AP – POLYCET

2015

Time : 2 Hours **Total Marks : 120**

Note : Before answering the questions, read carefully the instructions given on the OMR sheet.

Mathematics

1. The HCF of a^2b^3c and ab^2c where a, b and c are number is
   A. $a^2b^3c^2$
   B. $a^2b^2c^2$
   C. ab^2c
   D. a^2b^3c
2. If $x^2 + y^2 = 6xy$, *then* $2\log(x+y)$
   A. $\log x + \log y + 3\log 2$
   B. $\log x + \log y + 2\log 3$
   C. $\log x + \log y + \log 2$
   D. $\log x + \log y + 6\log 2$
3. The relation of $a + (b + c) = (a + b) + c$ is
   A. Commutative law
   B. Associative law
   C. Distributive law

D. None

4. $0.1010010001\ldots\overline{000}\ldots\ldots1$ is
   A. A retinal
   B. An irrational
   C. An integer
   D. None
5. In n is a natural number, then $9^{2n}-4^{2n}$ **is always divisible by**
   A. 5
   B. 15
   C. 25
   D. none
6. If $A \subset B$ and $B \subset C$, then $A \cap (B \cup C) =$
   A. A
   B. B
   C. C
   D. $\Diamond$
7. If $A = \{x / x \in N, 2 \le x \le 7\}$ then A =
   A. {1, 3, 4}
   B. {2, 3, 4, 5, 6}
   C. {2, 3, 4, 5, 6, 7}
   D. {3, 4, 5}
8. If A {Prime numbers less than 20} B = {whole number less than 10}, then $(A-B) \cap (B-A) =$

A. ϕ

B. μ

C. A

D. B

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

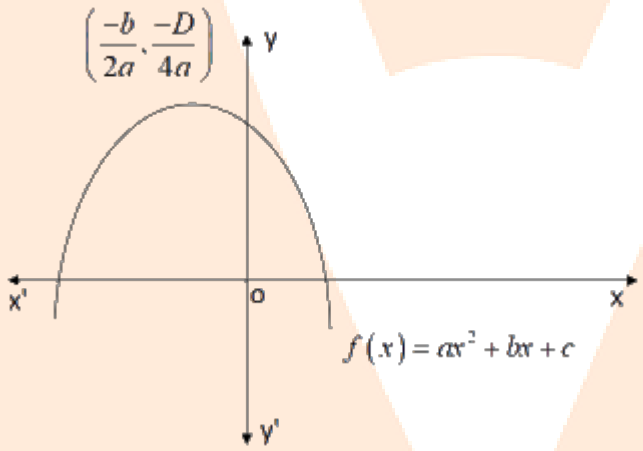
A. -1

B. 1

C. -9

D. 9

10.



The above figure shows the graph of $f(x) = ax^2 + bx + c$. Which of the following a correct?

A. $a < 0$. $b > 0$ and $c > 0$

B. $a < 0$, $b < 0$ and $c > 0$

C. $a < 0$, $b < 0$ and $c > 0$

D. $a > 0$. $b > 0$ and $c < 0$

11. If one root of the polynomial $f(x) = 5x^2 + 13x + k$ is reciprocal of the other, then the value of k is
    A. 0
    B. 5
    C. 1/6
    D. 6
12. The value of x which satisfies the equation
    A. 4.5
    B. 3
    C. 2.25
    D. 0.5
13. The value of k for which the system of equations $3x + y = 1$ and $(2k-1)x + (k-1)y = 2k+1$ inconsistent is
    A. 1
    B. 0
    C. -1
    D. 2
14. If a pair of linear equations in two variables a consistent, then the lines represented by the two equations are
    A. intersecting
    B. parallel
    C. intersecting or coincident

D. always coincident

15. If twice the son's age in sears is added hi the father's age, the sum is 70. But if twice the father's age is added to the son's age, the sum is 95. Then the age of the son is

A. 13
B. 20
C. 15
D. 41

16. Solve : $99x+101y=499,101x+99y=501$

A. (-3, -2)
B. (8, 9)
C. (1, 4)
D. (3, 2)

17. $\sqrt{\frac{a}{b}+2+\frac{b}{a}}=$

A. $\sqrt{\frac{a}{b}}+\sqrt{\frac{b}{a}}$
B. $\frac{a}{\sqrt{b}}+\frac{\sqrt{b}}{a}$
C. $\frac{a}{b}+\frac{b}{a}$
D. None

