Directions (Questions 1-4): *In each of the following questions, find out which part of the sentence has an error. If there is no mistake, the answer is 'No error'.*

1. Walking in the park one spring afternoon, a dog came running from behind
                  (A)   (B)
    and bit him in the right leg. No error
               (C)   (D)
    (1) A   (2) B   (3) C   (4) D

2. During their trial in the lower court, it was proved that the five accused
                  (A)   (B)
    did not carry any espionage activity. No error.
                  (C)   (D)
    (1) A   (2) B   (3) C   (4) D

3. The Minister had requested for booking only two rooms   one on the third floor for his staff,
                       (A)   (B)
    and the other on the ground floor for himself.   No error.
                   (C)   (D)
    (1) A   (2) B   (3) C   (4) D

4. Do you want   that I come with you   or do you want to go alone?   No error
         (A)   (B)   (C)   (D)
    (1) A   (2) B   (3) C   (4) D

Directions (Questions 5-8): *Choose the word nearest in meaning to the underlined part.*

5. The surreptitious movements of a lone figure among the dunes filled the villagers with curiosity and awe.
    (1) invisible   (2) nocturnal   (3) secret   (4) concealed

6. Sanguine as he is in his attitude to life and its problems, he cannot but be noticed wherever he goes.
    (1) Optimistic   (2) Enthusiastic   (3) Realistic   (4) Dispassionate

7. The opposition criticized the ruling party for the deteriorating law and order situation in the state.
    (1) disrupting   (2) worsening   (3) crumbling   (4) eroding

8. Quite often two persons' tastes coincide.
    (1) agree   (2) accede   (3) match   (4) harmonize

Directions (Questions 9-10): *In each of these questions, choose the option that best captures the essence of the text.*

9. The strength of the electronics industry in Japan is the Japanese ability to organize production and marketing rather than their achievements in original research. The British are generally recognized as a far more inventive collection of individuals, but never seem able to exploit what they invent. There are many examples, which all prove this sad rule. The Japanese were able to exploit their strengths in marketing and development many years ago, and their success was at first either not understood in the West or was dismissed as something which could have been produced only at their low price. They were sold because they were cheap copies of other peoples' ideas churned out of a workhouse which was dedicated to hard grind above all else.
    (1) Prosperity in industry largely depends upon a country's research capability.
    (2) Marketing abilities of British were really good and they took advantage of this aspect.
    (3) Japanese were not so inventive as British.
    (4) The role of marketing efficiency is really tremendous in industrial prosperity of a country.

10. A book is written, not to multiply the voice merely, not to carry it merely but to perpetuate it. The author has something to say which he perceives to be true and useful or helpfully beautiful. So far he knows no one has said it, so far as he knows no one else can say it. He is bound to say it clearly and melodiously if he may; clearly at all events. In the sum of his life, he finds this to be the thing or group of things, manifest him; this, the piece of true knowledge, or sight, which his share of sunshine and earth has permitted him to seize. That is a book.
    (1) Aim of writing a book is to repeat many times the precise message contained in the book.
    (2) A writer writes a book primarily to propagate the ideology of the author.
    (3) A book enables an author to convey his ideas in writing.
    (4) A book is written to preserve from extinction, the information it contains.

Directions (Questions 11-12): *Choose the order of the sentences marked A, B, C, D and E to form a logical paragraph.*

11. A   But, business always attracted him.
    B   As a child, he used to discuss business with his friends.
    C   Now, Aakash is a well known business man.
    D   Aakash did not come from a business family.
    E   Subsequently, he decided to do MBA from a good institute.
    (1) BEACD   (2) DABEC   (3) CDBAE   (4) ECBDA

12. A   So when he grew up, he expressed his desire to become a pilot.
    B   Umang was highly disappointed, but continued to persuade his mother.
    C   Since flying an aircraft is a bit risky, his mother opposed him.
    D   Umang had a fascination for flying aircraft.
    E   Finally, his mother allowed him and today he is an Air Force pilot.
    (1) CBADE   (2) AECDB   (3) DACBE   (4) BDACE

Directions (Questions 13-16): *In each of the following questions, out of the given alternatives, choose the word which can be substituted for the given words/sentence.*

13. Voluntarily giving up throne by king in favour of his son
     (1) Abdication   (2) Resurrection   (3) Accession   (4) Renunciation

14. Gradual recovery from illness
     (1) Hysteria   (2) Amnesia   (3) Superannuation   (4) Convalescence

15. One who plays a game for pleasure and not professionally
     (1) Veteran   (2) Player   (3) Connoisseur   (4) Amateur

16. One who totally abstains from alcoholic drinks
     (1) Puritan.   (2) Samaritan.   (3) Pedant   (4) Teetotaller

Directions (Questions 17-20): *Choose the word/phrase nearest in meaning to the underlined part.*

17. The operation was <u>touch and go</u> as new complications arose and were solved.
     (1) safe   (2) risky
     (3) easy   (4) quick

18. My friend <u>got the sack from</u> his first job.
     (1) got tired of   (2) was demoted from
     (3) resigned   (4) was dismissed from

19. In these days of rising prices, we are <u>paying through our nose</u>.
     (1) paying dearly   (2) reducing our purchases
     (3) buying on credit.   (4) paying in instalments

20. The police fired <u>at random</u> at the violent crowd and several persons lost their lives.
     (1) pointedly   (2) aimlessly
     (3) unwillingly   (4) intentionally

Directions (Questions 21-30): *Study the passages below and answer the questions that follow each passage.*

PASSAGE-I

The atmosphere is a mixture of several gases. There are about ten chemical elements which remain permanently in gaseous form in the atmosphere under all natural conditions. Of these permanent gases, oxygen makes up about 21 percent and nitrogen about 78 percent. Several other gases, such as argon, carbon dioxide, hydrogen, neon, krypton, and xenon, comprise the remaining 1 percent of the volume of dry air. The amount of water vapour, and its variations in amount and distribution, are of extraordinary importance in weather changes. Atmospheric gases hold in suspension great quantities of dust, pollen, smoke, and other impurities which are always present in considerable, but variable amount.

