HORIZON ACADEMY®

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Name.: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Date : 02 / 08 / 2015

Test No.: 0 1

Time : 3 Hrs. **M.M. : 360**

HORIZON TEST SERIES

for

Engineering Entrance Exam.

2016

[Test No. 1]

INSTRUCTIONS FOR STUDENTS

1. Read each question carefully.
2. It is mandatory to use Blue/Black Ball Point Pen to darken the appropriate circle in the answer sheet.
3. Mark should be dark and should complete fill the circle.
4. Rough work must not be done on the Question Paper, no additional sheet will be provided for this purpose.
5. Do not use white-fluid or any other rubbing material on answer sheet. No change in the answer once marked.
6. Student cannot use log tables and calculators or any other material in the examination hall.
7. Before attempting the question paper, student should ensure that the test paper contains all pages and no page is missing.
8. Each correct answer carries four marks. One mark will be deducted for each incorrect answer from the total score.
9. Before handing over the answer sheet to the invigilator, candidate should check the particulars have been filled and marked correctly.
10. Immediately after the prescribed examination time is over, the answer sheet to be returned to the invigilator.
11. Use of Calculator and other Electronic device is not permitted.

Test No. 1

Topics of The Test

Physics	Electrostatics I (Electric Charge and Coulomb's Law, Electric Field).
Chemistry	Chemical Bonding
Maths	Trigonometry Complete + Complex Nos.

Test No. 1

[PHYSICS]

1. Two identical charged spheres suspended from a common point by two massless strings of length *l* are initially a distance $d(d << l)$ apart because of their mutual repulsion. The charge begins to leak from both the spheres at a constant rate. As a result charges approach each other with a velocity v. Then as a function of distance x between them

(A) $v \propto x^{-1}$ (B) $v \propto x^{1/2}$

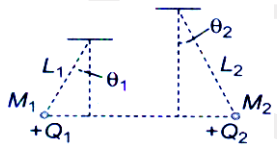
(C) $v \propto x$ (D) $v \propto x^{-1/2}$

2. Four charges equal to –Q are placed at the four corners of a square and a charge *q* is at its centre. If the system is in equilibrium the value of *q* is

(A) $-\frac{Q}{4}(1+2\sqrt{2})$ (B) $\frac{Q}{4}(1+2\sqrt{2})$

(C) $-\frac{Q}{2}(1+2\sqrt{2})$ (D) $\frac{Q}{2}(1+2\sqrt{2})$

3. Two small spheres of masses M_1 and M_2 are suspended by weightless insulating threads of lengths L_1 and L_2. The spheres carry charges Q_1 and Q_2 respectively. The spheres are suspended such that they are in level with one another and the threads are inclined to the vertical at angles of θ_1 and θ_2 as shown. Which one of the following conditions is essential, if $\theta_1 = \theta_2$?



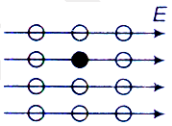
(A) $M_1 \neq M_2$, but $Q_1 = Q_2$

(B) $M_1 = M_2$

(C) $Q_1 = Q_2$

(D) $L_1 = L_2$

4. There is a uniform electric field of intensity E which is as shown. How many labelled points have the same electric potential as the fully shaded point ?



(A) 2 (B) 3

(C) 8 (D) 11

5. An object A has a charge of $-2\mu C$ and the object B has a charge of $+6\mu C$. Which statement is true ?

(A) $F_{AB} = -3F_{BA}$ (B) $F_{AB} = -F_{BA}$

(C) $3F_{AB} = -F_{BA}$ (D) $F_{AB} = 4F_{BA}$

6. A solid sphere of radius R_1 and volume charge density $\rho = \frac{\rho_0}{r}$ is enclosed by a hollow sphere of radius R_2 with negative surface charge density σ, such that the total charge in the system is zero, ρ_0 is positive constant and *r* is the distance from the centre of the sphere. The ratio $\frac{R_2}{R_1}$ is

