



RANKRIDGE IIT JEE/NEET JUNIOR COLLEGE (LONGTERM)

TELANGANA

STREAM: JR MPC
Time: 3:00 Hours

CUMULATIVE TEST-01

Date: 16-06-2025
Max Marks: 300

SYLLABUS

MATHEMATICS

: Compound angles

PHYSICS

: VECTORS, MOTION IN A STRAIGHT LINE(up to acceleration and applications)

CHEMISTRY

: Blackbody radiation, planck's quantum theory, photoelectric effect, spectra, hydrogen spectrum.

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

- If $\frac{x}{a} \cos\theta + \frac{y}{b} \sin\theta = 1$, $\frac{x}{a} \sin\theta - \frac{y}{b} \cos\theta = 1$ then $\frac{x^2}{a^2} + \frac{y^2}{b^2} =$
(A) 1 (B) -1
(C) 2 (D) 3
- If $k = (\sec A + \tan A)(\sec B + \tan B)$
 $(\sec C + \tan C) = (\sec A - \tan A)$
 $(\sec B - \tan B)(\sec C - \tan C)$ then K =
(A) 0 (B) ± 1
(C) ± 3 (D) ± 4
- $2\cos^2 B - 1 = \tan^2 A$, then $\cos A \cos B =$
(A) $\pm \frac{1}{2}$ (B) $\pm \frac{1}{3}$
(C) $\pm \frac{1}{\sqrt{2}}$ (D) ± 1
- $\cosec A = 4p + \frac{1}{16p} \Rightarrow$
 $\cosec A + \cot A =$
(A) $8p$ (B) $\frac{1}{8p}$
(C) $-8p$ (or) $\frac{1}{8p}$ (D) $8p$ (or) $\frac{1}{8p}$

- If $\sqrt{\frac{1-\sin A}{1+\sin A}} = \sec A - \tan A$ then A lies in the quadrants
(A) I,II (B) II,III
(C) I,IV (D) I,III
- If $2\sin x + 5\cos y + 7\sin z = 14$ then
 $7\tan \frac{x}{2} + 4\cos y - 6\cos z =$
(A) 4 (B) -3
(C) 11 (D) 5
- If $0 \leq x \leq \pi$, $4^{\sin^2 x} + 4^{\cos^2 x} = 5$, then X =
(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$
(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$
- $\cos\theta + \cos^2\theta = 1$,
 $a\sin^{12}\theta + b\sin^{10}\theta + c\sin^8\theta$
 $+ d\sin^6\theta = 1 \Rightarrow \frac{b+c}{a+d} =$
(A) 2 (B) 3
(C) 4 (D) 6
- $\tan 35^\circ + 2\tan 20^\circ = \tan x$ then x =
(A) 15° (B) 5°
(C) 55° (D) 50°
- If $270^\circ < A < 360^\circ, 90^\circ < B < 180^\circ$,
 $\cos A = \frac{5}{13}, \tan B = -\frac{15}{8}$ then
 $\sin(A+B) =$
(A) $\frac{140}{221}$ (B) $\frac{171}{221}$

(C) $\frac{140}{171}$ (D) $\frac{221}{171}$

11. If

$$x \cos \theta = y \cos\left(\theta + \frac{2\pi}{3}\right) = z \cos\left(\theta + \frac{4\pi}{3}\right)$$

then the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} =$

(A) 1

(B) 2

(C) 0

(D) $3 \cos \theta$

12. $\sin^2 \alpha + \cos^2(\alpha + \beta) + 2 \sin \alpha \sin \beta \cos(\alpha + \beta) =$

(A) $\sin^2 \alpha$ (B) $\sin^2 \beta$ (C) $\cos^2 \alpha$ (D) $\cos^2 \beta$

13. If $2 \tan A + \cot A = \tan B$ then
 $\cot A + 2 \tan(A - B) =$

(A) -1

(B) 0

(C) 1

(D) $\frac{1}{2}$

14. If $\sin A = \frac{1}{\sqrt{10}}$, $\sin B = \frac{1}{\sqrt{5}}$,

 $0 < A, B < \frac{\pi}{4}$ then $A + B =$ (A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{5}$

15. If $\cos(A - B) = \frac{3}{5}$ and $\tan A \tan B = 2$
then which one of the following is true
(A) $\sin(A + B) = \frac{1}{5}$
(B) $\sin(A + B) = -\frac{1}{5}$
(C) $\cos(A - B) = \frac{1}{5}$
(D) $\cos(A + B) = -\frac{1}{5}$

