All questions are compulsory.

There are five major sections in this paper - English, Mathematics, Physics, Chemistry and IQ. There is no negative marking.

The marks wise distribution of each of the section is as follows

Section	Subject	Marks	Time [Suggested]
A	English	8 + 6 + 6	30 Minutes
B	Mathematics	20	45 Minutes
C	Physics	20	30 Minutes
D	Chemistry	20	30 Minutes
E	IQ	10	15 Minutes

You are advised to spend the suggested time.

Please darken the appropriate answer in the provided answer sheet.

Special Note: The highest score obtained in either Physics or Chemistry will be considered for the evaluation.

Section A: English

The Battle of Chancellorsville

The Battle of Chancellorsville, one of the most famous battles of the Civil War, took place in Virginia in the spring of 1863. For months, the two armies had been staked out on opposite banks of a narrow river. The Confederate troops were led by perhaps the most revered military tactician in American history, General Robert E. Lee. The Union soldiers were led by "Fighting" Joe Hooker.

Paragraph II

In appearance, personality, and lifestyle, these men were nearly perfect opposites. Lee, an older man in poor health with a gray beard, had a somber, measured demeanor. Hooker was a blond, strapping young man whose vanity over his appearance was but one aspect of his egotism. Whereas Lee was devout and principled, Hooker was known for his rollicking enjoyment of both women and whiskey.

Paragraph III

Despite the fact that the Confederacy had won the last four major battles and the Union soldiers were famished, exhausted, and demoralized, Hooker proclaimed, "My plans are perfect. And when I start to carry them out, may God have mercy on Bobby Lee, for I shall have none." Why, aside from a propensity for narcissism, was Hooker so confident?

Paragraph IV

Hooker had used spies, analysts, and even hot air balloons to compile a vast amount of intelligence about Lee's army. He had discerned, for example, that Lee had only 61,000 men to Hooker's own 134,000. Buoyed by his superior numbers, Hooker covertly moved 70,000 of his men fifteen miles up and across the river, and then ordered them to sneak back down to position themselves behind Lee's army. In effect, Hooker had cut off the Confederate soldiers in front and behind. They were trapped. Satisfied with his advantage, Hooker became convinced that Lee's only option was to retreat to Richmond, thus assuring a Union victory.

Paragraph V

Yet Lee, despite his disadvantages of both numbers and position, did not retreat. Instead, he moved his troops into position to attack. Union soldiers who tried to warn Hooker that Lee was on the offensive were dismissed as cowards. Having become convinced that Lee had no choice but to retreat, Hooker began to ignore reality. When Lee's army attacked the Union soldiers at 5:00 p.m., they were eating supper, completely unprepared for battle. They abandoned their rifles and fled as Lee's troops came shrieking out of the brush, bayonets drawn. Against all odds, Lee won the Battle of Chancellorsville, and Hooker's forces withdrew in defeat.

1. Based on information in the passage, it can be concluded that Hooker lost the Battle of Chancellorsville mostly because of his

   A. Vanity
   B. Ignorance
   C. Overconfidence
   D. faulty information

2. The contrast drawn between Lee and Hooker in paragraph 2 is intended to

   A. showcase the different backgrounds and personal histories of these two enemy soldiers
   B. provide support for the idea that Lee was a more virtuous person than Hooker, and therefore a better military commander
   C. prove that two men with very different values could end up in similar positions of power
   D. imply that these men fundamentally differed in their approaches to nearly everything, including battle

3. In paragraph 3, the author quotes Hooker as saying, "My plans are perfect. And when I start to carry them out, may God have mercy on Bobby Lee, for I shall have none." The author most likely includes this quote in order to

   A. demonstrate Hooker's belief in his own infallibility
   B. provide an example of the way language has changed since 1863
   C. reveal that Hooker was a deeply religious man in spite of his lifestyle
   D. foreshadow Hooker's defeat at the hands of Lee's army

4. Based on its use in paragraph 3, it can be inferred that the word propensity belongs to which of the following word groups?

