

*Subject: P + M + C***IIT-JEE 09***Date: 15–09–2007**Time: 180 minutes**MM: 270***General Instructions:**

1. This question paper consists of 3 parts (Physics, Chemistry & Mathematics).
2. Before attempting the question paper ensure that it contains 9 pages (90 Questions) and that no paper and question is missing.
3. Please fill all the details asked in the question paper.
4. Student cannot use Blank Papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets and any other material in the examination hall.
5. Student must abide by the instructions issued during the examination, by the invigilators or the centre in charge.

**6. Structure and marking scheme:**

SECTION	Q. No.	TYPE	MARKING SCHEME		
			Correct	Incorrect	Unattempted
PHYSICS	1 to 30	ONLY ONE correct answer	+ 3	– 1	0
CHEMISTRY	31 to 60	ONLY ONE correct answer	+ 3	– 1	0
MATHEMATICS	61 to 90	ONLY ONE correct answer	+ 3	– 1	0

Name: \_\_\_\_\_

Batch :  E1  E2



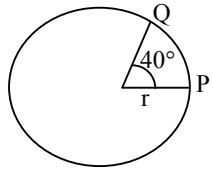
## Physics

1. A particle experiences constant acceleration for 20sec after starting from rest. It travels a distance  $s_1$  in first 10 sec and a distance  $s_2$  in the next 10 sec, then:  
(A)  $s_1 = s_2$       (B)  $s_2 = 2s_1$       (C)  $s_2 = 3s_1$       (D)  $s_2 = 4s_1$
2. The table shows the distance covered in successive seconds by a body accelerated uniformly from rest.

Time interval (s)	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>
Distance	2	6	10	14

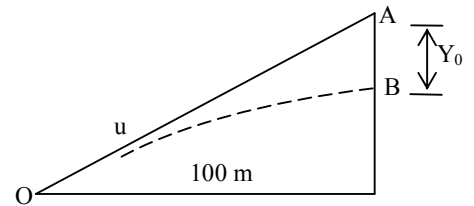
What is the speed of the body at the end of 4<sup>th</sup> sec:  
(A) 4cm/sec      (B) 8cm/sec      (C) 14cm/sec      (D) 16cm/sec
3. The velocity time relation of an electron starting from rest is given by  $v + kt$  where  $K = 2 \text{ m/s}^2$ . The distance traversed in 3 sec is:  
(A) 9m      (B) 16 m      (C) 27 cm      (D) 36 m
4. A stone is dropped from the top of a tower. If it covers 24.5 m in its last second of its motion. The height of the tower is:  
(A) 44.1 m/s      (B) 49 m/s      (C) 78.4 m      (D) 72 m
5. The distances travelled by a body falling freely from rest in first, second and third seconds are in the ratio:  
(A) 1 : 2 : 3      (B) 1 : 3 : 5      (C) 1 : 4 : 9      (D) none of these
6. The initial velocity of a particle is  $u$  (at  $t = 0$ ) and the acceleration  $f$  is given by  $at^2$ . Which of the following relation is valid.  
(A)  $v = u + at^3$       (B)  $v = u + \frac{at^3}{2}$       (C)  $v = u + \frac{at^3}{3}$       (D)  $v = u + at$
7. A bus is beginning to move with an acceleration of  $1 \text{ m/s}^2$ . A boy who is 48 m behind the bus starts running at 10 m/s. After what time will the boy be able to catch the bus:  
(A) 6 sec      (B) 8 sec  
(C) 10 sec      (D) The boy can not catch the bus
8. The velocity of a car moving on a straight road increase linearly according to equation  $v = a + bx$  where  $a$  and  $b$  are constants. Does the acceleration in the course of such motion  
(A) increases      (B) decreases      (C) stay constant      (D) becomes zero
9. If a body having initial velocity zero is moving with uniform acceleration  $8\text{m/s}^2$ ; the distance traversed by it in fifth second will be:  
(A) 36 m      (B) 40 m      (C) 100 m      (D) zero
10. 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) None of these