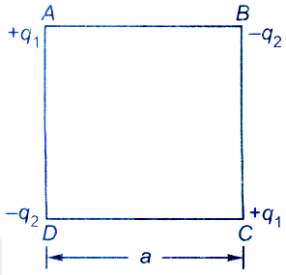
(A) $\frac{\sigma}{\rho_0}$ (B) $\sqrt{2\sigma/\rho_0}$

(C) $\sqrt{\rho_0/2\sigma}$ (D) $\frac{\rho_0}{\sigma}$

Space for Rough Work

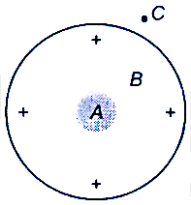
7. A comb run through one's dry hair attracts small bits of paper. This is due to
(A) comb is a good conductor
(B) paper is a good conductor
(C) the atoms in the paper get polarised by the charged comb
(D) the comb possesses magnetic properties

8. Charges are placed at corners of a square of side ***a*** as shown in the following figure. The charge *A* is in equilibrium. The ratio $\frac{q_1}{q_2}$ is



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

9. Two equal metal balls are charged to 10 and –20 units of electricity. Then they are brought in contact with each other and then again separated to the original distance. The ratio of magnitudes of the force between the two balls before and after contact is



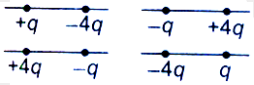
(A) 8 : 1 (B) 1 : 8
(C) 2 : 1 (D) 1 : 2

10. The bob of simple pendulum is hanging vertically down from a fixed identical bob by means of a string of length *l*. If both bobs are charged with a charge *q* each, time period of the pendulum is (ignore the radii of the bobs)

(A) $2\pi\sqrt{\frac{l}{g+\left(\frac{q^2}{l^2m}\right)}}$ (B) $2\pi\sqrt{\frac{l}{g-\left(\frac{q^2}{l^2m}\right)}}$

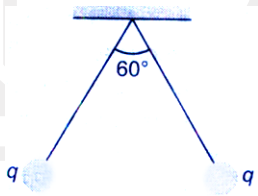
(C) $2\pi\sqrt{\frac{l}{g}}$ (D) $2\pi\sqrt{\frac{l}{g-\left(\frac{q^2}{l}\right)}}$

11. The figure shows four situations in which charges as indicated $(q>0)$ are fixed on an axis. In which situation is there a point to the left of the charges where an electron would be in equilibrium ?



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

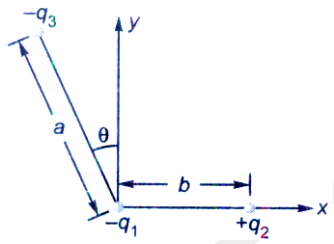
12. Two small sphere balls each carrying charge $q=10\mu C$ are suspended by two insulated threads of equal length 1m each, from a point fixed in the ceiling. It is found that in equilibrium, threads are separated by an angle 60° between them as shown in figure, the tension in the thread is



(A) 0.18 N (B) 18 N
(C) 1.8 N (D) None of the above

Space for Rough Work

13. Three charges $-q_1, +q_2$ and $-q_3$ are placed as shown in the figure. The x-component of the force on $-q_1$ is proportional to



(A) $\frac{q_2}{b^2} - \frac{q_3}{a^2}\cos\theta$ (B) $\frac{q_2}{b^2} + \frac{q_3}{a^2}\sin\theta$

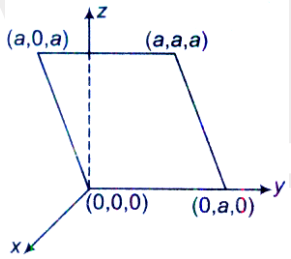
(C) $\frac{q_2}{b^2} + \frac{q_3}{a^2}\cos\theta$ (D) $\frac{q_2}{b^2} - \frac{q_3}{a^2}\sin\theta$

14. The charge on two identical metallic balls are $+40\mu C$ and $-10\mu C$ respectively and they are separated at 2.0 m. How much and nature of force will act between them ?