18. The product of the roots of $\sqrt{3}x^2 - 6x + 9\sqrt{3} = 0$ is

A. $\sqrt{3}$

B. 9

C. -3

D. None

19. If the roots of a quadratic equation are p/q and q/p, then the equation is

A. $qx^2 - \left(q^2 + p^2\right)x - pq = 0$

B. $pqx^2 - \left(p^2 + q^2\right)x + pq = 0$

C. $px^2 - \left(p^2 + 1\right)x + p = 0$

D. $p^2x^2 - \left(p^2 + q^2\right)x - pq = 0$

20. The discriminant of $\sqrt{x^2 + x + 1} = 2$ is

A. 13

B. -3

C. 11

D. None

21. If p, q, r, s, t, u and v are in AP, then q + r s + t + u =

A. $\frac{5}{2}(p + v)$

B. $\frac{2}{5}(v - p)$

C. $\frac{5}{2}p$

D. None

22. The sum of all natural numbers between 100 and 1000 which are multiples of 5
    A. 98450
    B. 99450
    C. 16450
    D. 94450
23. If a, b, C are in AP and GP both, then which or the following is correct?
    A. $a = b \neq c$
    B. $a \neq b = c$
    C. $a \neq b = c$
    D. $a \neq b \neq c$
24. The sum of all odd integers between 2 and 100 those are divisible by 3 is
    A. 767
    B. 467
    C. 567
    D. 867
25. The distance between the points ($a\cos\theta + b\sin\theta. 0$) and ($0, a\text{Sin}\theta - b\cos\theta$) is
    A. $a^2 + b^2$
    B. $a + b$
    C. $\sqrt{a^2 - b^2}$
    D. $\sqrt{a^2 + b^2}$

26. A triangle formed by the points $A(a,0), B(-a,0)$ and $c\left(0, a\sqrt{3}\right)$

A. a right-angled triangle
B. n isosceles triangle
C. an equilateral triangle
D. a scalene triangle

27. The area of the quadrilateral whose vertices taken in order are (-4. -2). (-3, -5), (-3, -2)

A. 56
B. 28
C. 84
D. None

28. If the points A(x, -1), B(2, 1) and C(4, 5) are collinear , then x =

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

29. The perimeter of the triangle formed by the points (-a, 0), (a, 0) and (0, a) is

A. $2a\left(1+\sqrt{2}\right)$
B. $a\left(2+\sqrt{2}\right)$
C. $2a\left(a+\sqrt{2}\right)$

D. None

30. If a line makes 60° with positive x – axis then its slope is

A. $1/\sqrt{3}$

B. 1

C. $\sqrt{3}$

D. $-\sqrt{3}$

31. In an isosceles triangle ABC with $AC = BC$ if $AB^2 = 2AC^2$, then $\angle C =$

A. 30°

B. 90°

C. 45°

D. 60°

32. In a right-angle triangle ABC right-angled at B, if P Q are points on the sides AB and BC respectively, then

A. $AQ^2 + CP^2 - 2\left(AC^2 + PQ^2\right)$

B. $2\left(AQ^2 + CP^2\right) = AC^2 + PQ^2$

C. $AQ^2 + CP^2 - AC^2 + PQ^2$

D. None

33. A man goes 24 m due west and then 7 m due north. Now far is he from the starting point?

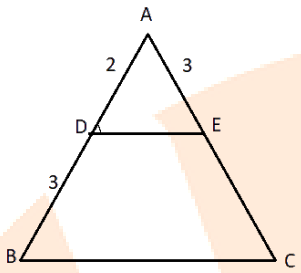
A. 31 m

B. 25 m

C. 26 m

D. 17 m

34.



In the above figure, if $\angle ADE = \angle ABC$, then CE =

A. 9/2

B. 5/2

C. 2/9

D. 4/9

35. If Δ ABC - Δ DEF such that AB = 9.1 cm and DE = 6.5 cm, and if the perimeter of ΔDEF is 25 cm, then the perimeter of ΔABC is

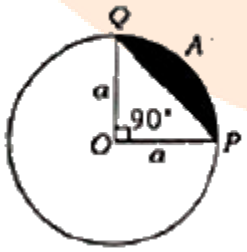
A. 37 cm

B. 36 cm

C. 35 cm

D. 34 cm

36.



