24. The rank of $\begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & -1 \\ -1 & 1 & 1 \end{bmatrix}$ is: __3__.

25. The Rank of $\begin{bmatrix} 1 & 2 & 3 & 1 \\ 2 & 4 & 6 & 2 \\ 1 & 2 & 3 & 2 \end{bmatrix}$ is __2__.

PHYSICS
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONLY ONE option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and –1 in all other cases

26. Rain is falling vertically at $10\sqrt{3}$ kmph. A man is running at 10 kmph. The angle with vertical at which he should hold his umbrella is
    (A) 60^0 (B) 45^0
    (C) 30^0 (D) 15^0

27. A person can swim in still water at 5 m/s. He moves in a river of velocity 3 m/s, first down the stream and next same distance up the stream. The ratio of times taken are
    (A) 1:1   (B) 1:2
    (C) 1:4   (D) 4:1

28. A boat covers certain distance between two spots on a river taking 't₁' time, going downstream and 't₂' time going upstream, what time will be taken by the boat to cover the same distance in still water
    (A) $\dfrac{t_1 + t_2}{2}$ (B) $\dfrac{t_1}{2} + \dfrac{3}{4}t_2$
    (C) $\dfrac{2t_1 t_2}{t_1 + t_2}$ (D) $\dfrac{t_1 + t_2}{2t_1 t_2}$

29. When it is raining vertically down, to a man walking on road the velocity of rain appears to be 1.5 times his velocity. To protect himself from rain he should hold the umbrella at an angle θ to vertical. Then $\tan\theta =$
    (A) $\dfrac{2}{\sqrt{5}}$ (B) $\dfrac{\sqrt{5}}{2}$
    (C) $\dfrac{2}{3}$ (D) $\dfrac{3}{2}$

30. A boat moves perpendicular to the bank with a velocity of 7.2 km/h. The current carries it 150m downstream, find the velocity of the current(The width of the river is 0.5 km).
    (A) 0.4 ms⁻¹   (B) 1.2ms⁻¹
    (C) 0.5 ms⁻¹   (D) 0.6 ms⁻¹

31. A person swims at 135° to current of river, to meet target on reaching opposite point. The ratio of person's velocity to river water velocity is
    (A) $\sqrt{3}:1$ (B) $\sqrt{2}:1$
    (C) $1:\sqrt{2}$ (D) $1:\sqrt{3}$

32. The velocity of water in a river is 2 kmph, while width is 400 m. A boat is rowed from a point rowing always aiming opposite point at 8 kmph of still water velocity. On reaching the opposite bank the drift obtained is
    (A) 93 m   (B) 100.8 m
    (C) 112.4 m   (D) 100 m

33. The vector sum of two vectors of magnitudes 10 units and 15 units can never be
    (A) 28 units   (B) 22 units
    (C) 18 units   (D) 8 units

34. Resultant of two vectors of magnitude P and Q is of magnitude 'Q'. If the magnitude of overline $\overline{Q}$ is doubled now the angle made by new resultant with $\overline{P}$
    (A) 30^0 (B) 90^0
    (C) 60^0 (D) 120^0

35. The square of the resultant of two forces 4 N and 3 N exceeds the square of the resultant of the two forces by 12 when they are mutually perpendicular. The angle between the vectors is
    (A) 30^0 (B) 60^0
    (C) 90^0 (D) 120^0

36. Two forces each numerically equal to 10 dynes are acting as shown in the following figure, then the resultant is
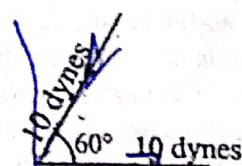
    (A) 10 dynes   (B) 20 dynes
    (C) $10\sqrt{3}$ dynes   (D) 5 dynes

RANKRIDGE IIT JEE/NEET JUNIOR COLLEGE (LONGTERM)
TELANGANA

STREAM: JR MPC
Time: 3:00 Hours

WEEKEND TEST-06

Date: 28-07-2025
Max Marks: 300

SYLLABUS

MATHEMATICS : Mathematical induction & Matrices

PHYSICS : Motion in a Plane: Addition of vectors, Parallelogram law, Lami's theorem, Motion of a boat in river, Rain umbrella.