   A. fondness, partiality, affection
   B. flaw, fault, shortcoming
   C. distaste, aversion, dissatisfaction
   D. tendency, inclination, predisposition

5. How many men did Hooker position behind Lee's army?

   A. 61,000
   B. 70,000
   C. 73,000
   D. 134,000

6. As used in paragraph 4, buoyed most nearly means

   A. strengthened
   B. anchored
   C. floated
   D. heartened

7. According to the author, Hooker's advantages going into the Battle of Chancellorsville included I. numbers II. position III. strategy

    A. I only
    B. II only
    C. I and II only
    D. II and III only

8. As used in paragraph 4, buoyed most nearly means

    A. Dialogue
    B. specific examples
    C. vivid details
    D. sensory words

9. If this passage were to continue, which of the following would most likely be the first sentence of the next paragraph?

    A. His army routed, Hooker and his reduced forces hobbled south, back to the center of Confederate operations where he was harshly rebuked for having squandered his vast army.
    B. In all his days of fighting, Hooker had never been met with such surprise and opposition; he took to solemn contemplation of the events that had transpired as well as the lessons he might learn from them.
    C. Wounded in both body and spirit, Hooker and his severely diminished forces retreated to higher ground where they proceeded to reload their weapons and prepare for a counter attack.
    D. Not one to gloat over his success, Lee remarked that the victory had been the product of valiant fighting and good luck, as he began to map out strategies for their next move.

ANALOGY

10. ELECTED : (____) :: CONDEMNED : EXECUTION

    A. graduation
    B. inauguration
    C. dismissal
    D. exhibition

11. DIVIDEND : STOCKHOLDER :: (____) : AUTHOR

    A. patent
    B. royalty
    C. wage
    D. interest

12. (____) : LENIENT :: MISER : CHARITABLE

    A. philanthropist
    B. virtuoso
    C. hedonist
    D. authoritarian

13. ALLAY : SUSPICION :: (____) : FEAR

    A. plant
    B. anger
    C. generate
    D. calm

14. (____) : PARALLELOGRAM :: 1 : 2

   A. square
   B. rhombus
   C. trapezium
   D. cube

15. The airplane manufacturer realized a flaw in its design when tests revealed that the cabin door required too much force to be opened in an emergency: for safety purposes, the door needs to be difficult to open but not _____.

   A. indelible
   B. immutable
   C. immobile
   D. impossible

16. When the headlights shone on the raccoon that was foraging in the trash, the alarmed critter _____ away.

   A. pilfered
   B. scurried
   C. dawdled
   D. trespassed

17. The three-legged race is _____ teambuilding activity: when two people are _____ together, they must communicate effectively in order to move forward.

   A. a superb ... weaned
   B. an excellent ... yoked
   C. an obvious ... waffled
   D. an ineffective ... cuffed

18. Many voters were turned off by the mayoral candidate's reliance on _____; he seemed unable to answer a question in a straightforward, nonevasive manner.

   A. circumlocution
   B. eloquence
   C. terseness
   D. conciseness

19. Due to a conflict of interest, the judge was forced to _____ herself from hearing the case and _____ from voting in the decision.

   A. A. remove ... pander
   B. quell ... forgo
   C. abjure ... afford
   D. recuse ... abstain

20. Because of rumors that the ship's passengers were sick with a terrible plague, the port _____ the ship and refused to let it dock.

   A. begrudged
   B. nurtured
   C. purported
   D. quarantined

Section B: Mathematics

21. If f(x) = 3x², then F(x) =

    A. 6x
    B. x³
    C. x³ + C
    D. 6x + C

22. The 2nd derivative of a function at point P is 0, and concavity is positive for values to the right of P. What must the concavity be to the left of P for P to be an inflection point?

    A. The concavity must also be positive.
    B. The concavity must be negative.
    C. The concavity must be neutral.
    D. The concavity must be imaginary.

23. The function y=f(x) will have a point of inflection at that point when

    A. f''(x)>0
    B. f''(x)=0
    C. f'(x)>0
    D. f'(x)=0

24. If A and B are symmetric matrices of same order, then AB is symmetric if and only if A and B are

    A. Commutative
    B. Associative
    C. A=0, B=0
    D. None

25. Find the points on circle 5x² + 5y² = 320 such that a line segment joining them would have slope = ∞

    A. (0,8) and (0,-8)
    B. (-3,4) and (-3,-4)
    C. (3,4) and (3,-4)
    D. All of the above

26. What is the slope of the line whose equation is 3x - 4y - 16 = 0?

    A. ¾
    B. 4/3
    C. -3/4
    D. 3

27. The tangent to the curve with equation $y = 2x^2 - 1$ is drawn at the point where $x = 0$. What is the gradient of this tangent?