11. A particle is moving at a speed of 5 m/s along east. After 10 s its velocity changes and becomes 5 m/s along north. What is the average acceleration during this interval :
- (A) 0 (B)  $1/\sqrt{2}$  m/s<sup>2</sup> north west  
(C)  $1/\sqrt{2}$  m/s<sup>2</sup> north east (D)  $\sqrt{2}$  m/s<sup>2</sup> north west
12. The magnitude of the vector product of the vectors is  $\sqrt{3}$  times their scalar product. The angle between the two vectors is:
- (A)  $\pi/3$  (B)  $\pi/6$  (C)  $\pi/2$  (D)  $\pi/4$
13. The angle made by vector  $i + j$  with Z-axis is:
- (A)  $0^\circ$  (B)  $30^\circ$  (C)  $60^\circ$  (D)  $90^\circ$
14. The angle made by vector  $1/\sqrt{2} i + 1/\sqrt{2} j$  with Y-axis is:
- (A)  $0^\circ$  (B)  $30^\circ$  (C)  $45^\circ$  (D)  $60^\circ$
15. If  $a \cdot b = |a \times b|$ , then the value of  $|a + b|$  is:
- (A)  $\sqrt{a^2 + b^2}$  (B)  $a + b$  (C)  $\sqrt{a^2 + b^2 + \sqrt{2}ab}$  (D)  $\sqrt{a^2 + b^2 + \frac{ab}{b^2}}$
16.  $0.4i + 0.8j + ck$  represents a unit vector when c is:
- (A) -0.2 (B)  $\sqrt{0.20}$  (C)  $\sqrt{0.80}$  (D) 0
17. If the vectors  $a = 2i + 4j - 2k$  and  $b = 3i - 2j + xk$  are to be right angles to each other, then the value of x should be:
- (A) 2 (B) -2 (C) 1 (D) -1
18. Consider a vector  $A = (4i - 3j)$ . Another vector B which is perpendicular to A is:
- (A)  $4i + 3j$  (B)  $6j$  (C)  $7k$  (D)  $3i + 4j$
19. The angle between  $\vec{A}$  and  $\vec{B}$  is  $\theta$ . The value of the triplet product  $\vec{A} \cdot \vec{B} \times \vec{A}$  is:
- (A)  $A^2B$  (B)  $A^2B \sin \theta$  (C)  $A^2B \cos \theta$  (D) zero
20. A particle is moving in a circle of radius r with speed v. The change in velocity in moving from P to Q is:
- (A)  $2v \cos 40^\circ$  (B)  $2v \sin 40^\circ$   
(C)  $2v \cos 20^\circ$  (D)  $2v \sin 20^\circ$
- 
21. A ball of mass m is thrown vertically upwards. Another ball of mass 2m is thrown at an angle  $\theta$  with the vertical. Both of them stay in air for the same interval of time. The heights attained by the balls are in the ratio of:
- (A) 2 : 1 (B) 1 : 1 (C) 1 :  $\sec \theta$  (D) 1 :  $\cos \theta$



22. A shooter aims his rifle at an angle of  $30^\circ$  with the horizontal to hit an object at A but the bullet hits at point B,  $y_0$  below A. If the initial velocity of the bullet is 600 m/s; the value of  $y_0$  is ( $g = 10 \text{ m/s}^2$ ):
- (A) 1.85 m (B) 18.5 m  
(C) 185 m (D) 1850 m



23. A coin placed on a rotating turntable just slips if it is placed at a distance of 4 cm from the centre. If the angular velocity of the turntable is doubled, it will just slip at a distance of
- (A) 1 cm (B) 2 cm (C) 4 cm (D) 8 cm
24. A train A runs from east to west and another train B of the same mass runs from west to east at the same speed along the equator. A presses the track with a force  $F_1$  and B presses the track with a force  $F_2$ .
- (A)  $F_1 > F_2$  (B)  $F_1 < F_2$  (C)  $F_1 = F_2$   
(D) The information is insufficient to find the relation between  $F_1$  and  $F_2$
25. Let  $\theta$  denote the angular displacement of a simple pendulum oscillating in a vertical plane. If the mass of the bob is  $m$ , the tension in the string is  $mg \cos \theta$
- (A) always (B) never  
(C) at the extreme positions (D) at the mean position
26. When Neils Bohr shook hand with Werner Heisenberg, what kind of force they exerted?
- (A) Gravitational (B) Electromagnetic (C) Nuclear (D) Weak
27. A block of mass  $m$  is placed on a smooth inclined plane of inclination  $\theta$  with the horizontal. The force exerted by the plane on the block has a magnitude.
- (A)  $mg$  (B)  $mg/\cos\theta$  (C)  $mg \cos\theta$  (D)  $mg \tan\theta$
28. A smooth wedge A is fitted in a chamber hanging from a fixed ceiling near the earth's surface. A block B placed at the top of the wedge takes a time  $T$  to slide down the length of the wedge. If the block is placed at the top of the wedge and the cable supporting the chamber is broken at the same instant, the block will
- (A) Take a time longer than  $T$  to slide down the wedge  
(B) Take a time shorter than  $T$  to slide down the wedge  
(C) Remain at the top of the wedge  
(D) Jump off the wedge
29. Two cars of unequal masses use similar tyres. If they are moving at the same initial speed, the minimum stopping distance
- (A) is smaller for the heavier car  
(B) is smaller for the lighter car  
(C) is same for both cars  
(D) depends on the volume of the car