16. If $\alpha + \beta + \gamma = \frac{\pi}{2}$ and $\cot \alpha, \cot \beta, \cot \gamma$

are in A.P then $\cot \alpha \cdot \cot \gamma =$

(A) 1

(B) 2

(C) 3

(D) 4

17. If $\tan \alpha, \tan \beta$ are the roots of theequation $x^2 + px + q = 0$ ($p \neq 0$) then

$$\sin^2(\alpha + \beta) + p \sin(\alpha + \beta)$$

$$\cos(\alpha + \beta) + q \cos^2(\alpha + \beta) =$$

(A) 0

(B) 1

(C) p

(D) q

18. If $\frac{\cos x}{\cos y} = 2$ and $\cos(x - y) = \frac{\sqrt{3}}{2}$ then
 $\tan y =$ (A) $\sqrt{3} + 4$ (B) $\sqrt{3} + 1$ (C) $\sqrt{3} - 4$ (D) $\sqrt{3} - 1$

19. Assertion (A):

$$\tan 40^\circ + \tan 80^\circ - \sqrt{3} \tan 40^\circ \tan 80^\circ = -\sqrt{3}$$

Reason (R): $\tan(A + B) = \tan A + \tan B + \tan(A + B) \tan A \tan B$

(A) A is true, R is true and R is correct explanation of A

(B) A is true, R is true and R is not correct explanation of A

(C) A is true, R is false

(D) A is false, R is true

20. Match the following:

List-I		List-II
1. $\cot\left(\frac{\pi}{4} + \theta\right) \cdot \cot\left(\frac{\pi}{4} - \theta\right)$	a.	0
2. $\sin(45^\circ + \theta) - \cos(45^\circ - \theta)$	b.	$\tan 56^\circ$
3. $\frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ}$	c.	$\frac{\sqrt{3}}{2}$
4. $\sin^2 75^\circ - \sin^2 15^\circ$	d.	1

- (A) 1-d, 2-a, 3-b, 4-c (B) 1-a, 2-b, 3-c, 4-d
(C) 1-c, 2-b, 3-d, 4-c (D) 1-b, 2-c, 3-a, 4-d

