



RANKRIDGE IIT JEE/NEET JUNIOR COLLEGE (LONGTERM)

TELANGANA

STREAM: JR MPC
Time: 3:00 Hours

WEEKEND TEST-01

Date: 16-06-2025
Max Marks: 300

SYLLABUS

MATHEMATICS

: Trigonometric ratios

PHYSICS

: Vectors

CHEMISTRY

: Atomic structure: Till characteristic properties of wave.

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. $3[\sin x - \cos x]^4 + 6[\sin x + \cos x]^2 + 4[\sin^6 x + \cos^6 x] =$
 (A) 3 (B) 6
 (C) 4 (D) 13

2. In ΔABC , right angled at C, then $\tan A + \tan B =$

$$\begin{array}{ll} (\text{A}) \frac{a^2}{bc} & (\text{B}) \frac{b^2}{ac} \\ (\cancel{C}) \frac{c^2}{ab} & (\text{D}) \frac{ab}{c} \end{array}$$

3. $\frac{1 + \cot \alpha + \operatorname{cosec} \alpha}{1 - \cot \alpha + \operatorname{cosec} \alpha}$

$$\begin{array}{ll} (\text{A}) \frac{\sin \alpha}{1 + \cos \alpha} & (\text{B}) \frac{\sin \alpha}{1 - \cos \alpha} \\ (\cancel{C}) \frac{1 + \cos \alpha}{\sin \alpha} & (\text{D}) \frac{1 - \sin \alpha}{\cos \alpha} \end{array}$$

4. If α, β are complementary angles,

$$\sin \alpha = \frac{3}{5}, \text{ then } \quad \times$$

$$\cos \alpha \cos \beta - \sin \alpha \sin \beta =$$

$$\begin{array}{ll} (\text{A}) 1 & (\text{B}) 2 \\ (\text{C}) \frac{4}{5} & (\cancel{D}) 0 \end{array}$$

5. If $\tan \theta, 2\tan \theta + 2, 3\tan \theta + 3$ are in G.P.
then the value of $\frac{7 - 5 \cot \theta}{9 - 4\sqrt{\sec^2 \theta - 1}}$ is

$$\begin{array}{ll} (\text{A}) \frac{12}{5} & (\cancel{B}) \frac{-33}{28} \\ (\cancel{C}) \frac{33}{100} & (\text{D}) \frac{12}{13} \end{array}$$

6. If $1 + \sin x + \sin^2 x + \dots$ to $\infty = 4 + 2\sqrt{3}, 0 < x < \pi$ and $x \neq \frac{\pi}{2}$ then

$$\begin{array}{ll} (\text{A}) 30^\circ, 60^\circ & (\cancel{B}) 60^\circ, 120^\circ \\ (\cancel{C}) 90^\circ, 120^\circ & (\text{D}) 30^\circ, 45^\circ \end{array}$$

7. If $0 \leq x \leq \pi, 81^{\sin^2 x} + 81^{\cos^2 x} = 30$ then

$$\begin{array}{ll} (\cancel{A}) \frac{\pi}{6} & (\text{B}) \frac{\pi}{4} \\ (\text{C}) \frac{\pi}{15} & (\text{D}) \frac{\pi}{8} \end{array}$$

8. If ABCD is a cyclic quadrilateral such that $12 \tan A - 5 = 0$ and $5 \cos B + 3 = 0$, then $\cos C \tan D =$

$$\begin{array}{ll} (\cancel{A}) \frac{-16}{13} & (\cancel{B}) \frac{16}{13} \\ (\text{C}) \frac{-13}{16} & (\text{D}) \frac{23}{16} \end{array}$$

9. If $e^{(1+\sin^2 x + \sin^4 x + \dots) \log 2} = 16$, then $\tan^2 x =$

$$\begin{array}{ll} (\text{A}) 1 & (\text{B}) 2 \\ (\cancel{C}) 3 & (\text{D}) 4 \end{array}$$

10. $\tan^2 \alpha = 1 - p^2$, then
 $\sec \alpha + \tan^3 \alpha \operatorname{cosec} \alpha =$