(A) 2.9 N, repulsive (B) 1.9 N, attractive

(C) 1.2 N, repulsive (D) 0.9 N, attractive

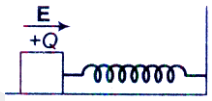
15. Consider an electric field $\mathbf{E} = E_0\hat{\mathbf{x}}$, where E_0 is a constant. The flux through the shaded area (as shown in the figure) due to this field is



(A) $2E_0a^2$ (B) $\sqrt{2}E_0a^2$

(C) E_0a^2 (D) $\frac{E_0a^2}{\sqrt{2}}$

16. A wooden block performs SHM on a frictionless surface with frequency ν_0. The block carries a charge $+Q$ on its surface. If now a uniform electric field **E** is switched on as shown, then the SHM of the block will be



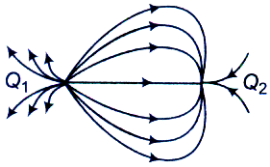
(A) of the same frequency and with shifted mean position

(B) of the same frequency and with the same mean position

(C) of changed frequency and with shifted mean position

(D) of changed frequency and with the same mean position

17. A few electric field lines for a system of two charges Q_1 and Q_2 fixed at two different points on the x-axis are shown in the figure. These lines suggest that



(A) $|Q_1| > |Q_2|$

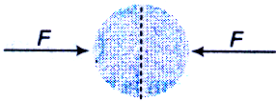
(B) $|Q_1| < |Q_2|$

(C) at a finite distance to the left of Q_1 the electric field is zero.

(D) at a finite distance to the right of Q_2 the electric field is zero

Space for Rough Work

18. A uniformly charged thin spherical shell of radius R carries uniform surface charge density of σ per unit area. It is made of two hemispherical shells, held together by pressing them with force F (sec figure). F is proportional to



(A) $\frac{1}{\varepsilon_0}\sigma^2R^2$ (B) $\frac{1}{\varepsilon_0}\sigma^2R$

(C) $\frac{1}{\varepsilon_0}\frac{\sigma^2}{R}$ (D) $\frac{1}{\varepsilon_0}\frac{\sigma^2}{R^2}$

19. Let $p(r)=\frac{Qr}{\pi R^4}$ be the charge density distribution for a solid sphere of radius R and total charge Q. For a point P inside the sphere at distance r_1 from the centre of the sphere, the magnitude of electric field is

(A) zero (B) $\frac{Q}{4\pi\varepsilon_0 r_1^2}$

(C) $\frac{Qr_1^2}{4\pi\varepsilon_0 R^4}$ (D) $\frac{Qr_1^2}{3\pi\varepsilon_0 R^4}$

20. A spherical shell of radius R has a charge +q units. the electric field due to the shell at a point

(A) inside is zero and varies as r^{-1} outside it

(B) inside the constant and varies as r^{-2} outside it

(C) inside is zero and varies as r^{-2} outside it

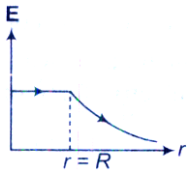
(D) inside is constant and varies as r^{-1} outside it

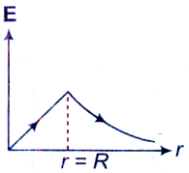
21. A particle of mass m carrying charge q is kept at rest in a uniform electric field E and then released. The kinetic energy gained by the particle, when it moves through a distance y is

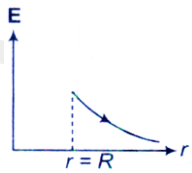
(A) $\frac{1}{2}qEy^2$ (B) qEy

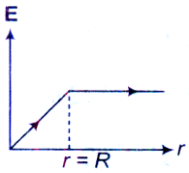
(C) qEy^2 (D) qE^2y

22. Which one of the following graphs represents the variation of electric field with distance r from the centre of a charged spherical conductor of radius R?