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

28. 10. Which of these equations represents a line parallel to the line 2x + y = 6?

    A. y = 2x + 3

B. y - 2x = 4
C. 2x - y = 8
D. y = -2x + 1

29. $\int x \cos x^2 \, dx$ is equal to

    A. $x\sin x^2$
    B. ½ $x^2 \sin x^2$
    C. ½ $\sin x^2$
    D. ½ $\cos x^2$

30. Find the equation of the line that has a slope of -2 and a y-intercept of -9.

    A. y = 2x - 9
    B. y = 2x + 9
    C. y = -2x - 9
    D. y = -2x + 9

31. The third term of an A.P. is 7 and its term is 2 more than thrice of its 3rd term. The first term is

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

32. The value of $(1-w)(1-w^2)(1-w^4)(1-w^5)$ equals

    A. 1
    B. 3
    C. 9
    D. 27

33. The equation of straight line passing through the point (-1,3) and and x-intercept is thrice the y- intercept is

    A. x + 3y = 8
    B. x – 3y = 5
    C. c. x – 3y = 8
    D. b. x + 3y = 5

34. $\lim\limits_{x \to 0} \dfrac{1-\cos 3x}{3x^2} =$

    A. 0
    B. 1
    C. ∞
    D. 3/2

35. The length of perpendicular from the point (1,1) to the line joining (0,4) to the point of intersection of 3x+4y-9=0 with the axis is

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

36. If two pairs of lines $ax^2 + 2hxy + by^2 + 2gx + 2fx + c = 0$ intersect on u-axis then

    A. $f^2=bc$
    B. $g^2=ac$
    C. $f^2+g^2=1$
    D. af + bg =c

37. The value of "k" for which $3x^2-4kxy+5x^2=0$ represents a pair of coincident lines is

A. $k= -\frac{3}{2}$

B. $k = \pm \frac{\sqrt{15}}{2}$

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

D. $k = \pm \frac{1}{\sqrt{2}}$

38, The least positive integer n for which $(1+i)^{2n}=(1-i)^{2n}$ is

A. 2

B. 4

C. 1

D. None

39. The parametric equations $x = at2$ and $y = 4at$, $t \, \varepsilon \, R$ represents,

A. parabola

B. hyperbola

C. ellipse

D. circle

40. The area of triangle formed by joining the mid points of its side is

A. 2(area of triangle)

B. 4(area of triangle)

C. 3(area of triangle)

D. $\frac{1}{4}$ (area of triangle)

Section C: Physics

41. Is there any electric field inside the capacitor?

A. No.

B. Yes.

C. Only when it holds a certain charge.

D. Cannot be predicted.

42. The AC meter always measures:

A. Average value

B. Peak value

C. RMS value

D. None of the above

43. Electrostatic field cannot,

A. Be circular

B. Intersect

C. Be directed towards negative terminal

D. Both a. and b.

44. A force of 120N and a force of 20N acting simultaneously at a point may produce a resultant force of:

A. 80 N

B. 140 N

C. 160 N

D. 150 N

45. The acceleration of a particle in S.H.M is

    A. Always zero

    B. Always constant

    C. Maximum at extreme position

    D. Maximum at equilibrium position

46. Two wires P and Q are made from the same material. Wire P is initially twice the diameter and twice the length of wire Q. The same force, applied to each wire, causes the wires to extend elastically. What is the ratio of the extension in P to that in Q?

    A. ½

    B. 1

    C. 2

    D. 4

47. A ball is thrown horizontally in still air from the top of a very tall building. The ball is affected by air resistance. What happens to the horizontal and to the vertical components of the ball's velocity?

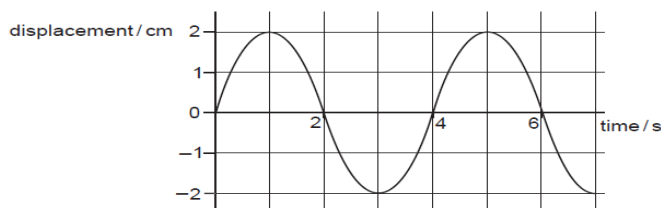|	Horizontal component of velocity	Vertical component of velocity
A.	Decreases to zero	Increases at a constant rate
B.	Decrease to zero	Increases to a constant rate
C.	Remains constant	Increases at a constant rate
D.	Remains constant	Increases to a constant rate

48. A student writes some statements about solids, liquids and gases.
- Solids are rigid because the molecules in a solid vibrate
- Liquids flow because the molecules in a liquid are closer than in a gas
- Gases are less dense than liquids because the molecules in a gas move randomly

Which statement is correct?

    A. 1 only

    B. 1 and 3 only

    C. 2 and 3 only

    D. None of above

49. The graph shows how the displacement of a particle in a wave varies with time.

Which of the following statement is true?

A. The wave has an amplitude of 2cm and could be either transverse or longitudinal
B. The wave has an amplitude of 2cm and must be transverse
C. The wave has an amplitude of 4cm and could be either transverse or longitudinal
D. The wave has an amplitude of 4cm and must be transverse

50. Which logic gate is also known as Universal gate?

A. AND gate
B. NAND gate
C. NOT gate
D. NOR gate

51. Swimming is possible by the

A. First law of motion
B. Second law of motion
C. Third law of motion
D. Newton's law of gravitation

52. For a hollow cylinder and a solid cylinder of the same mass and radius rolling without slipping on an inclined plane, which of these reaches the ground earlier?

A. Hollow cylinder
B. Solid cylinder
C. Both reaches simultaneously
D. Cannot say anything

53. Which of the following is not a perfectly inelastic collisions?

A. Striking of two glass balls
B. A bullet striking a bag of sand
C. An electron captured by proton
D. A man jumping onto moving cart

54. A grass hopper finds that it can jump a maximum horizontal distance of 1 m. The speed at which it jumps is

A. 1 m/s
B. 1.5 m/s
C. 2.24 m/s
D. 3.2 m/s

55. Two capacitors 3μf and 6μF are in series and combination is charged to a potential difference of 120 V. What is the potential across 3μF capacitor?

A. 60V
B. 80V
C. 120V
D. 240V

56. A copper disc has a hole. If the disc is heated, the size of hole

A. Increase
B. Decrease

C. Remains Same
D. First Decrease then increase

57. A particle in uniform rectilinear motion can posses

    A. Radial acceleration
    B. Tangential acceleration
    C. Both (a) and (b)
    D. None of the above

58. The velocity time graph of a body moving with constant acceleration is

    A. Straight line with –ve slope.
    B. Straight line with +ve slope.
    C. Straight ine parallel to X-axis
    D. Straight line parallel to Y-axis

59. In PN junction diode, when no potential is applied:

    A. Holes diffuse from P to N and electrons from N to P
    B. A small electric current is set up
    C. No effect
    D. Holes only diffuse from P to N.

60. Voltage gain of amplifier depends on

    A. Load resistance
    B. Voltage applied
    C. Current
    D. None

Section D: Chemistry

61. Which is not a case of oxidation

    A. Burning of coal
    B. Rusting of iron
    C. Combustion of CH_4
    D. Conversion of alcohol into alcohol

62. The conjugate acid of $H_2PO_4^-$ is

    A. H_3PO_4
    B. H_2PO_3
    C. PO_4^{3-}
    D. H_3O^+

63. Which of the following gases contains contain same number of molecules as 16g of oxygen?

    A. 16g of O_3
    B. 16g of SO_2
    C. 32g of SO_2
    D. All of the above

64. Hematite is an ore of:

   A. Copper
   B. Iron
   C. Silver
   D. Mercury

65. When magnesium nitrate, Mg (NO3)2.7H2O, is heated, which three gases are given off?

   A. Dinitrogen oxide, oxygen, water vapor
   B. Hydrogen, nitrogen, oxygen
   C. Hydrogen, nitrogen dioxide, oxygen
   D. Nitrogen dioxide, oxygen, water vapor

