150306 A

Question Booklet Series:

A

Polytechnic Written Test– 2015
QUESTION BOOKLET

INSTRUCTIONS

Question Booklet Number:

525198

Maximum Time Allowed : 3 Hours
Negative Marking : 0.25

No. of Questions: 180
Maximum Marks: 180

Roll Number: | | | | | | | | |

Answer Sheet Number: | | | | | | |

Please read the following instructions carefully:

1) **Check the Booklet thoroughly**: In case of any defect – Misprint, Missing question(s), Missing page, Blank page, Damaged or Defaced page, or duplication of question(s) / Page(s), get the Booklet changed with the Booklet of the same series from the Room Invigilator. No complaint shall be entertained after the Entrance Test is over.

2) Write your Roll Number and the OMR Answer Sheet Number on the Question Booklet.

3) Check your Roll Number, Question Booklet Number and Question Booklet Series carefully before entering them on the OMR Sheet. Ensure twice that you have made their entries on the OMR Answer Sheet correctly and darken the relevant bubbles on the Answer Sheet and sign at the appropriate place. Incomplete particulars given will result in the non-evaluation of your answer sheet.

4) Strictly follow the instructions given by the Centre Supervisor / Room Invigilator and those given on the Question Booklet.

5) Candidates are not allowed to carry any papers, notes, books, calculators, cellular phones, scanning devices, pagers etc. to the Examination Hall. Any candidate found using, or in possession of such unauthorized material or indulging in copying or impersonation or adopting unfair means / reporting late / without Admit Card will be debarred from the Entrance Test.

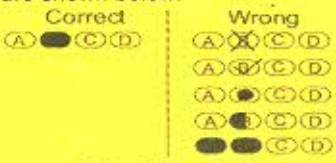
6) Please mark the right responses on the OMR Sheet with ONLY a Blue/Black ball point pen. Use of eraser, whitener (fluid) and cutting on the OMR Answer Sheet is NOT allowed.

7) The test is of objective type containing multiple choice questions (MCQs). Each objective question is followed by four responses. You are required to choose the correct/best response and mark your response on the OMR Answer Sheet and NOT on the Question Booklet.

8) There will be 0.25 negative marking for every wrong answer.

9) For marking response to a question, completely darken the CIRCLE so that the alphabet inside the CIRCLE is not visible. Ensure that you darken only one circle in the Answer Sheet.

Even a stray mark / faint mark on the Answer Sheet is read by the scanner and will make your answer invalid by reading it as a case of double shading. You have to be very very careful while darkening the bubbles. The CORRECT and the WRONG methods of darkening the CIRCLE on the OMR Answer Sheet are shown below.



10) Please be careful while marking the response to questions. The response once marked cannot be changed and if done shall be treated as a wrong answer.

11) In view of the limited time, do NOT waste your time on a question which you find difficult. Attempt easier questions first and come back to the difficult questions later during the test.

12) DO NOT make any stray marks anywhere on the OMR Answer Sheet. DO NOT fold or wrinkle the OMR answer sheet.

13) Rough work MUST NOT be done on the OMR Answer Sheet. Use rough page of your Question Booklet for this purpose.

14) Candidates are provided carbonless OMR Answer Sheet having original copy and candidate's copy. After completing the examination, candidates are directed to fold at perforation on the top of the sheet, tear it to separate original copy and candidate's copy and then hand over the original copy of OMR Answer Sheet to the Room Invigilator and retain candidate's copy.

15) If you have made any wrong entry of Roll Number, Booklet Number or Booklet Series Number in the OMR Answer Sheet, you should report it to the Invigilator / Superintendent or report it within three days after the conclusion of the Entrance Test to the BOPEE office, Jammu / Srinagar positively, failing which no complaint / representation shall be entertained and the OMR Answer Sheet shall be evaluated strictly according to the entries made by you.

DO NOT OPEN THE SEAL OF THIS BOOKLET UNTIL TOLD TO DO SO

Section 1 - English

1. Identify the sentence error in the following sentence:
Salim never liked bathing the dog, feeding the cats, or to ride the horse.
(A) bathing the
(B) feeding the
(C) to ride
(D) no error

2. Identify the sentence error in the following sentence:
Her and her friend like to stay in their hotel room and drink milk whenever they take a trip.
(A) Her
(B) her friend
(C) drink milk
(D) they take a trip

3. They narrowly avoided _____ the bus.
(A) missing
(B) to miss
(C) missed
(D) having miss

4. After months of studying hard, Mina _____ cleared UPSC Examinations.
(A) initially
(B) consequently
(C) finally
(D) therefore

5. Identify the sentence error in the following sentence:
Of all the students in my class, nobody-not even me-are excited about the new teacher.
(A) Of all the students
(B) nobody
(C) are excited
(D) the new teacher

6. Fatima knows German; _____, we have selected her to head our Bank in Germany.
(A) therefore
(B) moreover
(C) provided
(D) otherwise

7. I'm afraid I don't recollect _____ an exam today!
(A) to have
(B) to has
(C) to had
(D) having

8. _____ my family, I will also invite my friend on my Birthday.
(A) Aside
(B) Despite
(C) In spite
(D) Besides

9. Choose the correct alternative for the underlined word:
He suggested that, we should be bound by a code of conduct, isn't it?
(A) isn't it
(B) aren't we
(C) shouldn't we
(D) none of the above

10. Fill in the blank with words given in brackets, using the verbs in Past Perfect Tense.
_____ Jammu before you went there in 2013? (you / ever / to visit)
(A) Did you ever visited Jammu before you went there in 2013?
(B) Had you ever visited Jammu before you went there in 2013?
(C) Have you ever visited Jammu before you went there in 2013?
(D) Could you ever visited Jammu before you went there in 2013?

