V-01

Integrated M.Sc. Entrance Examination – 2011

Maximum Marks : 75 **Time : 2 hrs.**

Hall Ticket No. | | | | | | | | | | |

Instructions for students

I. Please enter your Hall Ticket Number on this page and on the OMR sheet without fail.

II. Read the following instructions carefully.

1. Questions 1-25 are in Biology, 26-50 in Chemistry, 51-75 in Physics and 76-100 are in Mathematics.
2. Answer as many questions as you can. Each question carries 1 mark. Each wrong answer will be awarded −0.33. The maximum marks for the paper is 75.
3. Answers are to be marked on the OMR sheet following the instructions given there.
4. Hand over both the question paper and the OMR sheet at the end of examination.
5. Non-programmable calculators are allowed. Log tables and programmable calculators are not allowed.
6. Rough work can be done anywhere on the question paper but not on the OMR sheet.
7. This book contains **18** pages including this page and pages for the rough work. Please check that your question paper has all the pages.

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1. Eukaryotic organisms that include protozoa and filamentous algae, such as Amoeba, Plasmodium, Euglena etc, belong to the kingdom
   (A) Protista. (B) Plantae. (C) Fungi. (D) Eubacteria.

2. A nucleotide is
   (A) a phosphate, a six-carbon sugar, and a nitrogen base.
   (B) a group of linked amino acids.
   (C) a protein, a sugar, and a phosphate.
   (D) a phosphate, five-carbon sugar, and a nitrogen base.

3. A haploid (n) set of chromosomes is present in
   (A) Carpel. (B) Style. (C) Pollen. (D) Petal.

4. If the sequence of a DNA strand is 5' ATG CGT TGA AAC TGA 3', the sequence of complimentary strand in 5' → 3' direction is:
   (A) 3' TCA GTT TCA ACG CAT 5' (B) 5' TCA GTT TCA ACG CAT 3'
   (C) 5' AGT CAA AGT TGC GTA 3' (D) 5' TAC GCA ACT TTG ACT 3'

5. Crabs, Prawns, Scorpions, Spiders, Millipedes and Centipedes belong to the phylum
   (A) Porifera. (B) Echinodermata. (C) Arthropoda. (D) Cnidaria.

6. *Wuchereria bancrofti* causes
   (A) Elephantiasis. (B) Malaria. (C) Diptheria. (D) Typhoid.

7. In chloroplasts, light-dependent reactions of photosynthesis take place in
   (A) stroma. (B) nucleus. (C) thylakoid membranes. (D) cytoplasm.

8. Human Immunodeficiency Virus (HIV) attacks
   (A) columnar epithelial cells of small intestine. (B) liver cells.
   (C) T-cells (a type of white blood cell). (D) oxyntic cells of stomach.

9 Given below are microbes paired with their commercially important products. The INCORRECT pair is:
   (A) *Saccharomyces cerevisiae*: saccharine. (B) *Aspergillus niger*: citric acid.
   (C) *Acetobacter aceti*: acetic acid. (D) *Lactobacillus*: lactic acid.

10. The relationship between a fungus and cyanobacteria in Lichens represents
   (A) Commensalism. (B) Symbiosis. (C) Parasitism. (D) Predation.

11. The technique Polymerase Chain Reaction (PCR) is used
   (A) to make large number of copies of a DNA fragment in laboratory.
   (B) to identify antibody production in laboratory.
   (C) to make RNA from DNA in laboratory.
   (D) to make proteins from RNA in laboratory.

12. Genetic alteration of a bacterium by introducing a piece of exogenous DNA is called
    (A) Lysogeny. (B) Recombination.
    (C) Transformation. (D) Translation.

13. Four tubes of DNA were analyzed for their nitrogenous base compositions. Based on percentages of adenine (A), guanine (G), thymine (T) and cytosine (C), the tube that contains double-stranded DNA is:
    (A) A=32%, G=18%, C=18% and T=32%
    (B) A=46%, G=28%, C=10% and T=16%
    (C) A=22%, G=18%, C=36% and T=22%
    (D) A=18%, G=18%, C=18% and T=46%

14. The base that is absent in messenger RNA is
    (A) Guanine. (B) Cytosine. (C) Adenine. (D) Thymine.

15. The process whereby the tissue concentrations of a contaminant increase as it passes up the food chain through two or more trophic level is called
    (A) Biodegradation. (B) Biomagnification.
    (C) Fermentation. (D) Biodiversity.