The layer of the air next to the earth, which extends upward for about 16 km, is known as the troposphere. On the whole, it makes up about 75 per cent of all the weight of the atmosphere. It is the warmest part of the atmosphere because most of the solar radiation is absorbed by the earth's surface, which warms the air immediately surrounding it. A steady decrease of temperature with increasing elevation is a most striking characteristic. The upper layers are colder because of their great distance from the earth's surface and rapid radiation of heat into space. The temperatures within the troposphere decrease about 3.5° per 1,000 feet increase in altitude. Within the troposphere, winds and air currents distribute heat and moisture. Strong winds, called jet streams, are located at the upper levels of the troposphere. These jet streams are both complex and widespread in occurrence. They normally show a wave-shaped pattern and move from west to east at velocities of 240 kmph, but velocities as high as 640 kmph have also been noted. The influences of changing locations and strengths of jet streams upon weather conditions and patterns are no doubt considerable.

Above the troposphere to a height of about 80 km is a zone called the stratosphere. The stratosphere is separated from the troposphere by a zone of uniform temperatures called the tropopause. Within the lower portions of the stratosphere is layer of ozone gases which filters out most of the ultraviolet rays from the sun. The ozone layer varies with air pressure. If this zone were not there, the full blast of the sun's ultraviolet light would burn our skins, blind our eyes, and eventually result in our destruction. Within the stratosphere, the temperature and atmosphere composition are relatively uniform.

The layer upward of about 80 km is the most fascinating but the least known of these three strata. It is called ionosphere because it consists of electrically charged particles called ions, thrown from the sun. Its effect upon weather conditions, if any, is as yet unknown.

21. This passage does not provide information about the

    (1) effect of refrigerants on ozone depletion.

    (2) amount of oxygen in the atmosphere.

    (3) presence of considerable waste products in the atmosphere.

    (4) presence of permanent gases in the atmosphere.

22. Which of the following questions is/are answered on the basis of information contained in the passage?

    I. How do the troposphere and the stratosphere differ?

    II. How does the ionosphere affect the weather?

    Select the correct answer using the code given below:

    (1) I only   (2) II only   (3) Both I and II   (4) Neither I nor II

23. It can be inferred from the passage that at the top of a location which is above 16,000 feet above a town, the temperature is usually

    (1) warmer than that in the town.

    (2) about 56° colder than that on the ground.

    (3) affected by the ionosphere.

    (4) None of these

24. Life as we know it exists on the earth because the atmosphere

    (1) is warmest at the bottom.

    (2) carries the ultraviolet rays of the sun.

    (3) contains a layer of ozone gases.

    (4) contains a lot of water vapours.

25. The troposphere is the warmest part of the atmosphere because it

    (1) radiates heat into space.

    (2) is warmed by the earth's heat.

    (3) has winds and air currents that distribute the heat.

    (4) contains jet streams.

PASSAGE-II

Book clubs are a great way to meet new friends or keep in touch with old ones, while keeping up on your reading and participating in lively and intellectually stimulating discussions. If you're interested in starting a book club, you should consider the following options and recommendations.

The first thing you'll need is members. Before recruiting, think carefully about how many people you want to participate and also what the club's focus will be. For example, some book clubs focus exclusively on fiction, others read nonfiction. Some are even more specific, focusing only on a particular genre such as mysteries, science fiction, or romance. Others have a more flexible and open focus. All of these possibilities can make for a great club, but it is important to decide on a focus at the outset so the guidelines will be clear to the group and prospective member. After setting the basic parameters, recruitment can begin. Notify friends and family, advertise in the local newspaper, and hang flyers on bulletin boards in local stores, colleges, libraries, and bookstores. When enough people

express interest, schedule a kick-off meeting during which decisions will be made about specific guidelines that will ensure the club runs smoothly. This meeting will need to establish where the group will meet (rotating homes or a public venue such as a library or coffee shop); how often the group will meet, and on what day of the week and at what time; how long the meetings will be; how books will be chosen and by whom; who will lead the group (if anyone); and whether refreshments will be served and if so, who will supply them. By the end of this meeting, these guidelines should be set and a book selection and date for the first official meeting should be finalized. Planning and running a book club is not without challenges, but when a book club is run effectively, the experience can be extremely rewarding for everyone involved.

26. Which of the following organizational patterns is the main one used in the passage?
    (1) Chronological   (2) Hierarchical
    (3) Comparison-contrast   (4) Cause and effect

27. According to the passage, when starting a book club, the first thing a person should do is
    (1) hang flyers in local establishments.
    (2) put an ad in a local newspaper.
    (3) decide on the focus and size of the club.
    (4) decide when and where the group will meet.

28. Which of the following would NOT be covered during the book club's kick-off meeting?
    (1) Deciding on whether refreshments will be served.
    (2) Discussing and/or appointing a leader.
    (3) Choosing the club's first selection.
    (4) Identifying what kind of books or genre will be the club's focus.

29. A good title for this passage would be
    (1) Book Clubs: A Great Way to Make New Friends.
    (2) Starting a Successful Book Club: A Guide.
    (3) Five Easy Steps to Starting a Successful Book Club.
    (4) Reading in Groups: Sharing Knowledge, Nurturing Friendships.

30. Which of the following inferences can be drawn from the passage?
    (1) Smaller groups are better for a variety of reasons.
    (2) The social aspect of book clubs is more important than the intellectual.
    (3) Starting your own book club is better than joining an existing one.
    (4) When starting and running a book club, a casual approach is risky.

31. The energy of one quantum of light with a wavelength of 600 nm is _____.
    (1) $3.31 \times 10^{-19} J$ (2) $3.1 \times 10^{-19} eV$ (3) $3.0 \times 10^{-19} C$ (4) $3.31 \times 10^{-16} J$

32. A drop of water is about 0.018 ml. The density of water at room temperature is 1.0 g ml⁻¹. The number of molecules present in a drop of water would be _____.
    (1) 6.023×10^{20} (2) 6.023×10^{-16} (3) 6.023×10^{-18} (4) 1.675×10^{-20}

33. The bonded pair, lone pair and bond angle in sp^2d^2 hybridization are respectively _____.
    (1) 5,1 and 90°   (2) 4,1 and 90°   (3) 5,2 and 90°   (4) 5,1 and 60°

34. Hydrogen bonding is not present in
    (1) Hydrogen chloride.   (2) Hydrogen sulphide.
    (3) Glycerine.   (4) Water.