CHEMISTRY : PERIODIC CLASSIFICATION OF ELEMENTS: From introduction to ionisation potential

MATHEMATICS
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONLY ONE option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and −1 in all other cases

1. If $a_n = \sqrt{7 + \sqrt{7 + \sqrt{7 + ...}}}$ having 'n' radical signs then by methods of mathematical induction which is true

   (A) $a_n > 7, \forall n \geq 1$ (B) $a_n < 2, \forall n \geq 1$
   (C) $a_n < 7, \forall n \geq 1$ (D) $a_n > 13, \forall n \geq 1$

2. $\forall n \in N, \dfrac{n^4}{24} + \dfrac{n^3}{4} + \dfrac{11n^2}{24} + \dfrac{n}{4}$ is a

   (A) Rational Number   (B) Integer
   (C) Natural Number   (D) Real Number

3. The greatest +ve integer which divides $(n+1)(n+2)....(n+r)$, for all $n \in N$ is

   (A) $(r+1)!$ (B) $r!$
   (C) r (D) $r-1$

4. $1^3 - 2^3 + 3^3 - 4^3 + ... + 9^3 =$

   (A) 425   (B) −425
   (C) 475   (D) −475

5. $\dfrac{1}{1.3} + \dfrac{1}{3.5} + \dfrac{1}{5.7} + ...(n-3)$ terms

   (A) $\dfrac{n}{n+2}$ (B) $\dfrac{n+1}{n(n+5)}$
   (C) $\dfrac{n-3}{2n-5}$ (D) $\dfrac{n-3}{n(2n-3)}$

6. If $1 + 5 + 12 + 22 + 35 + ... +$ upto 'n' terms $= \dfrac{n^2(n+1)}{2}$ then n^{th} term of L.H.S is

   (A) $\dfrac{n(4n-1)}{3}$ (B) $\dfrac{n(3n-1)}{2}$
   (C) $\dfrac{n(3n+1)}{2}$ (D) $\dfrac{n(4n+1)}{2}$

7. $\forall n \in N, 7^{2n} + 3^{n-1}.2^{3n-3}$ is divisible by

   (A) 50   (B) 25
   (C) 2425   (D) 2550

8. If $t_n = \sum_1^n n$, then $t_n' = \sum_1^n t_n =$

   (A) $\dfrac{n(n+1)}{2}$ (B) $\dfrac{n(n+3)}{2}$
   (C) $\dfrac{n(n+1)(n+2)}{6}$ (D) $\dfrac{n(n+4)}{3}$

9. $4^3 + 5^3 + 6^3 + ... + 10^3 =$

   (A) 1905   (B) 2358
   (C) 2447   (D) 2989

10. For any $n \in N$, the values of the expression $\sqrt{2 + \sqrt{2 + \sqrt{2 + ... n\,times}}}$ is

    (A) $2\cos\left(\dfrac{\pi}{2^{n+1}}\right)$ (B) $2\sin\left(\dfrac{\pi}{2^{n+1}}\right)$
    (C) $\sqrt{2}\cos(2^{n+1}\pi)$ (D) $2\cos(2^n\pi)$

11. The value of the sum in the 50th bracket of $(1) + (2+3) + (4+5+6) + (7+8+9+10) + ...$ is

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37. If $|\vec{A}-\vec{B}|=|\vec{A}|-|\vec{B}|$, the angle between $\vec{A}$ and $\vec{B}$ is
    (A) 60^0 (B) 0^0
   (C) 120^0 (D) 90^0

38. Five equal forces each of 20N are acting at a point in the same plane. If the angles between them are same, the resultant of these forces is
    (A) 0   (B) 40N
    (C) 20N   (D) $20\sqrt{2}N$

39. A boy is hanging from a horizontal branch of a tree. The tension in the arms will be maximum when the angle between the arms is
    (A) 0^0 (B) 30^0
    (C) 60^0 (D) 120^0

40. If 'P' is in equilibrium then $\dfrac{T_1}{T_2}$ is

    T_1 30^0 P 60^0 T_2

    900 N
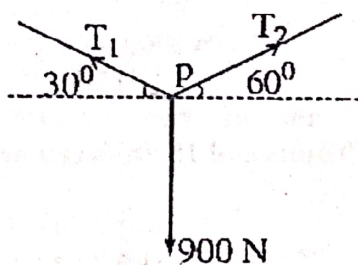
    (A) $\sqrt{3}$ (B) 2
    (C) $\dfrac{1}{\sqrt{3}}$ (D) $\dfrac{1}{2}$

41. Two forces whose magnitudes are in the ratio 3:5 give a resultant of 35N. If the angle between them is 60^0 the magnitude of each force is
    (A) 3N, 5N   (B) 9N, 25N
   (C) 15N, 25N   (D) 21N, 35N