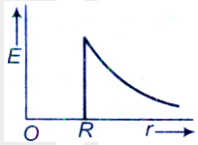
(A) 

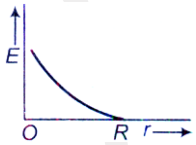
(B) 

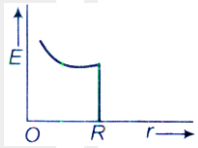
(C) 

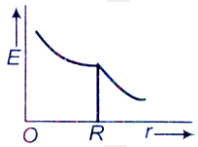
(D) 

23. A metallic spherical shell of radius R has a charge $-Q$ on it. A point charge $+Q$ is placed at the centre of the shell. Which of the graphs shown below may correctly represent the variation of the electric field E with distance r from the centre of the shell ?

(A) 

(B) 

(C) 

(D) 

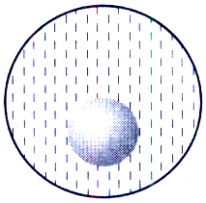
24. A simple pendulum has a length l and the mass of the bob is m. The bob is given a charge q coulomb. The pendulum is suspended between the vertical plates of a charged parallel plate capacitor. If E is the electric field strength between the plates, the time period of the pendulum is given by

(A) $2\pi\sqrt{\frac{l}{g}}$ (B) $2\pi\sqrt{\frac{l}{\sqrt{g+\frac{qE}{m}}}}$

(C) $2\pi\sqrt{\frac{l}{\sqrt{g-\frac{qE}{m}}}}$ (D) $2\pi\sqrt{\frac{l}{\sqrt{g^2+\left(\frac{qE}{m}\right)^2}}}$

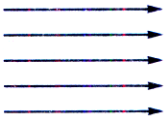
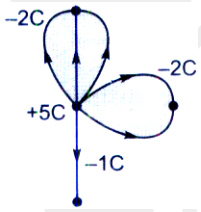
Space for Rough Work

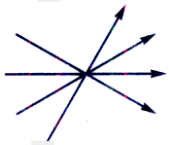
25. A spherical portion has been removed from a solid sphere having a charge distributed uniformly in its volume as shown in the figure. The elctric field inside the emptied space is



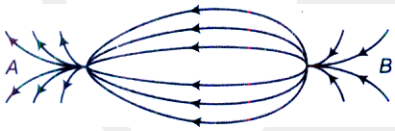
(A) zero everywhere (B) non-zero and uniform
(C) non-uniform (D) zero only at its centre

26. Which of the following configurations of electric lines of force is not possible ?

(A)  (B) 

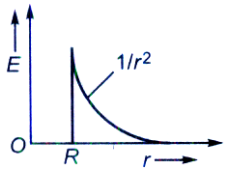
(C)  (D) Both (b) and (c)

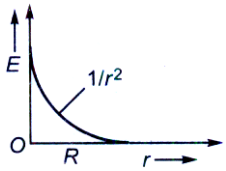
27. The spatial distribution of the electric field due to charges (A,B) is shown in figure. Which one of the following statements is correct ?

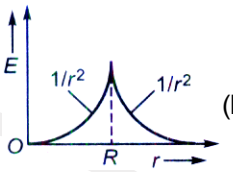


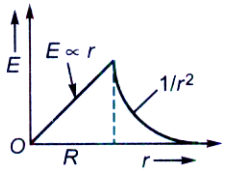
(A) A is +ve and B –ve, |A|>|B|
(B) A is –ve and B+ve, |A|=|B|
(C) Both are +ve but A > B
(D) Both are –ve but A > B

28. Which of the following plots represents the variation of the electric field with distance from the centre of a uniformly charged non-conducting sphere of radius R?