35. A sample of Br_2 occupies 2.0 litre at 27°C and 3 atm. If it occupies 4 litres at a pressure of 2 atm, then temperature will be _____.
    (1) 400 k   (2) 200 k   (3) 350 k   (4) 300 k

36. 50 ml of a gas A diffused through a membrane in the same time as for the diffusion of 30 ml of a gas B under identical pressure temperature conditions. If molecular weight of A=81, that of B would be _____.
    (1) 225   (2) 250   (3) 100   (4) 200

37. If the reaction $CaCO_3 \rightleftharpoons CaO(S) + CO_2(g)$ takes place at 977°C and 1 atm and $\Delta H = 200$ kJ, then ΔE will be _____.
    (1) 189.6 kJ   (2) 162 kJ   (3) 120 kJ   (4) 100 kJ

38. Kirchhoff's equation is variation of
    (1) heat of reaction with pressure.
    (2) entropy of reaction with temperature.
    (3) heat of reaction with temperature.
    (4) rate of reaction with temperature and pressure.

39. The enthalpy change when 2.8 g of CO vaporizes at its normal boiling point would be $(\Delta H_{vap} = 6.04 kJ \ mol^{-1})$ _____.
    (1) 604 J   (2) 302 J   (3) 500 J   (4) 400 J

40. For the reaction $A + B \rightleftharpoons C + D$, initially we start with equal concentrations of A and B. At equilibrium, we find the moles of C is three times of A. The equilibrium constant of the reaction is _____.
   (1) 4   (2) 9   (3) 2   (4) 1/4

41. The solubility of silver chromate in its saturated solution is 2×10^{-2} *moles* L^{-1}. Its solubility product is _____.
   (1) 32×10^{-6} (2) 21×10^{-4} (3) 12×10^{-6} (4) 12×10^{-4}

42. A 1.0 M solution of hydrocyanic acid is dissociated to the extent of (given $K_d = 4 \times 10^{-10}$) _____.
   (1) .002%   (2) .001%   (3) .02%   (4) .01%

43. The current in a given wire is 2 A. The number of coulomb that will pass through a given wire in 2 minutes would be _____.
   (1) 240 C   (2) 120 C   (3) 180 C   (4) 60 C

44. The coulombs required for the oxidation of two mole of H_2O to O_2 are _____.
   (1) 3.16×10^5 (2) 3.16×10^6 (3) 3.46×10^5 (4) 3.86×10^5

45. The oxidation state of carbon in $C_{12}H_{22}O_{11}$ is _____.
   (1) 1   (2) Zero   (3) 12/11   (4) 11/12

46. Osmotic pressure of 0.5% urea solution is 1.52 atm and that of 3.42% cane sugar is 2.48 atm. When the above two solutions are mixed, the osmotic pressure of resulting solution is _____.
   (1) 4.00 atm   (2) 0.96 atm   (3) 2.00 atm   (4) 3.00 atm

47. A sugar solution boils at 102°C. The molality of the sugar solution is (given $k_b = 0.5$ *k kg mol*$^{-1}$) _____.
   (1) 4   (2) 1.24   (3) 4.40   (4) 2.20

48. A 10% solution of cane sugar is isotonic with 1% solution of substance X. The molecular weight of X is _____.
   (1) 34.2   (2) 68.4   (3) 102.6   (4) 136.2

49. The first order rate constant for the decomposition of N_2O_5 is 6.93×10^{-4} s^{-1}. The $t_{1/2}$ of the decomposition is _____.
   (1) 1000 s   (2) 200 s   (3) 500 s   (4) 693 s

50. The 99% of the first reaction was completed in 16 min. The time needed to complete 99.99% of the reaction will be _____.

    (1) 16 min   (2) 32 min   (3) 48 min   (4) 64 min

51. Colloids are _____ and can be purified by _____

    (1) heterogeneous, dialysis   (2) homogeneous, dialysis

    (3) heterogeneous, coagulation   (4) homogeneous, coagulation

52. Initial mass of a radioactive element is 64 g. How many grams of it would be left after 24 years if its half-life is 6 years?

    (1) 4 g   (2) 2 g   (3) 1 g   (4) 8 g

53. The fundamental particle responsible for keeping the nucleus together is

    (1) Proton.   (2) Anti-proton.   (3) Meson.   (4) Baryon.

54. Number of neutrons in a nucleus X, which gives $^{14}_{7}N$ • • • • • • • • • • • • -emissions would be _____.

    (1) 10   (2) 8   (3) 9   (4) 5

55. An organic compound contains 4% oxygen. Its minimum molecular weight will be _____.

    (1) 400 g   (2) 200 g   (3) 100 g   (4) 320 g

56. Which of the following hydrocarbons contains 80% carbon and 20% hydrogen?

    (1) CH_3 (2) CH_4 (3) CH_2 (4) CH

57. Which of the following methods is used in the estimation of carbon and hydrogen?

    (1) Leibig's Method   (2) Kolbe's method   (3) Carius method   (4) All these

58. The number of grams of oxygen in 0.01 mole of $Na_2CO_3.10H_2O$ is _____.

    (1) 2.08 g   (2) 16 g   (3) 4 g   (4) 8 g

59. If 10^{21} molecules are removed from 100 mg of CO_2, then number of moles of CO_2 left are _____.

    (1) 0.61×10^{-3} (2) 0.81×10^{-3} (3) 0.11×10^{-3} (4) 0.61×10^{-1}

60. Cupellation process is used in the metallurgy of
    (1) Aluminum.   (2) Silver.   (3) Copper.   (4) Gold.

61. Which of the following is ore of copper?
    (1) Malachite   (2) Cinnabar   (3) Galena   (4) Calamine

62. In tritium, neutrons, protons and electrons are in the ratio _____.
    (1) 1:1:1   (2) 2:1:1   (3) 1:2:1   (4) 1:1:2

63. Which of the following metals (M) does not form oxides of the type MO?
    (1) Copper   (2) Silver   (3) Aluminum   (4) Zinc

64. Which of the following are constituents of water gas?
    (1) $CO + CH_2$ (2) $CO + Cl_2$ (3) $CO + H_2$ (4) $CO + CO_2$

65. The average concentration of Na^+ in human blood serum is about 2.3 g L^{-1}. The molarity of Na^+ is _____.
    (1) 0.10   (2) 2.3   (3) 0.23   (4) .20

66. The ratio of sodium to potassium in the red blood cells of human beings is _____.
    (1) 5:1   (2) 1:5   (3) 7:1   (4) 1:7

