

TS POLYCET - 2016

Time: 2 Hours

Total Marks: 120

Mathematics

1. The relation $a.(b.c)=(a.b).c$ is

- A. distributive law
- B. associative law
- C. commutative law
- D. closure law

2. The HCF of 1.2 and 0.12 is

- A. 1.2
- B. 12
- C. 0.12
- D. 120

3. The value of $\log_3 243 =$

- A. 5
- B. 6
- C. 4
- D. 8

4. $0.10110111011110\dots$ is

- A. an integer
- B. a rational number
- C. an irrational number
- D. a natural number

5. If $x = \log_2 3$ and $y = \log_2 5$, then $\log_2 15$ in terms of x and y is

- A. $x-y$
- B. $x+y$
- C. xy
- D. $x+y-1$

6. If $A \subseteq B$ and $B \subseteq C$, then $(A \subseteq B) \subseteq C =$

- A. \emptyset
- B. A
- C. B
- D. C

7. If $A = \{x \mid x \in \mathbb{N}, 3 \leq x \leq 6\}$, then $A =$

- A. $\{3, 4, 5\}$
- B. $\{3, 4, 5, 6\}$
- C. $\{4, 5\}$
- D. $\{4, 5, 6\}$

8. If $A = \{x|x \text{ is an even natural number less than } 12\}$ and $B = \{x|x \text{ is a prime number less than } 12\}$, then $A \cap B =$

A. $\{2, 4, 6, 8, 10\}$

B. $\{2, 3, 5, 7\}$

C. \emptyset

D. $\{2\}$

9. If two zeros of the polynomial $x^3 - 5x^2 + 6x$ are 2 and 3, then the third is

A. 0

B. 5

C. 6

D. 1

10. The value of $\sqrt{\frac{x}{y} + 2 + \frac{y}{x}}$ =

A. $\frac{x}{\sqrt{y}} + \frac{\sqrt{y}}{x}$

B. $\frac{x}{y} + \frac{y}{x}$

C. $\sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}}$

D. $\frac{\sqrt{x}}{y} + \frac{y}{\sqrt{x}}$

11. Which of the following is a solution for the equation $2(x+3)=18$?

- A. 6
- B. 8
- C. 21
- D. 13

12. If $3x+4y-k=0$ and $6x+8y-4=0$ are coincident lines, then the value of k is

- A. 3
- B. 4
- C. 6
- D. 2

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

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

14. If one root of $3x^2+2x+k=0$ is the reciprocal of the other, then the value of k is

- A. 3
- B. -3

C. 2

D. 6

15. If the roots of $2x^2+kx+3=0$ are real and equal, then the value of k is

A. $\pm 2\sqrt{6}$

B. $\pm 6\sqrt{2}$

C. ± 4

D. ± 5

16. A ball is thrown vertically upward from the ground. The distance s in t seconds is given by $s=4t^2+t-3$. After how many seconds does the ball come to rest?

A. 2 s

B. 1 s

C. $3/4$ s

D. $4/3$ s

17. The product of the roots of $\sqrt{2}x^2 - 10x + 5\sqrt{2} = 0$ is

A. $5\sqrt{2}$

B. 5

C. $2\sqrt{5}$

D. 2

18. The discriminant of $\sqrt{x^2 - 5x - 1} = 2$ is

- A. 21
- B. 23
- C. 27
- D. 45

19. If twice the age of A is added to B's age, the sum is 45 and if twice the age of B is added to A's age, the sum is 30. Then the age of 8 is

- A. 20
- B. 5
- C. 10
- D. 30

20. 3 pens and 5 pencils together cost Rs. 35, whereas 5 pens and 3 pencils together cost Rs. 37. The cost of a pencil is