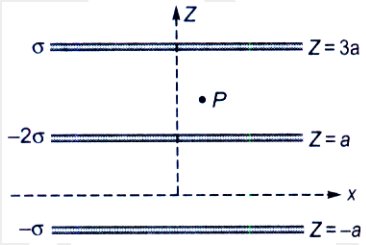
(A) 

(B) 

(C) 

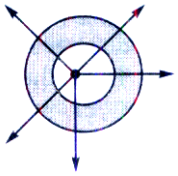
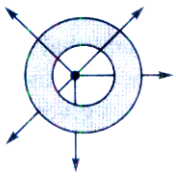
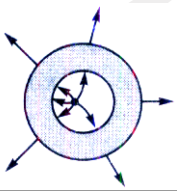
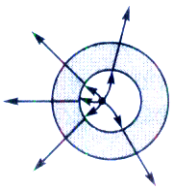
(D) 

29. Three infinitely long charge sheets are placed as shown in figure. The electric field at point P is



(A) $\frac{2\sigma}{\varepsilon_0}\hat{\mathbf{k}}$ (B) $-\frac{2\sigma}{\varepsilon_0}\hat{\mathbf{k}}$
(C) $\frac{4\sigma}{\varepsilon_0}\hat{\mathbf{k}}$ (D) $-\frac{4\sigma}{\varepsilon_0}\hat{\mathbf{k}}$

30. A metallic shell has a point charge *q* kept inside its cavity. Which one of the following diagrams correctly represents the electric lines of forces ?

(A)  (B) 
(C)  (D) 

Space for Rough Work

[CHEMISTRY]

31. Among the following the maximum covalent character is shown by the compound

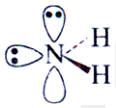
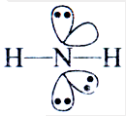
(A) $FeCl_2$ (B) $SnCl_2$

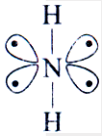
(C) $AlCl_3$ (D) $MgCl_2$

32. When a metal atom combines with a non-metal atom, the non-metal atom will

(A) lose electrons and decrease in size
(B) lose electrons and increase in size
(C) gain electrons and decrease in size
(D) gain electrons and increase is size

33. For $\overline{N}H_2$, the best three-dimensional view is

(A)  (B) 

(C)  (D) 

34. Which combination of atoms can form a polar covalent bond ?

(A) H and H (B) H and Br
(C) N and N (D) Na and Br

35. Which of the following has lowest boiling point ?

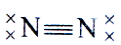
(A) $NaCl$ (B) $CuCl$

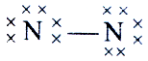
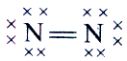
(C) $CuCl_2$ (D) $CsCl$

36. Which metal has a greater tendency to form metal oxide?

(A) Cr (B) Fe
(C) Al (D) Ca

37. Which of the following represents the Lewis structure of N_2 molecule ?

(A)  (B) 

(C)  (D) 

38. The charge/size ratio of cation determines its polarising power. Which one of the following sequences represents the increasing order of the polarising power of the cationic species, $K^+, Ca^{2+}, Mg^{2+}, Be^{2+}$?

(A) $Mg^{2+} < Be^{2+} < K^+ < Ca^{2+}$

(B) $Be^{2+} < K^+ < Ca^{2+} < Mg^{2+}$

(C) $K^+ < Ca^{2+} < Mg^{2+} < Be^{2+}$

(D) $Ca^{2+} < Mg^{2+} < Be^{2+} < K^+$

39. Lattice energy of an ionic compound depends upon

(A) charge on the ion and size of the ion
(B) packing of ions only
(C) size of the ion only
(D) charge on the ion only

40. $C-Cl$ bond is stronger than $C-I$ bond, because

(A) $C-Cl$ bond is more ionic than $C-I$
(B) $C-Cl$ bond is polar covalent bond
(C) $C-Cl$ bond is more covalent than $C-I$
(D) $C-Cl$ bond length is longer than $C-I$

41. Which of the following has covalent bond ?

(A) Na_2S (B) $AlCl_3$

(C) NaH (D) $MgCl_2$

42. Which of the following is not correct regarding the properties of ionic compounds ?

(A) Ionic compounds have high melting and boiling points
(B) Their reaction velocity in aqueous medium is very high
(C) Ionic compounds in their molten and aqueous solutions do not conduct electricity
(D) They are highly soluble in polar solvents