67. _____ is dithionic acid.
    (1) $H_2S_2O_6$ (2) $H_2S_2O_8$ (3) $H_2S_2O_{16}$ (4) $H_2S_2O_5$

68. P_4O_6 has
    (1) 8 P-O bonds.   (2) 6 P-O bonds.   (3) 12 P-O bonds.   (4) 10 P-O bonds.

69. The value of the Bohr Magneton for Ti^{2+} is _____.
    (1) 2.70   (2) 1.76   (3) 1.80   (4) 3.86

70. In biological processes, the element responsible for the oxidation of water to O_2 is _____.
    (1) Zn   (2) Fe   (3) Cl   (4) Mn

71. Which of the following are the most common oxidation states of Ce (Cerium)?

    (1) +1,+2   (2) +3,+4   (3) +1,+5   (4) +2,+4

72. The number of ions in potassium ferrocyanide are _____.

    (1) 2   (2) 3   (3) 5   (4) 1

73. How many d-electron are present in $[Cr(H_2O)_6]^{3+}$?

    (1) 1   (2) 2   (3) 3   (4) 4

74. Stereo-isomers are isomers with

    (1) same structural and molecular formula.

    (2) different structural formula and same molecular formula.

    (3) same structural formula and different molecular formula.

    (4) None of these

75. 43 g of n-hexane on combustion with excess of O_2 produces CO_2 equal to

    (1) 1 mole.   (2) 2 mole.   (3) 1.5 mole.   (4) 3 mole.

76. Racemic mixture is formed by mixing two

    (1) Stereo isomers.   (2) Optical isomers.   (3) Chiral compounds.   (4) None of these

77. Which of the following tests can distinguish Benzyl alcohol and phenol ?

    (1) Ferric chloride test   (2) Iodoform test

    (3) Grignard reagent test   (4) None of these

78. When a _____ reacts with alcohol, Schiff's base is produced.

    (1) Primary amine   (2) Secondary amine   (3) Tertiary amine   (4) Ketone

79. Which of the following alkyl halide has maximum density?

    (1) CH_3I (2) CH_3Cl (3) CH_3F (4) CH_3Cl_2

80. Vitamin B_1 contains _____ and vitamin B_{12} contains _____

    (1) nitrogen, cobalt   (2) hydrogen, cobalt   (3) iron, cobalt   (4) nitrogen, iron

81. For an L-R circuit, inductance and resistance are represented by L and R respectively. Then, the dimensions of the quantity (L/R) are identical to those of
   (1) force.
   (2) acceleration.
   (3) time.
   (4) velocity.

82. Which one of the following pairs of physical quantities has the same dimensions?
   (1) Surface tension and tension force
   (2) Velocity and acceleration
   (3) Work and torque
   (4) Force and momentum

83. The SI unit of electric permittivity can be expressed as _____.
   (1) $N\, m^2\, C^{-2}$
   (2) $C^2\, N^{-1}\, m^{-2}$
   (3) $C^2\, N^{-2}\, m^{-2}$
   (4) $C\, N^{-1}\, m^{-1}$

84. The number of significant figures in the light year of nearly 9.46×10^{15} m is
   (1) four.
   (2) three.
   (3) ten.
   (4) fifteen.

85. An object has kinetic energy E when it is projected at the angle of maximum range. Then, at the highest point of its path, the kinetic energy E' of the object will be _____.
   (1) zero
   (2) $E/2$
   (3) $E/\sqrt{2}$
   (4) E

86. A boat which has a speed of 5 km/h in still water is able to cross a river of width 1 km along the shortest possible path in 15 min. Then, the velocity of the river water is _____.
   (1) 3 km/h
   (2) $\sqrt{41}$ km/h
   (3) 4 km/h
   (4) 1 km/h

87. At the top of the trajectory of a projectile, the direction of its velocity and acceleration are likely to be
   (1) perpendicular to each other.
   (2) parallel to each other.
   (3) anti-parallel to each other.
   (4) inclined to each at an angle of 45°.

88. The area under acceleration – time graph represents
   (1) speed.
   (2) displacement.
   (3) distance covered.
   (4) change in velocity.

89. Two objects of masses 1 kg and 4 kg move with equal linear momentum. Then, the ratio of their kinetic energies is _____.
   (1) 2:1
   (2) 1:4
   (3) 4:1
   (4) 1:1

90. The area under the force – time graph of a particle represents
   (1) work.
   (2) power.
   (3) impulse.
   (4) pressure.

91. The working of a jet engine is based on the principle of conservation of
    (1) angular momentum.   (2) linear momentum.
    (3) energy.   (4) mass.

92. The spring force is
    (1) conservative and variable force.
    (2) non-conservative and repulsive force.
    (3) non-conservative and attractive force.
    (4) partially repulsive and partially attractive non-conservative force.

93. A bullet of mass 40 g strikes a target at velocity of 500 m/s that gets reduced to 200 m/s. Then, the loss of energy in the process is _____.
    (1) 2.8 kJ   (2) 5.4 kJ   (3) 4.2 kJ   (4) 3.6 kJ

94. If the momentum of an object increases by 10% then the percentage increase in its kinetic energy is _____.
    (1) 19%   (2) 21%   (3) 20%   (4) 10%

95. Which of the following statements follows the law of conservation of angular momentum?
    (1) Rotational kinetic energy is constant when angular momentum is constant.
    (2) The momentum of the body is conserved.
    (3) The angular momentum of the body is always constant.
    (4) The angular momentum of a body is conserved as long as no external torque acts on it.

96. The escape speed of a rocket, launched from the surface of the planet earth
    (1) depends on the mass of the planet towards which it is moving.
    (2) does not depend on the mass of the earth.
    (3) does not depend on the mass of the rocket.
    (4) depends on the mass of the rocket.

97. If a hole were drilled through the earth along its diameter and a stone is dropped into the hole. When the stone is at the centre of the earth, it possesses finite
    (1) weight.   (2) mass.   (3) potential energy.   (4) acceleration.