11. Choose the correct alternative for the underlined word:
She depends greatly on her brother.
(A) depend greatly
(B) has been depending
(C) should greatly depend
(D) No correction

12. Identify the type of clause for the underlined area of the sentence.
From the border of Punjab the great road continued on to Delhi, to Varanasi, the place we once called Benaras, to end in Calcutta, favoring the banks of Ganges for much of this distance.
(A) Adjective clause
(B) Independent clause
(C) Adverb clause
(D) Noun clause

13. Fill in the blank with words given in brackets, using the verbs in Past Perfect Tense.
_____ the office before they drove away? (they / to ring)
(A) Had they rung the office before they drove away?
(B) They rang the office before they drove away?
(C) Had they ring the office before they drove away?
(D) They had ring the office before they drove away?

14. Our dog is of very good breed as _____ is the offspring of two high breed dogs and inherited _____ features.
(A) this / its
(B) she / theirs
(C) it / their
(D) he / their

15. Fill in the blank with words given in brackets, using the verbs in Past Perfect Tense.
_____ the onions before he hurried to the window? (Saif / to cut)
(A) Did Saif cut the onions before he hurried to the window?
(B) Have Saif cut the onions before he hurried to the window?
(C) Had Saif cut the onions before he hurried to the window?
(D) Could Saif cut the onions before he hurried to the window?

16. The teacher could not remember the name of the student _____ science project received a cash prize of Rs. 20,000.
(A) who
(B) whose
(C) whom
(D) her

17. Identify the type of clause for the underlined area of the sentence.
If I say that we had a house and two servants in Dhaka, what you might imagine will not match reality.
(A) Adjective clause
(B) Independent clause
(C) Noun clause
(D) Adverb clause

18. The solicitor wrote a letter to Rahim and _____ in which he asked us if we could settle the matter between _____.
(A) me / us
(B) I / us
(C) mine / ours
(D) mine / we

19. She considered _____ homes.
(A) to change
(B) changing
(C) having change
(D) to be changing

20. Choose the correct reported speech version of the statement.
"What are they doing?" she asked.
(A) She wanted to know what they are doing.
(B) She wanted to know what they were doing.
(C) She wants to know what they were doing.
(D) She is wanting to know what they were doing.

21. Identify the type of clause for the underlined area of the sentence.
The great rivers of India have served as the arteries of civilization, with the Ganges the aorta of Northern India.
(A) Adverb clause
(B) Noun clause
(C) Adjective clause
(D) Independent clause

22. Join the three sentences using appropriate conjunction(s).
Jai saw a dog on the road. He decided to adopt the dog. Jai brought the dog home.
(A) Jai saw a dog on the road and decided to adopt the dog, so he brought the dog home.
(B) Jai saw a dog on the road so decided to adopt the dog, and he brought the dog home.
(C) Jai saw a dog on the road whom he decided to adopt, so he brought the dog home.
(D) Jai saw a dog on the road whom he decided to adopt the dog, and so he brought the dog home.

23. Choose the correct reported speech version of the statement.
Vikram said, "I want to visit my friends this weekend."
(A) Vikram said he wanted to visit his friends that weekend.
(B) Vikram said he wants to visit his friends that weekend.
(C) Vikram said he wanted to visit his friends this weekend.
(D) Vikram said he wanted to visit her friends that weekend.

24. Choose the correct reported speech version of the statement.
The teacher asked, "Who speaks English?"
(A) The teacher wants to know who spoke English.
(B) The teacher wanted to know who speak English.
(C) The teacher wanted to know who spoke English.
(D) The teacher wants to know who speak English.

25. Choose the type of Pronoun that is underlined in the sentence :
He tripped over and fell down.
(A) Personal Pronoun
(B) Relative Pronoun
(C) Reflexive Pronoun
(D) Indefinite Pronoun

26. Choose the correct alternative for the underlined word:
Hardly she had finished her lunch than the phone rang.
(A) while
(B) when
(C) then
(D) however

Direction for questions 27-30:

Complete the conversation by choosing the most appropriate given options:

Abraham: I heard that Rahim (9) _____ open a sweet shop, though he is little uncertain.
Margret: He (10) _____ not plunge into another business proposition; he (11) _____ forget the colossal failure of his last business venture.
Abraham: You (12) _____ not have any worry on that count, as he will not be investing any money.