43. Which of the following is a favourable factor for cation formation ?

(A) High electronegativity
(B) High electron affinity
(C) Low ionisation potential
(D) Smaller atomic size

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44. Which one of the following contains both ionic and covalent bonds ?
(A) C_6H_5Cl (B) H_2O
(C) $NaOH$ (D) CO_2

45. Which one of the following is highest melting halide ?
(A) $AgCl$ (B) $AgBr$
(C) AgF (D) AgI

46. What is the nature of the bond between B and O in $(C_2H_5)_2OBH_3$?
(A) Covalent (B) Coordinate covalent
(C) Ionic bond (D) Banana shaped bond

47. Which type of bond is present in H_2S molecule ?
(A) Ionic bond (B) Covalent bond
(C) Coordinate (D) All of three

48. When metals react with non-metals, the metal atoms tend to
(A) share electrons
(B) lose electrons
(C) gain electrons
(D) None of the above

49. Oxygen and the oxide ion have the
(A) same proton number
(B) same electronic configuration
(C) same electron number
(D) same size

50. Which of the following shows minimum melting point?
(A) Naphthalene (B) Diamond
(C) NaCl (D) Mn

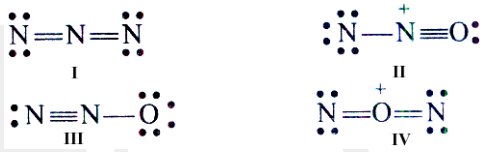
51. The molecule which has zero moment is
(A) CH_3Cl (B) NF_3
(C) BF_3 (D) ClO_2

52. If $H-X$ bond length is 2.00 Å and $H-X$ bond has dipole moment 5.12×10^{-30} C-m, the percentage of ionic character in the molecule will be
(A) 10% (B) 16%
(C) 18% (D) 20%

53. The bond length of HCl molecule is 1.275Å and its dipole moment is 1.03 D. The ionic character of the molecule (in per cent) (charge of the electron = 4.8×10^{-10}esu) is
(A) 100 (B) 67.3
(C) 33.66 (D) 16.83

54. The dipole moment of HBr is 1.6×10^{-30} cm and inter-atomic spacing is 1 Å. The % ionic character of HBr is
(A) 7 (B) 10
(C) 15 (D) 27

55. Which of the following are possible resonating structure of N_2O ?



(A) I and II (B) I and III
(C) I, II and III (D) All of these

56. Identify the non-polar molecule in the set of compounds given
HCl, HF, H_2, HBr
(A) H_2 (B) HCl
(C) HF, HBr (D) HBr

57. Which one of the following pairs of molecules will have permanent dipole moments for both members ?
(A) SiF_4 and NO_2 (B) NO_2 and CO_2
(C) NO_2 and O_3 (D) SiF_4 and CO_2

58. In the anion $HCOO^-$ the two carbon-oxygen bonds are found to be of equal length. What is the reason for it ?
(A) Electronic orbits of carbon atom are hybridised
(B) The $C=O$ bond is weaker than the $C-O$ bond
(C) The anion $HCOO^-$ has two resonating structures
(D) The anion is obtained by removal of a proton from the acid molecule

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59. The electronegativity of A and B are 1.20 and 4.0 respectively. Therefore, ionic character in $A-B$ bond will be

(A) 50% (B) 43%
(C) 53.3% (D) 72.23%

60. The only molecule having dipole moment is

(A) 2,2-dimethylpropane
(B) trans-2-pentene
(C) trans-3-hexene
(D) 2,2,3,3,-tetramethylbutane

[MATHEMATICS]

61. Let $f(\theta)=\sin\theta(\sin\theta+\sin 3\theta)$. Then, $f(\theta)$

(A) ≥ 0 only when $\theta \geq 0$
(B) ≤ 0 for all real θ
(C) ≥ 0 for all real θ
(D) ≤ 0 only when $\theta \leq 0$