In the above figure, area of the segment PAQ is _____ sq. units

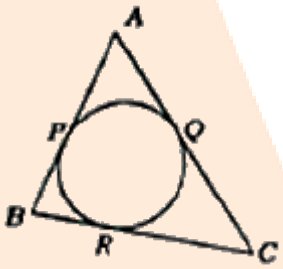
A. $\frac{a^2}{4}(\pi+2)$

B. $\frac{a^2}{4}(\pi-2)$

C. $\frac{a^2}{4}(\pi-1)$

D. $\frac{a^2}{4}(\pi+1)$

37.



In the above figure, if AP = PB, then which of the following is correct ?

A. AQ = CQ

B. AC = AB

C. AC = BC

D. AB = BC

38. The length of the tangent drawn from a point 8 cm away from the centre of a circle of radius 6 cm is

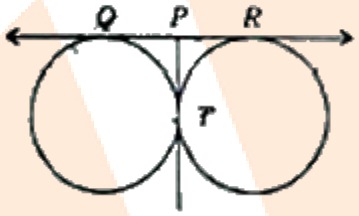
A. $2\sqrt{7}$ cm

B. $\sqrt{7}$ cm

C. 10 cm

D. 5 cm

39.



In the above figure, two equal circle touch each other at T. if QP = 4.5 cm, then QR =

A. 9 cm

B. 18 cm

C. 15 cm

D. 13.5 cm

40. The parallelogram circumscribing a circle is a

A. trapezium radar

B. square

C. rhombus

D. rectangle

41. The curved surface area of a right circular cone of radius 11.3 cm is 355 cm^2. What is its slant height?

$\left(Take\ \pi = \frac{355}{113} \right)$

A. 8 cm

B. 9 cm
C. 10 cm
D. 11 cm

42. Three solid spheres of gold whose radii are 1 cm, 6 cm and 8 cm respectively arc melted into a single sphere. Then the radius of the sphere is
A. 7 cm
B. 8 cm
C. 9 cm
D. 10 cm

43. A hemisphere of outer and inner radii 10 cm and 6 cm respectively is moulded as a cylinder of diameter 14 cm. Then the height of the cylinder = _____ cm.
A. 1.4
B. 1.33
C. 2.3
D. None

44. If $x = a\sin\theta$ and $y = b\cos\theta$ then $b^2x^2 + a^2y^2$
A. 1
B. $a^2 + b^2$
C. $a^2 - b^2$
D. a^2b^2

45. $\frac{1}{1-\sin\theta} + \frac{1}{a+\sin\theta} =$
A. $2\tan^2\theta$

B. $\sec^2\theta$

C. $2\cos ec\theta$

D. $2\cot^2\theta$

46. $\cot\theta+\tan\theta=$

A. $\sec\theta\cos ec\theta.$

B. $\sec^2\theta$

C. $\cos\theta\sin\theta$

D. None

47. The value of $\cos 1^o\cos 2^o\cos 3^o\cos 4^o.....\cos 180^o$ is

A. 1

B. 0

C. -1

D. 1/2

48. $\sec^4 A-\sec^2 A=$

A. $\tan^2 A-\tan^4 A$

B. $\tan^4 A-\tan^2 A$

C. $\tan^4 A+\tan^2 A$

D. None

49. $\tan 48^o\tan 16^o\tan 42^o\tan 74^o=$

A. $1/\sqrt{3}$

B. $\sqrt{3}$

C. 0

D. 1

50. In a $\Delta ABC, \sin\left(\frac{B+C}{2}\right)=$

A. $\cos\left(\frac{A}{2}\right)$

B. $\sin\left(\frac{A}{2}\right)$

C. $\cos\left(\frac{B+c}{2}\right)$

D. None

51. If a 1.5 m tall girl stands of a distance of 3 m from a lamp post and cast shadow of length 4.5 m on the ground then the height of the lamp post is

A. 1.5 cm

B. 2.5 m

C. 2 m

D. 2.8 m

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

A. 1/3

B. 3/7

C. 1/6

D. 1/2

53. Which of the following cannot be the probability of an event?

A. 2/3

B. 15%

C. -1.5
D. 0.7

54. A month is selected at random in a year. The probability that it is March or October is
A. 1/6
B. 1/6
C. 3/4
D. None

55. A number r is chosen at random from the numbers -3, -2, -1, 0, 1, 2, 3. The probability that II< 2 is
A. 5/7
B. 2/7
C. 3/7
D. 1/7