16. Tryptophan, Histidine, Valine and Glutamic acid are examples of
    (A) fatty acids. (B) nucleic acids.
    (C) amino acids. (D) carbohydrates.

17. The bond that is absent in a DNA molecule is
    (A) Phosphodiester bond. (B) Glycosidic bond.
    (C) Hydrogen bond. (D) Peptide bond.

18. The phylum that is called the amphibians of the plant kingdom is
    (A) Algae. (B) Bryophyta. (C) Pteridophyta. (D) Gymnosperms.

19. Conjoint and open vascular bundles with endarch protoxylem arranged in a ring are a feature of
    (A) Dicot root. (B) Monocot root.
    (C) Dicot stem. (D) Monocot stem.

20. In an eukaryotic cell, the messenger RNAs are synthesized in
    (A) Nucleus. (B) Cytoplasm. (C) Goldi aparatus. (D) Ribosome.

21. The end product of glycolysis under anaerobic conditions is
    (A) Citric acid. (B) Lactic acid.
    (C) Oxaloacetic acid. (D) Pyruvic acid

22. The phenotype for the ABO blood system is determined by:
    (A) O is dominant over A. (B) B is dominant over A.
    (C) O is recessive. (D) O is dominant over B.

23. Gibberellins, Auxins, Ethylene and Abscisic acid are
(A) plant growth regulators. (B) animal hormones.
(C) components of gastric juice. (D) products of microbial fermentation.

24. The correct statement for Meiosis cell division is:
(A) It takes place within somatic cells.
(B) The number of chromosomes per nucleus remains the same after division.
(C) The mother cell can either be haploid or diploid.
(D) There is at least one crossing-over per homologous pair of chromosomes.

25. Given that colour blindness is a dominant trait, the probability of two affected individuals having an unaffected child is:
(A) 0% (B) 25% (C) 50% (D) 75%

26. Which one of the following will have the largest number of atoms?
[At. Wts.: Li = 7, F = 19, P = 31]
(A) 1 g Li (B) 1 g F_2 (C) 1 g H_2O (D) 1 g PH_3

27. The volume of 0.5 N sodium hydroxide solution required to neutralize 50 ml of 0.25 M sulfuric acid is
(A) 25 ml. (B) 50 ml. (C) 75 ml. (D) 100 ml.

28. $CaCO_3$ reacts with aqueous HCl to produce $CaCl_2$, CO_2 and H_2O [At. Wts.: Ca = 40, Cl = 35.5]. The mass of $CaCO_3$ that will react completely with 25 ml of 1 N HCl is
(A) 0.25 g. (B) 0.50 g. (C) 1.0 g. (D) 1.25 g.

29. The solubility product (K_{SP}) of calcium sulphate is 9×10^{-6} M^2 [At. Wt. of S = 32]. The minimum volume of water required to dissolve 1 g of calcium sulphate is
(A) 1.22 litre. (B) 2.45 litre. (C) 4.50 litre. (D) 6.33 litre.

30. The atoms of the yet to be discovered elements, starting at Z = 121 will have electrons in the 5g orbitals. The number of elements expected in the 5g-block is:
(A) 14 (B) 18 (C) 22 (D) 26

31. The molecule with zero dipole moment among the following is:
(A) H_2O (B) NF_3 (C) BF_3 (D) $CHCl_3$

32. The ClF_3 molecule is
(A) T-shaped. (B) trigonal pyramidal.
(C) trigonal planar. (D) tetrahedral.

33. At 27°C and 760 mm Hg pressure a gas occupies 500 ml of volume. What will be the temperature when the pressure and volume of the gas are 570 mm Hg and 600 ml, respectively?
(A) 8°C (B) 3°C (C) −3°C (D) −8°C

34. At 50°C and constant pressure of 1 atmosphere 50% of N_2O_4 dissociates to NO_2. The equilibrium constant K_p of the process is:
(A) 1.02 (B) 1.33 (C) 2.04 (D) 2.66

35. The enthalpies of combustion of CH_4, C and H_2 at 298 K are -212 cal mol^{-1}, -94 cal mol^{-1} and -68 cal mol^{-1}, respectively. The enthalpy of formation of CH_4 is:
(A) -18 cal mol^{-1} (B) $+18$ cal mol^{-1}
(C) -50 cal mol^{-1} (D) $+50$ cal mol^{-1}

36. A current of 10 ampere was passed through molten $AlCl_3$ for 18 minutes. What will be the mass of aluminium deposited at the cathode? [At. Wt. of Al = 27, F = 96500 coulomb]
(A) 0.5 g (B) 1.0 g (C) 1.5 g (D) 3.0 g

37. The numbers of σ- and π-bonds in C_2H_2 are
(A) 1 and 2, respectively. (B) 2 and 3, respectively.
(C) 2 and 1, respectively. (D) 3 and 2, respectively.

