RANKRIDGE IIT JEE/NEET JUNIOR COLLEGE (LONGTERM)

TELANGANA

STREAM: JR MPC
Time: 3:00 Hours

WEEKEND TEST-02

Date: 21-06-2025
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

1. $\tan 40^0 + \tan 80^0 - \sqrt{3}\tan 40^0 \tan 80^0 =$
   (A) $\sqrt{3}$ (B) $-\sqrt{3}$
   (C) $\frac{1}{\sqrt{3}}$ (D) $\frac{-1}{\sqrt{3}}$

2. $\frac{\tan 225^0 - \cot 81^0 \cot 69^0}{\cot 261^0 + \tan 21^0} =$
   (A) 1 (B) $\frac{1}{\sqrt{2}}$
   (C) $\sqrt{3}$ (D) $\frac{1}{\sqrt{3}}$

3. $\frac{(1+\tan 13^0)(1+\tan 32^0)}{(1+\tan 12^0)(1+\tan 33^0)} =$
   (A) 1 (B) 2
   (C) 3 (D) 4

4. $\cos 20^0 + \cos 100^0 + \cos 140^0 =$
   (A) 0 (B) -1
   (C) 1 (D) 2

5. $\frac{\sin(\alpha+\beta)}{\sin(\alpha-\beta)} = \frac{a+b}{a-b} \Rightarrow \frac{\tan\alpha}{\tan\beta} =$
   (A) a/b (B) b/a
   (C) $a/2b$ (D) $-a/b$

6. If $\tan A + \tan B = p$ and $\cot A + \cot B = q$ then $\cot(A+B) =$
   (A) $\frac{p-q}{pq}$ (B) $\frac{q-p}{pq}$
   (C) $\frac{pq}{p+q}$ (D) $\frac{pq}{p-q}$

7. $\tan 40^0 + 2\tan 10^0 = \cot x$ then $x =$
   (A) 75^0 (B) 85^0
   (C) 30^0 (D) 40^0

8. $\cos 40^0 + \cos 80^0 + \cos 160^0 + \cos 240^0 =$
   (A) 0 (B) 1
   (C) $1/2$ (D) $-1/2$

9. If $B, A+B$ are acute angles, $\sin(A+B) = \frac{12}{13}, \sin B = \frac{5}{13}$ then $\sin A =$
   (A) $-\frac{119}{169}$ (B) $\frac{119}{169}$
   (C) $\frac{169}{119}$ (D) $-\frac{169}{119}$

10. If $270^0 < A < 360^0, 90^0 < B < 180^0$, then the quadrant to which $A+B$ belongs is
    (A) IV (B) III
    (C) II (D) I

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. IF $\frac{\cos A}{\cos B}=n$ and $\frac{\sin A}{\sin B}=m$ then $\left(m^2-n^2\right)\sin^2 B=$

(A) $1-n^2$ (B) $1+n^2$
(C) $1-n$ (D) $1+n$

13. In ΔABC if $\cot A+\cot B+\cot C=\sqrt{3}$ then the ΔABC is

(A) equilateral triangle
(B) right angled triangle
(C) isosceles (D) scalene triangle

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 $\tan A=\frac{17}{18}, \tan B=\frac{1}{35}$ then $\cos(A+B)=$

(A) 1 (B) $\sqrt{2}$
(C) -1 (D) $\frac{1}{\sqrt{2}}$

16. if $\tan\alpha=\frac{1}{7}$ and $\sin\beta=\frac{1}{\sqrt{10}}$ where $0<\alpha,\beta<\frac{\pi}{2}$ then 2β is equal to

(A) $\frac{\pi}{4}-\alpha$ (B) $\frac{3\pi}{4}-\alpha$
(C) $\frac{\pi}{8}-\alpha$ (D) $\frac{3\pi}{8}-\frac{\alpha}{2}$

17. If $\sin B=\frac{1}{5}.\sin(2A+B)$ then $\frac{\tan(A+B)}{\tan A}=$

(A) $5/3$ (B) $2/3$
(C) $3/2$ (D) $3/5$

18. If $\tan A=1, \tan B=2, \tan C=3$ then $A+B+C=$

(A) $\frac{n\pi}{2}, n\in z$ (B) $n\pi, n\in z$
(C) $\frac{n\pi}{4}, n\in z$ (D) $\frac{2n\pi}{3}, n\in z$