42. A boat takes 2 hours to travel 8km and back in still water lake. With water velocity of 4 kmph, the time taken for going upstream of 8km and coming back is
    (A) 160 minutes   (B) 80 minutes
    (C) 320 minutes   (D) 180 minutes

43. The speed of a swimmer in still water is 20 m/s. The speed of river water is 10 m/s and is flowing due east. If he is standing on the south bank and wishes to cross the river along the shortest path, the angle at which he should make his strokes w.r.t. north is given by :
    (A) 30° west   (B) 0°
    (C) 60° west   (D) 45° west

44. A river is flowing with a speed of 1 km/hr. A swimmer wants to go to point 'C' starting from 'A'. He swims with a speed of 5km/hr at an angle θ w.r.t. the river. If AB = BC = 400m Then the value of θ is:

    (A) 37^0 (B) 30^0
    (C) 53^0 (D) 45^0
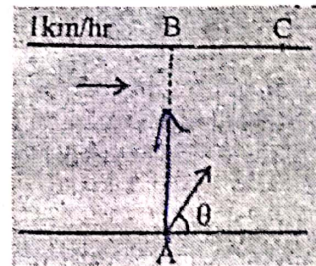
45. A swimmer crosses a flowing stream of width 'd' to and fro in time t_1. The time taken to cover the same distance up and down the stream is t_2. If t_3 is the time the swimmer would take to swim a distance 2d in still water, then
    (A) $t_1 = t_2 + t_3$ (B) $t_1 = t_2 - t_3$
    (C) $t_1 = t_2 t_3$ (D) $t_1 = \sqrt{t_2 t_3}$

NUMERICAL VALUE TYPE)
Section-II contains 5 Numerical Value Type questions.
Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases

46. A man travelling at 10.8 kmph in topless car on a rainy day. He holds an umbrella at angle of 37° with the vertical so that he does not wet. If rain drops falls vertically downwards what is rain velocity in ____ m/s.

47. Rain drops are falling down ward vertically at 4kmph. For a person moving forward at 3kmph feels the rain falling at ____ kmph.

48. The resultant of two forces acting at an angle of 150^0 is 10kg wt. and is perpendicular to one of the forces. The other force is ____ kgwt.

49. The resultant of two forces 2p and $\sqrt{2}p$ is $\sqrt{10}p$. The angle between the forces is ____

50. A man is crossing a river flowing with velocity of 5 m/s. He reaches a point directly across at a distance of 60 meter in 5 sec. His velocity in still water should be

$\vec{v}_r = 5m/s$ | 60 m

B

A
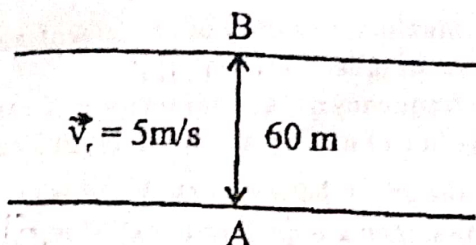
CHEMISTRY
(SINGLE CORRECT ANSWER TYPE)
This section contains 20 multiple choice questions.
Each question has 4 options (A), (B), (C) and (D)
for its answer, out of which ONLY ONE option
can be correct.
Marking scheme: +4 for correct answer, 0 if
not attempted and −1 in all other cases

51. Eka silicon is now called as
    (A) Gallium   (B) Scandium
    (C) Germanium   (D) Indium

52. The atomic weights of "Be" and "In" were
    corrected by Mendeleef using the formula
    (A) $\sqrt{v} = a(Z-b)$ (B) $mvr = \dfrac{nh}{2\pi}$
    (C) Atomic weight = Equivalent weight x
    valency
    (D) Equivalent weight = Atomic weight x
    valency.