27. Select the correct option for the blank numbered (10) in the passage above:
(A) need
(B) dare
(C) will
(D) shall

28. Select the correct option for the blank numbered (12) in the passage above:
(A) will
(B) shall
(C) need
(D) dare

29. Select the correct option for the blank numbered (9) in the passage above:
(A) may
(B) can
(C) could
(D) will

30. Select the correct option for the blank numbered (11) in the passage above:
(A) needn't
(B) won't
(C) can't
(D) shouldn't

Section 2 - Physics

31. Which of the following characteristics is NOT suitable for fuse wire?
(A) Thin and short
(B) Low melting point
(C) High resistance
(D) Thick and short

32. LPG has strong smell due to the presence of
(A) Eythl mercaptan
(B) Ethyl isocyanide
(C) Methyl amine
(D) Ethanol

33. A current carrying wire is placed along east-west in a magnetic field directed northwards. If the current in the wire is directed eastward, what will be the direction of force on the wire?
(A) Due west
(B) Due south
(C) Vertically upwards
(D) Vertically downward

34. The figure below shows the poles of an electromagnetic field. The magnetic field is most non-homogenous at the point

(A) P
(B) O
(C) T
(D) R

35. Three 3 ohm resistors are connected to form a triangle. What is the resistance between any two of the corners?
(A) 3/4 ohms
(B) 3 ohms
(C) 2 ohms
(D) 4/3 ohms

36. One type of energy which has NOT been controlled so far:
(A) geothermal energy
(B) nuclear fission energy
(C) ocean thermal energy
(D) nuclear fusion energy

37. Which of the following is NOT ultimately derived from the sun's energy?
(A) Wind energy
(B) Geothermal energy
(C) Biomass energy
(D) Ocean thermal energy

38. If the length of the conductor is doubled, then its resistivity becomes
(A) double
(B) halved
(C) remains same
(D) three times

39. The fossil fuel whose known reserve in the earth are expected to last for the minimum period is:
(A) uranium
(B) coal
(C) petroleum
(D) natural gas

40. Two electric bulbs have resistances in the ratio 1:2. If they are joined in series, the energy consumed in them are in the ratio
(A) 1:2
(B) 2:1
(C) 4:1
(D) 1:1

41. The phenomena responsible for the light of sun to stay beyond sunset is
(A) scattering
(B) refraction
(C) reflection
(D) dispersion

42. The lateral displacement is directly proportional to:
(A) angle of refraction
(B) thickness of slab
(C) angle of incidence
(D) none of these

43. Two resistances R_1 and R_2 give combined resistance of 4.5 ohms when in series and 1 ohm when in parallel. The resistances are
(A) 3 ohms and 6 ohms
(B) 3 ohms and 9 ohms
(C) 1.5 ohms and 3 ohms
(D) 1.5 ohms and 0.5 ohms

44. The minimum speed of wind necessary for the satisfactory working of a wind generator to produce electricity is about:
(A) 10 km/h
(B) 15 km/h
(C) 20 km/h
(D) 25 km/h

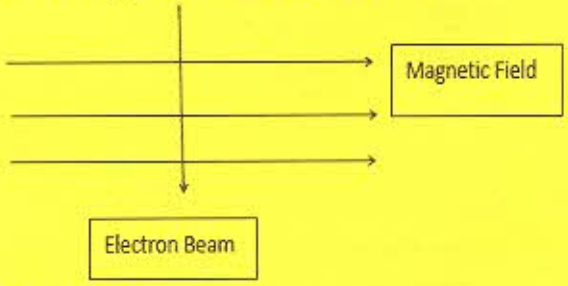
45. The force exerted on a current-carrying wire placed in a magnetic field is zero when the angle between the wire and the direction of magnetic field is:
(A) 45°
(B) 60°
(C) 90°
(D) 180°

46. Beam of white light splits into its constituent colours by a process known as
(A) Dispersion
(B) Reflection
(C) Refraction
(D) Convergence

47. The lamps in a household circuit are connected in parallel because
(A) this way they require less current
(B) if one lamp gets fused the other remains glowing
(C) in this way the power is saved
(D) it helps in short circuiting

48. A human eye can focus on objects at different distances by adjusting the focal length of the eye lens. This is due to:
(A) accommodation
(B) near sightedness
(C) long sightedness
(D) persistence of vision

49. An electron beam enters a magnetic field at right angles to it as shown in the figure. The direction of force acting on the electron beam will be:



(A) to the left
(B) to the right
(C) into the page
(D) out of the page

50. A wire has resistance of 21 ohms. It is melted down and from the same volume of metal a new wire is made, that is three times longer than the original one. What is the resistance of new wire?
(A) 63 ohms
(B) 189 ohms
(C) 7 ohms
(D) 21 ohms

51. An electric motor is a device which transforms:
(A) mechanical energy to electrical energy
(B) heat energy to electrical energy
(C) electrical energy to heat energy
(D) electrical energy to mechanical energy

52. A lens of power +3.5 D is placed in contact with the lens of power -2.5 D. The combination will behave like:
(A) A convergent lens of focal length 100 cm
(B) A divergent lens of focal length 100 cm
(C) A convergent lens of focal length 200 cm
(D) A divergent lens of focal length 200 cm

53. Heat produced in a current carrying wire in 5 s is 60 J. The same current is passed through another wire of half the resistance. The heat produced in 5 s will be
(A) 60 J
(B) 30 J
(C) 15 J
(D) 120 J

54. Three equal resistances when combined in series are equivalent to 90 W. Their equivalent resistance when combined in parallel will be
(A) 270 W
(B) 30 W
(C) 3.810 W
(D) 10 W

55. A wire of resistance 8 ohm is bent in the form of circle. The resistance across its diameter will be
(A) 8 ohm
(B) 4 ohm
(C) 2 ohm
(D) 16 ohm

56. A stick appears broken in water due to:
(A) Total depth of water body
(B) Refraction of light
(C) Reflection of light
(D) None of these