(A) $(2+p^2)^{\frac{3}{2}}$ (B) $(1+p^2)^{\frac{3}{2}}$

(C) $(2-p^2)^{\frac{3}{2}}$ (D) $(1-p^2)^{\frac{3}{2}}$

11. $\sin x + \sin^2 x + \sin^3 x = 1$

$\Rightarrow \cos^6 x - 4\cos^4 x + 8\cos^2 x =$

(A) 4 (B) 2
(C) 1 (D) 0

12. Let $\theta \in \left(0, \frac{\pi}{4}\right)$ and $t_1 = (\tan \theta)^{\tan 0}$,

$t_2 = (\tan \theta)^{\cot 0}$, $t_3 = (\cot \theta)^{\tan 0}$

$t_4 = (\cot \theta)^{\cot 0}$ then

(A) $t_1 > t_2 > t_3 > t_4$ (B) $t_4 > t_3 > t_1 > t_2$

(C) $t_3 > t_1 > t_2 > t_4$ (D) $t_2 > t_3 > t_1 > t_4$

13. $\cos \theta + \cos^2 \theta = 1$,

$a\sin^{12} \theta + b\sin^{10} \theta + c\sin^8 \theta$

$+ d\sin^6 \theta = 1 \Rightarrow \frac{b+c}{a+d} =$

(A) 2 (B) 3
(C) 4 (D) 6

14. Assertion A: In a right angled triangle $\sin^2 A + \sin^2 B + \sec^2 C = 2$.

Reason R: If α, β are complementary angles then $\sin^2 \alpha + \sin^2 \beta = 1$

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

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

(C) A is true, R is false

(D) A is false, R is true

15. $A = \tan 1, B = \tan 2, C = \tan 3$, then the

descending order of A, B, C is

(A) A, B, C (B) C, B, A
(C) A, C, B (D) B, C, A

16. Match the following:

	List-I		List-II
1.	$3\tan x + 27\cot x \geq$ $(x \in Q_1)$	a.	24
2.	$5\sec^2 x + 125\cos^2 x \geq$	b.	18
3.	$16\operatorname{cosec}^2 x + 9\sin^2 x \geq$	c.	50

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

17. If $\sin \theta$ and $\cos \theta$ are the roots of $px^2 + qx + r = 0$ then $q^2 - p^2 =$

(A) 0 (B) $-2pr$
(C) $2qr$ (D) $2rp$

18. $f(x) = x^3 - 2x^2 + 3x - 5$

$\Rightarrow f\left[\sin\left(\frac{5\pi}{2}\right)\right] + f\left[\sin\left(\frac{3\pi}{2}\right)\right] =$

(A) 10 (B) -10
(C) 14 (D) -14

19. $\cos^2 5^\circ + \dots + \cos^2 10^\circ$

$+ \cos^2 15^\circ + \dots + \cos^2 360^\circ =$

(A) 18 (B) 27
(C) 36 (D) 45

20. $a\sec \theta + b\tan \theta = 1, a\sec \theta - b\tan \theta = 5$

$\Rightarrow a^2(b^2 + 4) =$

(A) $3b^2$ (B) $9b^2$
(C) b^2 (D) $4b^2$

(NUMERICAL VALUE TYPE)

Section-II contains 5 Numerical Value Type questions.

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

21. If $\sin \theta - \cos \theta = 1$, then the value of $\sin^3 \theta - \cos^3 \theta$ is _____.

22. If $\sin \theta, \tan \theta, \cos \theta$ are in G.P. then $4\sin^2 \theta - 3\sin^4 \theta + \sin^6 \theta =$ _____

23. $\sin^4 \theta + 2\sin^2 \theta \left(1 - \frac{1}{\operatorname{cosec}^2 \theta}\right) + \cos^4 \theta =$ _____

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

25. If $\sin \theta + \cos \theta = a$, and $\tan \theta + \cot \theta = b$ then $b(a^2 - 1) =$ _____

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. Two vectors are given $\vec{a} = -2\hat{i} + \hat{j} - 3\hat{k}$ and $\vec{b} = 5\hat{i} + 3\hat{j} - 2\hat{k}$. If $3\vec{a} + 2\vec{b} - \vec{c} = 0$ then third vector \vec{c} is

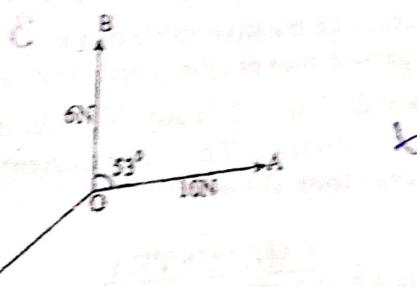
(A) $4\hat{i} + 9\hat{j} - 13\hat{k}$ (B) $-4\hat{i} - 9\hat{j} + 13\hat{k}$
 (C) $4\hat{i} - 9\hat{j} - 13\hat{k}$ (D) $2\hat{i} - 3\hat{j} + 13\hat{k}$

27. The car makes a displacement of 100m towards east and then 200m towards north. Find the magnitude and direction of the resultant.