62. The maximum value of the expression $\frac{1}{\sin^2\theta+3\sin\theta\cos\theta+5\cos^2\theta}$, is

(A) 2 (B) 3
(C) 4 (D) 6

63. Let $\cos(\alpha+\beta)=\frac{4}{5}$ and let $\sin(\alpha-\beta)=\frac{5}{13}$ where $0<\alpha,\beta\leq\frac{\pi}{4}$. Then, $\tan 2\alpha=$

(A) 19/12 (B) 20/7
(C) 25/16 (D) 56/33

64. The positive integral value of n > 3 satisfying $\frac{1}{\sin\left(\frac{\pi}{n}\right)}=\frac{1}{\sin\left(\frac{2\pi}{n}\right)}+\frac{1}{\sin\left(\frac{3\pi}{n}\right)}$, is

(A) 6 (B) 7
(C) 8 (D) 4

65. If $A_1A_2A_3A_4A_5$ be a regular pentagon inscribed in a unit circle. Then, $(A_1A_2)(A_1A_3)$ is equal to

(A) 1 (B) 3
(C) 4 (D) $\sqrt{5}$

66. If $\frac{x}{\cos\theta}=\frac{y}{\cos\left(\theta-\frac{2\pi}{3}\right)}=\frac{z}{\cos\left(\theta+\frac{2\pi}{3}\right)}$, then $x+y+z=$

(A) 1 (B) 0
(C) –1 (D) 2

67. If $\sin\theta_1+\sin\theta_2+\sin\theta_3=3$, then $\cos\theta_1+\cos\theta_2+\cos\theta_3=$

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

68. The value of the expression $3(\sin x-\cos x)^4+4(\sin^6 x+\cos^6 x)+6(\sin x+\cos x)^2$ is

(A) 10 (B) 12
(C) 13 (D) none of these

69. If $\sin x+\sin^2 x=1$, then the value of $\cos^{12}x+3\cos^{10}x+3\cos^8 x+\cos^6 x-1$ is equal to

(A) 2 (B) 1
(C) 0 (D) –1

70. $1+\sin x+\sin^2 x+\ldots$ to $\infty=4+2\sqrt{3}$, if

(A) $x=\frac{2\pi}{3}$ or, $\frac{\pi}{3}$ (B) $x=\frac{7\pi}{6}$
(C) $x=\frac{\pi}{6}$ (D) $x=\frac{\pi}{4}$

71. If in a triangle ABC, $\frac{\cos A}{a}=\frac{\cos B}{b}=\frac{\cos C}{c}$, then the triangle is

(A) right angled (B) obtuse angled
(C) equilateral (D) isosceles

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72. If in a triangle $a\cos^2\left(\frac{C}{2}\right)+c\cos^2\left(\frac{A}{2}\right)=\frac{3b}{2}$, then the sides of the triangle are in
(A) AP (B) GP
(C) HP (D) none of these

73. In a triangle ABC, angle A is greater then B. If the measures of angles A and B satisfy the equation
$3\sin x-4\sin^3 x-k=0, 0<k<1,$
then the measure of angle C, is
(A) $\pi/3$ (B) $\pi/2$
(C) $2\pi/3$ (D) $5\pi/6$

74. The area of a ΔABC is $b^2-(c-a)^2$. Then, $\tan B=$
(A) $\frac{4}{3}$ (B) $\frac{3}{4}$
(C) $\frac{8}{15}$ (D) none of these

75. In a $\Delta ABC, a^2\sin 2C+c^2\sin 2A=$
(A) Δ (B) 2Δ
(C) 3Δ (D) 4Δ

76. The complex number $\frac{(-\sqrt{3}+3i)(1-i)}{(3+\sqrt{3}i)\,(i)\,(\sqrt{3}+\sqrt{3}i)}$ when represented in the Argand diagram is
(A) in the second quadrant
(B) in the first quadrant
(C) on the y-axis (imaginary axis)
(D) on the x-axis (real axis)

77. The value of $\sum_{n=0}^{\infty}\left(\frac{2i}{3}\right)^n$ is
(A) $\frac{9+6i}{13}$ (B) $\frac{9-6i}{13}$
(C) $9+6i$ (D) $9-6i$