(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

21. If $\sin \theta, \tan \theta, \cos \theta$ are in G.P. then

$$4 \sin^2 \theta - 3 \sin^4 \theta + \sin^6 \theta =$$

22. If $\sin(\alpha + \beta) = 1, \sin(\alpha - \beta) = 1/2$ then

$$\tan(\alpha + 2\beta) \tan(2\alpha + \beta) =$$

23. If

$$\frac{\sin x + \cos x}{\cos^3 x} = a \tan^3 x + b \tan^2 x + c \tan x + d$$

$$\text{then } a + b + c + d =$$

24. If the value of $(1 + \tan 1^\circ)(1 + \tan 2^\circ)(1 + \tan 3^\circ) \dots (1 + \tan 44^\circ)(1 + \tan 45^\circ)$ is 2^λ , then the sum of the digits of the number λ is
25. If $15\sin^4 \alpha + 10\cos^4 \alpha = 6$, for some $\alpha \in R$, then the value of $27\sec^6 \alpha + 8\operatorname{cosec}^6 \alpha$ is equal to
- 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.
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26. The numerical ratio of displacement to distance is
- A) Always less than 1
 - B) Always greater than 1
 - C) Always equal to 1
 - D) May be less than 1 or equal to one
27. The numerical value of the ratio of average velocity to average speed is
- A) always less than one
 - B) always equal to one
 - C) always more than one
 - D) equal to or less than one
28. An object may have
- a) varying speed without having varying velocity
 - b) varying velocity without having varying speed
 - c) non zero acceleration without having varying velocity
 - d) non zero acceleration without having varying speed.
29. A body completes one round of a circle of radius 'R' in 20 second. The displacement of the body after 45 second is
- (A) $\frac{R}{\sqrt{2}}$
 - (B) $\sqrt{2}R$
 - (C) $2\sqrt{R}$
 - (D) R
30. For a train that travels from one station to another at a uniform speed of 40 kmh^{-1} and returns to final station at speed of 60 kmh^{-1} , then its average speed is
31. If a body travels 30m in an interval of 2s and 50m in the next interval of 2s, then the acceleration of the body is
- A) 10 m/s^2
 - B) 15 m/s^2
 - C) 20 m/s^2
 - D) 25 m/s^2
32. When the speed of a car is u , the minimum distance over which it can be stopped is s . If the speed becomes nu , what will be the minimum distance over which it can be stopped during the same time?
- A) s/n
 - B) ns
 - C) s/n^2
 - D) n^2s
33. If $S_n = 2 + 0.4n$ find initial velocity and acceleration
- A) 2.2 units, 0.4 units
 - B) 2.1 units, 0.3 units
 - C) 1.2 units, 0.4 units
 - D) 2.2 units, 0.3 units
34. A bus accelerates uniformly from rest and acquires a speed of 36kmph in 10s. The acceleration is
- A) 1 m/s^2
 - B) 2 m/s^2
 - C) $1/2 \text{ m/s}^2$
 - D) 3 m/s^2
35. If a car covers $2/5^{\text{th}}$ of the total distance with v_1 speed and $3/5^{\text{th}}$ distance with v_2 then average speed is
- (A) $\frac{1}{2} \sqrt{v_1 v_2}$
 - (B) $\frac{v_1 + v_2}{2}$
 - (C) $\frac{2v_1 v_2}{v_1 + v_2}$
 - (D) $\frac{5v_1 v_2}{3v_1 + 2v_2}$
36. A body travels 200cm in the first two seconds and 220cm in the next 4 seconds with deceleration. The velocity of the body at the end of the 7th second is
- A) 20 cm/s
 - B) 15 cm/s
 - C) 10 cm/s
 - D) 0 cm/s
37. If a body looses half of its velocity on penetrating 3cm in a wooden block, then how much will it penetrate more before coming to rest
- A) 1 cm
 - B) 2 cm
 - C) 3 cm
 - D) 4 cm
38. The coordinates of a moving particle at any time 't' are given by $x = at^3$ and $y = \beta t^3$. The speed of the particle at time 't' is given by
- (A) $\sqrt{\alpha^2 + \beta^2}$
 - (B) $3t\sqrt{\alpha^2 + \beta^2}$
 - (C) $3t^2\sqrt{\alpha^2 + \beta^2}$
 - (D) $t^2\sqrt{\alpha^2 + \beta^2}$
39. The angle between the diagonals of a cube with edges of unit length is

- A) $\sin^{-1}(1/3)$
 C) $\tan^{-1}(1/3)$
 D) $\cot^{-1}(1/3)$
 40. If l_1, m_1, n_1 and l_2, m_2, n_2 are the directional cosines of two vectors and θ is the angle between them, then their value of $\cos\theta$ is
 (A) $l_1 l_2 + m_1 m_2 + n_1 n_2$ (B) $l_1 m_1 + m_1 n_1 + n_1 l_1$
 (C) $l_1 m_2 + m_2 n_1 + n_1 l_2$ (D) $m_1 l_2 + l_2 m_2 + n_1 n_2$
41. If a vector has an x-component of -25.0 units and y-component of 40.0 units, then the magnitude and direction of this vector is
 (A) $5\sqrt{89}$ units; $\sin^{-1} \frac{-5}{\sqrt{89}}$ with x-axis
 (B) $5\sqrt{89}$ units; $\cos^{-1} \frac{-5}{\sqrt{89}}$ with x-axis
 (C) 45 units; $\cos^{-1} \frac{-5}{9}$ with x-axis
 (D) 45 units; $\sin^{-1} \frac{-5}{9}$ with x-axis
42. The component of a vector is
 (A) always less than its magnitude
 (B) always greater than its magnitude
 (C) always equal to its magnitude
 (D) Less than or equal to its magnitude
43. A vector is not changed if
 (A) it is rotated through an arbitrary angle
 (B) it is multiplied by an arbitrary scalar
 (C) it is cross multiplied by a unit vector
 (D) it slides parallel to itself
44. Two sides of a triangle are given by $\hat{i} + j + k$ and $-\hat{i} + 2j + 3k$, then area of triangles is
 (A) $\sqrt{26}$
 (B) $\sqrt{26}/2$
 (C) $\sqrt{46}$
 (D) 26
45. The vector sum of two vectors of magnitudes 10 units and 15 units can never be
 (A) 20 units
 (B) 22 units
 (C) 18 units
 (D) 3 units

NUMERICAL VALUE TYPE

Section-II contains 5 Numerical Value Type questions.

