RANKRIDGE IIT JEE/NEET JUNIOR COLLEGE (LONGTERM)

TELANGANA

STREAM: JR MPC
Time: 3:00 Hours

WEEKEND TEST-18

Date: 24-11-2025
Max Marks: 300

SYLLABUS

MATHEMATICS : Maxima and Minima, Mean value theorem
PHYSICS : Gravitation (Full chapter)
CHEMISTRY :

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 the function $f(x)=Kx^3-9x^2+6x+3$ is increasing $\forall x\in R$ then $K\in$

(A) $(-\infty,0)$ (B) $\left(-\infty,\frac{9}{2}\right)$

(C) $\left(\frac{9}{2},\infty\right)$ (D) $(3,4)$

2. If the function $f(x)=\frac{K\sin x+2\cos x}{\sin x+\cos x}$ is increasing for all values of x then

(A) $K<1$ (B) $K>1$
(C) $K<2$ (D) $K>2$

3. The interval on which the function $\sin 2x-x, 0<x<\frac{\pi}{2}$ decreases is

(A) $\left(0,\frac{\pi}{2}\right)$ (B) $\left(0,\frac{\pi}{6}\right)$

(C) $\left(0,\frac{\pi}{4}\right)$ (D) $\left(\frac{\pi}{6},\frac{\pi}{2}\right)$

4. The stationary points of $f(x)=x^3-9x^2+24x-12$ are

(A) $(2,4),(4,3)$ (B) $(2,8)(4,4)$
(C) $(0,-12)(1,4)$ (D) $(2,8)(1,4)$

5. The maximum value of $f(x)=x^3-2ax^2+a^2x\,(a>0)$ is

(A) 0 (B) a^3

(C) $\frac{4}{27}a^3$ (D) a

6. The function $f(x)=4x^5-25x^4+40x^3-10$ has

(A) One maximum and one minimum
(B) One maximum and two minimum
(C) Two maximum and one minimum
(D) Two maximum and two minimum

7. The absolute maximum of $f(x)=x^3-3x+2$ in $[0,2]$ is

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

8. The minimum value of $4x^2+\frac{3}{x^2}$ is

(A) $3\sqrt{4}$ (B) $2\sqrt{3}$
(C) $3\sqrt{2}$ (D) $4\sqrt{3}$

9. The sum of two numbers is 16. If their product is maximum then the numbers are

(A) 12, 4 (B) 10, 6
(C) 8, 8 (D) 2, 14

10. If $f(x)=a\log|x|+bx^2+x$ has its extreme values at $x=-1$ and $x=2$ then

(A) $a=2,b=-1$ (B) $a=2,b=-1/2$
(C) $a=-2,b=1/2$ (D) $a=1,b=1$

11. If $2\le x\le 4$ then the maximum value of $f(x)=(x-2)^6(4-x)^5$ is

(A) $\left(\frac{11}{12}\right)^5\left(\frac{11}{10}\right)^5$ (B) $\left(\frac{2}{11}\right)^6\left(\frac{10}{9}\right)^5$

(C) $\left(\frac{12}{11}\right)^6\left(\frac{10}{11}\right)^5$ (D) $\left(\frac{2}{11}\right)^6\left(\frac{10}{11}\right)^5$

12. The sides of a rectangle of the greatest area which can be inscribed into an ellipse $\frac{x^2}{25}+\frac{y^2}{9}=1$ are

(A) $3\sqrt{5}, 5\sqrt{5}$ (B) $5\sqrt{3}, 3\sqrt{3}$

(C) $5\sqrt{2}, 3\sqrt{2}$ (D) 5, 3

13. The volume of the largest possible right circular cylinder that can be in inscribed in a sphere of radius $\sqrt{3}$ is

(A) $\frac{4}{3}\sqrt{3}\pi$ (B) $\frac{8}{3}\sqrt{3}\pi$

(C) 4π (D) 2π

14. The maximum area of a right angled triangle with hypotenuse h is

(A) $\frac{h^2}{2\sqrt{2}}$ (B) $\frac{h^2}{2}$

(C) $\frac{h^2}{\sqrt{2}}$ (D) $\frac{h^2}{4}$

15. The point on the curve $y=x^2$ which is nearest to $(3,0)$ is

(A) $(1,-1)$ (B) $(-1,1)$

(C) $(-1,-1)$ (D) $(1,1)$

16. The value of 'c' in Rolle's theorem for $f(x)=\log\sin x$ in the interval $\left[\frac{\pi}{6},\frac{5\pi}{6}\right]$ is

