

D. 20 m

7. The set of all possible events is called

A. event

B. impossible event

C. sample space

D. None

8. From a deck of 52 cards, a card is drawn at random, then the probability of getting a red king is

A.  $\frac{1}{26}$

B.  $\frac{2}{13}$

C.  $\frac{3}{26}$

D. None

9. If  $P(A) = \frac{4}{15}$  then  $P(\bar{A})$

A.  $\frac{19}{15}$

B.  $\frac{11}{15}$

C.  $\frac{13}{15}$

D. None

10. The probability of getting 53 Fridays in a Leap year is

A.  $\frac{1}{7}$

B.  $\frac{2}{7}$

C.  $\frac{3}{7}$

D.  $\frac{4}{7}$

11. The width of the class in the distribution having class intervals 1-20, 21-40, 41-60 is 1-20, 21-40, 41-60

A. 19

B. 19.5

C. 20

D. 20.5

12. The arithmetic mean of the following data is

Class Interval	0-10	10-20	20-30
Frequency	5	14	6

A. 18.4

B. 19.4

C. 12.4

D. 15.4

13. The roots of  $x - \frac{3}{x} = 2$  are

A. 1, 3

B. 3, -1

C. 2, 2

D. 1, 2

14. If mean=44 and median=42, then mode=

A. 34

B. 36

C. 38

D. 40

15.  $x = \sqrt{3 + \sqrt{3 + \sqrt{3 + \dots \infty}}}$

A.  $x^2 - x + 3 = 0$

B.  $x^2 + x + 3 = 0$

C.  $x^2 - x - 3 = 0$

D.  $x^2 + x - 3 = 0$

16.  $\log_{10} 125 + \log_{10} 8 =$

- A. 1
- B. 2
- C. 3
- D. None

17. The relation  $a(b+c)=ab+bc$  is

- A. commutative law
- B. associative law
- C. distributive law
- D. None

18. If  $n$  is a natural number, then  $8^n-3^n$  is always divisible by

- A. 3
- B. 5
- C. 8
- D. 11

19. If  $\sqrt{x} + \frac{58}{\sqrt{x}} = 31$ , then  $x =$

- A. 529
- B. 933
- C. 729
- D. 841

20. If A and B are two sets then  $(A - B) \cap (B - A) =$

A. A

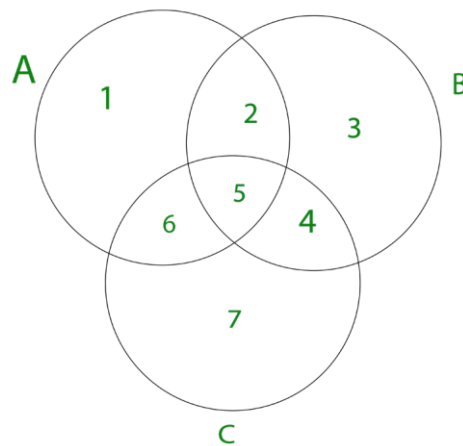
B. B

$x = \cos\theta + \sin\theta$

C.  $y = \cos\theta - \sin\theta$

D.  $\phi$

21. The following Venn-diagram design represented by C equals



A. {1, 2, 5, 6}

B. {6, 5, 4}

C. {4, 5, 6, 7}

D. {2, 5, 6}

22. The shaded area in the figure is

A.  $A \cap (B \cup C)$

B.  $A \cap (B \cap C)$

C.  $A \cup (B \cap C)$

D.  $A \cup (B \cup C)$

23. The remainder of  $3x^3 - 2x^2 + x = 2$  when divided by  $3x + 1$  is

A.  $\frac{4}{3}$

B.  $\frac{3}{4}$

C.  $-\frac{4}{3}$

D. None

24. If  $\alpha, \beta$  are the roots of  $5x^2 + 5x + 6 = 0$ , then  $(1 + \alpha)(1 + \beta) =$

A.  $\frac{4}{5}$

B.  $\frac{3}{5}$

C.  $\frac{6}{5}$

D.  $-\frac{6}{5}$

25. If the difference of two numbers is 5 and their product is 84, then the numbers are

A. 14, 6

B. 12, 7



C. 21, 4

D. 14, 9

26. If the perimeter of a rectangular room is 34 and the length of the diagonal is 13, then the dimensions of the room are