19. If $\tan\beta=2\sin\alpha\sin\gamma\cos ec(\alpha+\gamma)$, then $\cot\alpha, \cot\beta$ and $\cot\gamma$ are in

(A) A.P (B) G.P
(C) H.P (D) A.G.P

20. If $\sec\theta+\tan\theta=1$, then root of the equation $(a-2b+c)x^2+(b-2c+a)x+(c-2a+b)=0$ is

(A) $\sec\theta$ (B) $\tan\theta$
(C) $\sin\theta$ (D) $\cot\theta$

(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 $U_n=\sin n\theta\sec^n\theta, V_n=\cos n\theta\sec^n\theta$ for $n=0,1,2$, then $V_n-V_{n-1}+U_{n-1}\tan\theta=?$

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

23. If $\sin A+\sin B=\sqrt{3}(\cos B-\cos A)$ then $\sin 3A+\sin 3B=$

24. If $A+B+C=\frac{\pi}{2}$ then $\sum\frac{\cos(B+C)}{\cos B\cos C}=$

25. $\cos(x-y)+\cos(y-z)+\cos(z-x)=-\frac{3}{2}$

$\Rightarrow\sum(\cos x)=$

PHYSICS

(SINGLE CORRECT ANSWER TYPE)

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26. A body is moving along the circumference of a circle of radius 'R' and completes half of the revolution. Then, the ratio of its displacement to distance is

A) $\pi/2$ B) 2:1

C) $2/\pi$ D) 1:2

27. A body moves from one corner of an equilateral triangle of side 10 cm to the same corner along the sides. Then the distance and displacement are respectively

A) 30 cm & 10 cm B) 30 cm & 0 cm

C) 0 cm & 30 cm D) 30 cm & 30 cm.

28. If a body covers first half of its journey with uniform speed v_1 and the second half of the journey with uniform speed v_2 then the average speed is

(A) v_1+v_2 (B) $\frac{2v_1v_2}{v_1+v_2}$

(C) $\frac{v_1v_2}{v_1+v_2}$ (D) v_1v_2

29. For a body moving with uniform acceleration 'a', initial and final velocities in a time interval 't' are 'u' and 'v' respectively. Then, its average velocity in the time interval 't' is

(A) $(v+at)$ (B) $\left(v-\frac{at}{2}\right)$

(C) $(v-at)$ (D) $\left(u-\frac{at}{2}\right)$

30. For a train that travels from one station to another at a uniform speed of 40 m/s and returns to final station at speed of 60 m/s then its average speed is

A) 98 m/s B) 0 m/s

C) 50 m/s D) 48 m/s

31. A body moves with a velocity of 3m/s due east and then turns due north to travel with the same velocity. If the total time of travel is 6s, the acceleration of the body is

A) $\sqrt{3}m/s^2$ *towards north west*

B) $\frac{1}{\sqrt{2}}m/s^2$ *towards north west*

C) $\sqrt{2}m/s^2$ *towards north west*

D) all the above

32. 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) 10m /s^2 B) 5 m /s^2

C) 20 m /s^2 D) 25 m /s^2

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 particle is moving with uniform acceleration along a straight line ABC. Its velocity at 'A' and 'B' are 6 m/s and 9 m/s respectively. If AB : BC = 5 : 16 then its velocity at 'C' is

A) 9.6 m/s B) 12 m/s

C) 15 m/s D) 21.5 m/s

35. A body starting from rest moving with uniform acceleration has a displacement of 16 m in first 4 s and 9 m in first 3 s. The acceleration of the body is

A) 1 ms^{-2} B) 2 ms^{-2}

C) 3 ms^{-2} D) 4 ms^{-2}

36. A bus accelerates uniformly from rest and acquires a speed of 36kmph in 10s. The acceleration is

A) $1m/s^2$ B) $2m/s^2$

C) $\frac{1}{2}m/s^2$ D) $3m/s^2$

37. A car moving along a straight highway with speed of 126Kmh^{-1} is brought to a stop with in a distance of 200m. what is the retardation of the car

A) 3.06ms^{-2} B) 4 ms^{-2}

C) 5.06 ms^{-2} D) 6 ms^{-2}

38. A person moves 30m north and then 20m towards east and finally $30\sqrt{2}m$ in south-west direction. The displacement of the person from the origin will be

A) 10m along north B) 10 m along south

C) 10m along west D) zero

39. If a car covers 2/5th of the total distance with v_1 speed and 3/5th prime prime distance with v_2 then average speed is