57. A proton and an electron enter a region of space with equal speed in which a magnetic field is suddenly switched on. The force experienced by them are
(A) equal and opposite
(B) different in magnitude but in the same direction
(C) in the ratio of 18:37
(D) same in magnitude and direction

58. A convex mirror of focal length 10 cm is placed in water. The refractive index of water is 4/3. What will be the focal length of the mirror in water?
(A) 40/3 cm
(B) 30/4 cm
(C) 10 cm
(D) 20 cm

59. A spherical air bubble in water behaves as
(A) Convex lens
(B) Concave lens
(C) Concave mirror
(D) Plane mirror

60. If a long hollow copper pipe carries a current, the produced magnetic field will be
(A) inside the pipe only
(B) outside the pipe only
(C) both inside and outside the pipe
(D) neither inside nor outside the pipe

61. In vacuum, speed of light depends upon
(A) wavelength
(B) frequency
(C) color
(D) none of the above

62. The unit of expressing electric power is
(A) joule
(B) joule per sec
(C) coulomb per sec
(D) kilowatt hour

63. What should be the refractive index of completely transparent medium for it to be invisible in vacuum?
(A) Less than 1
(B) 1
(C) Greater than 1
(D) The medium cannot be invisible whatever be the value of refractive index

64. A concave mirror forms the real image of an object which is magnified 4 times. The object is moved 3 cm away, the magnification of the image is 3 times. What is the focal length of the mirror?
(A) 3 cm
(B) 4 cm
(C) 12 cm
(D) 36 cm

65. The resistivity of certain material is 0.6 ohm m. The material is most likely to be:
(A) insulator
(B) conductor
(C) semi-conductor
(D) super conductor

66. The index of refraction of diamond is 2.0, velocity of light in diamond in cm per second is approximately:
(A) 6×10^{10}
(B) 3.0×10^{10}
(C) 2×10^{10}
(D) 1.5×10^{10}

67. What is the magnification when the object is placed at 2f from the pole of a convex mirror?
(A) -1/3
(B) -2/3
(C) -1
(D) -3/2

68. A long sighted man is not able to see objects nearer to his eye than 50 cm. To enable him to read a book, 25 cm away, he should use spectacle lenses with the following power.
(A) - 6 D
(B) - 4 D
(C) 0 D
(D) + 4 D

69. One of the following does NOT contribute to acid rain. That is:
(A) sulphur dioxide
(B) carbon dioxide
(C) nitrogen monoxide
(D) carbon monoxide

70. If we double the radius of a current carrying coil keeping the current unchanged, what happens to the magnetic field at the centre?
(A) Becomes four times
(B) Is doubled
(C) Remains unchanged
(D) Is halved

71. A current is flowing towards north along a power line. The direction of the magnetic field above it is towards
(A) north
(B) east
(C) south
(D) west

72. A thin convex lens of focal length 10 cm and a thin concave lens of focal length 20 cm are in contact. The combination acts as:
(A) concave lens of focal length 10.0 cm
(B) concave lens of focal length 20.0 cm
(C) convex lens of focal length 10.0 cm
(D) convex lens of focal length 20.0 cm

73. If the potential difference between the ends of the fixed resistor is halved, the electric power will become
(A) four times
(B) one-fourth
(C) halved
(D) eight times

74. A long copper pipe carries a current. Then the magnetic field is
(A) zero inside and finite outside
(B) finite inside and zero outside
(C) finite both inside and outside
(D) zero both inside and outside

75. In order to find an efficient solar cooker, the cover of cooker box should be made of:
(A) iron sheet
(B) shining aluminum sheet
(C) transparent glass sheet
(D) butter paper sheet

76. For a fixed supply voltage, the current flowing through a conductor will decrease when
(A) cross-sectional area of the conductor is increased
(B) length of the conductor is reduced
(C) length of the conductor is increased
(D) cross-sectional area is increased and length is decreased

77. Which phenomenon is responsible for the twinkling of stars?
(A) Atmosphere Reflection
(B) Atmosphere Refraction
(C) Total Internal Reflection
(D) None of these

78. A convex lens of focal length 16 cm forms a virtual of double the size of the object. What is the distance of the object from the lens?
(A) 8 cm
(B) 16 cm
(C) 24 cm
(D) 32 cm

79. A minimum resistance is to be prepared from a copper wire, its length and diameter should be

(A) l and d

(B) l/2 and 2d

(C) 2l and d

(D) 2l and d/2

80. The radiation present in sunlight which makes a solar cooker work are:

(A) gamma rays

(B) visible light

(C) infrared rays

(D) ultraviolet rays

Section 3 -Chemistry

81. Which among the following elements form amphoteric oxide?
(A) Boron
(B) Aluminium
(C) Carbon
(D) Germanium

82. The indicators which turn red in acid solution are:
(A) litmus and methyl orange
(B) turmeric and litmus
(C) phenolphthalein and methyl orange
(D) phenolphthalein and litmus

83. The pair of element which exhibits the property of catenation is
(A) nitrogen and phosphorous
(B) carbon and silicon
(C) carbon and germanium
(D) carbon and nitrogen

84. A solid element X has four electrons in the outermost shell of its atom. An allotrope Y of this element is used as a dry lubricant and in making pencil leads. The allotrope Y is
(A) Diamond
(B) Graphite
(C) Buckminsterfullerene
(D) Cumene