53. In Mendeleef table, the triad of VIII group
    is
    (A) Ru, Rh, Pd   (B) Cu, Ag, Au
    (C) N, O, F   (D) Tl, Pb, Bi

54. The longest and shortest periods are
    (A) 1 & 6   (B) 2 & 6
    (C) 6 & 1   (D) 1 & 7

55. The atomicity of a noble gas is
    (A) 2   (B) 1
    (C) 4   (D) 6

56. The element with electron configuration $1s^2$
    $2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^5$ belongs to
    (A) 4th period, 15 group
    (B) 5th period, 14 group
    (C) 4th period, 17 group
    (D) 7th period, 14 group

57. Ce-58 is a member of
    (A) s-block   (B) p-block
    (C) d-block   (D) f-block

58. The total number of gaseous elements are
    (A) 8   (B) 9
    (C) 10   (D) 11

59. Which of the following is not the electronic
    configuration of a representative element
    (A) ns^2 (B) ns^2np^5
    (C) ns^2np^1 (D) ns^2np^6

60. Which pair of elements of atomic numbers
    given below will have similar chemical
    properties?
    (A) 13, 22   (B) 3, 11
    (C) 4, 24   (D) 2, 4

61. The atomic numbers of Lanthanides are
    from
    (A) 58 to 71   (B) 90 to 103
    (C) 21 to 30   (D) 39 to 48

62. The atomic number of an element 'X' is 34.
    Then it is present in _____ period and _____
    in group.
    (A) 4th period and 14 group
    (B) 4th period and 16 group
    (C) 4th period and 17 group
    (D) 5th period and 16 group

63. Which one is the correct order of the size of
    the iodine species?
    (A) $I > I^+ > I^-$ (B) $I > I^- > I^+$
    (C) $I^+ > I^- > I$ (D) $I^- > I > I^+$

64. If an element 'X' is assumed to have the
    types of radii, then their order is
    (A) Crystal radius > Vander waals radius >
    Covalent radius
    (B) Vander waals radius > Crystal radius >
    Covalent radius
    (C) Covalent radius > Crystal radius >
    Vander waals radius
    (D) Vander waals radius > Covalent radius >
    Crystal radius

65. O^{2-} and Si^{4+} are isoelectronic ions. If the
    ionic radius of O^{2-} is $1A^0$, the ionic radius of
    Si^{4+} will be
    (A) $1.4A°$ (B) $0.41A°$
    (C) $2.8A°$ (D) $1.5A°$

66. In a period, atom with smaller radius is
    (A) Chalcogen   (B) Halogen
    (C) Aerogen   (D) Pnicogen

67. Which of the following process refers to
    ionisation potential?
    (A) $X_{(s)} \rightarrow X^+_{(g)} + e^-$

    (B) $X_{(g)} + aq \rightarrow X^+_{(aq)} + e^-$

    (C) $X_{(g)} \rightarrow X^+_{(g)} + e^-$

    (D) $X_{(g)} + e^- \rightarrow X^-_{(g)}$

68. The I_1 of potassium is 4.339 eV/atom. The
    I_1 of sodium
    (A) 4.339   (B) 2.21
    (C) 5.138   (D) 1.002

69. The first ionization energy values of an
    element are 191, 578,872, and 5692 kcals.

The number of valence electrons in the element are

(A) 5
(B) 2
(C) 3
(D) 4

70. The peaks in ionisatoin potential curves are occupied by

(A) Alkali metals
(B) Inert gases
(C) Transition metals
(D) Halogens

(NUMERICAL VALUE TYPE)

Section-II contains 5 Numerical Value Type questions.

Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases

71. The electronic configuration of an element is $1s^2 2s^2 2p^6 3s^2 3p^3$. The atomic number of the element which is just below the above element in the periodic table is

33

72. An element with atomic number 20 will be placed in which period of the periodic table ____4____.

73. The maximum valency of an element with atomic number 7 is 3, 5

74. The frequency of the characterstic X ray of K_a line of metal targent 'M' is 2500 cm^{-1} and the graph between $\sqrt{v}$ Vs 'z' is as follows, then atomic number of M is 51.
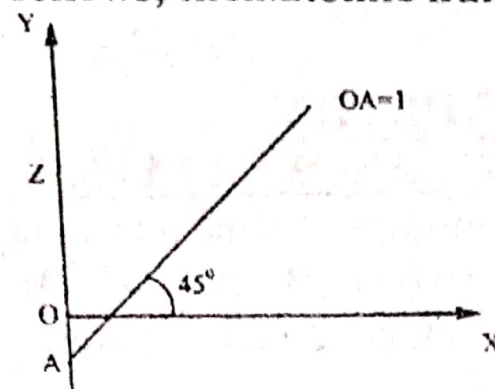
75. The number of valence electrons that can be present in the second element of any period is ____2____.

*****

2
8