(A) 0 (B) $\pi/4$

(C) $\pi/2$ (D) $\pi/3$

17. The value of 'c' of Lagrange's mean value theorem for $f(x)=2\sin x+\sin 2x$ in $[0,\pi]$ is

(A) $\pi/6$ (B) $\pi/3$

(C) $\pi/2$ (D) π

18. The value of 'θ' of the Lagrange's mean value theorem for $f(x)=x^2-2x+3$, $a=1, h=\frac{1}{2}$

(A) 1/4 (B) 1/8

(C) 3/4 (D) 1/2

19. If $27a+9b+3c+d=0$, then the equation $4ax^3+3bx^2+2cx+d=0$ has atleast one real root lying between

(A) 0 and 1 (B) 1 and 3

(C) 0 and 3 (D) 0 and 2

20. Let f be a function which is continuous and differentiable for all real x. If $f(2)=-4$ and $f'(x)\geq 6$ for all $x\in[2,4]$, then

(A) $f(4)<8$ (B) $f(4)\geq 8$

(C) $f(4)>12$ (D) $f(4)>8$

(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 $f(x)=x^3+bx^2+ax$ satisfies the conditions of Rolle's theorem in $[1,3]$ with $c=2+\frac{1}{\sqrt{3}}$ then $|ab|$ is equal to_____

22. If the value of 'c' Lagrange's mean value theorem for $f(x)=x^2-3x-2$ for $x\in[-1,2]$ is λ then 4λ _____

23 The real number x when added to its inverse gives the minimum value of the sum at $x=$_____

24. Let $f(x)$ be a cubic polynomial with $f(1)=-10, f(-1)=6$ and has a local minima at $x=1$ and $f'(x)$ has a local minima at $x=-1$. Then $f(3)$ is equal to___

25. A line segment of length 8cm is divided into two parts AP and PB by a point P. If AP^2+PB^2 is minimum then AP=32

PHYSICS

(SINGLE CORRECT ANSWER TYPE)

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26. Masses 2 kg and 8 kg are 18 cm apart. The point where the gravitational field due to them is zero is

(A) 6 cm from 8 kg mass

(B) 6 cm from 2 kg mass

(C) 1.8 cm from 8 kg mass

(D) 9 cm from each mass

27. Three particles each of mass m are kept at the vertices of an equilateral triangle of side L. The gravitational field at the centre due to these particles is

(A) Zero (B) $\frac{3GM}{L^2}$

(C) $\frac{9GM}{L^2}$ (D) $\frac{2GM}{L^2}$

28. A body of mass m is lifted from the surface of earth to a height equal to R/3 where R is the radius of earth, potential energy of the body increases by

(A) mgR/3 (B) mgR/4

(C) 2mgR/3 (D) mgR/9

29. The escape velocity of an object on a planet whose radius is 4times that of the earth and 'g' value 9 times that on the earth, in kms^{-1}, is

(A) 33.6 (B) 67.2

(C) 16.8 (D) 25.2

30. Two satellites are revolving round the earth at different heights. The ratio of their orbital speeds is 2: 1. If one of them is at a height of 100km, the height of the other satellite is (in km)

(A) 19600 (B) 24600

(C) 29600 (D) 14600

31. Angular momentum of a satellite revolving round the earth in a circular orbit at a height R above the surface is L. Here R is radius of the earth. The magnitude of angular momentum of another satellite of the same mass revolving very close to the surface of the earth is

(A) $L/2$ (B) $L/\sqrt{2}$

(C) $\sqrt{2}L$ (D) $2L$

32. If d is the distance between the centres of the earth of mass M_1 and moon of mass M_2 then the velocity with which a body should be projected from the mid point of the line joining the earth and the moon, so that it just escapes is

(A) $\sqrt{\frac{G(M_1+M_2)}{d}}$ (B) $\sqrt{\frac{G(M_1+M_2)}{2d}}$

(C) $\sqrt{\frac{2G(M_1+M_2)}{d}}$ (D) $\sqrt{\frac{4G(M_1+M_2)}{d}}$

33. The escape velocity of a planet having mass 6 times and radius 2 times as that of earth is

(A) $\sqrt{3}V_e$ (B) $3V_e$

(C) $\sqrt{2}V_e$ (D) $2V_e$

34. The work done to increase the radius of orbit of a satellite of mass 'm' revolving around a planet of mass M from orbit of radius R in to another orbit of radius 3R is

(A) $\frac{2GMm}{3R}$ (B) $\frac{GMm}{3R}$

(C) $\frac{GMm}{6R}$ (D) $\frac{GMm}{24R}$

35. Three particles of equal mass 'm' are situated at the vertices of an equilateral triangle of side 'L'. The work done in increasing the side of the triangle to 2L is

(A) $\frac{2G^2m}{2L}$ (B) $\frac{Gm^2}{2L}$

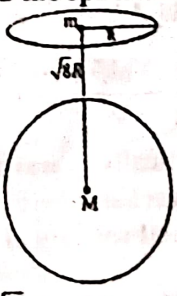
(C) $\frac{3Gm^2}{2L}$ (D) $\frac{3Gm^2}{L}$

36. The work done in bringing three particles each of mass 10 gm from large distance to the vertices of an equilateral triangle of side 10 cm is(approximately)

(A) $10^{-13}J$ (B) $2\times10^{-13}J$

(C) $4\times10^{-13}J$ (D) $10^{-11}J$

3. The centres of a ring of mass in and a sphere of mass M of equal radius R, are at a distance $\sqrt{8}R$ apart as shown in fig. The force of attraction between the ring and the sphere is



(A) $\frac{2\sqrt{2}}{27}\frac{GmM}{R^2}$ (B) $\frac{GmM}{8R^2}$

(C) $\frac{GmM}{9R^2}$ (D) $\frac{\sqrt{2}}{9}\frac{GmM}{9R^2}$

38. Two masses 90 kg and 160 kg are 5 m apart. The gravitational field intensity at a point 3m from 90 kg and 4 m from 160 kg is

(A) $10G$ (B) $5G$

(C) $5\sqrt{2}G$ (D) $10\sqrt{2}G$

39. The mass of the Earth is 9 times that of Mars. The radius of the Earth is twice that of Mars. The escape velocity of the Earth is 12 km/sec. The escape velocity on Mars is .... km/sec

(A) $4\sqrt{2}km/sec$ (B) $2\sqrt{2}km/sec$

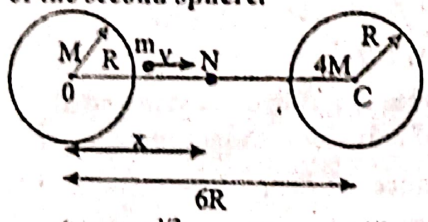
(C) $6\sqrt{2}km/sec$ (D) $8\sqrt{2}km/sec$

40. The gravitational field in a region isgiven by the equation $E=(5i+12j)N/kg$. If a particle of mass 2kg is moved from the origin to the point (12m, 5m) in this region, the change in the gravitational potential energy is

(A) $-240J$ (B) $-200J$

(C) 2455 (D) 0

41. Two uniform solid spheres of equal radii R, but mass M and 4M have a centre to centre separation 6R, as shown in Fig. The two spheres are held fixed.A projec- tile of mass 'm' is projected from the surface of the sphere of mass M directly towards the centre of the second sphere. Obtain an expression for the minimum speed 'v' of the projectile so that it reaches the surface of the second sphere.



(A) $\left(\frac{3GM}{5R}\right)^{1/2}$ (B) $\left(\frac{2GM}{5R}\right)^{1/2}$

(C) $\left(\frac{GM}{5R}\right)^{1/2}$ (D) $\left(\frac{3GM}{5R}\right)^{2}$

42. A particle is fired vertically upwards from the surface of earth reaches a height 6400Km. Find the initial velocity of the particle.

(A) 8m/sec (B) 8Km/sec

(C) 9m/sec (D)90m/sec

43. If Earth has mass nine times and radius twice that of the planet mars, calculate the velocity required by a rocket to pull out of the gravitational force of Mars. Take escape speed on surface of Earth to be 11.2 km/s

(A) 5.3Km/sec (B) 3.5Km/sec

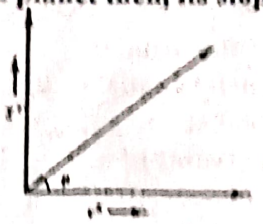
(C) 2.3Km/sec (D) 1.2Km/sec

44. The ratio of the orbital speeds of two satellites of the earth if the satellites are at heights 6400km and 19200km (Radius of the earth = 6400 km)

(A) $\sqrt{2}:1$ (B) $\sqrt{3}:1$

(C) $2:1$ (D) $3:1$

45. If a graph is plotted between T^2 and r^3 for a planet then, its slope will be



(A) $\frac{4\pi^2}{GM}$ (B) $\frac{GM}{4\pi^2}$

(C) $4\pi GM$ (D) Zero

NUMERICAL VALUE TYPE)

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46. A man can jump 1.5m on the Earth. The approximate height he might be able to jump on a planet whose density is one-quarter that of the Earth and whose radius is one-third that of the Earth=____m.

47. A planet in a distant solar system is 10 times more massive than the earth and its radius is 10 times smaller. Given that escape velocity from the earth is 11km/s, the escape velocity from the surface of the planet is ____ km/sec.

48. A launching vehicle carrying an artificial satellite of mass m is set for launch on the surface of the earth of mass M and radius R. If the satellite intended to move in a circular orbit of radius 7R, the minimum energy required to be spent by the launching vehicle on the satellite is $\frac{(x)GMm}{14R}$, where $x=$____.

49. An infinite number of particles each of mass m are placed on the positive X-axis at 1m,2m,4m,8m,.... from the origin. The magnitude of the resultant gravitational

force on mass 'm' kept at the origin = $\frac{x}{3}Gm^2$, where $x=$_____.

50. An asteroid is moving directly towards the centre of the earth. When at a dis tance of 10R (R is the radius of the earth) from the earths centre, it has a speed of 12 km/s. Neglecting the effect of earths atmosphere, what will be the speed of the asteroid when it hits the surface of the earth (escape velocity from the earth is 11.2 km/s)? Give your answer to the nearest integer_____. in Kms^{-1}

CHEMISTRY

(SINGLE CORRECT ANSWER TYPE)

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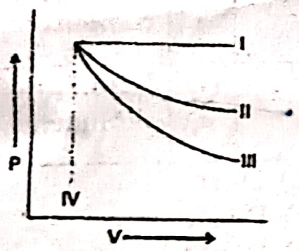
51.



The plots between P and V which represent isochoric and isobaric process respectively:
(A) I, II (B) IV, I
(C) I, IV (D) II, III

52. For the gas-phase decomposition $PCl_5(g) \overset{\Delta}{\rightleftharpoons} PCl_3(g)+Cl_2(g)$:
(A) $\Delta H<0, \Delta S<0$ (B) $\Delta H>0, \Delta S>0$
(C) $\Delta H>0, \Delta S<0$ (D) $\Delta H<0, \Delta S>0$

53. If $\Delta G=-177\,K\,cal$ for
$(1)\,2Fe(s)+\frac{3}{2}O_2(g)\rightarrow Fe_2O_3(s)$
And $\Delta G=-19K\,cal$ for
$(2)\,4Fe_2O_3(s)+Fe(s)\rightarrow 3Fe_3O_4(s)$
What is the Gibbs free energy of formation of $Fe_3O_4(s)$?
(A) +229.6 kcal/mol (B) -242.3 kcal/mol
(C) -727 kcal/mol (D) -229.6 kcal/mol

54. The γ for inert gases is
(A) 1.33 (B) 1.66
(C) 2.13 (D) 1.99

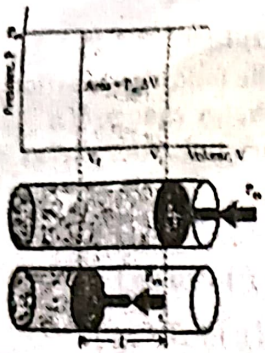
55. For which one of the following reaction does the molar enthalpy change of a reaction corresponds to Lattice energy of KBr?
(A) $KBr(s)\rightarrow K(s)+^{1/2}Br_2(g)$
(B) $KBr(g)\rightarrow K(g)+Br(g)$
(C) $KBr(s)\rightarrow K^+(g)+Br^-(g)$
(D) $KBr(g)\rightarrow K^+(g)+Br^-(g)$

56. The enthalpy of neutralization of which of the following acid & base is nearly -13.6 kcal.
(A) *HCN and NaOH*
(B) CH_3COOH *and* NH_4OH
(C) *HCl and KOH*
(D) *HCl and* NH_4OH

57. The value of enthalpy change (ΔH) for the reaction,
$C_2H_5OH_{(l)}+3O_{2(g)}\rightarrow 2CO_{2(g)}+3H_2O_{(l)}$
at 27^0C is 1366.5 $kJ\,mol^{-1}$. The value of internal energy change for the above reaction at this temperature will be:
(A) -1369.0 kJ (B) -1364.0 kJ
(C) -1361.5 kJ (D) -1371.5 kJ

58. Among the following, the state function(s) is (are)
(i) Internal energy
(ii) Irreversible expansion work
(iii) Reversible expansion work
(iv) Molar enthalpy
(A) (ii) and (iii) (B) (i), (ii) and (iii)
(C) (i) and (iv) (D) (i) only

59. Figure below is showing that one mole of an ideal gas is fitted with a frictionless piston. Total volume of the gas is V_i pressure of the gas inside is p. If external pressure is P_{ex} which is greater than p, is applied, piston is moved inward till the pressure inside becomes equal to P_{ex}.



What does the shaded area represents in the figure?

(A) Work done

(B) Pressure change

(C) Volume change

(D) Temperature change

60. Choose the reaction with negative ΔS value

(A) $2NaHCO_3(s) \rightarrow Na_2CO_3(s) + CO_2(g) + H_2O(g)$

(B) $Cl_2(g) \rightarrow 2Cl(g)$

(C) $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$

(D) $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$

61. During complete combustion of one mole of butane, 2658 kJ of heat is released. The thermochemical reaction for above change is

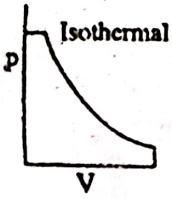
(A) $2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(l); \Delta_c H = -2658.0\,kJ\,mol^{-1}$

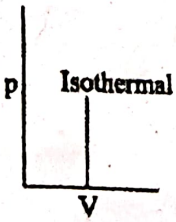
(B) $C_4H_{10}(g) + \frac{13}{2}O_2(g) \rightarrow 4CO_2(g) + 5H_2O(l); \Delta_c H = -1329.0\,kJ\,mol^{-1}$

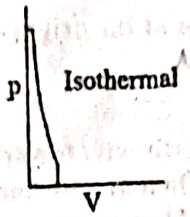
(C) $C_4H_{10}(g) + \frac{13}{2}O_2(g) \rightarrow 4CO_2(g) + 5H_2O(l); \Delta_c H = -2658.0\,kJ\,mol^{-1}$

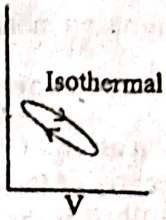
(D) $C_4H_{10}(g) + \frac{13}{2}O_2(g) \rightarrow 4CO_2(g) + 5H_2O(l); \Delta_c H = +2658.0\,kJ\,mol^{-1}$

62. Which of the following p-V curve represents maximum work done?

(A) 

(B) 

(C) 

(D) 

63. The correct option for free expansion of an ideal gas under adiabatic condition is

(A) $q = 0, \Delta T < 0$ *and* $w > 0$

(B) $q < 0, \Delta T = 0$ *and* $w = 0$

(C) $q > 0, \Delta T > 0$ *and* $w > 0$

(D) $q = 0, \Delta T = 0$ *and* $w = 0$

64. Match Column-I with Column-II

Column-I		Column-II	
(A)	$C_4H_{10} + \frac{13}{2}O_2 \rightarrow 4CO_2 + 5H_2O;$ $\Delta H = -w$	(p)	Enthalpy of atomisation
(B)	$CH_4 \rightarrow C + 4H; \Delta H = x$	(q)	Enthalpy of formation
(C)	$H_2 + Br_2 \rightarrow 2HBr;$ $\Delta H = y$	(r)	Enthalpy of combustion
(D)	$CO_2(s) \rightarrow CO_2(g);$ $\Delta H = z$	(s)	Enthalpy of sublimation

(A) A-(s), B-(p), C-(q), D-(r)

(B) A-(q), B-(r), C-(p), D-(s)

(C) A-(r), B-(p), C-(q), D-(s)

(D) A-(p), B-(q), C-(s), D-(r)