98. If M is the mass of the earth and R its radius, then the ratio of the gravitational attraction and the gravitational constant will be _____.
    (1) MR^2 (2) M/R   (3) M/R^2 (4) R^2/M

99. The gravitational field strength on the surface of the earth is _____.
    (1) 0.0 N/kg   (2) 9.8 N/kg   (3) 9.8 m/s^2 (4) 9.8 N/C

100. Detergents, added to hot water, are able to remove oil from objects because
    (1) of high temperature of water.
    (2) the detergents decrease the surface tension of water solution.
    (3) the detergents increase the surface tension of water solution.
    (4) the detergents change obtuse angle of contact to acute angle between oil and the object.

101. A bimetallic strip has been made of two strips of the metals, iron and copper. When the bimetallic strip is heated, then it will
    (1) get twisted.
    (2) bend with iron strip on the convex side.
    (3) bend with copper strip on the convex side.
    (4) not bend at all.

102. Which of the following combinations of physical properties of the material would be most desirable for making a cooking utensil?
    (1) Low specific heat capacity; low thermal conductivity
    (2) Low specific heat capacity; high thermal conductivity
    (3) High specific heat capacity; high thermal conductivity
    (4) High specific heat capacity; low thermal conductivity

103. The equation of state for μ moles of a perfect gas is $PV=\mu RT$, where R is a constant. Then, the SI unit of the constant R is _____.
    (1) $J\ K^{-1}\ g^{-1}$ (2) J/mol K   (3) J/kg K   (4) J/K molecule

104. A sink, which is a system as a colder object where heat is rejected is essential for the conversion of heat into work. From which of the following laws does this inference follow?
    (1) Zeroth law of thermodynamics   (2) First law of thermodynamics
    (3) Second law of thermodynamics   (4) Third law of thermodynamics

105. The frequency of an angular Simple Harmonic Motion (SHM)
    (1) depends on the angular displacement.
    (2) does not depend on the axis of rotation.
    (3) is independent of the angular displacement that may or may not be small enough.
    (4) remains invariant even for large angular displacements within elastic limit where the Hooke's law holds good.

106. An object executes Simple Harmonic Motion (SHM) with an amplitude A. At what displacement from the equilibrium position of the object does the potential energy of the object become one-fourth of its total energy?
    (1) A/4   (2) A/2   (3) 3A/4   (4) A

107. An observer moves towards a stationary source of sound with a velocity v which is one-tenth the velocity of sound v_s. Then, the apparent percentage increase in frequency is _____.
    (1) 0.0%   (2) 10%   (3) 0.1%   (4) 20%

108. A capacitor of capacitance C is given a charge Q to attain a potential difference V. The energy stored in the capacitor will be _____.

    (1) $\left(\dfrac{1}{2}\right)VQ^2$ (2) $\left(\dfrac{1}{2}\right)Q^2/C$ (3) QV (4) $\left(\dfrac{1}{2}\right)QV^2$

109. In a certain region of space, the electric field is zero. It means that in this region, the electric potential is
    (1) zero.
    (2) constant.
    (3) inversely proportional to the distance from the charge.
    (4) directly proportional to distance from the charge.

110. An electric dipole is kept in non-uniform electric field. Then, the dipole will experience
    (1) a force but not a torque.   (2) a torque but not a force.
    (3) both a force and a torque.   (4) neither a force nor a torque.

111. Which of the following is an ohmic resistor, obeying ohm's law?
    (1) Transistor   (2) Carbon resistor   (3) Tungsten wire   (4) Thermistor

112. Kirchhoff's first law at a junction in an electric circuit is based on the law of conservation of
    (1) linear momentum.   (2) mass.   (3) charge.   (4) energy.

113. Two electric bulbs A and B, of 40W and 60W respectively, each rated at 220V are connected in series with a supply of 440V. Which of the two electric bulbs will get fused?
    (1) 40W bulb A
    (2) 60W bulb B
    (3) Both 40W bulb A and 60W bulb B
    (4) Neither 40W bulb A nor 60W bulb B

114. A strong magnetic field is applied on a stationary electron, then the electron
    (1) starts spinning.
    (2) remains stationary.
    (3) moves in the direction of the magnetic field.
    (4) moves in the direction opposite to that of the magnetic field.

115. A magnetic field will
    (1) never exert a force on a charged particle.
    (2) always exert a force on a charged particle.
    (3) exert a force when the charged particle moves along the magnetic field lines.
    (4) exert a force when the charged particle moves perpendicular to the magnetic field lines.

116. Which one of the following can be used to produce a uniform magnetic field?
    (1) The earth
    (2) A long bar magnet
    (3) A long solenoid
    (4) A long circular coil

117. The magnetic moment of a pure diamagnetic atom is
    (1) equal to zero.
    (2) equal to one.
    (3) much greater than one.
    (4) between zero and one.

118. The laws of electromagnetic induction have been used in the design of a/an
    (1) voltmeter.   (2) electric motor.   (3) generator.   (4) galvanometer.

119. Faraday's law of electromagnetic induction is closely related to
    (1) law of conservation of angular momentum.
    (2) law of conservation of energy.
    (3) law of conservation of charge.
    (4) Newton's law of motion.

120. An ideal choke, used along with fluorescent tube, would behave like a
    (1) pure capacitor.
    (2) pure inductor.
    (3) pure resistor.
    (4) combination of an inductor and a capacitor.

121. Which of the following mirrors can be used to obtain a parallel beam of light from a small electric lamp?
    (1) A convex mirror only
    (2) A concave mirror only
    (3) A plane mirror only
    (4) Either a convex mirror or a concave mirror

122. A convex lens made of glass (n=3/2) has a focal length of 10 cm, when placed in air. If the convex lens is immersed in water (n' = 4/3), the focal length of the convex lens will be _____.
    (1) 5 cm   (2) 10 cm   (3) 20 cm   (4) 40 cm

123. Brewster's law for polarisation of light indicates that the polarising angle for a transparent medium depends on
(1) orientation of the plane of vibration.
(2) orientation of the plane of polarization.
(3) the wavelength of light .
(4) neither the wavelength of light nor the refractive index of the transparent medium.

124. A proton and an alpha-particle are accelerated through the same potential difference. The ratio of the de Broglie wavelength of the proton to that of the alpha-particle will be _____.
(1) $\sqrt{2}$:1
(2) 1:1
(3) 2:1
(4) 1:2

125. Spectral lines of Balmer Series are emitted by the hydrogen atom when an electron jumps from
(1) higher orbits to the first Bohr orbit.
(2) higher orbits to the second Bohr orbit.
(3) second Bohr orbit to any other higher orbit.
(4) third Bohr orbit to any other higher orbit.