(A) 223.7m, $\tan^{-1}(2)$, N of E
 (B) 223.7m, $\tan^{-1}(2)$, E of N
 (C) 300m, $\tan^{-1}(2)$, N of E
 (D) 100m, $\tan^{-1}(2)$, N of E

28. If the system is in equilibrium

($\cos 53^\circ = 3/5$), then the value of 'P' is



(A) 16N (B) 4N
 (C) $\sqrt{208}N$ (D) $\sqrt{232}N$

29. A car weighing 100kg is on a slope that makes an angle 30° with the horizontal. The component of car's weight parallel to the slope is ($g = 10\text{ms}^{-2}$)

(A) 500N (B) 1000N
 (C) 15,000N (D) 20,000N

30. If $\vec{P} = \hat{i} + 2\hat{j} + 6\hat{k}$, its direction cosines are

(A) $\frac{1}{41}, \frac{2}{41}$ and $\frac{6}{41}$

(B) $\frac{1}{\sqrt{41}}, \frac{2}{\sqrt{41}}$ and $\frac{6}{\sqrt{41}}$

(C) $\frac{3}{\sqrt{41}}, \frac{8}{\sqrt{41}}$ and $\frac{7}{\sqrt{41}}$

(D) 1, 2 and 6

31. If hat $\vec{A} = 3\hat{i} - 4\hat{j}$ and hat $\vec{B} = -\hat{i} - 4\hat{j}$, calculate the direction of dot A - overline B
 (A) along positive x-axis

(✓) along negative x-axis

(C) along positive y-axis
 (D) along negative y-axis

32. A bird moves in such a way that it has a displacement of 12 m towards east, 5 m towards north and 9 m vertically upwards. Find the magnitude of its displacement

(A) $5\sqrt{2}\text{m}$ (B) $5\sqrt{10}\text{m}$
 (C) $5\sqrt{5}\text{m}$ (D) 5m

33. The direction cosines of a vector \vec{A} are

$$\cos \alpha = \frac{4}{5\sqrt{2}}, \cos \beta = \frac{1}{\sqrt{2}}$$

and $\cos \gamma = \frac{3}{5\sqrt{2}}$, then the vector \vec{A} is

(A) $4\hat{i} + \hat{j} + 3\hat{k}$ (B) $4\hat{i} + 5\hat{j} + 3\hat{k}$
 (C) $4\hat{i} - 5\hat{j} - 3\hat{k}$ (D) $\hat{i} + 5\hat{j} - \hat{k}$

34. The unit vector parallel to the resultant of the vectors $\vec{A} = 4\hat{i} + 3\hat{j} + 6\hat{k}$ and

$\vec{B} = -\hat{i} + 3\hat{j} - 8\hat{k}$ is

(A) $\frac{1}{7}(3\hat{i} + 6\hat{j} - 2\hat{k})$ (B) $\frac{1}{7}(3\hat{i} + 6\hat{j} + 2\hat{k})$

(C) $\frac{1}{49}(3\hat{i} + 6\hat{j} - 2\hat{k})$ (D) $\frac{1}{49}(3\hat{i} - 6\hat{j} + 2\hat{k})$

35. If $\vec{a} = 2\hat{i} + 6\hat{j} + m\hat{k}$ and

$\vec{b} = n\hat{i} + 18\hat{j} + 3\hat{k}$ are parallel to each other then values of m, n are

(A) 1.6 (B) 6.1
 (C) -1.6 (D) -1.6

36. When a force vector $F = (\hat{i} + 2\hat{j} + \hat{k})N$ acts on a body and produces a displacement of $\vec{S} = (4\hat{i} + \hat{j} + 7\hat{k})\text{m}$, then the work done is

(A) 9J (B) 13J
 (C) 5J (D) 1J

37. The angle between the two vectors

$\vec{A} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{B} = -\hat{i} + \hat{j} - 2\hat{k}$ is

(A) 90° (B) 30°
 (C) 45° (D) 60°

38. Find the torque of a force

$\vec{F} = -3\hat{i} + 2\hat{j} + \hat{k}$ acting at the point

$\vec{r} = 8\hat{i} + 2\hat{j} + 3\hat{k}$ about origin ($\vec{\tau} = \vec{r} \times \vec{F}$)

- (A) $14\hat{i} - 38\hat{j} + 3k$ (B) $4\hat{i} + 4\hat{j}6k$
 (C) $-14\hat{i} + 38\hat{j} - 16k$ (D) $-4\hat{i} - 17\hat{j} + 22k$
39. Cosines of angles made by a vector with X, Y axes are $3/5\sqrt{2}, 4/5\sqrt{2}$ respectively. If the magnitude of the vector is $10\sqrt{2}$ then that vector is
 (A) $8\hat{i} + 6\hat{j} - 10k$ (B) $6\hat{i} - 8\hat{j} - 10k$
 (C) $-6\hat{i} - 8\hat{j} + 10k$ (D) $6\hat{i} + 8\hat{j} + 10k$
40. The angle made by the vector $\vec{A} = 2\hat{i} + 3\hat{j}$ with Y-axis is
 (A) $\tan^{-1}\left(\frac{3}{2}\right)$ (B) $\tan^{-1}\left(\frac{2}{3}\right)$
 (C) $\sin^{-1}\left(\frac{2}{3}\right)$ (D) $\cos^{-1}\left(\frac{3}{2}\right)$
41. The unit vector perpendicular to $\vec{A} = 2\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{B} = \hat{i} - \hat{j} + \hat{k}$ is
 (A) $\frac{4\hat{i} - \hat{j} - 5\hat{k}}{\sqrt{42}}$ (B) $\frac{4\hat{i} - \hat{j} + 5\hat{k}}{\sqrt{42}}$
 (C) $\frac{4\hat{i} + \hat{j} + 5\hat{k}}{\sqrt{42}}$ (D) $\frac{4\hat{i} + \hat{j} - 5\hat{k}}{\sqrt{42}}$
42. $(\hat{i} + \hat{j}) \times (\hat{i} - \hat{j}) =$
 (A) $-2\hat{k}$ (B) $2\hat{k}$
 (C) Zero (D) $2\hat{i}$
43. A particle has a displacement of 12 m towards east then 5 m towards north and then 6 m vertically upwards the resultant displacement is nearly
 (A) 10.04 m (B) 12.10 m
 (C) 14.32 m (D) 13.06 m
44. The work done by a force $2\hat{i} - \hat{j} + 5\hat{k}$ when it displaces the body from a point (3,4,6) to a point (7,2,5) is
 (A) 5 units (B) 7 units
 (C) 1 units (D) 15 units
45. A man travels 1 mile due east, then 5 miles due south, then 2 miles due east and finally 9 miles due north. His displacement is
 (A) 3 miles (B) 5 miles
 (C) 4 miles (D) between 5 and 9 miles

NUMERICAL VALUE TYPE

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46. The magnitude of the x-component of vector \vec{A} is 3 and the magnitude of vector \vec{A} is 5. What is the magnitude of the y-component of vector \vec{A} ? 4
47. If a vector \vec{P} making angles α, β , and γ respectively with the x, y and z axes respectively.
 $\sin^2 \theta + \sin^2 \beta + \sin^2 \gamma =$ 9
48. If two vectors $2\hat{i} + 3\hat{j} - \hat{k}$ and $-4\hat{i} - 6\hat{j} - \lambda\hat{k}$ are parallel to each other then value of λ will be -8.
49. The vector $\vec{P} = a\hat{i} + a\hat{j} + 3\hat{k}$ and $\vec{Q} = a\hat{i} - 2\hat{j} - \hat{k}$ perpendicular to each other. The positive value of a is 3.
50. A person moves 30m north and then 20m towards east and finally $30\sqrt{2}m$ in southwest direction. The displacement of the person from the origin will be

CHEMISTRY

(SINGLE CORRECT ANSWER TYPE)

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51. Which of the following statements is wrong about cathode rays?
 (A) They travel in straight lines towards cathode.
 (B) They produce heating effect.
 (C) They carry negative charge.
 (D) They produce X-rays when strike with material having high atomic masses.
52. When alpha particles are sent through a thin metal foil, most of them go straight through the foil because:
 (A) alpha particles are much heavier than electrons
 (B) alpha particles are positively charged
 (C) most part of the atom is empty space