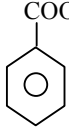
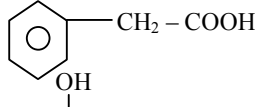
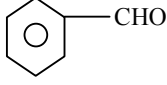



30. A block A kept on an inclined surface just begins to slide if the inclination is  $30^\circ$ , The block is replaced by another block B and it is found that it just begins to slide if the inclination is  $40^\circ$ .  
(A) mass of A > mass of B (B) Mass of A < mass of B  
(C) mass of A = mass of B (D) all the three are possible

### Chemistry

31.  $C_2H_5MgBr \xrightarrow[2 HOH]{1 CO_2} A \xrightarrow{CH_3MgBr} B$  compound B is:  
(A) Propanoic acid (B) propene (C) methane (D) butane
32.  $A \xrightarrow{NH_3} B \xrightarrow{P_2O_5} C \xrightarrow[2 H_2O]{1 C_2H_5MgBr} \text{butanone}$  A is:  
(A) Propanoic acid (B) Acetyl chloride (C) Acetic Anhydride (D) 2 & 3 both
33.  $A \xrightarrow{H^+ KMnO_4} B \xrightarrow{C_2H_5MgI} \text{Ethane}$  B is:  
(A) oxalic acid (B) Acetic Acid (C) Ethyl alcohol (D) 1 & 2 both
34.  $CH_3CHO \xrightarrow{H^+ K_2Cr_2O_7} A \xrightarrow{C_2H_5MgI} B$  B is  
(A) Acetic Acid (B) Ethane (C) 2-butanol (D) butanoic Acid
35.  $A \xrightarrow{P_2O_5} B \xrightarrow{CH_3CH_2MgBr} C \xrightarrow{H_3O^+} \text{propanal}$  A is:  
(A) formaldehyde (B) Acetic Acid (C) formamide (D) Hydrogencyanide
36.  $A \xrightarrow{Cl_2} B \xrightarrow[ Ether]{Mg} C \xrightarrow[2 HOH]{1 HCHO} \text{Neo hexyl alcohol}$  A is:  
(A) Neo pentyl alcohol (B) Isobutane  
(C) Neo pentane (D) ter.butyl alcohol
37.  $A \xrightarrow{C_2H_5MgBr} \text{Ethane}$  A is:  
(A) Ethyl alcohol (B) Propyne (C) 1 & 2 both (D) methyl iodide
38.  $A \xrightarrow{CH_3MgBr} B \xrightarrow{\text{Hydrolysis}} \text{sec. butyl alcohol}$  A is.  
(A) Acetone (B) Propanal (C) Ethanal (D) Ethyl Acetate
39.  $\text{Acetic Acid} \xrightarrow{P_2O_5} A \xrightarrow{LiAlH_4} B \xrightarrow{CH_3MgI} C$  C is.  
(A) methane (B) di Ethyl Ether (C) Acetic Anhydride (D) Ethyl alcohol
40.  $A \xrightarrow{CH_3MgBr} \text{1-butane}$  A is:  
(A) Allyl bromide (B) propenyl bromide (C) propyl bromide (D) none