38. How many moles of ethylene on complete combustion will produce 90 g of H_2O?
(A) 1.5 (B) 2 (C) 2.5 (D) 3

39. Treatment of benzene with CH_3COCl in presence of anhydrous $AlCl_3$ produces
(A) toluene. (B) chlorobenzene. (C) acetophenone. (D) benzaldehyde.

40. Dimethyl ether and ethyl alcohol exhibit
(A) chain isomerism. (B) position isomerism.
(C) tautomerism. (D) functional isomerism.

41. Alkaline hydrolysis of an ester is known as
(A) saponification. (B) neutralisation. (C) decomposition. (D) dissociation.

42. Treatment of one equivalent CH_3MgBr with one equivalent CH_3CH_2COCl produces:
(A) CH_3CH_2CHO (B) $CH_3CH_2COCH_3$
(C) CH_3CH_2COOH (D) $CH_3CH_2COOCH_3$

43. Nitration of phenol with dilute nitric acid will produce
(A) 2-nitrophenol only. (B) 2-nitrophenol and 3-nitrophenol.
(C) 2-nitrophenol and 4-nitrophenol. (D) 3-nitrophenol and 4-nitrophenol.

44. For 4-substituted benzoic acids where the substituents are H, Cl, NO_2 and OCH_3, the acidity decreases with the change of substituent in the order:
(A) $H > Cl > NO_2 > OCH_3$ (B) $NO_2 > Cl > H > OCH_3$
(C) $Cl > OCH_3 > H > NO_2$ (D) $OCH_3 > NO_2 > Cl > H$

45. Among the following, the compound that gives negative iodoform test is
(A) benzaldehyde. (B) ethanol. (C) acetophenone. (D) acetone.

46. Electrolysis of brine will produce:
(A) Na and Cl_2 (B) Na, H_2 and Cl_2
(C) NaOH and Cl_2 (D) NaOH, H_2 and Cl_2

47. The molecular formula of an oxide of iron (At. Wt.: 55.8) which has 69.9% iron and 30.1% oxygen is:
(A) FeO (B) FeO_2 (C) Fe_2O_3 (D) Fe_3O_4

48. The magnetic moment of the brown compound $[Fe(NO)(H_2O)_5]SO_4$ formed in the nitrate ring test is 3.87 B.M. What is the valence of iron in this compound?
(A) +1 (B) +2 (C) +3 (D) +4

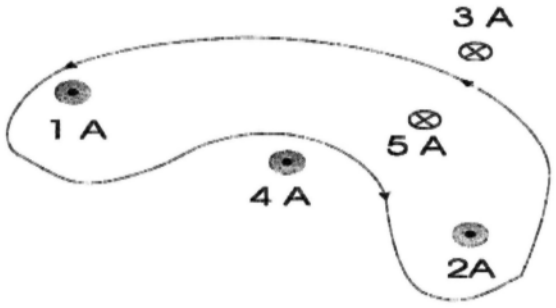
49. Hybridization of the metal ion in diamagnetic octahedral $[Co(NH_3)_6]Cl_3$ is:
(A) d^3sp^2 (B) sp^2d^3 (C) sp^3d^2 (D) d^2sp^3

50. Graphite belongs to which crystal system?
(A) Cubic (B) Hexagonal (C) Trigonal (D) Tetragonal

51. The height at which the acceleration due to gravity becomes g/9 (g = gravity on surface) in terms of R (radius of earth) is:
(A) $R\sqrt{2}$ (B) 2R (C) $R/\sqrt{2}$ (D) R/2

52. Two moles of helium gas are taken from 300 K to 500 K at constant pressure of 1 N/m^2. Assuming the gas to be ideal, the work done on the gas is:
(A) 500R (B) 200R (C) 300R (D) 400R

53. The integral $\int \mathbf{B}.\mathbf{ds}$ for the closed path shown in the following figure is:
(A) $-8\pi \times 10^{-7}$ Tm (B) $8\pi \times 10^{-7}$ Tm
(C) $-4\pi \times 10^{-7}$ Tm (D) $32\pi \times 10^{-7}$ Tm