66. Which element shows the greatest tendency to form some covalent compounds?

   A. Aluminum
   B. Magnesium
   C. Neon
   D. Potassium

67. Copper, Silver and gold are called

   A. Alkali metals
   B. Alkaline metals
   C. Coinage metals
   D. Active metals

68. Aqueous solution of FeCl3 is

   A. Acidic
   B. Basic
   C. Amphoteric
   D. Neutral

69. The equivalent mass of KMnO4 in acidic medium is

   A. M/2
   B. M/3
   C. M/4
   D. M/5

70. An atom of an element contains 13 electrons. Its nucleus has 14 neutrons. The mass number of element is
   A. 14
   B. 13
   C. 27
   D. 44

71. The hydrogen bonding is strongest in.

   A. O-H----S
   B. F-H----F
   C. S-H-----O
   D. F-H-----O

72. According to Hess's Law the change in enthalpy in chemical reaction depends on the.

    A. Intermediate State
    B. Initial State
    C. Initial and Final State
    D. Final State

73. Mass of CO_2 formed by reaction of 8 gm of CH_4 with 48 gm of O_2 is

    A. 22 gm
    B. 16.5 gm
    C. 11 gm
    D. 33 gm

74. The ratio of RMS speed to average speed of gas molecule at a particular temperature is

    A. 1.086:1
    B. 1:1.086
    C. 2:1.086
    D. 1.086:2

75. A zero order reaction is one:

    A. in which reactants do not react
    B. whose rate increases with time
    C. whose rate decreases with time
    D. whose rate does not change with time

76. 75% of the first order reaction was completed in 32 minutes. When was 50% of the reaction completed?

    A. 12 minutes
    B. 16 minutes
    C. 21 minutes 20 seconds
    D. 24 minutes

77. A hydrated salt when exposed to air loses water, it is called

    A. Efflorescent
    B. Deliquescent
    C. Hydroscopic
    D. None

78. The equivalent weight of bicarbonate ion is:

    A. 31.75
    B. 49
    C. 61
    D. 98

79. The molality of 4% by weight of NaOH solution is:

    A. 1.40
    B. 1.42
    C. 1.04
    D. 2.08

80. The conjugate acid of $H_2PO_4^-$ is

    A. H_3PO_4
    B. H_2PO_3
    C. PO_4^{3-}
    D. H_3O^+

Section E: IQ

81. Which number should come next in this series? 25,24,22,19,15

    A. 4
    B. 5
    C. 10
    D. 14

82. Which word does not belong? apple, marmalade, orange, cherry, grape

    A. Apple
    B. Marmalade
    C. Orange
    D. cherry

83. At the end of a banquet 10 people shake hands with each other. How many handshakes will there be in total?

    A. 100
    B. 20
    C. 45
    D. 50

84. The day before the day before yesterday is three days after Saturday. What day is it today?

    A. Monday
    B. Tuesday
    C. Wednesday
    D. Friday

85. Select the number that best completes the analogy 10 : 6 :: 3 : ?
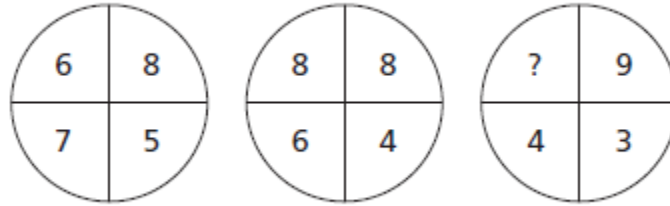
    A. 2
    B. 1
    C. -1
    D. 12

86. Which number should come next in the series 1, 3, 6, 10, 15,

    A. 8
    B. 11
    C. 24
    D. 21

87. 165135 is to peace as 1215225 is to

A. Lead
B. love
C. loop
D. castle

88. What number should replace the question mark?

A. 26
B. 36
C. 46
D. 56

89. What number should replace the question mark? 926 : 24, 799 : 72. 956 : ?

A. 41
B. 51
C. 61
D. 71

90. What is the value of x? 64 − 12 × 2 + 6 ÷ 3 = x

A. 32
B. 52
C. 22
D. 42