65. The most random state of H_2O system is

(A) Ice (B) $H_2O(l)$ *at* $80^0C; 1atm$

(C) Steam (D) $H_2O(l)$ *at* $25^0C; 1atm$

66. The statement "Heat cannot flow from colder body to hotter body" is known as

(A) 1 st law of Thermodynamics

(B) Zeroth law

(C) 2nd law of Thermodynamics

(D) Law of conservation of energy

67. Which of the following relations is not correct.

(A) $G = H - TS$

(B) $\Delta G_{system} = \Delta H_{system} - T\Delta S_{system}$

(C) $T\Delta S_{system} = \Delta H_{system} - \Delta G_{system}$

(D) $\Delta H_{system} = \Delta G_{system} - T\Delta S_{system}$

68. $\Delta S_{surroundings} = +959.1 Jk^{-1}mol^{-1}$

$\Delta S_{system} = -163.1 Jk^{-1}mol^{-1}$ Then the process is

(A) Spontaneous
(B) Non spontaneous
(C) At equilibrium
(D) Cannot be predicted from the information

69. C_v values for monoatomic and diatomic gases respectively are

(A) $\frac{1}{2}R, \frac{3}{2}R$ (B) $\frac{3}{2}R, \frac{5}{2}R$
(C) $\frac{5}{2}R, \frac{7}{2}R$ (D) $\frac{3}{2}R, \frac{3}{2}R$

70. On the basis of reaction,

$$\frac{4}{3}Al + O_2 \rightarrow \frac{2}{3}Al_2O_3, \Delta G = -827\,KJ\,mol^{-1}$$

of O_2, the minimum emf required to carry out electrolysis of Al_2O_3 is

(A) 6.42 V (B) 8.56 V
(C) 2.14 V (D) 4.28 V

(NUMERICAL VALUE TYPE)

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71. **What is the free energy change (ΔG) when 1.0 mole of water at 100^0C and 1atm pressure is converted into steam at 100^0C atm pressure?**

72. **On the basis of the following thermochemical data $\left(\Delta_f G^o H^+_{(aq)} = 0\right)$**

$$H_2O(\ell) \rightarrow H^+(aq) + OH^-(aq); \Delta H = 57\,kJ$$

$$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(\ell); \Delta H = -286\,kJ$$

The value of enthalpy of formation of OH^- ion at 25^0C is

73. **For the reaction $2NO_2(g) \rightleftharpoons N_2O_4(g)$, when $\Delta S = -176.0\,JK^{-1}$ and $\Delta H = -57.8\,kJ\,mol^{-1}$, the magnitude of ΔG at 298 K for the reaction is____ KJ mol^{-1}. (Nearest integer)**

74. **The difference in ΔH and ΔE for the combustion of methane at 27^0C would be____cal.**

75. **For the following reaction,**

$$C(diamond) + O_2 \rightarrow CO_2(g); \Delta H = -94.3\,kcal/mol$$

$$C(graphite) + O_2 \rightarrow CO_2(g); \Delta H = -97.6\,kcal/mol$$

The heat required to change 1g of C (diamond) $\rightarrow$ C (graphite) is ____ cal

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BEST OF LUCK

RANKRIDGE IIT JEE/NEET JUNIOR COLLEGE (LONGTERM)

TELANGANA

STREAM: JR MPC | WEEKEND TEST-18 | Date: 24-11-2025

Time: 3 Hours | Max Marks: 300

KEY SHEET

MATHEMTAICS

1) C	2) D	3) D	4) B	5) C	6) A	7) C	8) D	9) C	10) B
11) C	12) C	13) C	14) D	15) D	16) C	17) B	18) D	19) C	20) B
21) 66	22) 2	23) 1	24) 22	25) 4					

14 × 4 = 56 ⇒ 54 − 2

PHYSICS

26) 2	27) 1	28) 2	29) 2	30) 1	31) 2	32) 4	33) 1	34) 2	35) 3
36) 2	37) 1	38) 4	39) 1	40) 1	41) 1	42) 2	43) 1	44) 1	45) 1
46) 18	47) 110	48) 13	49) 4	50) 16					

19 × 4 = 76 ⇒ 72 − 4

CHEMISTRY

51) B	52) B	53) B	54) B	55) C	56) C	57) B	58) C	59) A	60) C
61) C	62) A	63) D	64) C	65) C	66) C	67) D	68) A	69) B	70) C
71) 0	72) -229	73) -5	74) -1200	75) 275					

85 + 72 + 54 = 211 − 4 = 207

21 × 4 = 84 ⇒ 81

22 × 4 = 88 − 3 = 85 ⇒ 81

100 × 2 = 200