- (D) alpha particles move with very high velocity
53. Which of the following atoms contains the least number of neutrons?
 (A) $^{235}_{92}U$ (B) $^{238}_{92}U$
 (C) $^{239}_{93}U$ (D) $^{240}_{93}U$
54. Increasing order (lowest first) for the values of elm (charge/mass) for electron (e), proton (p), neutron (n) and x-particle (l) is:
 (A) e, p, n, α (B) n, p, e, α
 (C) n, p, α , e (D) n, α , p, e
55. Isotopes of an element have:
 (A) different chemical and physical properties
 (B) similar chemical and physical properties
 (C) similar chemical but different physical properties
 (D) similar physical and different chemical properties
56. Which of the following pairs represents isobars?
 (A) 3_2He and 4_2He (B) $^{24}_{12}Mg$ and $^{25}_{12}Mg$
 (C) $^{40}_{19}K$ and $^{40}_{20}Ca$ (D) $^{40}_{19}K$ and $^{39}_{19}K$
57. The triad of nuclei that is isotonic is:
 (1) $^{14}_{6}C, ^{14}_{7}N, ^{19}_{9}F$ (2) $^{12}_{6}C, ^{14}_{7}N, ^{19}_{9}F$
 (3) $^{14}_{6}C, ^{14}_{7}N, ^{17}_{9}F$ (4) $^{14}_{6}C, ^{15}_{7}N, ^{17}_{9}F$
58. Neutron has:
 (A) charge +1, mass 1 (B) charge 0, mass 0
 (C) charge -1, mass 1 (D) charge 0, mass 1
59. When the speed of the electron increases, the specific charge
 (A) Decreases (B) Increases
 (C) Remains same (D) None
60. Sodium atoms and sodium ions:
 (A) are chemically similar
 (B) both react vigorously with water
 (C) have same number of electrons
 (D) have same number of protons
61. In $^{35}_{17}Cl$ and $^{37}_{17}Cl$, which of the following is false?
 (A) Both have 17 protons
 (B) Both have 17 electrons
 (C) Both have 18 neutrons
 (D) Both show same chemical properties
62. The hydride ion is isoelectronic with
 (A) H^+ (B) He^+
 (C) He (D) Be
63. An isotope of $^{76}_{32}Ge$ is:
 (A) $^{77}_{32}Ge$ (B) $^{78}_{33}As$
64. X-rays are produced when a stream of electrons in an X-ray tube:
 (A) hits the glass wall of the tube
 (B) strikes the metal target
 (C) passes through a strong magnetic field
 (D) none of the above
65. The nature of positive rays produced in a vacuum discharge tube depends upon:
 (A) the nature of the gas filled
 (B) nature of the material of cathode
 (C) nature of the material of anode
 (D) the potential applied across the electrodes
66. Electromagnetic radiation with maximum wavelength is:
 (A) ultraviolet (B) radiowaves
 (C) X-rays (D) infrared
67. Which of the following statements is incorrect?
 (A) The frequency of radiation is inversely proportional to its wavelength.
 (B) Energy of radiation increases with increase in frequency.
 (C) Energy of radiation decreases with increase in wavelength.
 (D) The frequency of radiation is directly proportional to its wavelength.
68. Identify the incorrectly matched set from the following
- | List-I | List-II |
|----------------|--------------|
| (A) Wavelength | — Nanometers |
| (B) Frequency | — Hertz |
| (C) Wavenumber | m^{-1} |
| (D) Velocity | ergs |
69. Ernest Rutherford's model of the atom didn't specifically include the _____
 (A) Proton (B) Electron
 (C) Nucleus (D) Neutron
70. A neutral atom, with atomic number greater than one consists of
 (A) Protons only (B) Protons and neutrons
 (C) Neutrons and electrons
 (D) Neutrons, electrons and protons

(NUMERICAL VALUE TYPE)

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71. The number of neutrons present in the deuterium isotope of hydrogen is _____.

72. If the wavelength of green light is about 5000\AA^0 , then the frequency of its wave is $x \times 10^{14}\text{ sec}^{-1}$. Where 'x' is?
73. In Millikan's experiment, static electric charge on the oil drops has been obtained by shining x-rays. If the static electric charge on the oil drops is $-1.282 \times 10^{-18}\text{C}$, calculate the number of electrons present on it ____.
74. The value of charge on the oil droplets

experimentally observed were -1.6×10^{-19} and -4×10^{-19} coulomb. The value of the electronic charge, indicated by these results is $-x \times 10^{-20}$. What is the value of 'x'?

75. An oil drop has 6.39×10^{-19} charge. What will be the number of electrons in this drop? 4

BEST OF LUCK