Previous Paper Questions

1. Q.Id: 155458

In the chemical reaction $A \rightarrow B$, what is the order of the reaction ? Given that the rate of reaction doubles if the concentration of A is increased four times.

A) 2

B) 1.5

C) 0.5

D) 1

2. Q.Id: 155456

Which species among the following doesn't show disproportionation reactions ?

A) ClO_2^-

B) ClO_3^-

C) ClO^-

D) ClO_4^-

3. Q.Id: 155454

Which among the following polymers can be formed by using caprolactam monomer unit ?

A) Nylon - 6, 6

B) Nylon - 2 - nylon - 6

C) Melamine polymer

D) Nylon - 6

4. Q.Id: 155453

In the extraction of silver, zinc metal is used as a reducing agent. What is the molecular structure of the zinc complex formed in this reaction ?

A) Tetrahedral

B) Linear

C) Bent

D) Square Planar

5. Q.Id: 155452

The ionic product of water _____ with increase in temperature

A) Remains constant

B) Increases

C) Decreases

D) May increase or decrease

6. Q.Id: 155451

Which acid among the following has the highest pK_a value ?

A) HCl

B) HF

C) HI

D) HBr

7. Q.Id: 155448

Work done by an ideal gas at a constant volume is _____

A) $-\frac{\Delta P}{P}$

B) $-V\,\Delta P$

C) 0

D) $\frac{nR}{P}$

8. Q.Id: 155447

The bond stability of N_2, N_2^- and N_2^{2-} varies as

A) $N_2 < N_2^- < N_2^{2-}$

B) $N_2^- < N_2 < N_2^{2-}$

C) $N_2^{2-} < N_2^- < N_2$

D) $N_2^- < N_2^{2-} < N_2$

9. Q.Id: 155443

Which of the following represents disproportionation of potassium chlorate ?

A) $2KClO_3 \rightarrow 2\,KCl + 3\,O_2$

B) $3KClO_3 \rightarrow 3\,KClO_2 + KClO_3$

C) $4KClO_3 \rightarrow 3\,KClO_4 + KCl$

D) None of the above

10. Q.Id: 155442

Which of following is the common oxidation state for 'transition' elements ?

A) +3

B) +1

C) +2

D) +4

11. Q.Id: 155440

What by product is formed in the process of making phenol from cumene ?

A) Propan - 2 - ol

B) n - Propanol

C) Propanal

D) Propan - 2 - one

12. Q.Id: 155439

Which factor makes Li the strongest reducing agent in aqueous solution ?

A) Sublimation enthalpy

B) Ionisation enthalpy

C) Hydration enthalpy

D) Electron - gain enthalpy

13. Q.Id: 155435

Vapour density of a metal chloride is 83. If equivalent weight of the metal is 6, its atomic weight will be _____

A) 12

B) 24

C) 18

D) 60

14. Q.Id: 155430

Which complex among the following has the highest value of spin only magnetic moment $[Fe(CN)_6]^{3-}, [Fe(CN)_6]^{4-}, [Ni(CN)_4]^{2-}, [NiCl_4]^{2-}$

A) $[Fe(CN)_6]^{3-}$

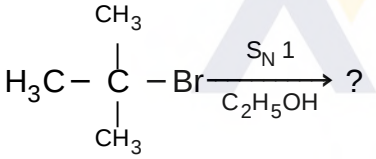
B) $[Fe(CN)_6]^{4-}$

C) $[Ni(CN)_4]^{2-}$

D) $[NiCl_4]^{2-}$

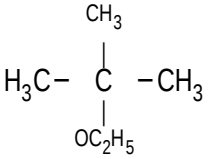
15. Q.Id: 155428

What is the product of the reaction given below ?



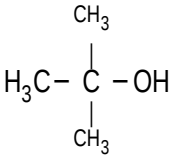
A) $CH_3-CH_2-CH_2-OC_2H_5$

B)



C) $CH_3-\underset{CH_3}{CH}-\underset{CH_3}{CH}-OC_2H_5$

D)



16. Q.Id: 155427

Tincture of iodine is the common name for _____

A) Iodoform

B) 2 - Iodopropane

C) 2 - 3% Iodine solution in alcohol water

D) Iodobenzene

17. Q.Id: 155426

The second ionization energies of Li, Be, B and C are in the order _____

A) Li > C > B > Be

B) Li > B > C > Be

C) Be > C > B > Li

D) B > C > Be > Li

18. Q.Id: 155424

1 - chloro butane on treatment with alcoholic potash forms _____

A) 2 - butanol

B) 1 - butane

C) 1 - butanol

D) 2 - butene

19. Q.Id: 155423

Match the following items of list - I with those of list - II

List1	List2
A. Nickel	I. Electrolytic refining
B. Titanium	II. Zone refining
C. Germanium	III. Van Arkel method
D. Copper	IV. Mond process