- A. Rs. 5
- B. Rs. 3
- C. Rs. 4
- D. Rs. 6

21. How many two-digit numbers are divisible by 6?

- A. 12
- B. 15

C. 10

D. 17

22. If the 2nd term of an AP is 4 and the 6th term is 16, then its 11th term is

A. 29

B. 33

C. 34

D. 31

23. Which term of the AP 24, 21, 18, ... is the first negative?

A. 10th

B. 8th

C. 7th

D. 6th

24. If $a=2$ and $d=2$, then $S_{15} =$

A. 220

B. 230

C. 240

D. 245

25. The points A(1, 7), B(4, 2), C(-1, -1) and D(-4, 4) are

A. collinear

- B. vertices of a square
- C. vertices of a rectangle
- D. None of these

26. If P divides the line joining A(x₁, y₁) and B(x₂, y₂) internally in the ratio m₁:m₂, then P is

- A. $\left(\frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}, \frac{m_1 y_1 + m_2 y_2}{m_1 + m_2} \right)$
- B. $\left(\frac{m_1 x_1 + m_2 x_2}{m_1 - m_2}, \frac{m_1 y_1 + m_2 y_2}{m_1 - m_2} \right)$
- C. $\left(\frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}, \frac{m_1 y_1 + m_2 y_2}{m_1 + m_2} \right)$
- D. $\left(\frac{m_1 x_1 - m_2 x_2}{m_1 + m_2}, \frac{m_1 y_1 - m_2 y_2}{m_1 + m_2} \right)$

27. The distance between the points A(4, 3) and B(8, 6) is

- A. 5
- B. 6
- C. 4
- D. 7

28. The points A(1, 5), B(2, 3) and C(-2, -1) are

- A. vertices of a right-angled triangle

B. vertices of an isosceles triangle

C. collinear

D. non-collinear

29. If the diagonals of a rhombus are 10 cm and 24 cm,

then the

area is

A. $2\sqrt{2}$

B. $2\sqrt{1}$

C. $2\sqrt{1}$

D. $2\sqrt{2}$

D. $2\sqrt{1}$

D. $2\sqrt{2}$

30. If a line makes an angle 45° with positive x-axis, then its slope is

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

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

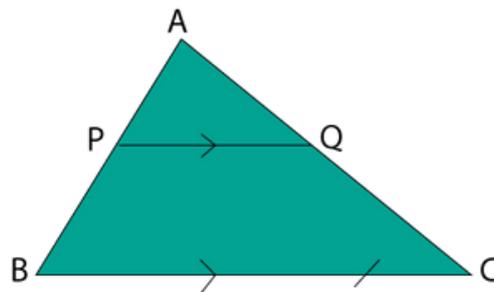
C. $\frac{\sqrt{3}}{2}$

D. 1

31. A flagpole 4 m tall casts a 6 m shadow. At the same time, a nearby building casts a shadow of 24 m. Then the height of the building is

- A. 16 m
- B. 20 m
- C. 24 m
- D. 18 m

32. In the figure below, $PO \parallel BC$. If $AP=3$, $PB=4$ and $AQ=4$, then $QC=$

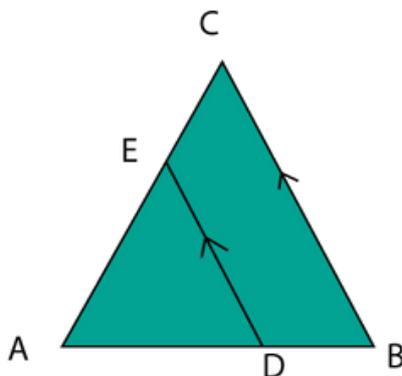


- A. $\frac{7}{3}$
- B. $\frac{4}{3}$
- C. $\frac{16}{3}$
- D. $\frac{3}{4}$

33. $\triangle ABC \sim \triangle DEF$ and their areas are 16 cm^2 and 81 cm^2 respectively. If $BC=4 \text{ cm}$, then $EF=$

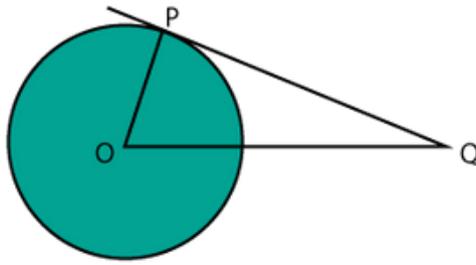
- A. 5 cm
- B. 4 cm
- C. 11 cm
- D. 9 cm

34. In the figure below, $DE \parallel BC$. If $AD=x$, $AE=x+2$, $DB=x-2$ and $CE=x-1$, then $x=$



- A. 4
- B. 5
- C. 6
- D. 7

35. The tangent PQ at a point P of a circle of radius 5 cm meet a line through the centre O at a point Q so that $OQ=12 \text{ cm}$. Then the length of the tangent is