85. An organic compound X having molecular formulae C_3H_6O is used as nail polish remover. The organic compound X is
(A) Propanal
(B) Acetone
(C) Methyl ethyl ether
(D) Acetaldehyde

86. The metal which is extracted from calamine is
(A) Ca
(B) Zn
(C) Al
(D) Fe

87. The organic compounds which are isomeric with each other are:
(A) aldehydes and ketones
(B) alcohols and aldehydes
(C) aldehyde and carboxylic acid
(D) alcohols and ketones

88. Which of the following non-metals exists in liquid state at room temperature?
(A) Mercury
(B) Bromine
(C) Iodine
(D) Carbon

89. One of the following molecular formulae represents a ketone. This formulae is
(A) $C_5H_{12}O$
(B) $C_6H_{12}O_2$
(C) $C_6H_{14}O$
(D) $C_6H_{12}O$

90. The salt whose aqueous solution will turn blue litmus to red is:
(A) sodium chloride
(B) sodium acetate
(C) ammonium sulphate
(D) potassium carbonate

91. The term pH comes from
(A) pure hydrogen content
(B) 'pure voir hydrogene' which implies potential of hydrogen
(C) purity of hydrogen ion in solution
(D) name of the scientist associated

92. An element X reacts with hydrogen to form hydride H_2X, having rotten egg smell. The element X is
(A) oxygen
(B) sulphur
(C) chlorine
(D) nitrogen

93. In Mendeleev's periodic table, gaps were left for the elements to be discovered later on. An element which found a vacant place in the periodic table later on is:
(A) Be
(B) Si
(C) Ge
(D) Se

94. The molecular formulae of an organic compound is $C_{46}H_{94}$. This compound belongs to the homologous series of
(A) Alkane
(B) Alkene
(C) Alkyne
(D) Aromatic hydrocarbon

95. The third member of the *homologous* series of alkyne is
(A) propyne
(B) butyne
(C) pentyne
(D) hexyne

96. A colourless lead salt, when heated produces a yellow residue and brown fumes. The lead salt is
(A) lead iodide
(B) lead nitrate
(C) lead sulphide
(D) lead sulphate

97. The electrons present in the valence shell of noble gas can be
(A) 2 only
(B) 8 only
(C) 2 and 8 only
(D) 8 or 7

98. Which of the following metals is a liquid?
(A) Sulphur
(B) Mercury
(C) Potassium
(D) Sodium

99. An organic compound which is main constituents of wine and beer on oxidation with alkaline potassium permanganate forms another compound X. The compound X is
(A) ethanol
(B) acetic acid
(C) acetone
(D) formic acid

100. The chemical reaction between two substances is characterized by a change in colour from orange to green. These two substances are most likely to be:
(A) potassium permanganate solution and lime juice
(B) potassium permanganate solution and sulphur dioxide
(C) potassium dichromate solution and sulphur dioxide
(D) potassium dichromate solution and carbon dioxide

101. When hydrogen burns in oxygen, water is formed and when water is electrolyzed, then hydrogen and oxygen are produced. What type of reaction are taking place respectively?
(A) Decomposition and combination reaction
(B) Combination and decomposition reaction
(C) Redox reaction and double decomposition
(D) Double decomposition and redox reaction

102. An element which is an essential constituent of all organic compounds belongs to which of the following groups of the modern periodic table?
(A) Group 2
(B) Group 13
(C) Group 14
(D) Group 17

103. It has been found that rubbing vinegar on the stung area of the skin of a person gives him relief. The person has been stung by:
(A) wasp
(B) ant
(C) honey bee
(D) scorpio

104. An organic acid X is a liquid which often freezes during winter time in cold countries having molecular formulae $C_2H_4O_2$. On warming it with methanol in the presence of a few drops of concentrated sulphuric acid, sweet smelling compound is formed. The sweet smelling compound is
(A) methyl ethanoate
(B) ethyl acetate
(C) ethyl methanoate
(D) acetic acid

105. The two metals which are extracted by means of electrolytic reduction of their salts are
(A) Mg and Mn
(B) Mg and Al
(C) Mg and Zn
(D) Fe and Al

106. A person found that the cake prepared by him is hard and small in size. Which ingredient has he forgotten to add that would have caused the cake to rise and become light?
(A) Baking soda
(B) Baking powder
(C) Gypsum
(D) Bleaching powder

107. Which of the following set of elements is written correctly in the order of their increasing metallic character?
(A) C,O,N
(B) Mg, Al, Si
(C) Be, Mg, Ca
(D) Na, Li, K

108. The number of carbon atoms joined in a spherical molecule of buckminsterfullerene is
(A) fifty
(B) sixty
(C) seventy
(D) ninety

109. A white precipitate can be obtained by adding dilute sulphuric acid to
(A) $CuSO_4$ solution
(B) Na_2SO_4 solution
(C) NaCl solution
(D) $BaCl_2$ solution

110. A strip of metal X is dipped in a blue coloured solution YSO_4. Metal X is used in galvanization whereas metal Y is used in making electrical wires. The metal X and Y are respectively
(A) Cu and Zn
(B) Zn and Cu
(C) Al and Cu
(D) Cu and Al

Section 4 - Mathematics

111. Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?
(A) 3/4
(B) 1/4
(C) 7/4
(D) 1/2