(A) $\frac{1}{2}\sqrt{v_1v_2}$ (B) $\frac{v_1+v_2}{2}$

(C) $\frac{2v_1v_2}{v_1+v_2}$ (D) $\frac{5v_1v_2}{3v_1+2v_2}$

40. A man walks on a straight road from his home to a market 2.5 km away with a speed of 5 km/h. Finding the market closed, he instantly turns and walks back home with a speed of 7.5 km/h. What is the (a) magnitude of average velocity and (b) average speed of the man over the time interval 0 to 50 min (in kmph).
A) 0,4 B) 0.6
C) 0.8 D) 0,12

41. A moving car possesses average velocities of $5ms^{-1}$,$10ms^{-1}$ and $15ms^{-1}$ in the first, second, and third seconds respectively. What is the total distance covered by the car in these 3s?
A) 15m B) 30m
C) 55m D) 45m

42. A motorist drives north for 35.0 minutes at 85.0 km/h and then stops for 15.0 minutes. He next continues north, travelling 130 km in 2.00 hours. What is his total displacement
A) 85 km B) 179.6 km
C) 20 km D) 140 km

43. 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) $t^2\sqrt{\alpha^2+\beta^2}$

44. An express train moving at 30 m/s reduces its speed to 10 m/s in a distance of 240 m. If the breaking force is increased by 12.5% in the beginning find the distance that it travels before coming to rest
(A) 270 m (B) 240 m
(C) 210 m (D) 195 m

45. For motion of an object along the x-axis, the velocity v depends on the displacement x as $v = 3x^2 - 2x$ then what is the acceleration at $x = 2m$
A) $48ms^{-2}$ B) $80\ ms^{-2}$
C) $18\ ms^{-2}$ D) $10\ ms^{-2}$

NUMERICAL VALUE TYPE)

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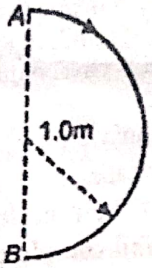
46. In 1.0s a particle goes from point A to point B, moving in a semicircle of radius 1.0m (see figure). The magnitude of the average velocity is_____ ms^{-1}



47. A particle moves along a straight line such that its displacement at any time t is given by $S = t^3 - 6t^2 + 3t + 4$. The velocity, when its acceleration is zero, is _____ ms^{-1}

48. A man walks 8m towards east and 6m towards north. The magnitude of displacement is_____ m

49. If $V = x^2 - 5x + 4$, find the acceleration of the particle when velocity of the particle is zero_____

50. A particle starting from rest has a constant acceleration of $4ms^2$ for 4 seconds. If then retards uniformly for next 8 seconds and comes to rest. Average acceleration during the motion of the particle is_____

CHEMISTRY

(SINGLE CORRECT ANSWER TYPE)

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51. Which one of the following is not the characteristic of Planck's quantum theory of radiation?
(1) The energy is not absorbed or emitted in whole number multiple of quantum.
(2) Radiation is associated with energy.
(3) Radiation energy is not emitted or absorbed continuously but in the form of small packets called quanta.
(4) This magnitude of energy associated with a quantum is proportional to the frequency

52. The spectral lines corresponding to the radiation emitted by an electron jumping from 6th, 5th and 4th orbits to 5th orbit belong to:
(1) Lyman series (2) Balmer series

(3) Paschen series (4) Pfund series

53. **Find the value of wave number $\bar{\nu}$ in terms of Rydberg's constant, when transition of electron takes place between two levels of He^+ ion whose sum is 4 and difference is 2.**

(1) $\frac{8R}{9}$ (2) $\frac{32R}{9}$

(3) $\frac{3R}{4}$ (4) None of these

54. **The photoelectric effect supports quantum nature of light because:**

(1) there is a minimum frequency of light below which no photoelectrons are emitted

(2) the maximum kinetic energy of photoelectrons depends only on the frequency of light and not on its intensity

(3) even when metal surface is faintly illuminated the photoelectrons leave the surface immediately

(4) electric charge of photoelectrons is quantised

55. **The value of Planck's constant is $6.63\times10^{-34} J-s$. The velocity of light is $3\times10^{8} m/\sec$. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of $8\times10^{15}\sec^{-1}$**

(1) 5×10^{-18} (2) 4×10^{1}

(3) 3×10^{7} (4) 2×10^{-25}

56. **For the Paschen series the value of n_1 and n_2 in the expression $\Delta E = R_H\left[\frac{1}{n_1^2}-\frac{1}{n_2^2}\right]$ is:**

(1) $n_1=1, n_2=2,3,4$ ---

(2) $n_1=2, n_2=3,4,5$------

(3) $n_1=3, n_2=4,5,6$------

(4) $n_1=4, n_2=5,6,7$------

57. **The wavelength of first line of Balmer spectrum of hydrogen will be:**

(1) 4340 Å (2) 4101 Å

(3) 6569 Å (4) 4861 Å

58. **Which of the following is not correctly matched?**

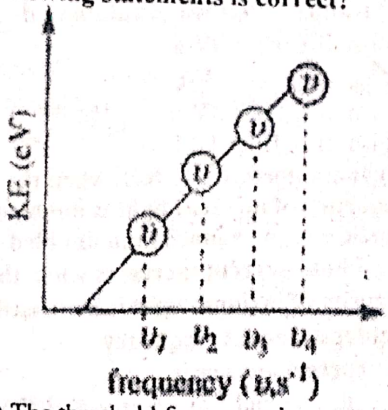
(1) $H_\alpha - 6569\,\overset{0}{A}(Red)$

(2) $H_\beta - 4861\,\overset{0}{A}(Green)$

(3) $H_\gamma - 4340\,\overset{0}{A}(Orange)$

(4) $H_\delta - 4101\,\overset{0}{A}(Violet)$

59. **In a photoelectric experiment, kinetic energy of photoelectrons was plotted aganist the frequency of incident radiation (v), as the shown in figure. Which of the following statements is correct?**



1) The threshold frequency is v_1

2) The slope of this line is equal to Plank's constant.

3) As the frequency of incident radiation increase frequency, kinetic energy of photoelectrons decreases

4) It is impossible to obtain such a graph.

60. **True statements among the following are**

1) Number of waves generated by the electron in the 5th orbit is five

2) As the temperature increases maximum intensity of radiation emitted by the black body shifts towards lower wavelength side

3) As the intensity of incident radiation increases kinetic energy of photo electrons increases

(1) A and B (2) B and C

(3) A and C (4) A, B and C

61. **The energy difference between two successive levels is maximum between**

1) 1 and 2 2) 2 and 3

3) 3 and 4 4) 4 and 5

62. **A surface ejects electrons when hit by green light but not when hit by yellow light. Will electrons be ejected if the surface is hit by red light ?**

1) Yes 2) No

3) Yes , if the red beam is quite intense

4) Yes , if the red beam continues to fall upon

63. **The wave length of two photons A and B are 100 A° and 100nm. The ratio of their energies will be**

1) 1:1 2) 2:1

3) 10:1 4) 1:10

64. **The wavelengths of two radiations are 200 & 300nm respectively. Then identify the correct statement**

LIST – A	LIST - B
I) Ratio of their energies	a) 1:1
II) Ratio of their frequency	b) 2:3
III) Ratio of their velocity	c) 3:2
IV) Ratio of their wave number	d) 2: 9

(1) I-b, II-c, III-a, IV-a
(2) I-c, II-c, III-a, IV-c
(3) I-b, II-b, III-b, IV-b
(4) I-b, II-b, III-b, IV-b

65. **(A):In photoelectric effect, when the frequency of incident light is doubled, kinetic energy is more than doubled**
(R): Photo current increases when the intensity of incident light is increased and is independent of frequency
The correct answer is
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

66. **Line spectrum is characteristic of**
1) Atoms 2) Molecules
3) Any substance in solid state
4) Any substance in liquid state

67. **The spectrum obtained from incandescent solids is**
1) Continuous 2) Line
3) Band 4) Absorption

68. **(1): Hydrogen has only one electron in its orbit but produces several spectral lines**
(R): There are many excited energy levels available in a sample of Hydrogen gas
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

69. **The metal best used in photoelectric cells is**
1) Na 2) Mg
3) Al 4) Cs

70. **The minimum energy required to emit an electron from the surface of a metal is called**
1) Activation energy 2) Threshold energy
3) Critical energy 4) Kinetic energy

(NUMERICAL VALUE TYPE)

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71. **If Paschen series of hydrogen spectrum has 4 lines then number of lines in Balmar series will be_____**

72. **Number of possible spectral lines which may be emitted in Brackett series in H-atom, if electrons in 9th excited state returns to ground state are_____**

73. **In a hydrogen atom, the transition takes place from n=3 to n= 2. If Rydberg constant is 1.097×10^7 m^{-1}, the wave number of the emitted radiation is $x \times 10^3$ m^{-1}. The value of x is _____ (give answer in 4 digits)**

74. **The wave length of the radiation emitted when an electron falls from orbit 4 to 2 in hydrogen atom is_____nm. (give answer in 3 digits)**

75. **The wave number of the first line is Balmer series of hydrogen in 152cm^{-1}. The wave number of the first line in the Balmer series of Li^{2+} is_____ cm^{-1}**

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BEST OF LUCK