- A. 13 cm
- B. $\sqrt{19}$ cm
- C. 14 cm
- D. 11 cm

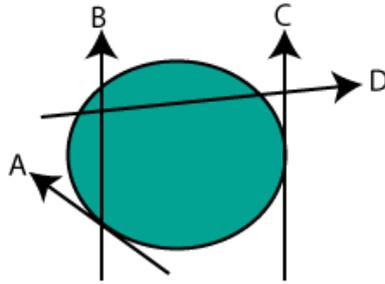
36. A parallelogram circumscribing a circle is a

- A. trapezium
- B. rhombus
- C. square
- D. rectangle

37. If the radius of a circle is 4 cm and the sector angle is 30° , then the area of the sector is

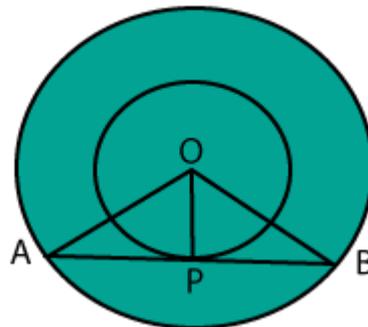
- A. $\frac{3\pi}{4}$ sq. cm
- B. 3π sq. cm
- C. 4π sq. cm
- D. $\frac{4\pi}{3}$ sq. cm

38. In the figure below, which of the following are tangents to the circle?



- A. A, B, C
- B. A, D C.
- A, C D. A,
- B, D

39. In the figure below, $OP=3$ cm and $OB=5$ cm. Then $AB=$



- A. 8 cm
- B. 9 cm
- C. 4 cm
- D. 10 cm

40. The radius and height of a right circular cone are 6 cm and 7 cm respectively. Then the volume of the cone is

- A. 264 cc
- B. 300 cc
- C. 246 cc
- D. 256 cc

41. A metallic sphere of radius 2 cm is melted to recast into the shape of a cylinder of radius 4 cm. Then the height of the cylinder is

- A. $\frac{1}{3}$ cm
- B. $\frac{4}{3}$ cm
- C. $\frac{2}{3}$ cm
- D. 1 cm

42. Three spheres of radii 6 cm, 1 cm and 8 cm are melted so as to form a single sphere. Then the radius of the new sphere is

- A. 11 cm
- B. 9 cm
- C. 8 cm
- D. 10 cm

43. If $\sin A = \cos B$, then $A + B =$

- A. 45°
- B. 60°
- C. 90°
- D. 75°

44. The value of $\cos 36^\circ \cos 54^\circ - \sin 36^\circ \sin 54^\circ =$

- A. 1
- B. 0
- C. 2
- D. -1

45. The value of $\frac{1}{1 + \cos \theta} + \frac{1}{1 - \cos \theta} =$

- A. $2\sec^2 \theta$
- B. $2\sec \theta$
- C. $2\operatorname{cosec}^2 \theta$
- D. $2\operatorname{cosec} \theta$

46. The value of $\tan^2 \theta + \tan^4 \theta =$

- A. $\sec^4 \theta - \sec^2 \theta$
- B. $\sec^2 \theta - \sec^4 \theta$
- C. $\sin^2 \theta - \cos^2 \theta$

D. $\sec^2 \theta - \tan^2 \theta$

47. The value of $\cos 45^\circ \cdot \cos 30^\circ \cdot \cos 90^\circ \cdot \cos 60^\circ =$

A. $\frac{\sqrt{3}}{4\sqrt{2}}$

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

C. 0

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

48. If $x = a \operatorname{cosec} \theta$ and $y = a \cot \theta$, then which of the following is true?

A. $x^2 + y^2 = a^2$

B. $x^2 - y^2 = a^2$

C. $x + y = a$

D. $xy = a$

49. If $\frac{1}{n}$ then $\cot A =$

A. $\frac{25}{7}$

B. 1

C. $\frac{24}{25}$

D. $\frac{24}{7}$

50. An observer of height 1.8 m is 13.2 m away from a palm tree. The angle of elevation of the top of the tree from his eyes is 45° . Then the height of the palm tree is

A. 13.2 m

B. 15 m

C. 14 m

D. 11.4 m

51. A boy goes 5 m due west and then 5 m due north. How far is he from the starting point?

A. 10 m

B. $10\sqrt{2}$ m

C. 5 m

D. $5\sqrt{2}$ m

52. Rama and Reshma are playing a chess game. If the probability of Rama winning is 0.52, then the probability of winning chess game by Reshma is

A. 1.38

B. 0.62

C. 0.48

D. 1.62

53. A number x is chosen at random from the numbers $-4, -3, -2, -1, 0, 1, 2, 3, 4$. The probability that $x < 1$ is

A. $\frac{1}{9}$

B. $\frac{5}{9}$

C. $\frac{4}{9}$

D. $\frac{7}{9}$

54. From the letters of the word 'MOTHER', a letter is selected. The probability that the letter is a vowel is

A. $\frac{1}{3}$

B. $\frac{2}{3}$

C. $\frac{3}{6}$

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

55. The probability of getting a total of 13 when two dice are thrown at the same time is

A. $\frac{1}{36}$

B. 0

C. $\frac{5}{36}$

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

56. The median of 5, 6, 9, 10, 8, 4, 3, 7, 11 is

A. 8

B. 7

C. 9

D. 6

57. The mode of $5, \frac{x}{2}, 6, 7, \frac{x}{2}, 3, \frac{x}{2}$ is 9. Then the value of x is

A. 3

B. 4.5

C. 2

D. 18

58. Find the mean of the marks of the students from the given table:

Marks obtained (x1)	10	20	25	30
No. of students (fi)	2	3	2	1

- A. 20
- B. 25
- C. 15
- D. 10

59. The median of the grouped data can be calculated using the formula

A. $L + \frac{N}{2} \frac{cf}{f}$

B. $L + \frac{N - cf}{f} h$

C. $L + \frac{N + cf}{f} h$

D. $L + \frac{N - f}{cf} h$

60. The median of 5, 3, 10, 7, 2, 9, 11, 2 is

- A. 6
- B. 5
- C. 7
- D. 2

Physics

61. A person is not feeling hot or cold with surroundings. Then he is in the state of

- A. thermal equilibrium
- B. high temperature
- C. low temperature
- D. both high and low temperatures

62. x g of water is heated from $y^\circ\text{C}$ to $z^\circ\text{C}$. The quantity of heat required in calories is

- A. $x \frac{z - y}{100}$
- B. $x \frac{z}{100} - \frac{y}{100}$
- C. $x(z - y)$
- D. $x(z + y)$

63. During phase change of a substance

- A. temperature remains constant
- B. temperature increases
- C. temperature decreases
- D. temperature may increase or decrease

64. When parallel rays are incident on a concave mirror, at what point do they meet after reflection?

- A. Centre of curvature
- B. Focus
- C. Pole
- D. Infinity

65. Which of the following relations is correct in general for spherical mirrors with object distance u , image distance v and focal length f ?

A. $-\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

B. $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

C. $\frac{1}{f} = \frac{1}{u} - \frac{1}{v}$

D. $\frac{1}{f} - \frac{1}{u} = \frac{1}{v}$

66. An object is placed between pole and focus of a concave mirror. The nature of the image is

- A. real, inverted and diminished
- B. real, inverted and same size
- C. virtual, erect and enlarged
- D. virtual, erect and diminished

67. If speed of light in medium 1 is v_1 and in medium 2 is v_2 , then the refractive index of second medium with respect to first medium is

A. $n_{12} = \frac{v_1}{v_2}$

B. $n_{21} = \frac{v_2}{v_1}$

C. $n_{21} = \frac{v_1}{v_2}$

D. $n_{12} = \frac{v_2}{v_1}$

68. The main principle behind working of optical fibres is

- A. total internal reflection
- B. dispersion
- C. refraction
- D. reflection

69. The formula for refractive index (n) of a prism having angle of prism A and angle of minimum deviation D is

$$A. n = \frac{\sin\left(\frac{A - D}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

$$B. n = \frac{\sin\left(\frac{A}{2}\right)}{\sin\left(\frac{A - D}{2}\right)}$$

$$C. n = \frac{\sin(A)}{\sin\left(\frac{A + D}{2}\right)}$$

$$D. n = \frac{\sin\left(\frac{A + D}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

70. What happens to refractive index of a medium when wavelength of incident light ray increases?

- A. Decreases
- B. Increases
- C. Becomes zero
- D. Becomes infinity

71. The midpoint of a thin lens is called

- A. focus

- B. optic centre
- C. centre of curvature
- D. principal centre

72. The distance between two focal points of a thin lens having focal length f is

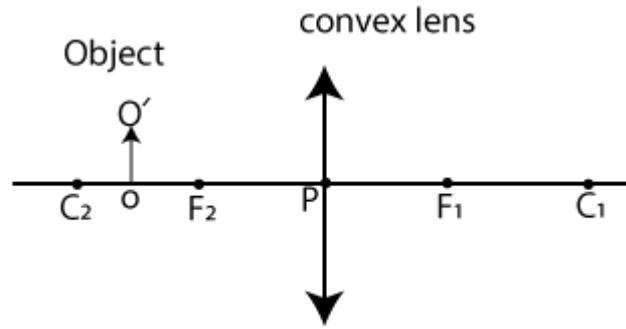
- A. f
- B. $\frac{f}{2}$
- C. $2f$
- D. infinity

73. Read the following two statements related to a lens and pick the correct answer:

- (a) Any ray passing along the principal axis is undeviated.
- (b) A ray passing parallel to the principal axis converges at the focus or appears to diverge from the focus.

- A. Only (a) is true
- B. Only (b) is true
- C. Both (a) and (b) are false
- D. Both (a) and (b) are true

74. An object is placed between the centre of curvature and focus on the principal axis of a convex lens as shown in the figure below. The image is formed



- A. Only (a) is true
- B. Only (b) is true
- C. Both (a) and (b) are true
- D. Both (a) and (b) are false

75. The least distance of distinct vision of normal human eye is about

- A. 25 cm
- B. 50 cm
- C. 5 cm
- D. infinity

76. The innermost colour in the rainbow is

- A. red
- B. green
- C. violet
- D. yellow

77. Which of the following statements is correct?

- A. A person with hypermetropia can see nearby objects clearly.
- B. A person with myopia can see nearby objects clearly.
- C. A person with hypermetropia cannot see distant objects clearly.
- D. A person with myopia can see distant objects clearly.

78. Which of the following changes takes place when you walk out of bright sunshine into a poorly lit room?

- A. The pupil becomes larger
- B. The lens becomes thicker
- C. The ciliary muscle relaxes
- D. The pupil becomes smaller

79. The phenomenon due to which white light splits into component colours is called

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

80. If the potential difference in a circuit is 240 V and the resistance is 60 Ω , then the current flowing through the circuit is

- A. 300 A
- B. 180 A
- C. 0.25 A

D. 4 A

81. If 5Ω , 10Ω and 15Ω are connected in series, then the resultant resistance $R =$

A. 30Ω

B. 25Ω

C. 5Ω

D. 15Ω

82. The graph between potential difference (V) and electric current (I) in a circuit for ohmic conductor is

A. parabola

B. circle

C. straight line

D. curved line

83. Which of the following is used to prevent damages due to overloading to the household circuit?

A. Switch

B. Fuse

C. Resistance

D. All of these

84. Three resistors of resistances $3\ \Omega$, $4\ \Omega$ and $6\ \Omega$ are connected in parallel. The combination is connected to a battery of 8 V. The current in the circuit is

- A. 4A
- B. 3A
- C. 6A
- D. 8A

85. Read the following statement and indicate which law states that:

- A. Kirchhoff's junction law
- B. Kirchhoff's loop law
- C. Ohm's law
- D. Coulomb's law

86. The magnetic force experienced by a charge q moving with a velocity v perpendicular to the magnetic field B is

- A. $F = \frac{qv}{B}$
- B. $F = qvB$
- C. $F = \frac{B}{qv}$
- D. $F = \frac{Bv}{q}$

87. In electric motors

- A. electrical energy is converted into mechanical energy
- B. mechanical energy is converted into electrical energy
- C. electrical energy is converted into light energy
- D. mechanical energy is converted into light energy

88. A current-carrying circular coil has n turns. The magnetic field produced in the entire coil is

- A. $\frac{1}{n}$ times as large as that produced by a single turn
- B. same as that produced by a single turn
- C. n times as large as that produced by a single turn
- D. zero

