Master JEE CLASSES
Kukatpally, Hyderabad.

JEE-ADVANCED-2012-P1-Model

Max. Marks: 210

PAPER-I

MATHEMATICS:

Transformation formulae, Conditional Identities, Graphs of Trigonometric Functions, Periodicity and extreme values (30%); Trigonometric Equations (60%); Cumulative (10%)

PHYSICS:

Non - uniform accelerated motion in 1D & related graphs, Motion in 2D,Projectile motion(Excluding projection on inclined planes) (60%)

Kinematics : Motion in 1D,Uniform motion, uniform accelerated motion, motion under gravity and related graphs (30%)

Cumulative syllabus covered till now (10%)

CHEMISTRY:

Enthalpy of reaction - different types of enthalpies, Hess's law, Effect of temperature on enthalpy of reaction - Kirchoff's equation, Hess's law and its applications, Determination of enthalpy of hydration of CuSO4, Resonance energy, Limitations of first law of thermodynamics; Second law of Thermodynamics; Carnot cycle, efficiency of thermodynamic system, Entropy - physical significance, expressions in all types of processes ,Gibb's free energy - physical significance, spontneity of processes(60%)

Thermodynamics: Terms involved in thermodynamics - System & Surrounding, Extensive and Intensive Properties, Path and State function, types of processes, First law of thermodynamics , Reversible and irrevesible processes; Work - expressions for reversible, irreversible isothermal and adiabatic processes, Heat and Heat capacity, Thermochemistry: Enthalpy(30%), Cumulative Syllabus(10%)

JEE-ADVANCED-2012-P1-Model

IMPORTANT INSTRUCTIONS **Max Marks: 210**

PHYSICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 10)	Questions with Single Correct Choice	3	-1	10	30
Sec – II(Q.N : 11 – 15)	Questions with Multiple Correct Choice	4	0	5	20
Sec – III(Q.N : 16 – 20)	Questions with Integer Answer Type	4	0	5	20
Total				**20**	**70**

CHEMISTRY:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 21 – 30)	Questions with Single Correct Choice	3	-1	10	30
Sec – II(Q.N : 31 – 35)	Questions with Multiple Correct Choice	4	0	5	20
Sec – III(Q.N : 36 – 40)	Questions with Integer Answer Type	4	0	5	20
Total				**20**	**70**

MATHEMATICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 41 – 50)	Questions with Single Correct Choice	3	-1	10	30
Sec – II(Q.N : 51 – 55)	Questions with Multiple Correct Choice	4	0	5	20
Sec – III(Q.N : 56 – 60)	Questions with Integer Answer Type	4	0	5	20
Total				**20**	**70**

SECTION I
(Single Correct Answer Type)

This section contains 10 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 +3 for correct answer , 0 if not attempted and -1 in all other cases.

01. A body is moving with velocity of 10 m/s towards east and it's acceleration is 4 m/s^2 towards west. Then the displacement and distance of the body at $t = 3\,\text{sec}$

A) 12m,48m B) 12m,13m C) 12m,12m D) 12m,24m

02. A particle moves along a straight line according to law $s^2 = at^2 + 2bt + c$. The acceleration of a particle varies as

A) s^3 B) s^{-3} C) $s^{2/3}$ D) $s^{-3/2}$

03. A point moves in x-y plane according to equation $x = at; y = at(1-\alpha t)$, where a and α are constants and t is the time. Find the moment at which the velocity vector forms an angle of 90^0 with acceleration vector

A) $t = \frac{1}{a}$ B) $t = \frac{1}{\alpha}$ C) $t = \frac{1}{2\alpha}$ D) $t = \frac{1}{a} + \frac{1}{\alpha}$

04. The deceleration experienced by a moving motor boat, after it's engine is cut off is given by $\frac{dv}{dt} = -kv^3$, where k is constant. It V_o is the magnitude of the velocity at cutoff, the magnitude of the velocity at a time 't' after cutoff.

A) $\frac{V_o}{2}$ B) V C) $V_o e^{-kt}$ D) $\frac{V_0}{\sqrt{2V_0^2 kt + 1}}$

05. A particle is thrown over a triangle from one end of horizontal base and grazing the vertex falls on the other end of base. It α and β are the base angle and θ be the angle of injection then.

A) $Cot\theta = Cot\alpha + Cot\beta$ B) $Tan\theta = Tan\alpha + Tan\beta$

C) $Sin\theta = Sin\alpha + Sin\beta$ D) $Tan\theta = Tan(\alpha + \beta)$

06. A point moves in a straight line under retardation av^2. If initial velocity is u, the distance covered in't' seconds is

A) aut B) $\frac{1}{a}\log(aut)$ C) $\frac{1}{a}\log(1+aut)$ D) a log (aut)

07. The ball rolls off from the top of a staircase with a horizontal velocity 'u'. If each step is at height 'h' and width 'b' then the ball will just hit n^{th} step, directly then n is

A) $\frac{2bu^2}{gh^2}$ B) $\frac{2hu^2}{gb^2}$ C) $\frac{2hu}{gb}$ D) $\frac{2hb^2}{gu^2}$

08. A stone is dropped from height of 10cm above the top of the window 80cm high. The time taken by it to cross window is $\left(g = 9.8m/s^2\right)$

A) $\frac{1}{7}s$ B) $\frac{3}{7}s$ C) $\frac{2}{7}s$ D) $\frac{4}{7}s$

09. A body starts from rest and travels a distance of S with uniform acceleration, and moves uniformly a distance of 2S and finally cones to rest after moving further 5S under uniform retardation. Find ratio of average velocity to maximum velocity.

A) $\frac{7}{4}$ B) $\frac{4}{7}$ C) $\frac{3}{7}$ D) $\frac{7}{3}$

10. If $\overline{P}-\overline{Q}=\overline{R}$ and $P=Q=R$. Angle between $\overline{P}$ and $\overline{Q}$ is β. Angle between $\overline{P}$ and $\overline{R}$ is α then β/α is

A) 1 B) 2 C) 3 D) 4

SECTION – II
(MULTIPLE CORRECT ANSWER TYPE)

This section contains 5 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONE OR MORE than ONE option can be correct.
Marking scheme +4 for correct answer , 0 if not attempted and 0 in all other cases.

11. $\overline{A}$ and $\overline{B}$ are the two vectors. Then correct options are

A) If $\overline{A}+\overline{B}$ magnitude is equal to magnitude of $\overline{A}-\overline{B}$, when angle b/w $\overline{A}$ and $\overline{B}$ is 90^0

B) If angle b/w $\overline{A}+\overline{B}$ and $\overline{A}-\overline{B}$ is 60^0 their resultant is $\sqrt{3A^2+B^2}$

C) If $\overline{A}+\overline{B}$ and $\overline{A}-\overline{B}$ vectors are perpendicular $\overline{A}-\overline{B}$ is null vector

D) $\left(\overline{A}+\overline{B}\right).\left(\overline{A}-\overline{B}\right)=0$ if $\overline{A}$ & $\overline{B}$ have equal magnitude

12. Two bodies A and B are at top and bottom of a tower of height h respectively. A is projected down with a speed u. and B with a speed u vertically along the same line simultaneously mark correct option. They collide in air, neglect air resistance.

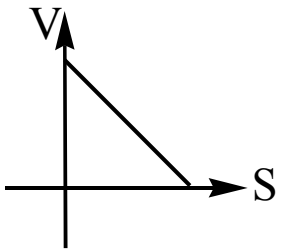
A) The change in velocity of bodies in time interval is same for the bodies

B) Time interval after which both bodies collide is $\frac{h}{2u}$

C) Time interval after which both bodies collide is $< \frac{h}{2u}$

D) Time interval after which both bodies collide is $> \frac{h}{2u}$

13. V-S graph of a particle moving in a straight line is as shown in fig



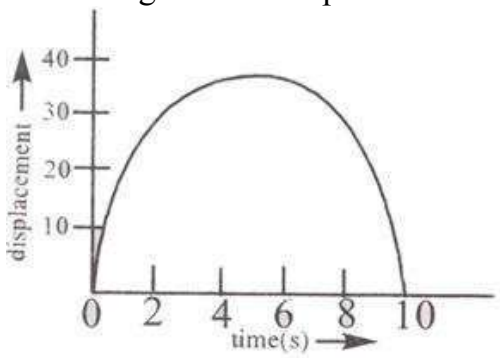
A) Magnitude of acceleration of particle is decreasing

B) Magnitude of acceleration of particle is increasing

C) Acceleration vs displacement graph is straight line

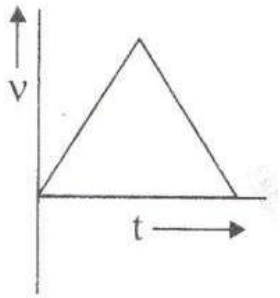
D) Acceleration vs displacement graph is parabola

14. The displacement-time graph of a moving object is shown in figure. Which of the velocity-time graphs shown in figure could represent the motion of the same body?

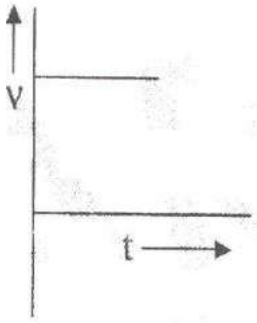


$time(s) \rightarrow$

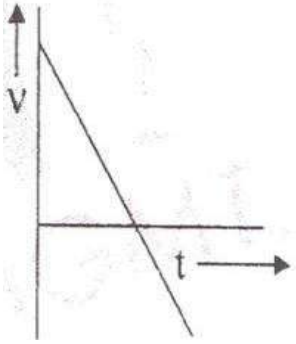
A)



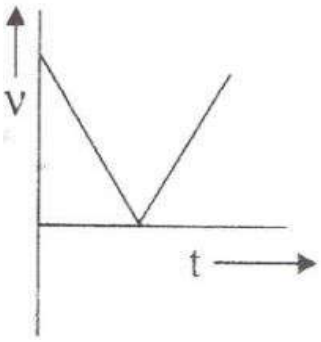
B)



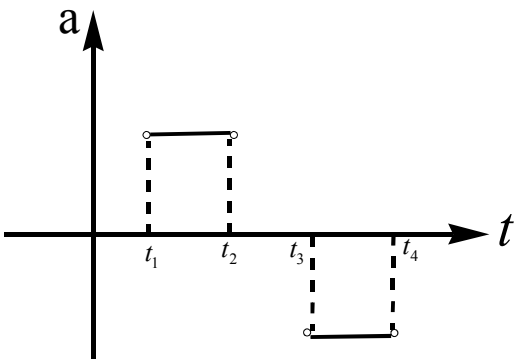
C)

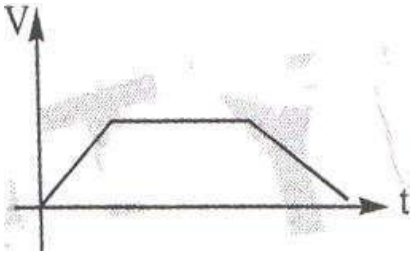


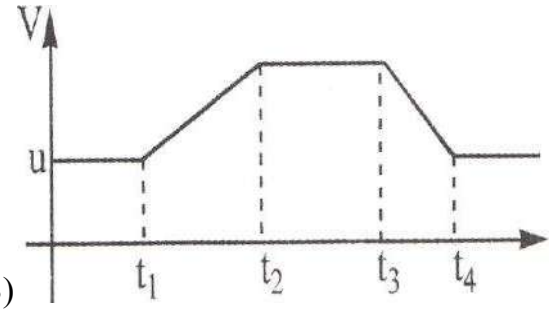
D)

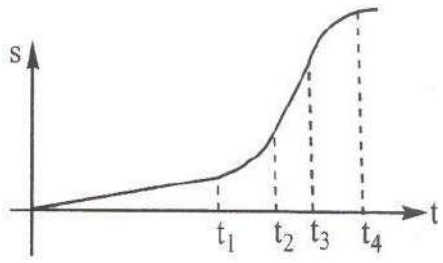


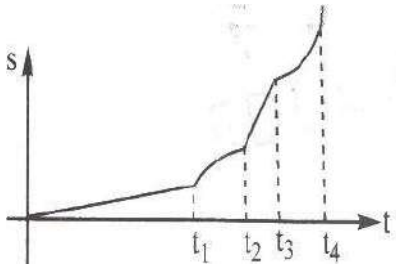
15. Which of the following in correct for the given a - t graph



A)


B)


C)


D)


SECTION III
(Integer Answer Type)

This section contains **5 questions**. The answer to each question is single digit integer, ranging from 0 to 9 (*both inclusive*).The correct digit below the question number in the ORS is to be bubbled).

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

16. An object is moving with speed of 6.25 m/s, is decelerated at a rate given by $\frac{dv}{dt} = -2.5\sqrt{v}$, where v is instantaneous speed. The time taken by the object to come to rest would be in

17. Given $|\vec{A}_1| = 2$, $|\vec{A}_2| = 3$ and $|\vec{A}_1 + \vec{A}_2| = 3$, if the value of $\left(\vec{A}_1 + 2\vec{A}_2\right).\left(3\vec{A}_1 + \vec{A}_2\right)$ is 4^n then n =

18. A cricket ball hit for six having the bat at angle of 60^0 to the horizontal with K.E 'k'. At the top KE of ball is $\frac{k}{n}$ then n =

19. A body starts from rest with uniform acceleration. Its velocity after 2n seconds is V_0 the displacement of body in last 'n' seconds is $\frac{3V_0 n}{\beta}$, value of β =

20. A parachutist jumps freely from an aero plane for 10 sec, and then his parachute opens out. Now we descends with net retardation of $2.5 m/s^2$. If he bails out of plane at height of 2495m and $g = 10 m/s^2$, his velocity on reaching the ground will be 5x m/s , then x=

CHEMISTRY: **Max.Marks: 70**

SECTION I

Single Correct Answer Type

This section contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

21. 22.3 grams of oxygen expands from 1 atm to 0.25 atm at 30^0C.The entropy change is (JK^{-1})

A) 4 B) 8 C) 16 D) 2.303

22. For liquid water at $25^0C, H_2(g)+\frac{1}{2}O_2(g)\rightarrow H_2O(l)$, $\Delta H^0_{298}=-285.83kJ$

Given $C_{P,m}(J.K^{-1}.mol^{-1})=75.29$ for $H_2O(l)$ and 33.57 for $H_2O(g)$ and that the ,molar heat of vaporization of liquid water at 100^0C is40.88 kJ.,mol^{-1}. Find ΔH^0_{298} for

$$H_2(g)+\frac{1}{2}O_2(g)\rightarrow H_2O(g)$$

A) -241.82 kJ B) – 341.28 kJ

C) -239.3 kJ D) - 245.0 kJ

23. Bond enthalpies of AB, A_2 and B_2 respectively are in the ratio 1:1:0.5.If ΔH for the formation of AB is -200 kJ, bond enthalpy of A_2 will be (in $kJmol^{-1}$)

A) 100A B) 300 C) 800 D) 400

24. If ΔH & ΔG are negative and ΔS is positive then reaction is

A) spontaneous at all temperatures

B) non-spontaneous at all temperatures

C) spontaneous at low temperature & non-spontaneous at high temperatures

D) in equilibrium

25. One mole of ideal mono atomic gas at 27^0C is subjected to a reversible isoentropic compression until final temperature reached to 327 ^{0}C. if the initial pressure was1atm then find the value of ln P_2:

A) 1.75atm B) 2 atm C) 2.5 atm D) 0.5 atm

26. Two litre of N_2 at 0^0C and 5 atm pressure are expanded isothermally against a constant external pressure of 1 atm until the pressure of gas reaches 1 atm. Assuming gas to be ideal, work of expansion is.

A) $-10 litre\ atm$ B) $-40 litre\ atm$

C) $-4 litre\ atm$ D) $-8 litre\ atm$

27. When 1.0 kcal of heat is added to 1.2 L of oxygen in a cylinder at a constant pressure of 1.00 atm , the volume increases to 1.5 L . ΔU of the process will be

A)1.007 kcal B) 0.993 kcal C) 8.85 kcal D) 4.21kcal

28. If $S + O_2 \longrightarrow SO_2$; $\Delta H = -298.2$ kJ

$SO_2 + \frac{1}{2}O_2 \longrightarrow SO_3$; $\Delta H = -98.7$ kJ

$SO_3 + H_2O \longrightarrow H_2SO_4$; $\Delta H = -130.2$kJ

$H_2 + \frac{1}{2}O_2 \longrightarrow H_2O$; $\Delta H = -227.3$ kJ

The enthalpy of formation of H_2SO_4 at 298 K will be

A)–650.3 kJ B) +320.5 kJ C) –754.4 kJ D) –433.7 kJ

29. At 25^0C, $\Delta G_f^0 \; of \; Al_2O_3(s) = -1582 kJ\, mol^{-1}$, $\Delta G_f^0 \; of \; Na_2O(s) = -377 kJ\, mol^{-1}$ and $\Delta G_f^0 \; of \; Li_2O(s) = --544 kJ\, mol^{-1}$. The aluminium oxide can be reduced to Al metal by(Given $Al_2O_3(s) + 6Na(s) \rightarrow 3Na_2O(s) + 2Al(s)$ and $Al_2O_3(s) + 6Li(s) \rightarrow 3Li_2O(s) + 2Al(s)$)

A) Sodium B) Lithium

C) Both Sodium and Lithium D) can not be predicted

30. The slope of an isochore , plotted for a van der Waals gas neglecting molecular attractions present in it , is equal to

A) $\frac{R}{V}$ B) $\frac{V-b}{R}$ C) $\frac{R}{V+b}$ D) $\frac{R}{V-b}$

SECTION – II
(MULTIPLE CORRECT ANSWER TYPE)

This section contains 5 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONE OR MORE than ONE option can be correct.

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

31. Which of the following statement(s) are correct ?

A) For mono atomic gases Poisson's ratio is 1.66

B) The value of $\frac{C_{p,m}}{C_{V,m}}$ for a mixture of 1 mole of a mono atomic gas ($\gamma = 5/3$)

and 1 mole of a diatomic gas ($\gamma = 7/5$) is 1.5

C) Slope of the graph drawn between enthalpy and temperature is C_p .

D) Specific heat capacity is an intensive property .

32. The heat of neutralization of (i) HCl and NaOH (ii) HNO_3 and NH_3 and

(iii) an acid HA and KOH are – 57.1, - 52.2 and – 53.2 kJ mol^{-1} respectively.

The acid HA would be

A) H_2SO_4 B) CH_3COOH C) HF D) $HClO_4$

33. Which of the following statement (s) is/ are correct?

A) standard heat of formation of elements in their standard state is zero

B) standard entropy of elements in their standard state is zero

C) standard free energy of elements in their standard state is zero

D) entropies of all perfectly crystalline substances are the same at absolute zero temperature .

34. Which of the following is correct matching

A) Ideal gas expands in Vaccum - $\Delta S_{sys} = 0$

B) Real gas expands in vaccum adiabiatically - $\Delta S_{sur} = 0$

C) Ideal gas expands reversibly and isothermally - $\Delta S_{total} = 0$

D) Ideal gas expands reversibly and adiabiatically - $\Delta S_{total} = +Ve$

35. Identify the extensive variable from the following

A) Internal energy B) Entropy

C) Vapour pressure D) Free energy per mole

SECTION III
(Integer Answer Type)

This section contains **5 questions.** The answer to each question is single digit integer, ranging from 0 to 9 (*both inclusive*). The correct digit below the question number in the ORS is to be bubbled).

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

36. One mole of an ideal gas at 300K expands isothermally and reversibly from 10 atm to 1 atm. Then $\Delta U + \Delta H + W_{\max} + q$ is equal to -

37. The mole fraction of each gas for the greatest ΔG in a mixture of four ideal gases at constant temperature and pressure is $\frac{1}{x}$ and x is-

38. An insulated container contains 1 mole of a liquid, molar volume 100ml,at 1 bar. When liquid is steeply pressed to 100 bar , volume decreases to 99 ml . Then $\Delta H = \frac{x}{2} barL$. x is (nearly) -

39. Two acid solutions A and B are titrated separately each with 25mL of 1N Na_2CO_3 solution. The volume of each acid used for titration are 10 ml and 40 ml respectively. Find out the volume ratio of acid B and A respectively ,which should be mixed to prepare 1mL of 1N solution .

40. The heat of vaporization of water and heat of fusion of ice are 540 cal/g and 80 cal/g. Then the ratio of $\frac{\Delta S_{vap}}{\Delta S_{fus}}$ for water is (nearly)-

SECTION I
(Single Correct Answer Type)

This section contains 10 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 +3 for correct answer , 0 if not attempted and -1 in all other cases.

41. $\frac{\cos 6x+6\cos 4x+15\cos 2x+10}{\cos 5x+5\cos 3x+10\cos x}=-2$ Then number of values of $x\in[0,2\pi]$ satisfying the equation is

A) 1 B) 2 C) 3 D) 0

42. The number of values of 'x' in $[0,2\pi]$ satisfying the equation $|\cos x-\sin x|\geq\sqrt{2}$ is

A) 0 B) 1 C) 3 D) 2

43. If $\frac{\cos(\theta_1-\theta_2)}{\cos(\theta_1+\theta_2)}+\frac{\cos(\theta_3+\theta_4)}{\cos(\theta_3-\theta_4)}=0$ then $\frac{\tan\theta_1.\tan\theta_3}{\cot\theta_2.\cot\theta_4}=$

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

44. If k is period of $\cos ec\left(x+\frac{4x}{2}+\frac{7x}{2^2}+\frac{10x}{2^3}+.....\infty\right)$ then $(\tan k)^{2015}+(\cot k)^{2017}=$

A) 2014 B) 4032 C) 1 D) 2

45. The most general values of 'θ' for which $\sin\theta-\cos\theta=\min\{1,\ a^2-6a+13;\ a\in R\}$ are given by

A) $n\pi+(-1)^n\frac{\pi}{4}-\frac{\pi}{4};n\in Z$ B) $n\pi+(-1)^n\frac{\pi}{4}+\frac{\pi}{4};n\in Z$

C) $2n\pi+\frac{\pi}{4};n\in Z$ D) $n\pi+\frac{\pi}{2};n\in Z$

46. The number of values of 'x' in the interval $[0,5\pi]$ satisfying the equation $2\sin^2 x+5\sin x-3=0$ is

A) 2 B) 4 C) 6 D) 5

47. In a ΔABC the angle A is greater than angle B. if the values of angles A and B satisfy the equation $3\sin x-4\sin^3 x-k=0$, 0<k<1 then ΔABC must be

A) acute angled triangle B) obtuse angled triangle

C) Right angled triangle D) Right angled isosceles triangle

48. If the equation $7\cos x+5\sin x=2k+1 \quad (k\in Z)$ has a solution then $|k_{\max}-k_{\min}|$ ($k_{\max}$ = Maximum possible value of k, $k_{\min}$ = Minimum possible value of k)

A) 7 B)4 C)6 D)10

49. Find the range of $\frac{1}{4\cos x+3\sin x+2}$

A) $\left[\frac{-1}{3},\frac{1}{7}\right]$ B) $\left(-\infty,\frac{-1}{3}\right]\cup\left[\frac{1}{7},\infty\right)$

C) $[-3,7]$ D) $\left[\frac{-1}{3},0\right]\cup\left[\frac{1}{7},\infty\right)$

50. If the equation $4\sin^2 x + 4\sin x + a^2 - 3 = 0$ has a solution then exhaustive range of possible values of a is

A) $[-2, 2]$ B) $[-1, 1]$ C) $[-3, 3]$ D) $[-4, 4]$

SECTION – II
(MULTIPLE CORRECT ANSWER TYPE)

This section contains 5 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONE OR MORE than ONE option can be correct.

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

51. If $M = \cos(23^0) - \sin(23^0), G = \cos(32^0) - \sin(32^0), R = (\cos 55^0 - \sin 55^0)$ then which of the following is correct

A)M>G>R B)R>G>M C)M+G+R>0 D)M+G-R>0

52. If $f(\alpha) = \tan\alpha + 2\tan(2\alpha) + 4\tan(4\alpha) + 8\cot(8\alpha)$, then which of the following is not correct

A) $f\left(\frac{\pi}{4}\right) = -1$ B) $f\left(\frac{\pi}{3}\right) = \frac{1}{\sqrt{3}}$ C) $f\left(\frac{\pi}{3}\right) = \sqrt{3}$ D) $f\left(\frac{3\pi}{4}\right) = 1$

53. If $\sin\theta = 2\max\{\sin\theta,\ \cos\theta\}$ then which of the following is true

A) number of values of $\theta \in (0, \pi/4)$ satisfying the equation are 2

B) if $\theta \in (0, \pi/4)$ then number of values of θ satisfying the equation are zero

C) no values of $\theta \in (\pi/4, \pi/2)$ satisfy the equation

D) 4 values $\theta \in (\pi/4, \pi/2)$ satisfy the equation

54. The equation $\sin^4 x + \cos^4 x = a$ has a solution for

A) $a = \frac{1}{2}$ B) $a = \frac{1}{3}$ C) a=1 D)a=2

55. The inequation $3^{\sin^2\theta} + 3^{\cos^2\theta} \le 2\sqrt{3}$ is true and $\theta \in [0, 2\pi]$ the values of 'θ' are written is ascending order then

A) They form an A.P B) They form a G.P

C) A.P with common difference $\frac{\pi}{2}$ D) G.P with common ratio 3

SECTION III
(Integer Answer Type)

This section contains **5 questions.** The answer to each question is single digit integer, ranging from 0 to 9 (*both inclusive*). The correct digit below the question number in the ORS is to be bubbled).

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

56. If $\cos(A+B+C) = \cos A.\cos B.\cos C \left(A, B, C \ne \frac{k\pi}{2}\right) k \in Z$ then $\left|\frac{8\sin(A+B).\sin(B+C).\sin(C+A)}{\sin 2A.\sin 2B.\sin 2C}\right|$

= _____

57. If $\frac{\sin x}{\sin y} = \frac{1}{2}, \frac{\cos x}{\cos y} = \frac{3}{2}$ where $x, y \in (0, \pi/2)$ and $\tan\left(\frac{x+y}{2}\right) = \frac{\sqrt{3}}{\sqrt{3+k}}$ then $k =$

58. $2\sin^2 x + 3\sin x - 2 > 0$ *and* $x^2 - x - 2 < 0$ then exhaustive values of x satisfying the two inequalities are $\left(\frac{\pi}{k}, m\right)$ then k+m=

59. The number of solutions of the equations $|x| = \cos x$ is

60. Number of orders pairs (x, y) satisfying $\cos x.\cos y = 1$ where $-\pi \le x \le \pi$, $-\pi \le y \le \pi$ is

Master JEE CLASSES
Kukatpally, Hyderabad.

JEE-ADVANCED-2012-P1-Model
Max.Marks:210

KEY SHEET

PHYSICS

1	**B**	2	**B**	3	**C**	4	**D**	5	**B**
6	**C**	7	**B**	8	**C**	9	**B**	10	**A**
11	**AD**	12	**AB**	13	**AC**	14	**C**	15	**BC**
16	**2**	17	**2**	18	**4**	19	**4**	20	**1**

CHEMISTRY

21	**B**	22	**A**	23	**C**	24	**A**	25	**A**
26	**D**	27	**B**	28	**C**	29	**B**	30	**D**
31	**ABCD**	32	**BC**	33	**ACD**	34	**BCD**	35	**AB**
36	**0**	37	**4**	38	**5**	39	**4**	40	**5**

MATHS

41	**A**	42	**D**	43	**A**	44	**D**	45	**B**
46	**C**	47	**B**	48	**A**	49	**B**	50	**A**
51	**ACD**	52	**ACD**	53	**BC**	54	**AC**	55	**AC**
56	**1**	57	**2**	58	**8**	59	**2**	60	**5**

SOLUTIONS :

PHYSICS

01. displacent = 12m

$s = ut + \frac{1}{2}at^2$

Distance= $s(2.5) + sl0.5$

At t=2.5 sec, the velocity becomes zero and starts moving backwards

02. $S^2 = at^2 + bt + C$

$\frac{ds}{dt} = velocity(V)$

$\frac{dr}{dt} =$ acceleration (a)

$a\alpha\ 5^3$

03. $x = at, y = at[1 - \alpha t]$

$y = at - a\alpha t^2$

$V_x = a\ , \qquad V_y = a - 2a\alpha t$

$\vec{V} = a\hat{i} + (a - 2a\alpha t)\overset{a}{j}$

$a_x = 0, \quad ay = -2a\alpha$

$\vec{a} = -2a\alpha\overset{\alpha}{j}$

$\overline{V}.\overline{a} = 0$

$1 - 2\alpha t = 0$

$t = \frac{1}{2}\alpha$

04. $\frac{dv}{dt} = kv^3$

$\frac{dv}{\sqrt{3}} = -kdt$

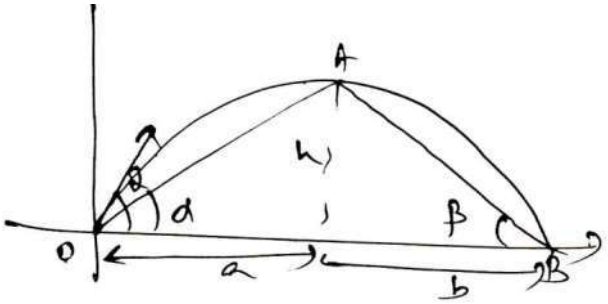
$\int_{v_0}^{V} \frac{dv}{V^3} = \int_0^t -kdt$

$\left[-\frac{1}{2V^2}\right]_{V_0}^{V} = -kt$

$$V^2 = \frac{V_0^2}{1+2V_0^2kt}$$

$$V = \frac{V_0}{\sqrt{1+2V_0^2kt}}$$

05.



$$y = xTan\theta\left(1-\frac{x}{R}\right)$$

$$Tan\alpha = \frac{h}{a}, Tan\beta = \frac{h}{b}$$

$$h = a\,Tan\theta\left(1-\frac{a}{a+b}\right)$$

Solve then we get

$$Tan\theta = Tan\alpha + Tan\beta$$

06. $$\frac{dv}{dt} = -av^2$$

$$-\int_u^v \frac{dv}{v^2} = \int_0^t -adt$$

$$\frac{1}{v} = \frac{1}{4} + at$$

$$\frac{dt}{dx} = \frac{1}{4} + at$$

$$dx = \frac{udt}{1+aut}$$

$$\int_0^s dx = \int_0^t \frac{udt}{1+aut}$$

$$s = \frac{1}{a}lon\left(1+out\right)$$

07. nb=ut __(1) and $nh = \frac{1}{2}gt^2$ ___(2)

$t = \frac{nb}{u}$

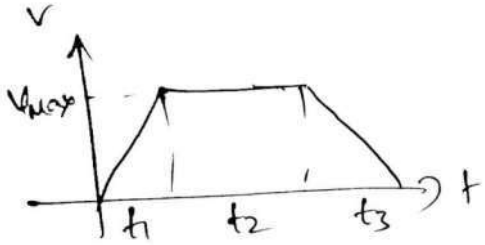
Substitute in eng (2)

Then $n = \frac{2hu^2}{gb^2}$

08. $t_1 = \sqrt{\frac{2\times 0.1}{9.8}}, \quad t_2 = \sqrt{\frac{2\times 0.9}{9.8}}$

$t_2 - t_1 = \frac{2}{7}$ sec

09.



$S = \frac{1}{2}v_{\max}t_1 \Rightarrow t_1 = \frac{2s}{v_{\max}}$

$2s = v_{\max}t_2 \Rightarrow t_2 = \frac{2s}{v_{\max}}$

$5s = \frac{1}{2}v_{\max}t_3 \rightarrow t_3 = \frac{10s}{v_{\max}}$

$v_{ag} = \frac{s+2s+5s}{\frac{2s}{v_{\max}} + \frac{2s}{v_{\max}} + \frac{10s}{v_{\max}}}$

$v_{avg} = \frac{8s}{14s} \times v_{\max}$

$\frac{v_{avg}}{v_{\max}} = \frac{4}{7}$

10. Use $Tan\alpha = \left(\frac{B\sin\theta}{A + Bcon\theta}\right)$

11. Conceptual

12. Conceptual

13. Conceptual

14. Conceptual

15. Conceptual

16. $\frac{dv}{dt} = -2.5\sqrt{v}$

$\frac{dv}{\sqrt{v}} = -2.5dt$

$\int_{6.25m/s}^{0} v^{-\frac{1}{2}} dv = -2.5\int_{0}^{t} dt$

$2\left(v^{-\frac{1}{2}}\right)_{6.25}^{0} = -(2.5)t$

$t = \frac{-2\times(6.25)^{\frac{1}{2}}}{-2.5} = 2\sec$

17.

18. $k^1 = kcon^2\theta$

19. $v_o = 2na \rightarrow a = \frac{v_o}{2n}$

$s = \frac{1}{2}(2na)^2 - \frac{1}{2}an^2$

$s = \frac{3}{2}an^2$

$= \frac{3}{2}\left(\frac{v}{2n}\right)n^2$

$= \frac{3v_o n}{4}$

20. Vel after 10 sec

$v = u + gt \Rightarrow 100m/s$

Dint travelled for lose

$s = \frac{1}{2gt^2 = 500m}$

Distance travelled by panache under xtandation

$s_2 = 2495 - 500 = 1995$

"v" in vel on ground

$v^2 - (100)^2 = 2(-2.5)(1995)$

$v = 5m/s$

SOLUTIONS :

21. $\Delta S = 2.303 \times \frac{22.3}{32} \times 8.314 \times \log \frac{1}{0.25} = 8$

22. $\Delta H^0_{298} = \Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H_4$

$= -285.83 + 75.291(373-298) \times 10^{-3} + 40.88 + 33.57(398-373) \times 10^{-3}$

$= -241.82\,\text{kJ}$

23. Let the bond dissociation energies of AB,A_2 and B_2 be x, x and 0.5 x respectively

24. conceptual

25.

$\Rightarrow nR \ln \frac{p_1}{p_2} + nc_p \ln \frac{T_2}{T_1} = 0 \because \Delta S = 0$

$c_p = 5cal \quad R = 2cal$

$\Rightarrow 2 \ln \frac{1}{p_2} + 1 \times 5 \ln \frac{2}{1} = 0$

$5 \ln \frac{2}{1} = +2 \ln p_2$

$5 \times 0.7 = 2 \ln p_2$

$\ln p_2 = 1.75$

26. Since external pressure is greatly different from pressure of the nitrogen and thus , the process is irreversible.

$\Rightarrow p_1 v_1 = p_2 v_2$

$5 \times 2 = 1 \times v_2$

$v_2 = 10$

$w = -1(10-2)$

$= -10 litre\ atm$

27. $\Delta U = Q - P\Delta V$

$P\Delta V = 1 \times 0.3 atm.L = 0.3 \times 101.3\,J = \frac{30.39}{4.2 \times 1000} kcal = 0.007 kcal$

28. $H_2 + S + 2O_2 \rightarrow H_2SO_4, \Delta H = ?$

29. $Al_2O_3(s) + 6Li(s) \rightarrow 3Li_2O(s) + 2Al(s)$

$\Delta G^0_f = 3 \times \Delta G^0_f\, Li_2O(s) - \Delta G^0_f\, Al_2O_3(s)$

$= 3 \times -544 - (-1582) = -50 kJ\, mol^{-1}$

$$P(V-b)=RT$$

30. $$P=\frac{R}{(V-b)}T$$

36. $\Delta U=0$, $\Delta H=0$, $W_{\max}=-q$

37. For the greatest Gibb's free energy change, the mole fraction of each gas should be the same .Therefore mole fraction of each gas is ¼ and x is =4.

38.

$$\Delta U=W=-P_2(V_2-V_1)=-100(99-100)10^{-3}=0.1barL$$
$$\Delta H=\Delta U+\Delta(PV)$$
$$=\Delta U+P_2V_2-P_1V_1=0.1+9.8=9.9barL$$

39. Normality of acid A=2.5N and Normality of acid B=2.5/4

$$\frac{\frac{2.5}{4}V_B+2.5(1-V_B)}{1}=1$$
$$\therefore V_B=6/7.5 \; and \; V_A=(1-V_B)=1.5/7.5$$
$$\frac{V_B}{V_A}=4$$

40.

$$\frac{\Delta S_{vap}}{\Delta S_{fus}}=\frac{\Delta H_{vap}}{boiling\ point}\times\frac{freezing\ point}{\Delta H_{fus}}$$
$$=\frac{540}{373}\times\frac{273}{80}=4.94\simeq 5$$

MATHS

SOLUTIONS :

41. $$\frac{(\cos x+\cos x)+5(\cos 4x\cos 2x)+10(\cos 2x+1)}{\cos 5x+5\cos 3x+10\cos x}$$

$$\Rightarrow 2\cos x=-2$$

$$\Rightarrow \cos x=-1\Rightarrow x=\pi,3\pi$$

42. Conceptual

43. Conceptual

44. A.G.P

45. $\sin\theta - \cos\theta = 1$

46. Conceptual

47. 1 angle must be obtuse

48. $K = \{-4, -3, -2, -1, 0, 1, 2, 3\}$

49. Conceptual

50. $4 - a^2 = (2\sin x + 1)^2$

51. Through graph

52. $f(\alpha) = \cot\alpha$

53. Conceptual

54. Conceptual

55. $AM = GM$

56. $\sin(A + B) = \dfrac{-\sin A \sin B \cos C}{\sin C}$

57. Conceptual

58. Conceptual

59. Through graph

60. $\cos x = 1, \cos y = 1$ *or* $\cos x = -1, \cos y = -1$