54. A charge Q is placed at the three corners of a square of side a. The magnitude of the electric field at the center is:
(A) $(1/2\pi\varepsilon_0)\ Q/a^2$ (B) $(1/4\pi\varepsilon_0)\ Q/a^2$
(C) $(1/8\pi\varepsilon_0)\ Q/a^2$ (D) $(1/16\pi\varepsilon_0)\ Q/a^2$

55. A particle has initial velocity $0.3\mathbf{i} + 0.4\mathbf{j}$ and an acceleration $0.4\mathbf{i} + 0.3\mathbf{j}$. Its speed after 10s is:
(A) 8.5 units (B) 5.5 units (C) $7\sqrt{2}$ units (D) 7 units

56. The velocity of a particle is $v = v_0 + gt + ft^2$. If its position is x = 0 at t = 0, then its displacement after unit time (t = 1) is:
(A) $v_0 + 2g + 3f$ (B) $v_0 + g/2 + f/3$
(C) $v_0 + g + f$ (D) $v_0 + g/2 + f$

57. Two charges of magnitude Q are placed at two adjacent corners of a square, while that of magnitude q is kept at the other two corners. If one of the q charges are interchanged with one Q charge, and **E** and V are the electric field and potential respectively,

(A) both **E** and V at center change. (B) only **E** changes not V.

(C) only V changes not **E**. (D) neither changes.

58. A block of mass m is connected to another block of mass M by a spring (massless) of spring constant k. The blocks are placed on a smooth horizontal plane. Initially the blocks are at rest, and the spring unstretched. Then a constant force F is applied on the block of mass M to pull it. The net force on the block of mass m is:

(A) mF/M (B) (M + m)F/m (C) mF/(m + M) (D) $mF/(M+m)^2$

59. A block of mass m is connected to a spring of force constant k, and is oscillating with frequency f. If the spring is made 4 times stiffer (i.e., force constant 4k) the new frequency of oscillation is:

(A) 4f (B) 2f (C) f/2 (D) f/4

60. Consider two concentric spherical surfaces S_1 with radius a and S_2 with radius 2a, both centered on the origin. There is a charge +q at the origin, and no other charges. The relation of the flux Φ_1 through S_1 with the flux Φ_2 through S_2 is:

(A) $\Phi_1 = 4\Phi_2$ (B) $\Phi_1 = 2\Phi_2$ (C) $\Phi_1 = \Phi_2$ (D) $\Phi_1 = \Phi_2/2$

61. A man 2 m tall, whose eye level is 1.84 m above the ground, looks at his image in a vertical mirror. The minimum vertical length of the mirror required for the man to be able to see the whole of himself is:

(A) 1 m (B) 2 m (C) 0.75 m (D) 1.25 m

62. A point charge of 3μC is located at a distance 1 m away from another point charge of 6μC. The ratio of the magnitudes of the forces on the two charges is:

(A) 1/2 (B) 1 (C) 2 (D) 18

63. A body of mass 1 Kg is constrained to move along a circle of radius 10 m. At a given instant, its speed is 5 m/s and the speed is increasing at the rate of 2.5 m/s^2. The angle between the particles velocity and acceleration vectors is:

(A) 0^o (B) 30^o (C) 90^o (D) 45^o

64. The ratio of the radius of the electron orbit in the ground state (n = 1) of helium ion He^+ to the n = 2 orbit of the hydrogen atom is given by:

(A) 2 (B) ½ (C) 4 (D) 1

65. The work done in increasing the pressure of n moles of an ideal gas from P_1 to P_2 by an isothermal process is given by:

(A) $nRT \ln(P_1/P_2)$ (B) $nRT \ln(P_2/P_1)$

(C) $nRT (\ln P_1/\ln P_2)$ (D) $nRT(\ln P_2/\ln P_1)$

66. The momentum of a photon of frequency v is:

(A) v/c (B) hvc (C) hv/c^2 (D) hv/c

67. Suppose an electron is attracted towards the origin by a force 'k/r' where 'k' is a constant and 'r' is the distance of the electron from the origin. By applying Bohr model to this system, the kinetic energy of the electron is found to be 'T_n' in the n-th orbit. Then which of the following is true?