78. The number of complex numbers z such that $|z-1|=|z+1|=|z-i|$ equals
(A) 0 (B) 1
(C) 2 (D) ∞

79. If $\left|z-\frac{4}{z}\right|=2$, then the maximum value of |z| is equal to
(A) $\sqrt{3}+1$ (B) $\sqrt{5}+1$
(C) 2 (D) $2+\sqrt{2}$

80. If m_1, m_2, m_3 and m_4 respectively denote the moduli of the complex numbers $1+4i, 3+i, 1-i$ and $2-3i$, then the correct one, among the following is
(A) $m_1<m_2<m_3<m_4$
(B) $m_4<m_3<m_2<m_1$
(C) $m_3<m_2<m_4<m_1$
(D) $m_3<m_1<m_2<m_4$

81. If $|z+4|\le 3$, then the greatest and the least value of $|z+1|$ are respectively
(A) 6,–6 (B) 6,0
(C) 7,2 (D) 0,–1

82. If z and w are two non-zero complex numbers such that |zw|=1 and arg (z) – arg $(w)=\frac{\pi}{2}$, then $\bar{z}w$ is equal to
(A) 1 (B) –1
(C) i (D) $-i$

83. Let $z=\cos\theta+i\sin\theta$. Then, the value of $\sum_{m=1}^{15}\text{Im}(z^{2m-1})$ at $\theta=2^\circ$ is
(A) $\frac{1}{\sin 2^\circ}$ (B) $\frac{1}{3\sin 2^\circ}$
(C) $\frac{1}{2\sin 2^\circ}$ (D) $\frac{1}{4\sin 2^\circ}$

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84. If $z^2+z+1=0$, where z is a complex number, then the value of $\left(z+\frac{1}{z}\right)^2+\left(z^2+\frac{1}{z^2}\right)^2+\left(z^3+\frac{1}{z^3}\right)^2+.....+\left(z^6+\frac{1}{z^6}\right)^2$ is

(A) 6 (B) 12
(C) 18 (D) 24

85. If ω is a complex cube root of unity, then $\sin\left\{(\omega^{10}+\omega^{23})\pi-\frac{\pi}{4}\right\}$ is equal to

(A) $\frac{1}{\sqrt{2}}$ (B) $\frac{1}{2}$
(C) 1 (D) $\frac{\sqrt{3}}{2}$

86. The value of the expression

$2\left(1+\frac{1}{\omega}\right)\left(1+\frac{1}{\omega^2}\right)+3\left(2+\frac{1}{\omega}\right)\left(2+\frac{1}{\omega^2}\right)+...+(n+1)\left(n+\frac{1}{\omega}\right)\left(n+\frac{1}{\omega^2}\right)$ is

(A) $\left[\frac{n(n+1)}{2}\right]^2$ (B) $\left[\frac{n(n+1)}{2}\right]^2-n$
(C) $\left[\frac{n(n+1)}{2}\right]^2+n$ (D) None of these

87. If 1, $a_1,a_2,....,a_{n-1}$ are the n roots of unity, then the value of $(1-a_1)(1-a_2)(1-a_3)...(1-a_{n-1})$ is equal to

(A) $\sqrt{3}$ (B) $\frac{1}{2}$
(C) n (D) 0

88. The value of $1+\sum_{k=0}^{14}\left\{\cos\frac{(2k+1)}{15}\pi+i\sin\frac{(2k+1)}{15}\pi\right\}$ is

(A) 0 (B) –1
(C) 1 (D) i

89. If the area of triangle on the argand plane formed by the complex numbers $-z, iz, z-iz$ is 600 sq unit, then, |z| is equal to

(A) 10 (B) 20
(C) 30 (D) 40

90. If $w=\frac{z}{z-\frac{1}{3}i}$ and $|w|=1$, then z lies on

(A) a parabola (B) a straight line
(C) a circle (D) an ellipse

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