112. The value of $\cos^2 x + 1/(1 + \cot^2 x)$ is
(A) 0
(B) -1
(C) 1
(D) 2

113. If $\sin\theta = 3/5$, then the value of $(\tan\theta + \sec\theta)^2$ is
(A) 1
(B) 2
(C) 3
(D) 4

114. ABC is an isosceles triangle with AB = AC. Draw AP $\perp$ BC. Then
(A) $\angle B = \angle C$
(B) $\angle B + \angle C = 90°$
(C) AP = BP
(D) BP $\neq$ PC

115. How many times does the graph of $y = 2x^2 - 2x + 3$ intersect the x-axis?
(A) None
(B) One
(C) Two
(D) Three

116. The L.C.M of two numbers is 24 and their H.C.F is 2. If one of the numbers is 6, find the other number.
(A) 8
(B) 5
(C) 7
(D) 4

117. $\Delta ABC \sim \Delta PQR$, M is the mid-point of BC and N is the mid-point of QR. If the area of ΔABC = 100 sq. cm, the area of ΔPQR = 144 sq. cm and AM = 4 cm, then PN is:
(A) 4.8 cm
(B) 12 cm
(C) 4 cm
(D) 5.6 cm

118. If the area of rectangular mango grove is 800 m^2 and its length is twice its breadth, then its length is
(A) 40 m
(B) 30 m
(C) 20 m
(D) 50 m

119. A part of the monthly hostel charges in a college are fixed and the remaining depends on the number of days one has taken food in the mess. When a student X takes food for 25 days, he has to pay Rs. 1750 as hostel charges, whereas a student Y, who takes food for 28 days, pays Rs. 1900 as hostel charges. The fixed charges and the cost of food per day is
(A) Rs. 500, Rs. 50
(B) Rs. 600, Rs. 80
(C) Rs. 600, Rs. 50
(D) Rs. 500, Rs. 80

120. What is the solution set of the quadratic equation $8x^2 + 2x + 1 = 0$?
(A) $\left\{-\frac{1}{2}, \frac{1}{4}\right\}$
(B) $\left\{-1+\sqrt{2}, -1-\sqrt{2}\right\}$
(C) $\left\{\frac{-1+\sqrt{7}}{8}, \frac{-1-\sqrt{7}}{8}\right\}$
(D) no real solution

121. 66 cubic centimetres of silver is drawn into a wire 1 mm in diameter. The length of the wire in meters will be:

(A) 76 m

(B) 80 m

(C) 84 m

(D) 88 m

122. A linear equation in two variables is of the form

(A) ax = b

(B) by + c = x

(C) ax + by + c = 0

(D) x = y

123. If the 5th and 9th terms of an A.P be respectively 14 and 26, then the sum of its 20 terms is

(A) 610

(B) 590

(C) 620

(D) 600

124. Father's age is three times the sum of ages of his two children. After five years his age will be twice the sum of ages of his two children. The age of the father is

(A) 42 years

(B) 45 years

(C) 50 years

(D) 48 years

125. Four steps to derive the quadratic formula are shown below. What is the correct order for these steps?

I. $x^2 + \frac{bx}{a} = \frac{-c}{a}$

II. $\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$

III. $x = \pm\sqrt{\frac{b^2 - 4ac}{4a^2}} - \frac{b}{2a}$

IV. $x^2 + \frac{bx}{a} + \left(\frac{b}{2a}\right)^2 = \frac{-c}{a} + \left(\frac{b}{2a}\right)^2$

(A) I, IV, II, III

(B) I, III, IV, II

(C) II, IV,I, III

(D) II, III, I, IV

126. A box contains 20 electric bulbs, out of which 4 are defective. Two bulbs are chosen at random from this box. The probability that at least one of these is defective is

(A) 7/19

(B) 6/19

(C) 5/19

(D) 4/19

127. The co-ordinates of two points are (6, 0) and (0, -8). The co-ordinates of the mid-point are

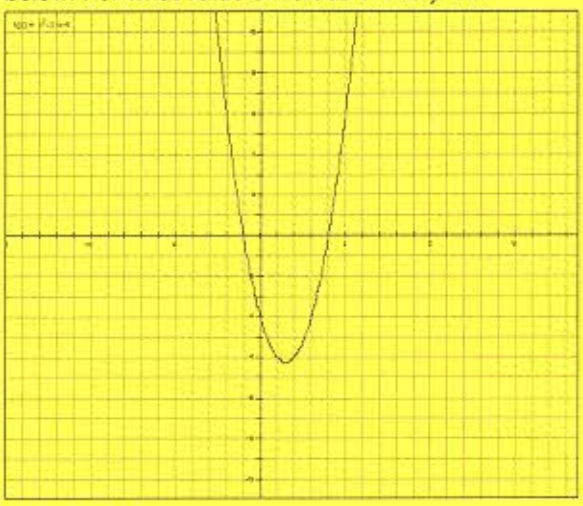
(A) (3, 4)

(B) (3, -4)

(C) (0, 0)

(D) (-4, 3)

128. The graph of the equation $y = x^2 - 3x - 4$ is shown below. For what value or values of x is y = 0?



(A) x = -1 only

(B) x = -4 only

(C) x = -1 and x = 4

(D) x = 1 and x = -4

129. If tanA = tanB, then A + B is

(A) 90°

(B) 30°

(C) 45°

(D) 180°

130. In a right angle isosceles triangle, right angled at B, find ∠A

(A) 40°

(B) 50°

(C) 45°

(D) 35°

131. The graph of the equation $y = x^2 + 2x + 3$ intersects the x-axis at how many points?

(A) 0

(B) 1

(C) 2

(D) 3

132. P is a point on x axis at a distance of 3 unit from y axis to its left. The co-ordinates of P are

(A) (3, 0)