126. The SI unit of activity of the radioactive sample is
(1) roentgen.
(2) curie.
(3) becquerel.
(4) rutherford.

127. A crystal where conduction band is almost empty and the valence band is completely filled with electrons is a/an
(1) metallic conductor.
(2) insulator.
(3) superconductor.
(4) n-type semi-conductor.

128. The light emitting diode (LED)
(1) emits light when it is reverse biased.
(2) gives light output which increases with temperature.
(3) is usually made from silicon or germanium crystal.
(4) is commonly made from the semiconducting compound gallium arsenide phosphide.

129. Holes are majority charge carriers in
(1) ionic solids.
(2) metals.
(3) n-type semiconductors.
(4) p-type semiconductors.

130. The depletion layer in the pn junction region is caused by
(1) drift of electrons.
(2) drift of holes.
(3) diffusion of charge carriers, electrons and holes, across the pn junction.
(4) migration of impurity ions.

131. The constant term in the expansion of $\left(x^2 - \dfrac{1}{3x} \right)^9$ is _____.

(1) $\dfrac{28}{243}$ (2) $-\dfrac{28}{243}$ (3) $\dfrac{28}{81}$ (4) $-\dfrac{28}{81}$

132. The coefficients of 5th, 6th and 7th terms in the expansion of $(1+x)^n$ are in A.P., then n can take values _____.

(1) 7, 13   (2) 7, 14   (3) 11, 13   (4) 8, 11

133. The number of diagonals that can be drawn by joining the vertices of a dodecagon (polygon with 12 vertices) is _____.

(1) 66   (2) 54   (3) 50   (4) 48

134. The solution set of $\left| x + \dfrac{1}{x} \right| > 2$ is _____.

(1) $R - \{-1, 0, 1\}$ (2) R   (3) R − {0}   (4) R − {1}

135. If $-2x + 17 < -13$, then _____.

(1) $x \in (2, \infty)$ (2) $x \in [-2, \infty)$ (3) $x \in (15, \infty)$ (4) $x \in [-\infty, 15)$

136. The set of values of x satisfying $\left(x^2 - 2x + 1 \right)(x - 4) \geq 0$ is _____.

(1) $(-\infty, 4)$ (2) $(-\infty, 4]$ (3) $(4, \infty)$ (4) $[4, \infty)$

137. $\dfrac{i + i^4}{i^5 + i^6 + i^7 + i^8 + i^9} = $ _____.

(1) $2(1 - i)$ (2) $1 - i$ (3) $\dfrac{1+i}{2}$ (4) $2(1 + i)$

138. Argument of $\dfrac{1 + i\sqrt{3}}{\sqrt{3} + i} = $ _____.

(1) $-\dfrac{\pi}{6}$ (2) $-\dfrac{\pi}{3}$ (3) $\dfrac{\pi}{3}$ (4) $\dfrac{\pi}{6}$

139. For all natural numbers n, $3^{2n} + 7$, is divisible by _____.

(1) 8   (2) 7   (3) 6   (4) 9

140. $x^n - 1$ is divisible by $x - k$ for all natural numbers n. Then the least positive integral value of k is _____.

(1) 1   (2) 2   (3) 3   (4) 4

141. $2 + 4 + 6 + 8 + \ldots + 2n =$ _____ .

    (1) $n(n + 1)$ (2) $2n(n + 1)$ (3) $\dfrac{n(n+1)}{3}$ (4) $\dfrac{2n(n+1)}{3}$

142. The function $f : R \to R$ given by $f(x) = 7^{|x|}$ is
    (1) one-one but not onto.   (2) onto but not one-one.
    (3) neither one-one nor onto.   (4) both one-one and onto.

143. If $n(A) = 4$ and $n(B) = 5$, then total number of onto functions from A to B is _____ .
    (1) 4^5 (2) $5!$ (3) 0 (4) 20

144. Let number of elements in a set A is 3 and X = P(A). Then number of elements in P(X)= _____ .
    (1) 128   (2) 256   (3) 512   (4) 1024

145. Let $A = \{1,2,3\}$ and $B = \{1,2,3,4,5\}$. Then $(A - B) \times (A \cup B) =$ _____ .
    (1) ϕ (2) A   (3) B   (4) $A \cup B$

146. If f is both absolutely continuous on [a, b] and singular on [a, b], then f is _____ .
    (1) discontinuous on [a,b]   (2) constant on [a,b]
    (3) not differentiable on [a,b]   (4) non constant on [a,b]

147. Laplace transform of $\dfrac{\cos At}{t}$ is _____ .

    (1) $\cot^{-1} \dfrac{s}{A}$ (2) $\tan^{-1} \dfrac{s}{A}$ (3) $\cos^{-1} \dfrac{s}{A}$ (4) Does not exist

148. The sum of all numbers between 202 and 401 which are divisible by 9 is _____ .
    (1) 6336   (2) 3366   (3) 6633   (4) 6363

149. How many terms of the progression $6,3,0,-3,-6,-9,\ldots$ are required so that their sum is 9?
    (1) 14   (2) 3   (3) 24   (4) 27

150. If a, b and c are in G.P and $a^l = b^m = c^n$, then which of the following is true?

    (1) $\dfrac{1}{l} + \dfrac{1}{n} = \dfrac{1}{m}$ (2) $\dfrac{1}{l} + \dfrac{1}{n} = \dfrac{1}{2m}$ (3) $\dfrac{1}{l} + \dfrac{1}{n} = \dfrac{2}{m}$ (4) $\dfrac{1}{l} + \dfrac{2}{n} = \dfrac{1}{m}$

151. The number of positive factors and sum of factors of 8669 are _____.
    (1) 5, 24542   (2) 2, 8670   (3) 4, 18250   (4) 6, 36578

152. The equations $ax^2 + 4x + 1 = 0$ and $x^2 + ax + 4 = 0$ has one common root if $a =$ _____.
    (1) -5   (2) 5   (3) 3   (4) -3

153. The equation $ax^2 + rx + 2b$ is divisible by $x - 2a$ and $b - 2x$. Then
    (1) $2 + \dfrac{ab}{4} = \dfrac{b}{2a} - a^2$ (2) $2 + \dfrac{ab}{4} = \dfrac{b}{2a} + a^2$ (3) $2 - \dfrac{ab}{4} = \dfrac{b}{2a} - a^2$ (4) $2 - \dfrac{ab}{4} = \dfrac{b}{2a} + a^2$

154. Determinant of $S_{2 \times 2}$ matrix is same as that of $kS_{2 \times 2}$, then the numbers of such k's is
    (1) finite.   (2) infinite.
    (3) zero.   (4) either 2 or infinite.