41.  $A \xrightarrow{\text{Aq.KOH}} B \xrightarrow[2 \text{ Hydrolysis}]{1 \text{ C}_2\text{H}_5 \text{ Mg Br}} \text{sec butyl alcohol}$  A is:  
(A) Acetaldehyde (B) Ethylene chloride  
(C) Ethyl alcohol (D) Ethylchloride
42. Acetonitrile + A  $\xrightarrow{\text{H}_3\text{O}^+}$  butanone A is:  
(A)  $\text{CH}_3\text{MgBr}$  (B)  $(\text{CH}_3)_2\text{CH MgI}$  (C)  $(\text{CH}_3)_3\text{C Mg Br}$  (D)  $\text{CH}_3\text{CH}_2\text{Mg I}$
43. Benzonitrile  $\xrightarrow{\text{H}_3\text{O}^+}$  A is:  
(A)  (B)   
(C)  (D) 
44. A  $\xrightarrow[\text{excess}]{\text{Aq.KOH}}$  oxalic Acid (pot.salt)  
(A) trichloro acetic acid (B) hexa Chloro Ethane  
(C) Cynogen (D) All
45. When Chloroform is hydrolysed with aq.KOH, the gas released:  
(A) CO (B)  $\text{CO}_2$  (C)  $\text{H}_2$  (D) None of these
46. The difference between the Heat of the reaction in k j at constant pressure and constant volume for the reaction.  
 $2\text{C}_6\text{H}_6(l) + 15 \text{O}_2(g) \rightarrow 12 \text{CO}_2(g) + 6\text{H}_2\text{O}(l)$  at  $25^\circ\text{C}$   
(A) -7.43 (B) + 3.72 (C) -3.72 (D) + 7.43
47. The Gibbs free energy of a reaction at  $27^\circ\text{C}$  is - 26 K cal and its entropy change in 60 cal/deg.  $\Delta H$  for the reaction is:  
(A) -44 K cals (B) -8 k.Cals (C) 34 K.cals (D) -14 k.cals
48. The  $\Delta H^\circ_f$  for  $\text{CO}_2(g)$ ,  $\text{CO}(g)$  and  $\text{H}_2\text{O}(g)$  are - 393.5, -110.5 and -241.8 kJ/mol respectively. The standard enthalpy change (in kJ) for the reaction:  
 $\text{CO}_2(g) + \text{H}_2(g) \rightarrow \text{CO}(g) + \text{H}_2\text{O}(g)$  is:  
(A) 524.1 (B) 41.2 (C) -262.5 (D) -41.2
49. The amount of heat liberated when 1 mol of  $\text{NH}_4\text{OH}$  reacts with the mol of HCl is:  
(A) 13.7 kcal (B) more than 13.7 kcal  
(C) less than 13.7 kcal (D) can not be produced



50. Which of the following statement is false?  
(A) The standard free energies of formation of all elements are taken as zero  
(B) The entropies of all pure crystalline solids at 0.K are zero  
(C) If  $\Delta G$  is zero, the reaction is in equilibrium  
(D) Greater the magnitude of  $-\Delta G$ , faster the rate of reaction
51. A process is termed spontaneous:  
(A) if  $\Delta H$  has a positive value (B) if  $\Delta H$  has a negative value  
(C) if  $\Delta G$  has positive value (D) if  $\Delta G$  has a negative value
52. The enthalpies of combustion of  $C_{(\text{graphite})}$  and  $C_{(\text{diamond})}$  are  $-393.5$  and  $-395.4$  kJ/mol respectively. The enthalpy of conversion of  $C_{(\text{graphite})}$  to  $C_{(\text{diamond})}$  in kJ/mol is  
(A)  $-1.9$  (B)  $-7.889$  (C)  $1.9$  (D)  $7.889$
53. An example of an extensive property is:  
(A) temperature (B) pressure (C) molar volume (D) enthalpy
54. The correct order of increasing C – O bond length of  $\text{CO}$ ,  $\text{CO}_3^{-2}$ ,  $\text{CO}_2$  is  
(A)  $\text{CO}_3^{-2} < \text{CO}_2 < \text{CO}$  (B)  $\text{CO}_2 < \text{CO}_3^{-2} < \text{CO}$   
(C)  $\text{CO} < \text{CO}_3^{-2} < \text{CO}_2$  (D)  $\text{CO} < \text{CO}_2 < \text{CO}_3^{-2}$
55. Which of the following has zero dipole moment.  
(A)  $\text{ClF}$  (B)  $\text{PCl}_3$  (C)  $\text{SiF}_4$  (D)  $\text{CFCl}_3$
56. The hybrid orbital used by chlorine atom in  $\text{ClO}_2^-$  ion is:  
(A)  $sp^3$  (B)  $sp^2$  (C)  $sp$  (D) none
57. Which of the following species is paramagnetic:  
(A)  $\text{O}_2$  (B)  $\text{CN}^-$  (C)  $\text{CO}$  (D)  $\text{NO}^+$
58. Which is the most ionic:  
(A)  $\text{LiF}$  (B)  $\text{Li}_2\text{O}$  (C)  $\text{Li}_3\text{N}$  (D) All same
59. The bond length in  $\text{O}_2^+$ ,  $\text{O}_2$ ,  $\text{O}_2^-$  and  $\text{O}_2^{-2}$  follows. The order:  
(A)  $\text{O}_2^{-2} > \text{O}_2^{-1} > \text{O}_2 > \text{O}_2^{+2}$  (B)  $\text{O}_2^+ > \text{O}_2 > \text{O}_2^- > \text{O}_2^{-2}$   
(C)  $\text{O}_2 > \text{O}_2^- > \text{O}_2^{-2} > \text{O}_2^+$  (D)  $\text{O}_2^- > \text{O}_2^{-2} > \text{O}_2^+ > \text{O}_2$
60. Which contains both polar and non polar bond:  
(A)  $\text{NH}_4\text{Cl}$  (B)  $\text{HCN}$  (C)  $\text{H}_2\text{O}_2$  (D)  $\text{CH}_4$