89. The SI unit of resistivity is

- A. ohm
- B. ohm-m
- C. volt
- D. ampere

90. A conductor of 1 m length is moving with a speed of 10 m/s in the direction of magnetic field of induction 0.8 T. The induced e.m.f. between the ends of the conductor is:

- A. 10 V
- B. 1 V

C. 2 V

D. 8 V

Chemistry

91. The chemical formula of limestone is

A. Ca(OH)_2

B. CaCO_3

C. CaO

D. $\text{Ca(NO}_3)_2$

92. What is the colour of the gas evolved by heating lead nitrate?

A. Brown

B. Pink

C. White

D. Black

93. The weight of one mole of table salt is

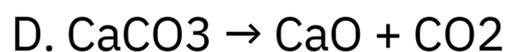
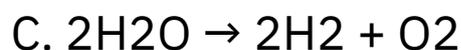
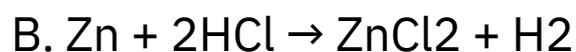
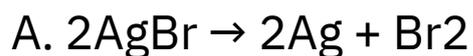
A. 35.5 g

B. 58.5 g

C. 23 g

D. 40 g

94. Which of the following is an example of photochemical reaction?



95. Which of the following solutions gives yellow colour with methyl orange indicator?



96. Which of the following compounds is used in glass, paper and soap industry?

A. Washing soda

B. Baking soda

C. Calcium hydroxide

D. Plaster of Paris

97. The formula of sodium zincate is



C. NaZnO_2

D. NaZnO

98. Which of the following bases is used in antacids?

A. Ca(OH)_2

B. NaOH

C. Mg(OH)_2

D. NH_4OH

99. Which of the following elements belongs to d-block?

A. Cl

B. Cr

C. Sr

D. Ar

100. No two electrons in an atom have the same set of four quantum numbers." This rule was stated by

A. Pauli

B. Aufbau

C. Hund

D. Bohr

101. Quantum theory was proposed by

A. Sommerfeld

B. Niels Bohr

C. Max Planck

D. Lande

102. Which of the following groups of elements has ns^2 electronic configuration?

A. Alkali metals

B. Alkali earth metals

C. Halogens

D. Chalcogens

103. The general electronic configuration of noble gases is

A. ns^1

B. ns^2

C. ns^2np^6

D. ns^2np^3

104. The longest period in the modern periodic table is

A. 7th

B. 6th

C. 5th

D. 4th

105. Which among the following elements has the highest electronegativity?

- A. Cl
- B. F
- C. Br
- D. I

106. Law of octaves was proposed by

- A. Dobereiner
- B. Newlands
- C. Neils Bohr
- D. Mendeleeff

107. Ionic compounds are soluble in

- A. kerosene
- B. benzene
- C. water
- D. ether

108. The number of covalent bonds in methane is

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

109. Which of the following elements forms a unipositive ion?

- A. Mg
- B. Al
- C. Ca
- D. Na

110. Which of the following anions has Ne electronic configuration?

- A. Cl⁻
- B. O²⁻
- C. P³⁻
- D. Br⁻

111. The bond angle in BeCl₂ molecule is

- A. 109°28'
- B. 120°
- C. 180°
- D. 104°31'

112. The chemical formula of rust is

- A. Fe₂O₃ · nH₂O
- B. FeO
- C. FeS
- D. Fe₂O₅

113. The reducing agent in thermite process is

- A. Cu
- B. Mg
- C. Al
- D. Hg

114. The metal extracted from galena is

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

115. Which of the following molecules undergoes sp hybridization?

- A. CH_4
- B. C_2H_4
- C. C_2H_6
- D. C_2H_2

116. Which of the following is not an electrical conductor?

- A. Nanotube
- B. Graphene
- C. Diamond
- D. Graphite

117. Who among the following disproved Vitalism theory?

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

118. The sweet odour substance formed by the reaction of an alcohol and a carboxylic acid is

- A. ester
- B. amine
- C. ether
- D. aldehyde

119. The general formula of alkynes is

- A. C_nH_{2n+2}
- B. C_nH_{2n-2}
- C. C_nH_{2n}
- D. C_nH_{2n-1}

120. The functional group in ketone is

A.



B. -COOH

C. -OH

D. -COOR