155. The length of intercept of the line $2x + y = 5$ between axes is equal to the intercept of the line _____.
    (1) $2x - y = 5$ (2) $x + 2y = 5$ (3) $x - 2y = 5$ (4) $2x + 2y = 5$

156. The equation of the line passing through the intersection of lines $ax + by = c, bx + ay = c$ and having slope $\pi / 2$ is _____.
    (1) $x = c/(a - b)$ (2) $x = (a + b)/c$ (3) $x = (a - b)/c$ (4) $x = c/(a + b)$

157. The image of the point (a,b) in the line $x - 2y = 0$ is $(b, 2a)$. Then $b =$ _____.
    (1) $\dfrac{1}{2}\left(19a \pm \sqrt{5}a\right)$ (2) $\dfrac{1}{2}(5a \pm \sqrt{19}a)$ (3) $\dfrac{1}{2}\left(5a \pm \sqrt{13}a\right)$ (4) $\dfrac{1}{2}\left(13a \pm \sqrt{5}a\right)$

158. The graph of the function $Sin(x) - xCos(x)$ in the interval $\left(0, \dfrac{\pi}{2}\right)$ is
    (1) in 1st quadrant.   (2) in 4th quadrant.
    (3) in both 1st and 4th.   (4) on $x - axis$.

159. The function $\left|Sin(x^2 + 1)\right|$ is not differentiable at _____ points.
    (1) 4   (2) 12   (3) 8   (4) 6

160. Let $2 < f'(x) < 4$ on [2, 5] and $f(2) = 10$. Then $f(5)$ can never take value _____.
    (1) 18   (2) 20   (3) 21   (4) 25

20

161. The positive function $f(x)$ has derivative $f'(x) > f(x)$. Then number of zeroes of $f(x)$ are
_____.

(1) 0

(2) infinite

(3) non zero finite

(4) Can't be determined

162. Expansion in the spherical ball while air is pumped into it is 1.6 mm^3/min. How fast the radius of ball is increasing when radius is 10 cm?

(1) $0.012\,\pi$ cm/min

(2) $0.012\,\pi$ mm/min

(3) $0.024\,\pi$ cm/min

(4) $0.024\,\pi$ mm/min

163. A 5 feet tall man walks away from a lamp post in the night of length 18 feet at the rate of 1.5 km/hour. At what rate length of shadow is decreasing?

(1) 1.2 km/hour

(2) 0.7 km/hour

(3) 0.2 km/hour

(4) 0.9 km/hour

164. Interval where $x^3 - 3x^2 + 5x$ is strictly increasing is _____.

(1) $(-\infty, \infty)$

(2) $\left(-\infty, -\dfrac{1}{3}\right)$

(3) $\left(-\dfrac{1}{3}, \infty\right)$

(4) $\left(-\dfrac{1}{3}, \dfrac{1}{3}\right)$

165. If $\int 17^x \left(2x + x^2 \ln 17\right) dx$ then _____.

(1) $17^x x + C$

(2) $17^x x^2 + C$

(3) $17^x + C$

(4) $17^x x^3 + C$

166. If $\int \tan^5 x\, dx = a \tan^4 x + b \tan^2 x - \ln|\sec x| + C$ then _____.

(1) $a = \dfrac{1}{4}, b = -\dfrac{1}{2}$

(2) $a = -\dfrac{1}{4}, b = -\dfrac{1}{2}$

(3) $a = \dfrac{1}{4}, b = \dfrac{1}{2}$

(4) $a = \dfrac{1}{4}, b = -\dfrac{1}{4}$

167. $\displaystyle \lim_{n \to \infty} \frac{1}{n} \sum_{r=1}^{2n} \frac{r}{\sqrt{n^2 + r^2}}$ is _____.

(1) $\sqrt{5} - 1$

(2) $\sqrt{5} + 1$

(3) $-\sqrt{5} - 1$

(4) $-\sqrt{5} + 1$

168. Area enclosed by $|y| = 1 - x^2$ and $x^2 + y^2 = 1$ is _____.

(1) $\pi - \dfrac{8}{3}$

(2) $\pi + \dfrac{8}{3}$

(3) $\pi - \dfrac{4}{3}$

(4) $\pi + \dfrac{4}{3}$

169. Solution of differential equation $x\,dy - y\,dx = \sqrt{x^2 - y^2}\,dx$ is _____.

(1) $Cy = e^{\sin^{-1} y/x}$

(2) $Cx = e^{\cos^{-1} y/x}$

(3) $Cx = e^{\sin^{-1} y/x}$

(4) $Cy = e^{\cos^{-1} y/x}$

170. Solution of differential equation $xy\left(1 + xy^2\right)\dfrac{dy}{dx} = 1$ is _____.

(1) $x\left(2 - y + Ce^{-y^2}\right) = 1$

(2) $x^2\left(2 - y + Ce^{-y^2}\right) = 1$

(3) $x\left(2 - y^2 + Ce^{-y^2}\right) = 1$

(4) $x^2\left(2 - y^2 + Ce^{-y^2}\right) = 1$

171. The solution of $\dfrac{dx}{dy}+\dfrac{x}{y}=y^5$, $y=1$ for $x=1$ is _____.

(1) $6xy=y^6+5$ (2) $7xy=y^7+6$ (3) $6xy=y^6-1$ (4) $7xy=y^7+1$

172. If the vectors $3a\hat{i}+b\hat{j}+c\hat{k}$, $b\hat{i}+c\hat{j}+3a\hat{k}$ and $c\hat{i}+3a\hat{j}+b\hat{k}$ are coplanar, then line $ax+by+c=0$ will always pass through _____.
(1) (1,3)   (2) (–1,3)   (3) (3,–1)   (4) (3,1)

173. If $\vec{a}=\hat{i}+\hat{j}+\hat{k}$, $\vec{b}=2t+3\hat{j}+4\hat{k}$ and $c=\hat{i}+t\hat{j}+t^2\hat{k}$ are linearly dependent then possible value(s) of t is/are _____.
(1) 1,–1   (2) 1   (3) –1   (4) 1,0

174. The number of vectors of unit length perpendicular to the vector $\vec{a}=\hat{i}+\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}-\hat{j}$ is _____.
(1) 0   (2) 1   (3) 2   (4) infinite

175. Equation of the plane that contains the lines $\dfrac{x+1}{3}=\dfrac{y-2}{2}=\dfrac{z}{1}$ and $\dfrac{x-3}{3}=\dfrac{y+4}{2}=\dfrac{z-1}{1}$ are ____.
(1) $8x+y-16z+6=0$ (2) $8x-y+16z+6=0$
(3) $8x+y-26z+6=0$ (4) $8x+y+26z+6=0$

176. The image of the point P(1,2,3) in the plane $x+y+z=3$ is _____.
(1) (–1,0,1)   (2) (1,0,–1)   (3) (–1,0,–1)   (4) (1,0,1)

177. If A and B are independent events, then which of the following is false?
(1) $P(A\cap B)=P(A).P(B)$ (2) $P(A/B)=P(A)$
(3) $P(B/A)=P(A)$ (4) $P(A\cap B)=0$

178. What is the probability that the sum of two dices will be greater than 9, given that the first dice is 5?
(1) $\dfrac{2}{5}$ (2) $\dfrac{3}{6}$ (3) $\dfrac{2}{6}$ (4) $\dfrac{2}{36}$

179. Matrix $\begin{bmatrix} 0 & 1/\sqrt{5} & 2/\sqrt{5} \\ 1 & 0 & 0 \\ 0 & 2/\sqrt{5} & 1/\sqrt{5} \end{bmatrix}$ is _____.

(1) Normal but not Orthogonal   (2) Normal and Orthogonal
(3) Orthogonal but not Normal   (4) None of these

180. If A is an upper triangular with all diagonal entries zero, then $I+A$ is
(1) Singular.   (2) Invertible.   (3) Symmetric.   (4) Hermitian.

181. Which three countries have finalized the draft of the Chabahar Trilateral Agreement on transport and transit corridors in April 2016?
   (1) India, Nepal and Bhutan
   (2) India, Afghanistan and Iran
   (3) India, Pakistan and Afghanistan
   (4) India, Bangladesh and Myanmar

182. Which country won the 25th edition of Sultan Azlan Shah Hockey tournament 2016?
   (1) India
   (2) Pakistan
   (3) Australia
   (4) New Zealand

183. The BRICS New Development Bank (NDB) has approved its first package of loans worth 811 million dollars for four_____ Projects in Brazil, China, South Africa and India.
   (1) New Highway
   (2) Space Research
   (3) Railway
   (4) Renewable Energy

184. Where did the first ever Maritime India Summit 2016 take place in April 2016?
   (1) Mumbai
   (2) New Delhi
   (3) Chennai
   (4) Kolkata

185. India is negotiating with which one of the following countries to buy the two engine fighter aircraft 'Rafale'?
   (1) The USA
   (2) Germany
   (3) France
   (4) The UK

186. Which one of the following Indian film stars is promoting the 'melange', the range of fashion clothing from the house of Lifestyle?
   (1) Farhan Akhtar
   (2) Kangana Ranaut
   (3) Anushka Sharma
   (4) Hrithik Roshan

187. The World Heritage Day is celebrated every year on
   (1) April 18.
   (2) March 08.
   (3) April 07.
   (4) March 23.

188. In which one of the following cities, the Iron Fist 2016 exercise (air power demonstration) was conducted by the Indian Air Force (IAF) in March 2016?
   (1) Gujarat
   (2) Punjab
   (3) Maharashtra
   (4) Rajasthan

189. Mathematician Andrew J Wiles who won the prestigious 2016 Abel Prize given by the Norwegian Academy of Sciences and Letters belongs to
   (1) Finland.
   (2) The UK.
   (3) Canada.
   (4) Sweden.

190. The Union Ministry of Health and Family Welfare has recently launched India's first indigenous rotavirus vaccine named 'Rotavac' to combat infant mortality due to
   (1) Polio.
   (2) Measles.
   (3) Tetanus.
   (4) Diarrhea.

191. According to the Chinese Zodiac, 2016 is the year of the ____, which has started from 08 February 2016.
    (1) Rabbit   (2) Dragon   (3) Monkey   (4) Snake

192. Which among the following group of nations has successfully launched 'ExoMars 2016', an unmanned spacecraft to search for biosignatures on Mars?
    (1) Europe and Russia   (2) The USA and South America
    (3) The UK and China   (4) Brazil and Japan

193. Who among the following has been selected for the Padma Vibhushan 2016 in the field of Medicine-Oncology?
    (1) Vishwanathan Shanta   (2) Ramoji Rao
    (3) Vasudev Kalkunte Aatre   (4) Avinash Dixit

194. Dipa Karmakar, the Indian female player who has qualified for 2016 summer Olympics is a
    (1) Shuttler.   (2) Gymnast.   (3) Archer.   (4) Wrestler.

195. Who has been selected as the first female Chief Justice of Supreme Court of Nepal by the constitutional council of Nepal in April 2016?
    (1) Bidhya Devi Bhandari   (2) Sushila Karki
    (3) Onsari Gharti Magar   (4) None of these

196. According to the recent information by World Wildlife Fund (WWF) and the Global Tiger Forum (GTF), the global tiger population has increased by _____ after a century of constant decline.
    (1) 9%   (2) 14%   (3) 19%   (4) 22%

197. Researchers of which country have developed recently Graphene based all-weather solar cell that can generate electricity even during rains?
    (1) India   (2) China   (3) Japan   (4) Korea

198. Recently, Mother Teresa has been posthumously conferred with the prestigious Founders Award 2016 given by
    (1) United Kingdom.   (2) Japan.   (3) Italy.   (4) The USA.

199. A bronze bust of ancient Indian mathematician and astronomer Aryabhatta was recently unveiled at the
    (1) UNESCO Headquarters, Paris.   (2) United Nations Headquarters, New York
    (3) United Nations Office, Geneva   (4) United Nations Office, Vienna

200. Which country has won the 2016 Asian Nations Cup Chess men's tournament?
    (1) China   (2) India   (3) Iran   (4) Vietnam