(A) $T_n \alpha 1/n$ (B) $T_n \alpha n$

(C) $T_n \alpha 1/n^2$ (D) T_n is independent of n

68. A planet is 10 times more massive than the earth and its radius is 10 times larger. If the escape velocity from the earth is v, the escape velocity from the planet surface is:

(A) 10v (B) v/10 (C) v/100 (D) v

69. Consider an oscillation given by $x = A\sin\omega t$. A second oscillation with the same amplitude A and angular frequency ω reaches the end of its oscillations a fraction β of the period T later than the first one. The phase of the second oscillation with respect to the first one is:

(A) $-2\pi\beta$ (B) $2\pi\beta$ (C) $-\pi\beta$ (D) $\pi\beta$

70. A solid ball of volume V and uniform density ρ_1 is falling through a liquid of density ρ_2 ($\rho_2 < \rho_1$). Assume that the liquid applies a viscous force on the ball that is proportional to the speed v, i.e., $F_{viscous} = -kv$ ($k > 0$). The terminal speed of the ball is:

(A) $\sqrt{(V\rho_1 g/k)}$ (B) $Vg(\rho_1 - \rho_2)/k$

(C) $\sqrt{(Vg(\rho_1 - \rho_2)/k)}$ (D) $Vg\rho_1/k$

71. The non-zero vectors **a**, **b** and **c** are related by $\mathbf{a} = 8\mathbf{b}$, $\mathbf{c} = -7\mathbf{b}$. Then the angle between **a** and **c** is:

(A) $\pi/2$ (B) π (C) 0 (D) $\pi/4$

72. Two capacitors have net capacitance 40 μF when connected in parallel, and 7.5 μF when connected in series. The larger capacitance is:

(A) 20 μF (B) 40 μF (C) 30 μF (D) 300μF

73. If two wires carrying current I are placed perpendicular to each other, the force due to one wire on the other will be

(A) 0. (B) directed perpendicular to both wires.

(C) directed along the wires. (D) directed at 45° between the wires.

74. A certain charge Q is to be divided into two parts, one of which is q. What is the relation of Q to q if the two parts, placed at a given distance apart, are to have maximum Coulomb repulsion?

(A) Q = q (B) Q = 2q (C) Q = q/2 (D) Q = 4q

75. Two submarines travelling at 20.2 Km/h and 94.6 Km/h are on a collision course. The first submarine sends out a sonar signal at 1030 Hz, travelling through water at 5470 Km/h. What frequency does the second submarine hear?

(A) 2060 Hz (B) 1030 Hz (C) 1050 Hz (D) 515 Hz

76. Define a relation S in the set $\mathbb{R}$ of real numbers defined as $S = \{(x, y)/xy = 1\}$ then S is

(A) an equivalence relation
(B) symmetric and transitive but not reflexive
(C) symmetric and reflexive but not transitive
(D) symmetric neither reflexive nor transitive

77. Let $f : \mathbb{R} \to (-1, 1)$ be a function defined by $f(x) = \dfrac{x}{1 + |x|}$, then f is

(A) one – one but not onto
(B) onto but not one – one
(C) neither one – one nor onto
(D) both one – one and onto

78. If $a + b + c < 0$ then $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is

(A) always negative
(B) always positive
(C) equal to $a^2 + b^2 - c^2$
(D) equal to$(a + b + c)^2 - (a^2 + b^2 + c^2)$

79. The matrix $\begin{pmatrix} a & 0 & c \\ 0 & b & 0 \\ c & 0 & a \end{pmatrix}$ is invertible if and only if

(A) $b \neq 0$
(B) $|a| \neq |c|$
(C) $b \neq 0$ and $|a| + |c| \neq 0$
(D) $b \neq 0$ and $|a| \neq |c|$

80. Let $f : \mathbb{R} - \{0\} \to \mathbb{R}$ be a function defined by $f(x) = \dfrac{1}{x}$, then f is

(A) continuous but not differentiable
(B) discontinuous
(C) continuous and differentiable
(D) integrable

81. $\lim\limits_{x \to 0} \dfrac{\exp(-1/x^2)}{x} =$

(A) $-\infty$
(B) 0
(C) 1
(D) ∞

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82. $\frac{d}{dx}\int_0^{x^2} \frac{\tan\sqrt{y}}{\sqrt{y}}dy =$

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

83. Let $f : \mathbb{R} \to \mathbb{R}$ be a function defined by $f(x) = x^2 \sin(\frac{1}{x})$ when $x \neq 0$ and f is continuous. Then $f'(0)$=

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

84. Let $f : \mathbb{R} \to \mathbb{R}$ be a twice differentiable function. Then the correct statement form the following is

(A) If $f'(0) = 0$ then f has local maximum or local minimum at 0
(B) If f has maximum or minimum at 0 then $f'(0) = 0$
(C) If $f'(0) = 0,\ f''(0) = 0$ then f has maximum or minimum at 0
(D) If f has maximum or minimum at 0 then $f'(0) = 0,\ f''(0) = 0$

85. The area of the region bounded by the curve $|x| + |y| = 1$ is

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

86. If $\tan\theta = \frac{b}{a}$ then $a\cos 2\theta + b\sin 2\theta =$

(A) a (B) b (C) $a + b$ (D) $\frac{a^2 - b^2}{a^2 + b^2}$

87. Two sides of a triangle are $\sqrt{3}+1$, $\sqrt{3}-1$ and the included angle is $\pi/3$. The other side is

(A) $\sqrt{6}$ (B) $2\sqrt{3}$ (C) 1 (D) $\sqrt{3}/2$

88. $\cos^4\frac{\pi}{8} + \cos^4\frac{3\pi}{8} + \cos^4\frac{5\pi}{8} + \cos^4\frac{7\pi}{8} =$

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

89. $\sin^{-1}(\sin(\frac{2\pi}{3})) =$

(A) $\frac{4\pi}{3}$ (B) $\frac{2\pi}{3}$ (C) $\frac{\pi}{3}$ (D) 0

90. $\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right) =$

(A) $\frac{x}{2}$ (B) $\frac{\pi+x}{2}$ (C) $\frac{\pi+x}{4}$ (D) $\frac{\pi+2x}{4}$

91. If $x+iy = \sqrt{\frac{a+ib}{c+id}}$, then $(x^2+y^2)^2 =$

(A) $\sqrt{\frac{a^2+ib^2}{c^2+id^2}}$ (B) $\frac{(a^2+b^2)^2}{(c^2+d^2)^2}$ (C) $\sqrt{\frac{a^2+b^2}{c^2+d^2}}$ (D) $\frac{a^2+b^2}{c^2+d^2}$

92. The equation $\frac{(x-3)^2}{9}+\frac{(y+2)^2}{25}=1$ represents an ellipse with foci at

(A) $(-3,-6)$, $(-3,2)$ (B) $(-3,6)$, $(-3,-2)$
(C) $(3,-6)$, $(3,2)$ (D) $(3,6)$, $(3,-2)$

93. The hypotenuse of a right angled triangle has its ends at the points $(1,3)$ and $(-4,1)$. The equations of its other two sides are

(A) $x=1,\ y=1$ (B) $x=1,\ y=-1$
(C) $x=-1,\ y=1$ (D) $x=-1,\ y=-1$

94. The equation of the hyperbola whose foci are $(0,12)$, $(0,-12)$ and the length of the latus rectum is 36 is

(A) $\frac{x^2}{36}-\frac{y^2}{108}=1$ (B) $\frac{-x^2}{36}+\frac{y^2}{108}=1$
(C) $\frac{x^2}{108}-\frac{y^2}{36}=1$ (D) $\frac{y^2}{36}-\frac{x^2}{108}=1$

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95. The number of common tangents to the circles $x^2+y^2+2x-10y-38=0$, $x^2+y^2-4x-2y-4=0$ is

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

96. Let $\mathbf{a}, \mathbf{b}, \mathbf{c}$ be 3 distinct nonzero vectors lying on the plane P and the angle between $\mathbf{b}$, $\mathbf{c}$ is $\pi/4$, then

(A) the angle between $\mathbf{a} \times (\mathbf{b} \times \mathbf{c})$ and P is $\pi/4$
(B) $\mathbf{a} \times (\mathbf{b} \times \mathbf{c})$ is normal to the plane P
(C) $\mathbf{a} \times (\mathbf{b} \times \mathbf{c})$ is on the plane P
(D) $[\mathbf{a}\ \mathbf{b}\ \mathbf{c}] = 1/2$

97. The number of vectors whose magnitude is $2\sqrt{3}$ and orthogonal to both $\mathrm{i}+\mathrm{j}$, $-\mathrm{j}+\mathrm{k}$ is

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

98. There are two boxes containing 100 balls each labelled 1 to 100. If one selects one ball from each box then the probability of getting balls with same number is

(A) $\frac{1}{10}$ (B) $\frac{1}{100}$ (C) $\frac{1}{1000}$ (D) $\frac{1}{10000}$

99. In a bag there are 2 red balls and 2 blue balls. A ball is drawn and then replaced along with another ball of same colour before drawing a ball next time. The probability of getting a red ball in the second draw is

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) $\frac{1}{5}$

100. There are 6 post boxes labelled 1 to 6. The number of ways one can put 4 different letters in such a way that no box contains more than one letter is

(A) 15 (B) 180 (C) 360 (D) 720

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