A. 7, 6

B. 11, 6

C. 12, 5

D. 12, 6

27. If  $9x+11y=51$  and  $11x+9y=49$ , then  $x=$

A. -1

B. -2

C. 1

D. 2

28. If the pair of equations  $a_1x+b_1y+c_1=0$  and  $a_2x+b_2y+c_2=0$  has unique solution, then

A.  $\frac{a_1}{a_2} = \frac{b_1}{b_2}$

B.  $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

C.  $\frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$$D. \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

29. The graph of  $y+x^2=0$  lies in the quadrants

A.  $Q_1, Q_2$

B.  $Q_2, Q_3$

C.  $Q_3, Q_4$

D.  $Q_4, Q_1$

30. The line  $x=2017$  is

A. slope not defined

B. parallel to y-axis

C. 1 and 2

D. None

$$31. \sqrt{6 + \sqrt{6 + \sqrt{6 + \dots \infty}}} =$$

A. 1

B. 2

C. 3

D. 4

$$32. \text{ If } x + \frac{1}{x} = 2, \text{ then } x^2 + \frac{1}{x^2} =$$

A. 0

B. 2

C. 4

D. 8

33. The discriminant of the quadratic equation  $ax^2+bx+c=0$

A.  $b^2-4ac$

B.  $a^2-4bc$

C.  $c^2-4ab$

D. None

34. If  $\alpha, \beta$  are the roots of  $x^2+2x+5=0$  then  $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} =$

A.  $\frac{6}{5}$

B.  $\frac{4}{5}$

C.  $-\frac{6}{5}$

D.  $-\frac{4}{5}$

35. Which is the three digit number divisible by 7?

A. 100

B. 133

C. 137

D. 143

36. The 6th term in the GP 2, 8, 32, ... is

A. 512

B. 128

C. 2048

D. 256

37.  $1+1+1+\dots$  n terms =

A.  $\frac{n}{2}$

B.  $\frac{n-1}{2}$

C. n

D.  $\frac{n+1}{2}$

38.  $1+3+6+10+\dots$  n terms =

A.  $\frac{n(n+1)(n+2)}{4}$

B.  $\frac{n(n+1)(n+2)}{8}$

C.  $\frac{n(n+1)(n+2)}{6}$

D. None

39. If  $(k, 2)$  lies in II quadrant then  $(-k, -2)$  lies in the quadrant

- A. I
- B. II
- C. III
- D. IV

40. The point of intersection of the lines  $2x+3y-5=0$  and  $3x-4y+1=0$  lies in which quadrant?

- A. I
- B. II
- C. III
- D. IV

41.  $(0, 0)$ ,  $(1, 0)$ ,  $(0, -4)$  are the vertices of a \_\_\_\_\_ triangle.

- A. equilateral
- B. isosceles
- C. right-angled isosceles
- D. right-angled

42. If  $(8, 1)$ ,  $(k, -4)$   $(2 - 5)$  are collinear, then  $k =$

- A. 1
- B. 2
- C. 3

D. 4

43. If the slope of the line through  $(2, -7)$  and  $(x, 5)$  is 3 then  $x =$

A. 4

B. 5

C. 6

D. 7

44. The distance between the points  $(\cos \theta, \sin \theta)$  and  $(-3\sin \theta, \cos \theta)$  is

A. 1

B.  $\sqrt{2}$

C. 2

D.  $\sqrt{3}$

45. The number of elements in a triangle is

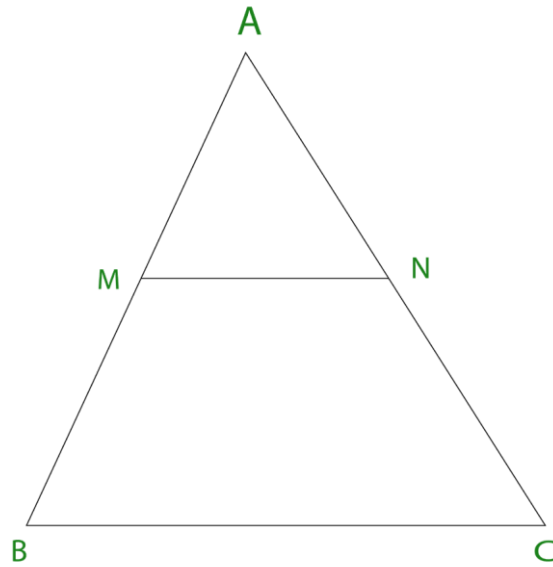
A. 3

B. 4

C. 6

D. 5

46. In the figure



If  $MN \parallel BC$ ,  $AN=3$ ,  $NC=18$ ,  $MB=24$ , then  $AM=$

- A. 2
- B. 4
- C. 6
- D. 8

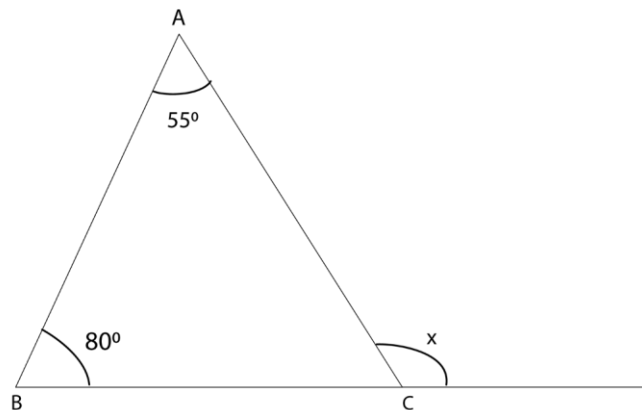
47. If two triangles have the same base and area then they lie between

- A. parallel lines
- B. two straight lines
- C. perpendicular lines
- D. intersecting lines

48. A 1.5 m tall boy casts 2 m shadow. At the same instance, a lamppost casts a shadow of 10 m. Then the height of the lamppost is

- A. 6.5 m
- B. 7.5 m
- C. 8.5 m
- D. None

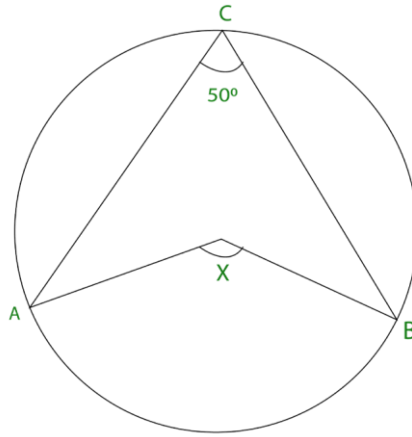
49. In the figure,  $x =$



- A.  $45^\circ$
- B.  $135^\circ$
- C.  $90^\circ$
- D.  $15^\circ$

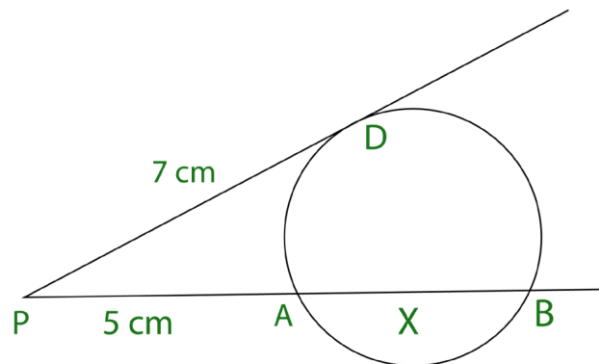
50. In the figure,  $x =$





- A.  $100^\circ$
- B.  $90^\circ$
- C.  $110^\circ$
- D.  $80^\circ$

51. In the adjacent figure,  $x =$



- A.  $5.8\text{ cm}$
- B.  $6.8\text{ cm}$
- C.  $4.8\text{ cm}$
- D.  $3.8\text{ cm}$

52. The length of the minute hand of a clock is 21 cm. The area swept by the minute hand in 20 minutes is

- A.  $462 \text{ cm}^2$
- B.  $362 \text{ cm}^2$
- C.  $562 \text{ cm}^2$
- D. None

53. A secant intersects the circle at point(s).

- A. single
- B. two
- C. three
- D. None

54. How many tangents can be drawn to a circle from a point outside the circle?

- A. 1
- B. 2
- C. 3
- D. None

55. If a sphere, a cylinder and a cone have the same radius and same height, then the ratio of their curved surface areas is

- A.  $2 : \sqrt{3} : 4$
- B.  $4 : 4 : \sqrt{5}$

C.  $3 : \sqrt{5} : 4$

D. None

56. The volume of the cone=

A.  $\frac{4}{3} \pi r^2$

B.  $\frac{1}{3} \pi r^2 h$

C.  $\pi r^2 h$

D.  $\frac{1}{2} \pi r^2 h$

57. If the diagonal of a cube is  $4\sqrt{3}$ , then the side of the cube is

A. 1

B. 2

C. 3

D. 4

58. If the volume of a hemisphere is  $19404 \text{ cm}^3$  then its radius is

A. 7

B. 14

C. 21

D. 28

59. If  $x = \cos \theta + \sin \theta$  and  $y = \cos \theta - \sin \theta$  then  $x^2 + y^2 =$

A. 0

B. 1

C. -1

D. 2

60.  $\sin(A+B) \cos(A-B) + \sin(A-B) \cos(A+B) =$

A.  $\sin 2A$

B.  $\sin 2B$

C.  $\cos 2A$

D.  $\cos 2B$

## Physics

61. The magnetic field is called uniform if

A. strength and direction of magnetic field are changing

B. strength and direction of magnetic field are constant

C. only magnetic field strength is constant

D. only direction of magnetic field is constant

62. Which of the following equations is correct in electromagnetism?

A.  $F = \frac{qv}{B \sin \theta}$

B.  $F = \frac{qB \sin \theta}{b}$

C.  $F=qvB\sin\theta$

D.  $F=qvB\cos\theta$

63. In which of the following electric energy is converted into mechanical energy?

A. Galvanometer

B. Ammeter

C. Generator

D. Electric motor

64. Whenever there is continuous change of magnetic flux linked with closed coil, a current is generated in coil. This is

A. Lenz's law

B. Ampere's law

C. Faraday's law

D. Ohm's law

65. A conductor of length 1 m moving with velocity  $V$  perpendicular to the magnetic field of strength 10 tesla induces an e.m.f. of 10 volt. Then  $V = \underline{\hspace{2cm}}$  m/s

A. 100

B. 10

C. 1

D. 0.1

66. The peak value of alternative current is 2 ampere. The r.m.s. value of current is

- A.  $\sqrt{2}$
- B.  $2\sqrt{2}$
- C.  $\frac{1}{\sqrt{2}}$
- D.  $\frac{1}{2\sqrt{2}}$

67. Magnetic flux density (B) =

- A.  $\frac{\text{Area}}{\text{Magnetic flux}}$
- B.  $\frac{\text{Length}}{\text{Magnetic flux}}$
- C.  $\frac{\text{Magnetic flux}}{\text{Length}}$
- D.  $\frac{\text{Magnetic flux}}{\text{Area}}$

68. A light ray incidents on a plane mirror at an angle  $33^\circ$ . Then what is the angle of reflection?

- A.  $66^\circ$
- B.  $33^\circ$
- C.  $22^\circ$

D.  $11^\circ$

69. Which of the following is used by the dentists?

- A. Convex lens
- B. Concave lens
- C. Convex mirror
- D. Concave mirror

70. Which of the following is true in case of virtual image?

- A. Always erect
- B. Always inverted
- C. Obtained on screen
- D. None of the above

71. An object placed at a distance of 30 cm in front of a concave mirror of focal length 20 cm. The image is formed at a distance of

- A. 60 cm
- B. -60 cm
- C. 30 cm
- D. -30 cm

72. Every lens has \_\_\_\_\_ focal points

- A. one
- B. two

- C. three
- D. infinite

73. The radii curvatures of a double convex lens are 10 cm and 10 cm. Its refractive index is 1.5. The focal length is

- A. 10 cm
- B. 0.1 cm
- C. 0.01 cm
- D. zero

74. An object is placed 10 cm from a converging lens of focal length 10 cm. The image is formed at a distance of

- A. 10 cm
- B. 20 cm
- C. 100 cm
- D.  $\infty$

75. A convex lens is placed in water. The focal length will

- A. remain same
- B. decrease
- C. increase
- D. None of the above

76. A light ray incident on curved surface travelling from rarer medium to denser medium bends \_\_\_\_\_ the normal.



- A. towards
- B. away from
- C. parallel to
- D. none

77. Which part of human eye is called 'variable aperture'?

- A. Retina
- B. Cornea
- C. Pupil
- D. Lens

78. In case of eye defect called 'myopia' image forms

- A. after retina
- B. before retina
- C. on retina
- D. None of the above

79. In prism experiment, the i-d curve looks like

- A. straight line
- B. circle
- C. parabola
- D. ellipse

80. The splitting of white light into different colours is called

- A. dispersion
- B. scattering
- C. refraction
- D. reflection

81. Which of the following molecules in atmosphere are responsible for blue colour of sky?

- A.  $H_2$ ,  $Cl_2$
- B. He,  $H_2$
- C. CO,  $SO_2$
- D.  $N_2$ ,  $O_2$

82. Light is a/an

- A. longitudinal wave
- B. stationary wave
- C. electromagnetic wave
- D. None of the above

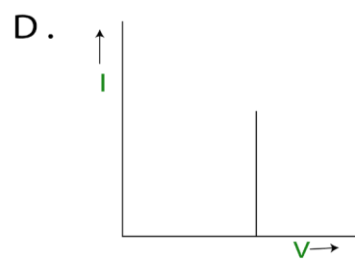
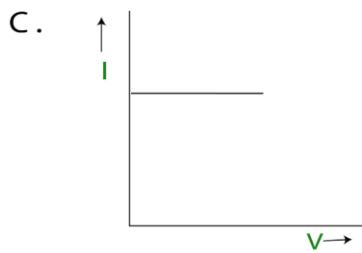
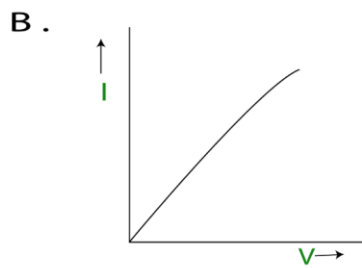
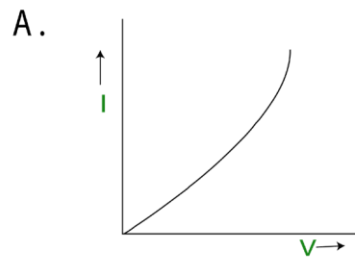
83. Which of the following is true for conductor-like metals according to Lorentz-Drude theory?

- A. Negative ions are fixed
- B. Positive ions move
- C. Positive ions are fixed
- D. None of the above

84. The SI unit of potential difference is

- A. coulomb
- B. volt
- C. ampere
- D. None of above

85. In case of non-ohmic materials, the V-I graph is



86. The resistance of conductor depends on

- A. length
- B. cross sectional area
- C. temperature
- D. All of the above

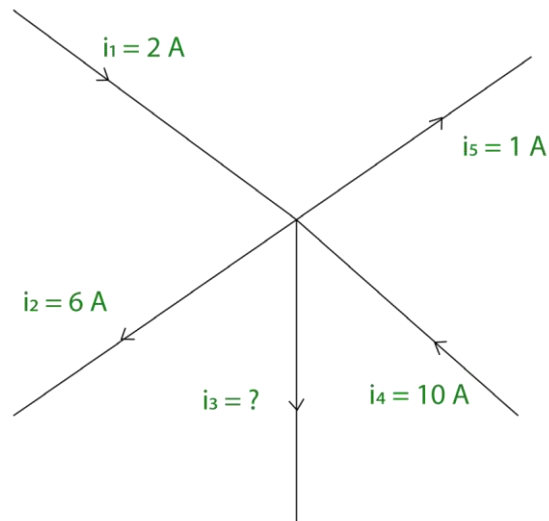
87. Two resistors are connected in \_\_\_\_\_, then same current flows through two resistors.

- A. series
- B. parallel
- C. series and parallel
- D. none of the above

88. Three resistors, 2 ohm, 3 ohm and R ohm are connected in series to a battery of voltage 20 V. If the current through the circuit is 1 ampere, then the value of R is ohm.

- A. 5
- B. 10
- C. 15
- D. 25

89. Apply Kirchhoff's junction law and find  $i$ , value of the following figure



- A. 19 A
- B. 5 A
- C. 2 A
- D. 1 A

90. Which of the following is correct regarding electricity?

- A.  $P = \frac{V^2}{R}$
- B.  $P = \frac{I^2}{R}$
- C.  $P = V^2R$
- D.  $P = VIR$