### Maths

61. In  $\Delta ABC$ , If  $a = 2$ ,  $b = 4$  and  $\angle C = 60^\circ$ , then  $\angle A$  and  $\angle B$  are equal to:  
(A)  $90^\circ, 30^\circ$  (B)  $60^\circ, 60^\circ$  (C)  $30^\circ, 90^\circ$  (D)  $60^\circ, 45^\circ$
62. In  $\Delta ABC$ ,  $2 \left( a \sin^2 \frac{C}{2} + c \sin^2 \frac{A}{2} \right)$  is equal to:  
(A)  $a + b - c$  (B)  $c + a - b$  (C)  $b + c - a$  (D)  $a + b + c$



63. In a triangle ABC,  $\cos A = \frac{\sin B}{2\sin C}$ , then the triangle is:  
(A) equilateral (B) isosceles (C) right angled (D) none of these
64. In  $\Delta ABC$ , if  $8R^2 = a^2 + b^2 + c^2$ , then the triangle is:  
(A) right angled (B) equilateral (C) acute angled (D) obtuse angled
65. The sides of a triangle are  $\sin \alpha$ ,  $\cos \alpha$  and  $\sqrt{1 + \sin \alpha \cos \alpha}$  for some  $0 < \alpha < \frac{\pi}{2}$ .  
Then the greatest angle of the triangle is:  
(A)  $60^\circ$  (B)  $90^\circ$  (C)  $120^\circ$  (D)  $150^\circ$
66. In a triangle PQR,  $\angle R = \frac{\pi}{2}$ . If  $\tan\left(\frac{P}{2}\right)$  and  $\tan\left(\frac{Q}{2}\right)$  are the roots of  
 $ax^2 + bx + c = 0$ ,  $a \neq 0$ , then:  
(A)  $b = a + c$  (B)  $b = c$  (C)  $c = a + b$  (D)  $a = b + c$
67. In triangle  $\left(1 - \frac{r_1}{r_2}\right) \left(1 - \frac{r_1}{r_3}\right) = 2$ , then the triangle is:  
(A) right angled (B) equilateral (C) isosceles (D) none of these
68. If the median AD of  $\Delta ABC$ , makes an angle  $\theta$  with side AB, then  $\sin(A - \theta)$  is equal to:  
(A)  $\left(\frac{b}{c}\right) \operatorname{cosec} \theta$  (B)  $\left(\frac{b}{c}\right) \sin \theta$  (C)  $\left(\frac{c}{b}\right) \sin \theta$  (D)  $\left(\frac{c}{b}\right) \operatorname{cosec} \theta$
69. The value of  $\cos 1^\circ \cos 2^\circ \cos 3^\circ \dots \cos 100^\circ$  is equal to:  
(A) 1 (B) -1 (C) 0 (D) none of these
70. If  $\alpha$  is a root of  $25 \cos^2 \theta + 5 \cos \theta - 12 = 0$ ,  $\frac{\pi}{2} < \alpha < \pi$ , then  $\sin 2\alpha$  is equal to:  
(A)  $\frac{24}{25}$  (B)  $-\frac{24}{25}$  (C)  $\frac{13}{18}$  (D)  $-\frac{13}{18}$
71. If  $0 < x < \pi$  and  $\cos x + \sin x = \frac{1}{2}$ , then  $\tan x$  is:  
(A)  $\frac{(4 - \sqrt{7})}{3}$  (B)  $-\frac{(4 + \sqrt{7})}{3}$  (C)  $\frac{(1 + \sqrt{7})}{4}$  (D)  $\frac{(1 - \sqrt{7})}{4}$
72. The maximum value of  $4\sin^2 x + 3\cos^2 x + \sin \frac{x}{2} + \cos \frac{x}{2}$  is:  
(A)  $4 + \sqrt{2}$  (B)  $3 + \sqrt{2}$  (C) 9 (D) 4
73. The number of ordered pairs  $(\alpha, \beta)$ , where  $\alpha, \beta \in (-\pi, \pi)$  satisfying  $\cos(\alpha - \beta) = 1$  and  $\cos(\alpha + \beta) = \frac{1}{e}$  is:  
(A) 0 (B) 1 (C) 2 (D) 4