56. The media of the marks scored by 50 students in a 50 marks test is

Marks	1-10	11-20	21-30	31-40	41-50
No. of students	3	12	16	14	5

A. 25.75
B. 26.75
C. 27.75
D. None

57. The mean of n observations in $\overline{X}$. If the first term is increased by 1, second by 2, third by 1 and so on, then the new mean is

A. $\overline{X}+n$

B. $\overline{X}+\frac{n}{2}$

C. $\overline{X}+\frac{n+1}{2}$

D. $\overline{X}+\frac{n-1}{2}$

58. The median of the scores 6, 49, 14, 16, 42, 26, 32, 28, is

A. 30

B. 32

C. 31

D. None

59. The observations of some data are $\frac{x}{5}, x, \frac{x}{4}, \frac{x}{2} and \frac{x}{3}$, where x > 0 if the median of the data is 8, then the value of x is

A. 24

B. 8/3

C. 3/8

D. 8

60. Mode is

A. least frequent value
B. middle most value
C. most frequents value
D. None

SECTION – II

Physics

61. The SI unit of specific heat is
    A. J / K
    B. J / kg
    C. J.kg / K
    D. J / kg.K
62. The change of phase from liquid to gas that occurs at the surface of a liquid is called
    A. melting
    B. freezing
    C. condensation
    D. evaporation
63. The final temperature of a mixture of 100 g of water at 30 ºC temperature and 100g of water at 60 ºC temperature Is
    A. 45 ºC
    B. 70 ºC

C. 90 °C
D. 130 °C

64. The distance between the pole and the centre of curvature of a concave mirror is called
A. focal length
B. object distance
C. image distance
D. radius of curvature

65. if i and r be the angle of incidence and Angle of reflection respectively. then which one of the following conditions Is correct when a light my is reflected by a plane surface?
A. i = r
B. I > r
C. I < r
D. None of the above

66. The scientist who proposed the idea that the light ray always travels the path of least time is
A. Archimedes
B. Snell
C. Fermat
D. Raman

67. Which among the following is a dimensionless physical quantity ?
A. Power of lens

B. Radius of curvature
C. Wavelength Refractive index
D. Refractive index

68. If n is the refractive index of a medium and v be the velocity of light in that medium, then which one of the following statements is correct?
A. If n is high, v is low
B. If n is high v is also high
C. n = v for all media
D. n and v are independent of each other

69. if n_1 and n_2 be the refractive indices of denser and media respectively and C is the creitical angle, then
A. $sinC = \frac{n_1}{n_2}$
B. $\sin C = \frac{n_2}{n_1}$
C. $\sin C \sqrt{\frac{n_1}{n_2}}$
D. $\sin C = \sqrt{\frac{n_2}{n_1}}$

70. The refractive index of glass is 3/2. If the speed of light in vacuum is 3×10^8 m/s. then the speed of light in glass is
A. $2 \times 10^8 \ m/s$

B. $3\times10^{8}\ m/s$
C. $10^{8}\ m/s$
D. $1.5\times10^{8}\ m/s$

71. The number of focal points, that every lens has, is
A. 4
B. 3
C. 2
D. 1

72. A virtual, erected image is formed when an object is placed on the principal axis of a convex lens
A. Beyond the centre of curvature
B. At the center of curvature
C. Between the centre of curvature and focal point
D. Between focal point and optic center

73. An image is formed at a distance of 60 cm from the centre of a convex lens when the object distnnce is 30 cm. The focal length of the lens is
A. 90 cm
B. 20 cm
C. 2 cm
D. 0.05 cm

74. Read the following two statement and pick the correct options:
a. The virtual image can be capture on a screen
b. The real image can be captured on a screen

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 angle of vision for a healthy being is about
A. 10^o
B. 30^o
C. 60^o
D. 90^o

76. To correct one's hypermetropia defect, the type of lens to be used is
A. Biconcave
B. Biconvex
C. Plano-concave
D. Plano-convex