## Chemistry

91. The bond angle in  $C_2H_2$  molecule is

A.  $109^{\circ}28'$

B.  $120^{\circ}$

C.  $180^{\circ}$

D.  $107^{\circ}$

92. Esters are derivatives of

A. ketones

B. alcohols

C. ethers

D. carboxylic acids

93. The name of the structure  $\text{CH}_3 - \text{CH} = \text{CH} = \text{CH}_2$  is

A. butene

B. buta-1, 2-diene

C. butadiene

D. 1, 3-butadiene

94. Which of the following organic compounds undergoes substitution reaction?

A. Alkanes

B. Alkenes

C. Alkynes

D. All

95. When dilute hydrochloric acid is added to iron fillings
- A. hydrogen gas and iron chloride are formed
  - B. chlorine gas and iron chloride are formed
  - C. no reaction takes place
  - D. iron salt and water are produced
96. pH scale is introduced by
- A. Sorensen
  - B. Mosley
  - C. Schrodinger
  - D. C. V. Raman
97. Which principle states that “No two electrons of the same atom can have all the four quantum numbers the same”?
- A. Pauli’s
  - B. Aufbau
  - C. Hund’s
  - D. Bohr’s
98. The coordination number  $\text{Na}^+$  in  $\text{NaCl}$  is
- A. 3
  - B. 4
  - C. 5
  - D. 6

99. Who proved that 'vital force theory' is not correct?

- A. Berzelius
- B. Linus Pauling
- C. Wohler
- D. Dalton

100. Which of the following reactions is exothermic reaction?

- A.  $C + O_2 \rightarrow CO_2$
- B.  $N_2 + O_2 \rightarrow 2NO$
- C.  $2AgCl \rightarrow 2Ag + Cl_2$
- D.  $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

101. Gram-molar volume is equal to

- A. 20 litres
- B. 2.24 litres
- C. 22.4 litres
- D. 112 litres

102. In the reaction,  $Na + H_2O \rightarrow NaOH + H_2 \uparrow$ , how many moles of Na and  $H_2O$  react together to form NaOH and  $H_2$ ?

- A. 2, 2
- B. 2, 1
- C. 1, 1



D. 1, 2

103. Phenolphthalein indicator gets pink colour in

- A. HCl solution
- B. NaOH solution
- C. H<sub>2</sub>SO<sub>4</sub> solution
- D. CH<sub>3</sub>COOH solution

104. HCl solution with Na<sub>2</sub>CO<sub>3</sub> and NaHCO<sub>3</sub> produces

- A. H<sub>2</sub> gas
- B. NaH (Sodium hydride)
- C. H<sub>2</sub>CO<sub>3</sub>
- D. CO<sub>2</sub> gas

105. Milk of magnesia is

- A. MgO
- B. Mg(OH)<sub>2</sub>
- C. MgCl<sub>2</sub>
- D. Mg(HCO<sub>3</sub>)<sub>2</sub>

106. Which of the following quantum numbers describes the orientation of orbital in space around the nucleus of atom?

- A. Magnetic quantum number
- B. Spin quantum number

C. Azimuthal quantum number

D. Principal quantum number

107. The maximum number of electrons in  $n=3$  main energy level given as

A. 8

B. 16

C. 18

D. 32

108. Modern periodic law states that the properties of elements are functions of their

A. atomic weights

B. atomic number

C. electronic configurations

D. Both (2) and (3)

109. Which of the following is the p-block elements?

A. Ti

B. Ce

C. Ga

D. K

110. How many s-block elements and p-block elements are there in the third period of the periodic table?

- A. 2, 8
- B. 8, 2
- C. 4, 4
- D. 2, 6

111. Metalloids are

- A. s-block elements
- B. d-block elements
- C. f-block elements
- D. p-block elements

112. The ionization energy in the periodic table

- A. decreases go down the group
- B. increases go down the group
- C. decreases from left to right in a period
- D. remains same go down the group

113. Which of the following elements lose three valence electrons to get octet in its outer shell?

- A. Cs
- B. Mg
- C. O
- D. Al

114. The element with negative charge having the electronic configuration 2, 8, 8 is

- A.  $O^{2-}$
- B.  $Cl^-$
- C.  $S^{2-}$
- D.  $P^{3-}$

115. The condition for the formation of ionic bond is

- A. elements involved should be of equal size
- B. high electro positivity of atoms
- C. atoms should have low ionization potential
- D. elements with high electronegativity difference

116. The molecule involves  $sp^3$  hybridization is

- A.  $CH_4$
- B.  $NH_3$
- C.  $H_2O$
- D. All

117. Ionic compounds are soluble in

- A. Benzene
- B.  $CCl_4$
- C. Kerosene
- D. Water

118. Carnallite is the ore of

- A. Pb
- B. Mg
- C. Hg
- D. Zn

119. Thermite reaction involves reaction of metal oxide with

- A. Ag
- B. Fe
- C. Al
- D. Hg

120. How many unpaired electrons the carbon atom possess in the ground state?

- A. 2
- B. 3
- C. 4
- D. 1