74. If  $4n\alpha = \pi$ , then the value of  $\tan \alpha \cdot \tan 2\alpha \cdot \tan 3\alpha \cdot \tan 4\alpha \dots \tan (2n-2)\alpha \tan (2n-1)\alpha$  is:  
(A) 0 (B) 1 (C) -1 (D) none of these
75. If  $\cos A = m \cos B$ , and  $\cot \frac{A+B}{2} = \lambda \tan \frac{B-A}{2}$ , then  $\lambda$  is:  
(A)  $\frac{m}{m-1}$  (B)  $\frac{m+1}{m}$  (C)  $\frac{m+1}{m-1}$  (D) none of these
76. If  $(a-b) \sin(\theta + \phi) = (a+b) \sin(\theta - \phi)$  and  $a \tan \frac{\theta}{2} - b \tan \frac{\phi}{2} = c$ , then the value of  $\sin \phi$  is equal to:  
(A)  $\frac{2ab}{a^2 - b^2 - c^2}$  (B)  $\frac{2bc}{a^2 - b^2 - c^2}$  (C)  $\frac{2abc}{a^2 - b^2 + c^2}$  (D)  $\frac{2ab}{a^2 - b^2 + c^2}$
77.  $\tan \frac{2\pi}{5} - \tan \frac{\pi}{15} - \sqrt{3} \tan \frac{2\pi}{5} \tan \frac{\pi}{15}$  is equal to:  
(A)  $-\sqrt{3}$  (B)  $\frac{1}{\sqrt{3}}$  (C) 1 (D)  $\sqrt{3}$
78. If  $\sin B = \frac{1}{5} \sin(2A + B)$ , then  $\frac{\tan(A+B)}{\tan A}$  is equal to:  
(A)  $\frac{2}{3}$  (B)  $\frac{3}{2}$  (C)  $\frac{3}{4}$  (D) none of these
79.  $\sin^2 \theta = \frac{4xy}{(x+y)^2}$  is true, if and only if:  
(A)  $x + y \neq 0$  (B)  $x = y, x \neq 0, y \neq 0$  (C)  $x = y$  (D)  $x \neq 0, y \neq 0$
80. If  $A$  is the area and  $2s$  the sum of three sides of a triangle, then:  
(A)  $A \leq \frac{s^2}{3\sqrt{3}}$  (B)  $A \leq \frac{s^2}{2}$  (C)  $A > \frac{s^2}{\sqrt{3}}$  (D) none of these
81. The sides of a triangle are in the ratio  $1 : \sqrt{3} : 2$ , then the angles of the triangle are in ratio:  
(A)  $1 : 3 : 5$  (B)  $2 : 3 : 1$  (C)  $3 : 2 : 1$  (D)  $1 : 2 : 3$
82. In a triangle  $ABC$ ,  $\angle B = \frac{\pi}{3}$  and  $\angle C = \frac{\pi}{4}$  and  $D$  divides  $BC$  internally in the ratio  $1 : 3$ . Then  $\frac{\sin \angle BAD}{\sin \angle CAD}$  is equal to:  
(A)  $\frac{1}{3}$  (B)  $\frac{1}{\sqrt{3}}$  (C)  $\frac{1}{\sqrt{6}}$  (D)  $\sqrt{\frac{2}{3}}$
83. The number of values of  $x$  in the interval  $[0, 3\pi]$  satisfying the equation  $2 \sin^2 x + 5 \sin x - 3 = 0$  is:  
(A) 6 (B) 1 (C) 2 (D) 4