(B) (0, 3)

(C) (-3, 0)

(D) (0, -3)

133. The points (-4, 0), (4, 0) and (0, 3) are the vertices of a:

(A) right triangle

(B) isosceles triangle

(C) equilateral triangle

(D) scalene triangle

134. If α, β be the zeroes of the polynomial $x^2 - 5x + 6$, then the value of $\alpha^3 + \beta^3$ is

(A) 30

(B) 35

(C) 38

(D) 40

135. If ΔABC ≅ ΔDEF and if AB = 3.5 = DE and BC = EF = 5.5, then necessary condition is

(A) ∠A = ∠D

(B) ∠B = ∠E

(C) ∠C = ∠F

(D) CA = FD

136. A tree is broken at a height of 10 m above the ground. The broken part touches the ground and makes an angle of 30° with the horizontal. The height of the tree is

(A) 30 m

(B) 20 m

(C) 10 m

(D) 15 m

137. The distance of point P (3, -2) from y-axis is

(A) 3 units

(B) 2 units

(C) -2 units

(D) 13 units

138. The areas of two similar triangles ABC and PQR are 25 cm^2 and 49 cm^2 respectively. If QR = 9.8 cm, then BC is:
(A) 9.8 cm
(B) 7 cm
(C) 49 cm
(D) 25 cm

139. If a + b + c = 0, then the quadratic equation $3ax^2 + 2bx + c = 0$ has
(A) at least one root in [0, 1]
(B) one root in [2, 3] and the other in [- 2, - 1]
(C) imaginary roots
(D) none of these

140. The value of p for which the pair of equations $3x + y = 1$ and $(2p - 1)x + (p - 1)y = 2p + 1$ has no solution is
(A) p = 1
(B) p = 0
(C) p = 3
(D) p = 2

141. The value of $\sin60° . \cos30° + \sin30° . \cos60°$
(A) 1
(B) 2
(C) 4
(D) 3

142. $\Delta ABC \sim \Delta PQR$. If ar(ABC) = 2.25 m^2, ar(PQR) = 6.25 m^2, PQ = 0.5 m, then the length of AB is:
(A) 30 cm
(B) 0.5 m
(C) 50 m
(D) 3 m

143. A construction worker drops a tool from the top of a building that is 200 ft high. The height of the tool above ground can be modeled by $h = -16t^2 + 200$, where h is the height in feet and t is the time in seconds. How long will it take for the tool to hit the ground?
(A) 5.6 s
(B) 3.5 s
(C) 4.2 s
(D) 0.1 s

144. A vertical stick 30 m long casts a shadow 15 m long on the ground. At the same time, a tower casts a shadow 75 m long on the ground. The height of the tower is
(A) 150 m
(B) 100 m
(C) 25 m
(D) 200 m

145. If the ratio of the corresponding sides of two similar triangles is 2 : 3, then the ratio of their corresponding altitude is:
(A) 3 : 2
(B) 16 : 81
(C) 4 : 9
(D) 2 : 3

146. Which of the following CANNOT be the sides of a right triangle?
(A) 9 cm, 15 cm, 12 cm
(B) 2 cm, 1 cm, 5 cm
(C) 400 mm, 300 mm, 500 mm
(D) 9 cm, 5 cm, 7 cm

147. The value of $\cot^2x - 1/\sin^2x$ is
(A) 2
(B) -2
(C) 1
(D) -1

148. The perimeter of triangle formed by the points (0, 0), (2, 0) and (0, 2) is
(A) 4 units
(B) 6 units
(C) 6 $\sqrt{2}$ units
(D) 4 $\sqrt{2}$ units

149. The first term, common difference and last term of an A.P are 12, 6 and 252 respectively. The sum of all terms of this A.P is
(A) 5408
(B) 5412
(C) 5402
(D) 5416

150. A man rowing at the rate of 5 km/hr in still water takes thrice as much time in going 40 km up the river as in going 40 km down. The rate at which the river flows is
(A) 3 km/hr
(B) 2.5 km/hr
(C) 2 km/hr
(D) 4 km/hr

151. An observer 1.5 m tall is 20.5 metres away from a tower 22 m high. The angle of elevation of the top of the tower from the eye of the observer is
(A) 30°
(B) 45°
(C) 60°
(D) 90°

152. ΔABC is such that AB = 3 cm, BC = 2 cm and CA = 2.5 cm. If $\Delta DEF \sim \Delta ABC$ and EF = 4 cm, then perimeter of ΔDEF is:
(A) 15 cm
(B) 22.5 cm
(C) 7.5 cm
(D) 30 cm

153. If the zeroes of $x^3 - 9x^2 + 23x - 15$ are $\alpha - \beta$ and $\alpha + \beta$, then
(A) $\alpha = 2, \beta = 5$
(B) $\alpha = 2, \beta = 6$
(C) $\alpha = 3, \beta = 5$
(D) $\alpha = 2, \beta = 4$