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STREAM: JR MPC

46. If the resultant of n forces of different magnitudes acting at a point is zero, then the minimum value of n is _____ 3
47. If $V = x^2 - 5x + 4$ find the acceleration of the particle when velocity of the particle is zero _____.
48. In 1.0 s a particle goes from point A to point B, moving in a semicircle of radius 1.0 m (see figure). The magnitude of the average velocity is _____ ms⁻¹.
- 
49. Find the value of m so that the vector $3\hat{i} - 2\hat{j} + \hat{k}$ may be perpendicular to the vector $2\hat{i} + 6\hat{j} + m\hat{k}$ 6
50. If $\vec{P} \times \vec{Q} = \vec{Q} \times \vec{P}$, the angle between \vec{P} and \vec{Q} is $\theta (0^\circ < \theta < 360^\circ)$. The value of ' θ ' will be 150°

CHEMISTRY (SINGLE CORRECT ANSWER TYPE)

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51. The number of neutrons in the dipoisitive zinc ion (Mass no. of Zn = 65)
 A) 35
 B) 33
 C) 65
 D) 67
52. The wave number of the radiation whose quantum is 1 erg is
 A) $5 \times 10^{15} \text{ cm}^{-1}$
 B) $15 \times 10^5 \text{ cm}^{-1}$
 C) $1.5 \times 10^{15} \text{ cm}^{-1}$
 D) $5 \times 10^5 \text{ cm}^{-1}$
53. The equation corresponding to the way number of spectral lines in Pfund series is

R $\left[\frac{1}{4^2} - \frac{1}{5^2} \right]$ R $\left[\frac{1}{3^2} - \frac{1}{4^2} \right]$
 R $\left[\frac{1}{2^2} - \frac{1}{3^2} \right]$ R $\left[\frac{1}{5^2} - \frac{1}{6^2} \right]$

54. In a H-atom, the transition takes place from L to K shell. If $R = 1.08 \times 10^7 \text{ m}^{-1}$, the wave length of the light emitted is nearly
 A) 4400 \AA^0
 B) 1250 \AA^0
 C) 1650 \AA^0
 D) 1850 \AA^0
55. The charge of an electron is $1.6 \times 10^{-19} \text{ coulombs}$. What will be the value of charge on Na^+ ion
 A) $1.6 \times 10^{-19} \text{ C}$
 B) $3.2 \times 10^{-19} \text{ C}$
 C) $4 \times 10^{-19} \text{ C}$
 D) $11 \times 1.6 \times 10^{-19} \text{ C}$
56. The mass of one mole of electrons is
 A) 1.008 g
 B) 0.55 mg
 C) 0.184 mg
 D) 1.673 mg
57. Mass numbers of Li, Be and B are 7, 9 and 10 respectively. Which of the following has two electrons, three protons and four neutrons?
 A) B^+
 B) Li^+
 C) Be^{2+}
 D) Be^-
58. (A): K and Cs are commonly used in photoelectric cells.
 (R): K and Cs can emit electrons when exposed to light of lesser frequency
 A) Both A and R are true and R is the correct explanation
 B) Both A and R are true but R is not the correct explanation of A
 C) A is true but R is false
 D) A is false but R is true
59. (A): Thomson's atomic model is known as 'raisin pudding' model
 (R): The atom is visualized as a pudding of positive charge with electrons (raisins) embedded in it
 A) Both A and R are true and R is the correct explanation
 B) Both A and R are true but R is not the correct explanation of A
 C) A is true but R is false
 D) A is false but R is true
60. (A): A few positively charged α - particles are deflected in Rutherford experiments
 (R): Most of the space in the atom is empty
 A) Both A and R are true and R is the correct explanation
 B) Both A and R are true but R is not the correct explanation of A
 C) A is true but R is false
 D) A is false but R is true
61. In the two elements, ${}_{\text{Z}_1}A^{m_1}$ and ${}_{\text{Z}_2}B^{m_2}$, the following relations are. $M_1 \neq M_2$ and $Z_1 \neq Z_2$ but $M_1 - Z_1 = M_2 - Z_2$ These elements are (M is atomic weight, Z is atomic number)
 A) Isotonic
 B) Isobaric
 C) Isotopic
 D) Isoelectronic
62. Find the correct set with Isoelectronic species?
 A) $N^{3-}, F^-, O_2, Ca^{2+}$
 B) $Cg^{2+}, Cl^-, Al^{3+}, O_2^-$
 C) $N^{3-}, Mg^{2+}, F^-, O_2^-$
 D) $Mg^{2+}, O_2^-, Cl^-, N_3^-$
63. Which of the following series correctly represents the energy of the radiation?
 A) Radio waves > X-rays > visible > IR
 B) UV > X-rays > IR > radio waves
 C) γ -rays > IR > visible > micro wave
 D) X-rays > UV > IR > micro wave
64. In the Millikan's oil drop method, which of the following force does not act on the oil drop?
 A) Gravitational force
 B) Viscous force
 C) Magnetic force
 D) Electrostatic force
65. Calculate the number of protons, neutrons and electrons respectively in ${}_{\text{Z}}^{\text{A}}N^{3-}$
 A) 7, 10, 7
 B) 7, 7, 10
 C) 10, 7, 7
 D) 7, 7, 7
66. Given that the abundances of ${}^{54}\text{Fe}$, ${}^{56}\text{Fe}$ and ${}^{57}\text{Fe}$ are 5%, 90% and 5%, respectively, the atomic mass of Fe is
 A) 55.85
 B) 55.95
 C) 55.75
 D) 56.05
67. Compared with an atom of atomic weight 12 and atomic number 6, the atom of atomic weight 13 and atomic number 6.
 A) Contains more neutrons
 B) Contains more electrons
 C) Contains more protons
 D) Is a different element
68. Pick out the Isoelectronic structures from the following
 A) CH_3^+ B) H_3O^+ C) NH_3 D) CH_4
 I II III IV
 (A) I and II (B) I and IV
 (C) I and III (D) I, III and IV
69. Light of wavelength λ shines on a metal surface with intensity x and the metal