84. The number of value of  $x$  lying in the interval  $(-\pi, \pi)$  which satisfy the equation  $8^{(1 + |\cos x| + \cos 2x + |\cos 3x| + \dots + \infty)} = 4^3$ , is :  
(A) 3 (B) 4 (C) 5 (D) 6
85. The number of ordered pairs  $(x, y)$  satisfying  $y = 2 \sin x$  and  $y = 5x^2 + 2x + 3$  is:  
(A) 0 (B) 1 (C) 2 (D)  $\infty$
86. If the solutions for  $\theta$ ,  $\cos p\theta + \cos q\theta = 0$ ,  $p > 0$ ,  $q > 0$  are in AP, than the numerically smallest common difference of AP is:  
(A)  $\frac{\pi}{p+q}$  (B)  $\frac{2\pi}{p+q}$  (C)  $\frac{\pi}{2(p+q)}$  (D)  $\frac{1}{p+q}$
87. The number of solutions of the given equations  $\tan \theta + \sec \theta = \sqrt{3}$ , where  $0 < \theta < 2\pi$  is :  
(A) 0 (B) 1 (C) 2 (D) 3
88. If  $\tan^2 \theta - (1 + \sqrt{3}) \tan \theta + \sqrt{3} = 0$ , then the general value of  $\theta$  is:  
(A)  $n\pi + \frac{\pi}{4}, n\pi + \frac{\pi}{3}$  (B)  $n\pi - \frac{\pi}{4}, n\pi + \frac{\pi}{3}$   
(C)  $n\pi + \frac{\pi}{4}, n\pi - \frac{\pi}{3}$  (D)  $n\pi - \frac{\pi}{4}, n\pi - \frac{\pi}{3}$
89. The general solution of  $\sin x - 3 \sin 2x + \sin 3x = \cos x - 3 \cos 2x + \cos 3x$  is :  
(A)  $n\pi + \frac{\pi}{8}$  (B)  $\frac{n\pi}{2} + \frac{\pi}{8}$  (C)  $(-1)^n \frac{n\pi}{2} + \frac{\pi}{8}$  (D)  $2n\pi + \cos^{-1} \frac{3}{2}$
90. If the equation  $\sin^2 \theta - \cos \theta = \frac{1}{4}$ , then the value of  $\theta$  lying in the interval  $0 \leq \theta \leq 2\pi$  is :  
(A)  $\frac{\pi}{3}, \frac{5\pi}{3}$  (B)  $\frac{\pi}{3}, \frac{2\pi}{3}$  (C)  $\frac{4\pi}{3}, \frac{5\pi}{3}$  (D)  $\frac{3\pi}{5}, \frac{\pi}{5}$

*Subject: P + M + C***IIT-JEE 09***Date: 15–09–2007**Time: 180 minutes**MM: 270*

Name: \_\_\_\_\_

Batch :  E1  E2

**ORS**  
**Physics**

<b>Q. No.</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>
<b>Ans.</b>					

**Chemistry**

<b>Q. No.</b>	<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>	<b>40</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>41</b>	<b>42</b>	<b>43</b>	<b>44</b>	<b>45</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>	<b>50</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>51</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>55</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>56</b>	<b>57</b>	<b>58</b>	<b>59</b>	<b>60</b>
<b>Ans.</b>					



## *Maths*

<b>Q. No.</b>	<b>61</b>	<b>62</b>	<b>63</b>	<b>64</b>	<b>65</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>66</b>	<b>67</b>	<b>68</b>	<b>69</b>	<b>70</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>71</b>	<b>72</b>	<b>73</b>	<b>74</b>	<b>75</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>76</b>	<b>77</b>	<b>78</b>	<b>79</b>	<b>80</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>81</b>	<b>82</b>	<b>83</b>	<b>84</b>	<b>85</b>
<b>Ans.</b>					
<b>Q. No.</b>	<b>86</b>	<b>87</b>	<b>88</b>	<b>89</b>	<b>90</b>
<b>Ans.</b>					

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<b>Physics</b>	<b>Chemistry</b>	<b>Maths</b>	<b>Total</b>

*Subject: P + M + C***IIT-JEE 09***Date: 15-09-2007**Time: 180 minutes**MM: 280***Answer Key****Physics**

<b>Q. No.</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Ans.</b>	<b>C</b>	<b>D</b>	<b>A</b>	<b>A</b>	<b>B</b>
<b>Q. No.</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>Ans.</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>A</b>	<b>D</b>
<b>Q. No.</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>
<b>Ans.</b>	<b>B</b>	<b>A</b>	<b>D</b>	<b>C</b>	<b>C</b>
<b>Q. No.</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
<b>Ans.</b>	<b>B</b>	<b>D</b>	<b>C/D</b>	<b>D</b>	<b>*</b>
<b>Q. No.</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>
<b>Ans.</b>	<b>B</b>	<b>B</b>	<b>A</b>	<b>A</b>	<b>C</b>
<b>Q. No.</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>
<b>Ans.</b>	<b>B</b>	<b>C</b>	<b>C</b>	<b>C</b>	<b>D</b>

**Chemistry**

<b>Q. No.</b>	<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>
<b>Ans.</b>	<b>C</b>	<b>D</b>	<b>D</b>	<b>B</b>	<b>C</b>
<b>Q. No.</b>	<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>	<b>40</b>
<b>Ans.</b>	<b>C</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>*</b>
<b>Q. No.</b>	<b>41</b>	<b>42</b>	<b>43</b>	<b>44</b>	<b>45</b>
<b>Ans.</b>	<b>B</b>	<b>D</b>	<b>A</b>	<b>D</b>	<b>A</b>
<b>Q. No.</b>	<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>	<b>50</b>
<b>Ans.</b>	<b>A</b>	<b>B</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>Q. No.</b>	<b>51</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>55</b>
<b>Ans.</b>	<b>D</b>	<b>C</b>	<b>D</b>	<b>D</b>	<b>C</b>
<b>Q. No.</b>	<b>56</b>	<b>57</b>	<b>58</b>	<b>59</b>	<b>60</b>
<b>Ans.</b>	<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>	<b>C</b>



*Maths*

<b>Q. No.</b>	<b>61</b>	<b>62</b>	<b>63</b>	<b>64</b>	<b>65</b>
<b>Ans.</b>	<b>C</b>	<b>B</b>	<b>B</b>	<b>A</b>	<b>C</b>
<b>Q. No.</b>	<b>66</b>	<b>67</b>	<b>68</b>	<b>69</b>	<b>70</b>
<b>Ans.</b>	<b>C</b>	<b>A</b>	<b>C</b>	<b>C</b>	<b>B</b>
<b>Q. No.</b>	<b>71</b>	<b>72</b>	<b>73</b>	<b>74</b>	<b>75</b>
<b>Ans.</b>	<b>B</b>	<b>A</b>	<b>D</b>	<b>B</b>	<b>C</b>
<b>Q. No.</b>	<b>76</b>	<b>77</b>	<b>78</b>	<b>79</b>	<b>80</b>
<b>Ans.</b>	<b>B</b>	<b>D</b>	<b>B</b>	<b>B</b>	<b>A</b>
<b>Q. No.</b>	<b>81</b>	<b>82</b>	<b>83</b>	<b>84</b>	<b>85</b>
<b>Ans.</b>	<b>D</b>	<b>C</b>	<b>D</b>	<b>B</b>	<b>A</b>
<b>Q. No.</b>	<b>86</b>	<b>87</b>	<b>88</b>	<b>89</b>	<b>90</b>
<b>Ans.</b>	<b>B</b>	<b>C</b>	<b>A</b>	<b>A</b>	<b>A</b>