77. Which one among the following colours has the minimum angle of deviation ?
A. Red
B. Blue
C. Green
D. Violet

78. The formation of rainbow in the sky is due to the desperation of sunlight by
A. Clouds
B. Water droplets

C. Air molecules
D. Water in the sea

79. Which one among the following quantities has the unit diopter?
A. Accommodation
B. Pocal length of lens
C. Power of lens
D. Refractive index

80. The product of potential difference and current given
A. Resistance
B. Electric power
C. Electromotive force
D. Specific resistance

81. Read the following two statements pick the correct answer
a. Semiconductor obey the ohm's law
b. Metallic conductor obey the ohm's law
A. Only (a) is true
B. Only (b) is true
C. Both (a) is true
D. Both (a) and (b) are false

82. Which among the following materials have their resistivity of the order 10^{14} to 10^{16} O.m ?
A. Conductor
B. Semiconductor

C. Insulators
D. All

83. Three resistors each of value 3Ω are resistance in parallel combination. The equivalent resistance is
A. 27 Ω
B. 9 Ω
C. 3 Ω
D. 1 Ω

84. An electric blub of 360 Ω resistance is connected to a 6 v battery. The power consumption is
A. 0.1 w
B. 3 w
C. 2 w
D. 20 w

85. Which one among the following statements is true?
A. Resistance of a conductor is independent of its length.
B. Resistance of a conductor is directly proportional to its length.
C. Resistance of a conductor is inversely proportional to its length.
D. Resistance of a conductor is independent of its temperature.

86. Oersted is the unit of
A. Magnetic field strength

B. Magnetic flux density
C. Magnetic pole strength
D. magnetic flux

87. The magnetic force acting on a straight wire of length / carrying a current i which is p!accd perpendicular to the uniform magnetic field B is
A. B/if
B. i / Bl
C. il^2B
D. ilB

88. The law which states that 'an induced e.m.f will appear in such a direction that it opposes the change in its flux' is
A. Faradays law
B. Kirchhoff's loop law
C. Ohm's law
D. Lenz's law

89. 1 tesla = _____
A. 1 weber
B. 1 weber / $metre^2$
C. 1 watt / $metre^2$
D. 1 coulomb

90. In which among the following, the principle of electromagnetic induction is not involved ?

A. In security check, where people are made to walk through a large upright coil of wire
B. Working of taps recorder
C. Working of an electric bulb
D. Working of ATM card

SECTION – III

Chemistry

91. Oxidation reaction involves
    A. Addition of H_2
    B. Removal of O_2
    C. Removal of H_2
    D. None
92. The gaseous mixture contains hydrogen and oxygen in the ratio of 1 : 8 by mass respectively. The ratio of the number of molecules of hydrogen and oxygen m the above mixture
    A. 1: 8
    B. 8: 1
    C. 1: 2
    D. 2 : 1
93. Match the following

Column – A	column – B
(a) $C + O_2 \rightarrow CO_2 + Q$	(i) Prevent rancidity
(b) $N_2 + O_2 \rightarrow 2NO - Q$	(ii) Endothermic reaction
(c) Antioxidants	(iii) Endothermic reaction
(d) Stainless steel	(iv) Exothermic reaction

A. (a) (b) (c) (d)
(i) (ii) (iii) (iv)
B. (a) (b) (c) (d)
(iv) (iii) (ii) (i)
C. (a) (b) (c) (d)
(iv) (iii) (i) (iii)
D. (a) (b) (c) (d)
(iii) (iv) (ii) (i)

94. In the reaction $2PbO + C \rightarrow 2Pb + CO_2$

A. Carbon is reduced
B. PbO is oxidized
C. PbO is reduced
D. PbO reduces card to CO_2

95. Winch one of the following statements is wrong for the chemical reaction A + B → C if the reactants and product are gaseous in state'

A. One lore of A combines with one liter of B to give one liter of C
B. One mole of A combines with one mole of B to give one mole of C
C. One gram of A combines with one gram of B to give one gram of C
D. One molecule of A combines with one molecule of B to give one molecule of C.

96. The volume of oxygen required for complete oxidation of 2 liters of methane at STP is
A. 4 liters
B. 12.25 liters
C. 1 liters
D. 8 liters

97. Which one of the following produces more number of OH^+ ions?
A. HCl solution
B. CH_2COOH solution
C. NH_4OH solution
D. NaOH solution

98. Which one of the following produce more number of H_3O^+ ions?
A. HCl solution
B. CH_3COOH solution
C. NaOH solution

D. $Mg(OH)_2$ solution

99. Which one of the following is a weak base?
   A. KOH
   B. NaOH
   C. NH_4OH
   D. None of the above

100. Which if the following group elements are known as chalcogen ?
   A. 16
   B. 6
   C. 1
   D. 17

101. The number of electrons that are present in *p*-orbitals of CL^- ion is
   A. 6
   B. 5
   C. 11
   D. 12

102. The impossible set for quantum number for any electron of an atom is
   A. $n = 2, l = 1, m_l = 0, m_s = +1/2$

B. $n = 2, l = 2, m_l = -1, m_s = -1/2$

C. $n = 3, l = 2, m_l = +1, m_s = +1/2$

D. $n = 3, l = 0, m_l = 0, m_s = -1/2$

103. Elliptical orbits are introduced by

A. Bohr

B. Sommerfeld

C. Schrodinger

D. Zeeman

104. Which one of the following is the correct configuration of O^{2-} ?

A. $1s^2\ 2s^2\ 2p^4$

B. $1s^2\ 2s^2\ 2p^6$

C. $1s^2\ 2s^2\ 2p^2$

D. $1s^2\ 2s^2\ 2p^5$

105. Where do Na and N belong?

A. s- block

B. Na belongs to s-block and N belong to d-block

C. p-block

D. Na belongs to s-block and N belong to p-block

106. The atomic number of actinide series elements are

A. 58 to 71

B. 90 to 103

C. 92 to 105

D. 60 to 73

107. The order of second ionization energy values of O and N is

A. O > N

B. N > O

C. O = N

D. IE_2 is less than IE_1

108. Generally the order of electronegativity in groups

A. decreases

B. increases

C. remains same

D. initially decreases and then increases

109. Which of the following is not an ionic compound?

A. NaF

B. NaCl

C. MgO

D. NH_3

110. The molecule with two bond pairs in two covalent bonds around the nucleus of the central atom without any lone pair in the valence shell is

A. $BeCl_2$

B. BF_3

C. NH_3

D. CH_4

111. The molecules with decreasing order of bond angles are

A. BF_3, NH_3, H_2O, CH_4

B. $BeCl_2$, BF_3, CH_4, NH_3

C. $BeCl_3$, H_2O, NH_3, CH_4

D. $BeCl_2$, H_2O, NH_3, CH_4

112. Which one of the following is wrong in case of NaCl crystal?

A. It does not conduct electricity in aqueous

state

B. It is soluble in water

C. The coordination number of Cl^- in crystal is 6

D. It is a face-centred cubic crystal

113. Which of the following is used as reducing agent in metallurgical process?

A. Coke

B. O_2

C. $KMnO_4$

D. None of these

114. The metal which do not displace hydrogen from dil. HCl is

A. Zn

B. Mg

C. Cu

D. Fe

115. Generally metallic oxides are converted into medals by

A. roasting

B. calcination

C. oxidation

D. reduction

116. The reducing agent is used to join railings of railway tracks is

A. Al

B. CO_2

C. SO_2

D. None of the above

117. The bond angle (H—C--H) in C_2H_4 is

A. $109^0\ 28'$

B. 180^0

C. $104^0\ 27'$

D. 120^0

118. The general formula is alcohol is

A. $(C_nH_{2n+1})\ OH$

B. $(C_nH_{2n+1})\ NH_2$

C. $(C_nH_{2n+1})\ CHO$

D. $(C_nH_{2n+1})_2\ O$

119. If a carbon compound has many functional groups, then the order of preference while naming it according to IUPAC nomenclature is

A. $CONH_2 > CHO > NH_2 > -- COOH$

B. $–COOH > CONH_2 > CHO > NH_2$

C. $–CHO > CONH_2 > COOH > NH_2$

D. $COOH > CHO > NH_2 > -- CONH_2$

120. The IUPAC name of $NH_2 \_ CH_2 – CHOH – CH_2 –$ COOH is

A. 1 – amino-2–hydroxybutanoic acid

B. 3 – hydroxy- 4–aminobutenoic acid

C. 4 – amino-3 – hydroxybutanoic acid

D. 1 – amino-3 – hydroxybutyric acid