emits y electrons per second of average energy, z . What will happen to y and z if x is doubled?

- (A) y will be doubled and z will become half
(B) y will remain same and z will be doubled
(C) both y and z will be doubled
(D) y will be doubled but z will remain same

70. Photon of which light has maximum energy:

- (A) red (B) blue
(C) violet (D) green

(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 energy of a photon is 3×10^{-12} ergs. What is its wavelength in nm? (C = 3×10^{10} Cms⁻¹)

72. Atomic number and mass number of an element M are 25 and 52 respectively. The sum of number of electrons, protons and neutrons in M^{+2} ion.

73. (A) 25, 25 and 27 (B) 25, 27 and 25
(C) 27, 25 and 27 (D) 25, 25 and 27
The photons of light having a wavelength 4000 Å are necessary to provide 1.00 J of energy are $x \times 10^{-11}$. What is the value of 'x'? (Give answer to nearest integer)

74. If threshold wavelength (λ_0) for ejection of electron from metal is 330 nm, then work function for the photoelectric emission is $x \times 10^{-18}$ J. What is the value of 'x'? (Give answer to nearest integer)

75. The MRI (magnetic resonance imaging) body scanners used in hospitals operate with 400 MHz radio frequency. The wavelength corresponding to this radio frequency is $x \times 10^{-2}$ m.
(1 MHz = 10^6 Hz)

BEST OF LUCK

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2 3
2 5
2 7
2 5
~~2 5~~



**RANKRIDGE IIT JEE/NEET JUNIOR
COLLEGE (LONGTERM)
TELANGANA**

STREAM: JR MPC
Time: 3 Hours

CUMULATIVE TEST-01

Date: 23-06-2025
Max Marks: 300

KEY SHEET

MATHEMTAICS

1) C	2) B	3) C	4) D	5) C	6) C	7) D	8) B	9) C	10) B
11) C	12) D	13) B	14) C	15) D	16) C	17) D	18) C	19) A	20) A
21) 1	22) 1	23) 4	24) 5	25) 250					

PHYSICS

26) D	27) D	28) B	29) B	30) D	31) B	32) D	33) A	34) A	35) D
36) C	37) A	38) C	39) B	40) A	41) B	42) D	43) C	44) B	45) D
46) C	47) 0	48) 2	49) 6	50) 180					

CHEMISTRY

51) A	52) A	53) D	54) B	55) A	56) B	57) C	58) A	59) B	60) B
61) A	62) C	63) D	64) C	65) B	66) B	67) A	68) D	69) D	70) C
71) 662	72) 77	73) 2	74) 6	75) 75					

$$\frac{1}{1+f} = \frac{2}{2}$$