154. The HCF of 38220 and 196, using Euclid's Division Algorithm is,
(A) 190
(B) 195
(C) 196
(D) 198

155. The radii of the ends of a frustum of a cone 40 cm high are 38 cm and 8 cm. The slant height of the frustum of cone is
(A) 50 cm
(B) $10\sqrt{7}$ cm
(C) 60.96 cm
(D) $4\sqrt{2}$ cm

156. The surface area of a sphere is same as the curved surface area of a right circular cylinder whose height and diameter are 12 cm each. The radius of the sphere is:
(A) 4 cm
(B) 6 cm
(C) 8 cm
(D) 10 cm

157. If the centroid of the triangle formed by (9, a), (b, -4) and (7, 8) is (6, 8), then (a, b) is
(A) (4, 5)
(B) (5, 4)
(C) (5, 2)
(D) (3, 2)

158. A circular well with a diameter of 2 meters is dug to a depth of 14 meters. What is the volume of the earth dug out?
(A) 40 m^3
(B) 42 m^3
(C) 44 m^3
(D) 46 m^3

159. If AB = QR, BC = PR and CA = PQ, then
(A) Δ ABC $\cong$ Δ PQR
(B) Δ CBA $\cong$ Δ PRQ
(C) Δ BAC $\cong$ Δ RPQ
(D) Δ PQR $\cong$ Δ BCA

160. The radii of two cones are in ratio 2:1, their volumes are equal. Find the ratio of their heights.
(A) 1:4
(B) 1:3
(C) 1:2
(D) 1:5

161. A hemisphere and a cone have equal bases. If their heights are also equal, then the ratio of their curved surface will be:
(A) 2:1
(B) 1:$\sqrt{2}$
(C) $\sqrt{2}$:1
(D) $\sqrt{3}$:1

162. What is the greatest number with six digits, exactly divisible by 24, 15 and 36?
(A) 999999
(B) 999720
(C) 999780
(D) 999792

163. The auto-rickshaw charges in a city comprises a fixed charge together with the charge for the distance covered. For a journey of 13 km, the charge paid is Rs. 96 and for the journey of 18 km, the charge paid is Rs. 131. The amount a person has to pay for travelling a distance of 25 km is
(A) Rs. 190
(B) Rs. 200
(C) Rs. 170
(D) Rs. 180

164. In the equation given below, the quadratic equation is
(A) $x^2 - 3\sqrt{x} + 2 = 0$
(B) $2x^2 - 3x - 5 = 0$
(C) $x + 5/x = x^2$
(D) $x^2 - 6x + 5$

165. If the distance between (4, 0) and (0, x) is 5 units, the value of x will be
(A) 2
(B) 3
(C) 4
(D) 5

166. How many cubes of 10 cm edge can be put in a cubical box of 1 m edge?
(A) 10000 cubes
(B) 1000 cubes
(C) 100 cubes
(D) 50 cubes

167. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither blue nor green?
(A) 2/3
(B) 8/21
(C) 3/7
(D) 9/22

168. The ratio of the length of a tree and its shadow is 1 : $1/\sqrt{3}$. The angle of elevation of the sun is
(A) 30°
(B) 45°
(C) 60°
(D) 90°

169. The sum of the zeroes of the polynomial $6x^2 - 6 - 5x$ is
(A) 2/3
(B) 5/6
(C) 3/4
(D) 7/6

170. The value of $2\sin^2 30° - 3\cos^2 45° + \tan^2 60°$ is
(A) 5
(B) 3
(C) 1
(D) 2

171. D and E are respectively the points on the sides AB and AC of a triangle ABC such that AD = 2 cm, BD = 4 cm, BC = 9 cm and DE || BC. Then, length of DE (in cm) is:
(A) 6
(B) 5
(C) 3
(D) 2.5

172. The cost of the paint is Rs. 36.50 per kg. If 1 kg of paint covers 16 square feet, how much will it cost to paint outside of a cube having 8 feet each side?
(A) Rs. 850
(B) Rs. 860
(C) Rs. 876
(D) Rs. 886

173. Value of $\cos^2\theta(1 + \tan^2\theta)$ is equal to
(A) 2
(B) -1
(C) 1
(D) 3

174. A boat having a length 3 m and breadth 2 m is floating on a lake. The boat sinks by 1 cm when a man gets into it. The mass of the man is:
(A) 50 kg
(B) 60 kg
(C) 70 kg
(D) 80 kg

175. The tops of two poles of height 10 m and 18 m are connected with wire. If wire makes an angle of 30° with horizontal, then length of wire is
(A) 10 m
(B) 18 m
(C) 12 m
(D) 16 m

176. If $3x^2 - 5x - 2$ is divided by $3x + 1$, then the quotient is
(A) x - 2
(B) x + 2
(C) x + 3
(D) x - 3

177. If θ is a positive acute angle such that $\sec\theta = \text{cosec}60°$, then the value of $2\cos^2\theta - 1$ is
(A) ½
(B) ¾
(C) ⅓
(D) 2

178. The slant height of a conical mountain is 2.5 km and the area of its base is 1.54 km square. The height of mountain is:
(A) 2.3 km
(B) 2.4 km
(C) 2.5 km
(D) 2.6 km

179. The value of tan 48°. tan 23°. tan 42°. tan 67° is

(A) 1

(B) 2

(C) 3

(D) 4

180. From a pack of 52 cards, two cards are drawn together, what is the probability that both the cards are kings?

(A) 2/121

(B) 2/221

(C) 1/221

(D) 1/13

Space for Rough Work:

Space for Rough Work: