A	ThisYearForSure.com - Anaphora Open to Talents	Roll No.
	PCM — JEE (MAIN) 2014	
	CHEMISTRY, PHYSICS & MATHEMATICS	

Time: 1½Hrs **Date: 6th April-2014** **Marks: 120**

Note :
Correct answer : 4 marks
Attempted wrong answer : -1 mark.
Not attempted : 0 mark
(There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response.)

PART A : CHEMISTRY

1 $[Cr(H_2O)_6]\,Cl_3$ (at. No. of Cr = 24) has a magnetic moment of 3.83 B.M. The correct distribution of 3d electrons in the chromium of the complex is

A. $3d^1_{xy}, 3d^1_{yz}, 3d^1_{xz}$

B. $3d^1_{xy}, 3d^1_{yz}, 3d^1_{z^2}$

C. $3d^1_{x^2-y^2}, 3d^1_{z^2}, 3d^1_{xz}$

D. $3d^1_{xy}, 3d^1_{x^2-y^2}, 3d^1_{yz}$

2 The reaction given below is known as $C_2H_5ONa + IC_2H_5 \rightarrow C_2H_5OC_2H_5 + NaI$

A. Kolbe's synthesis

B. Wurtz's synthesis

C. Williamson's synthesis

D. Grignard's synthesis

3 Cresols are

A. Hydroxy toluenes B. Dihydric phenols

C. Trihydric phenols D. Trihydric alcohols

4 In $CH_3CH_2OH \xrightarrow[350^oC]{X} CH_2 = CH_2 + H_2O$; 'X' is

A. NaCl B. $CaCl_2$

C. P_2O_5 D. Al_2O_3

5 The I.U.P.A.C. name of $K_3\,[Ir(C_2O_4)_3]$ is

A. potassium trioxalato iridium (III)

B. potassium trioxalato iridate (III)

C. potassium tris (oxalate) iridium (III)

D. potassium tris (oxalate) iridate (III)

6 Tetrahedral complex $[ML_4]^{2+}$ the ligand 'L' is neutral. The oxidation state of the metal and nature of the complex in

A. + 2, high spin B. + 6, low spin

C. + 3, High spin D. O, low spin

7 In the following compounds, order of acidity is

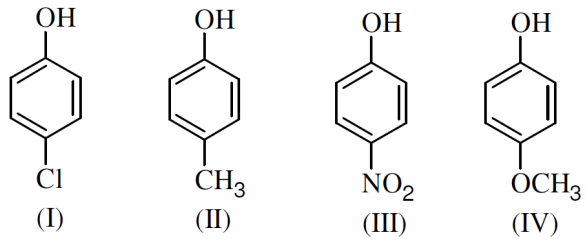

Figure 1: of the question 7

A. II < I < III < IV B. III > IV > II > I

C. IV < III < I < II D. IV < III < II < I

8 Mixture X = 0.02 mol of $[Co(NH_3)_5SO_4]\,Br$ and 0.02 mol of $[Co(NH_3)_5Br]\,SO_4$ was prepared in 2 litre of solution
1 litre of mixture X + excess $AgNO_3 \rightarrow Y$
1 litre of mixture X + excess $BaCl_2 \rightarrow Z$
Number of moles of Y and Z are

A. 0.01, 0.01 B. 0.02, 0.01

C. 0.01, 0.02 D. 0.02, 0.02

9 $A \xleftarrow[\Delta]{Cu} CH_3CH_2OH \xrightarrow[\Delta]{Al_2O_3} B.$
A and B respectively are

A. Alkene, alkanal B. Alkyne, alkanal

C. Alkanal, alkene D. Alkene, alkyne

10 $Ag^+ + NH_3 \rightleftharpoons [Ag\,(NH_3)]^+$;
$k_1 = 3.5 \times 10^{-3}$
$[Ag\,(NH_3)] + NH_3 \rightleftharpoons [Ag(NH_3)_2]^+$;
$k_2 = 1.7 \times 10^{-3}$ then the formation constant of $[Ag(NH_3)_2]^+$ is

A. 6.08×10^{-6} B. 6.08×10^{6}

C. 6.08×10^{-7} D. None of these

PART B : PHYSICS

11 A hollow cylinder of radius a and b is filled with a material of resistivity ρ . What is the current through ammeter in a circuit shown in fig

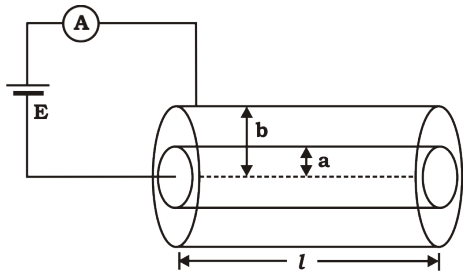

Figure 2: of the question 11

A. $\frac{E\pi\left(b^2-a^2\right)}{\rho}$ B. $\frac{E\pi l}{\rho \log_e(b/a)}$

C. $\frac{E2\pi l}{\rho \log_e(b/a)}$ D. $\frac{E2\pi l}{\rho \log_e(a/b)}$

12 Three identical spheres, each of mass M are placed at the corners of a right angled triangle with mutually perpendicular sides equal to 2 m. Taking their point of intersection as the origin, the position vector of centre of mass is

A. $\frac{1}{3}\left(\hat{i}-\hat{j}\right)$ B. $\frac{2}{3}\left(\hat{i}-\hat{j}\right)$

C. $\frac{2}{3}\left(\hat{i}+\hat{j}\right)$ D. $\frac{1}{3}\left(\hat{i}+\hat{j}\right)$

13 The radius of gyration of a uniform rod of length L about on axis passing through its centre of mass and perpendicular to its length is

A. $\frac{L}{\sqrt{12}}$ B. $\frac{L^2}{\sqrt{12}}$

C. $\frac{L}{\sqrt{3}}$ D. $\frac{L}{\sqrt{2}}$

14 The moment of inertia of a uniform rod of length $2l$ and mass m about an axis XX passing through its centre and inclined at an angle α , figure is

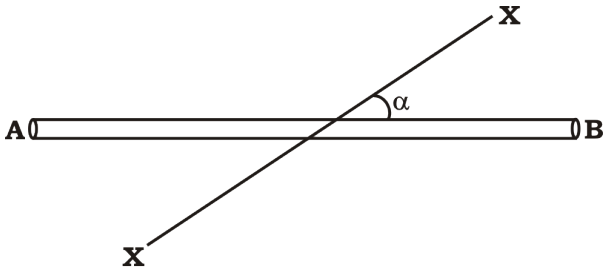

Figure 3: of the question 14

A. $\frac{ml^2}{3}\sin^2\alpha$ B. $\frac{ml^2}{12}\sin^2\alpha$

C. $\frac{ml^2}{6}\cos^2\alpha$ D. $\frac{ml^2}{2}\cos^2\alpha$

15 A particle of mass m is attached to three springs A, B and C of equal force constant k fig. If the particle is pushed a little towards any one of the springs and left, find the time period of its oscillations

A. $2\pi\sqrt{\left(\frac{m}{k}\right)}$ B. $2\pi\sqrt{\frac{2m}{k}}$

C. $2\pi\sqrt{\frac{m}{(2k)}}$ D. $2\pi\sqrt{\frac{m}{3k}}$

16 A simple pendulum has a length l cm : Mass of the bob is m grams. The bob is given a charge of + q stat coulombs. The pendulum is suspended between the plates of a charged parallel plate capacitor. If E is the electric intensity between the plates as shown in fig then, the time period T is

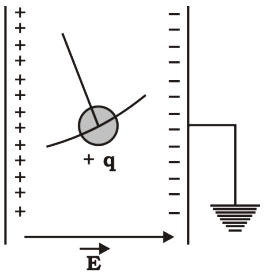

Figure 4: of the question 16

A. $T=2\pi\sqrt{\frac{l}{g}}$

B. $T=2\pi\sqrt{\frac{l}{g+\frac{qE}{m}}}$

C. $T=2\pi\sqrt{\frac{l}{g-\frac{qE}{m}}}$

D. $T=2\pi\sqrt{\frac{l}{\sqrt{g^2+\left(\frac{qE}{m}\right)^2}}}$

17 A block of mass , attached to a spring of spring constant K, oscillate on a smooth horizontal table. The other end of the sring is fixed to a wall. The block has a speed v when the spring is at its natural length. Before coming to an instantaneous rest, if

the block moves a distanace x from the mean position, then

A. $x = \frac{1}{v}\sqrt{\frac{m}{K}}$ B. $x = v\sqrt{\frac{m}{K}}$

C. $x = \sqrt{\frac{mv}{K}}$ D. $x = \sqrt{\frac{m}{K}}$

18 A body performs S.H.M. Its kinetic energy K, varies with time t, as indicated in graph

A.

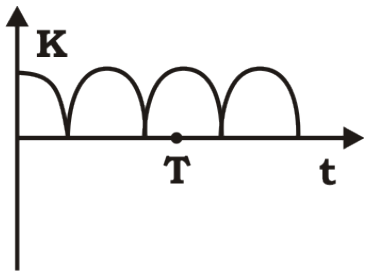

Figure 5: of the question 18

B.

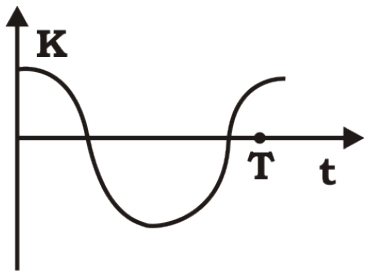

Figure 6: of the question 18

C.

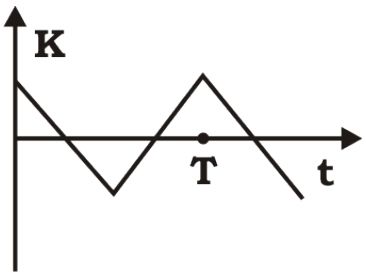

Figure 7: of the question 18

D.

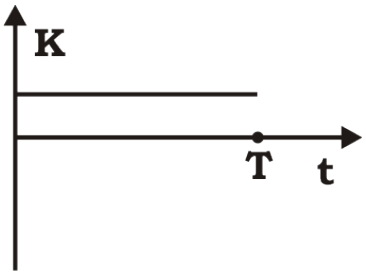

Figure 8: of the question 18

19 A cube of side a is placed on an inclined plane of inclination θ . What is the maximum value of θ for which cube will not topple ?

A. 15^0 B. 30^0

C. 45^0 D. 60^0

20 There is a current of 0.21 A in a copper wire whose area of cross - section is $10^{-6}m^2$. If the number of free electrons per m^3 is 8.4×10^{28} , then find the drift velocity. $(e = 1.6 \times 10^{-19}C)$

A. $2 \times 10^{-5}ms^{-1}$ B. $1.56 \times 10^{-5}ms^{-1}$

C. $1 \times 10^{-5}ms^{-1}$ D. $0.64 \times 10^{-5}ms^{-1}$

PART C : MATHEMATICS

21 Shaded region is represented by

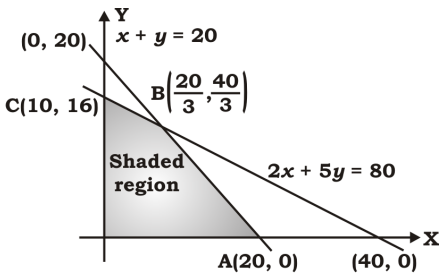

Figure 9: of the question 21

A. $2x + 5y \geqslant 80, x + y \leqslant 20, x \geqslant 0, y \leqslant 0$

B. $2x + 5y \geqslant 80, x + y \geqslant 20, x \geqslant 0, y \geqslant 0$

C. $2x + 5y \leqslant 80, x + y \leqslant 20, x \geqslant 0, y \geqslant 0$

D. $2x + 5y \leqslant 80, x + y \leqslant 20, x \leqslant 0, y \leqslant 0$

22 The plane $lx + my = 0$ is rotated by an angle α about its line of intersection with the plane $z = 0$, then the equation to the plane in its new position is

A. $lx + my \pm z\sqrt{(l^2 + m^2)}\tan\alpha = 0$

B. $lx - my \pm z\sqrt{(l^2 + m^2)}\tan\alpha = 0$

C. $lx + my \pm z\sqrt{(l^2 + m^2)}\cos\alpha = 0$

D. $lx - my \pm z\sqrt{(l^2 + m^2)}\cos\alpha = 0$

23 Which of the following is a contradiction

A. $(p \wedge q) \wedge \sim (p \vee q)$

B. $p \vee (\sim p \vee q)$

C. $(p \Rightarrow q) \Rightarrow p$

D. None of these

24 If $f(x) = \begin{cases} \sin x, & x \neq n\pi, n \in Z \\ 0, & \text{otherwise} \end{cases}$ and $g(x) = \begin{cases} x^2+1, & x \neq 0, \quad 2 \\ 4, & x = 0 \\ 5, & x = 2 \end{cases}$ then $\lim\limits_{x \to 0} g\{f(x)\} =$

A. 1 B. 0

C. $1/2$ D. $1/4$

25 If $A = [1 \;\; 2 \;\; 3]$ and $B = \begin{bmatrix} -5 & 4 & 0 \\ 0 & 2 & -1 \\ 1 & -3 & 2 \end{bmatrix}$, then $AB =$

A. $\begin{bmatrix} -5 & 4 & 0 \\ 0 & 4 & -2 \\ 3 & -9 & 6 \end{bmatrix}$

B. $\begin{bmatrix} 3 \\ 1 \\ 1 \end{bmatrix}$

C. $[-2 \quad -1 \quad 4]$

D. $\begin{bmatrix} -5 & 8 & 0 \\ 0 & 4 & -3 \\ 1 & -6 & 6 \end{bmatrix}$

26 If for non-zero x, $af(x) + bf\left(\frac{1}{x}\right) = \frac{1}{x} - 5$, where $a \neq b$, then $\int_1^2 f(x)\,dx =$

A. $\frac{1}{(a^2+b^2)}\left[a\log 2 - 5a + \frac{7}{2}b\right]$

B. $\frac{1}{(a^2-b^2)}\left[a\log 2 - 5a + \frac{7}{2}b\right]$

C. $\frac{1}{(a^2-b^2)}\left[a\log 2 - 5a - \frac{7}{2}b\right]$

D. $\frac{1}{(a^2+b^2)}\left[a\log 2 - 5a - \frac{7}{2}b\right]$

27 If $y = \frac{1-x}{1+x}$ then $y_6 =$

A. $\frac{2\,|\underline{6}}{(1+x)^7}$

B. $\frac{-2\,|\underline{6}}{(1+x)^7}$

C. $\frac{|\underline{6}}{(1+x)^7}$

D. none of these

28 The expression of $\frac{dy}{dx}$ of the function $y = a^{x^{a^{x \cdots \infty}}}$ is

A. $\frac{y^2}{x(1-y\log x)}$

B. $\frac{y^2 \log y}{x(1-y\log x)}$

C. $\frac{y^2 \log y}{x(1-y\log x\log y)}$

D. $\frac{y^2 \log y}{x(1+y\log x\log y)}$

29 If m and n are the order and degree of the differential equation

$$\left(\frac{d^2y}{dx^2}\right) + 4\frac{\left(\frac{d^2y}{dx^2}\right)^3}{\left(\frac{d^3y}{dx^3}\right)} + \frac{d^3y}{dx^3} = x^2 - 1\,,$$

then

A. $m = 3$ and $n = 5$

B. $m = 3$ and $n = 1$

C. $m = 3$ and $n = 3$

D. $m = 3$ and $n = 2$

30 $\sum\limits_{i=1}^{n}\sum\limits_{j=1}^{i}\sum\limits_{k=1}^{j} 1$ is equal to

A. $\frac{n(n+1)(2n+1)}{6}$

B. $\left[\frac{n(n+1)}{2}\right]^2$

C. $\frac{n(n+1)}{2}$

D. $\frac{n(n+1)(n+2)}{6}$