A) A - iv, b - i, c - iii, d - ii

B) A - iii, b - iv, c - ii, d - i

C) A - iv, b - iii, c - ii, d - i

D) A - ii, b - i, c - iv, d - iii

20. Q.Id: 155422

Choose the correct option regarding :

Assertion : Energy of the orbital decreases with increaseof 'n'

Reason : Energy is required in shifting away the negatively charged electron from positively charged nucleus

A) Assertion and reasoning are correct statements and reason is the explanation for assertion

B) Assertion and reasoning are correct statements and reason is not the explanation for assertion

C) Assertion is correct, reason is wrong

D) Assertion is wrong, reason is correct

21. Q.Id: 155420

The number of hydrogen bonds formed by a water molecules at normal conditions is

A) 1

B) 2

C) 3

D) 4

22. Q.Id: 155419

When $CaCl_2$ is added to AgCl crystal, the defect introduced is

A) Frenkel defect only

B) Schottky defect only

C) No change

D) Both Frenkel and Schottky defects

23. Q.Id: 155418

The charge on colloidal particles is due to _____

A) Presence of electrolyte

B) Very small size of particles

C) Adsorption of ions from the solution

D) Can't be determined

24. Q.Id: 155417

Which among the following acts as a vitamin ?

A) Aspartic acid

B) Ascorbic acid

C) Saccharin acid

D) Adipic acid

25. Q.Id: 155416

Which of the following statements is correct about the cathode rays ?

1) These rays start from anode and move towards cathode

2) They are visible with human eye

3) In presence of electric and magnetic fields, they behave like positively charged particles

4) Their characteristic does not depend on the nature of material at electrode

A) 1

B) 2

C) 3

D) 4

26. Q.Id: 155414

The pH of 10^{-8} M HCl solution is

A) 8

B) - 8

C) Between 7 - 8

D) Between 6 - 7

27. Q.Id: 155413

The solubility of AgBr with solubility product 5.0×10^{-13} at 298 K in 0.1 M NaBr solution would be _____

A) 7×10^{-6} M

B) 5×10^{-12} M

C) 5×10^{-14} M

D) 5×10^{-6} M

28. Q.Id: 155412

The linear shape of CO_2 is due to _____

A) sp^3 hybridization of carbon

B) sp hybridization of carbon

C) $p\pi - d\pi$ bonding between carbon and oxygen

D) sp^2 hybridization of carbon

29. Q.Id: 155411

Which of the following units is useful in relating concentration of solution with its vapour pressure ?

A) Mole fraction

B) Parts per million

C) Mass percentage

D) Molality

30. Q.Id: 155410

Conc.HNO_3 turns brown on standing due to formation of _____

A) NO

B) NO_2

C) N_2O

D) N_2O_4

31. Q.Id: 155409

Compound 'A' undergoes formation of cyanohydrins, which on hydrolysis gives lactic acid$(CH_3CHOHCOOH)$. Therefore, compound 'A' is _____

A) Formaldehyde

B) Acet aldehyde

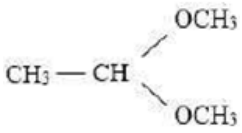
C) Acetone

D) Benzaldehyde

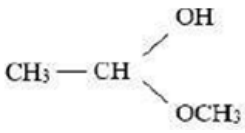
32. Q.Id: 155408

Which of the following represent the structure of methyl hemiacetal of formaldehyde ?

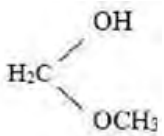
A)



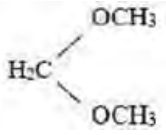
B)



C)



D)



33. Q.Id: 155406

The number of elements among O, Cl, F, N, P, Sn, Ti, K, Sc which show more than one non - zero oxidation state is :

A) 2

B) 3

C) 6

D) 8

34. Q.Id: 155405

The Molarity of $0.2\ N\ Na_2CO_3$ solution will be

A) 0.05 M

B) 0.2 M

C) 0.1 M

D) 0.4 M

35. Q.Id: 155404

In an agricultural field, Which among the following is the highest producer of methane

A) Wheat Crop

B) Paddy Crop

C) Cotton Crop

D) Groundnut Crop

36. Q.Id: 155403

Which of the following is an example for Chain - Growth polymer ?

A) Bakelite

B) Teflon

C) Nylon

D) Terylene

37. Q.Id: 155402

If $\Delta H > 0$ and $\Delta S > 0$, the reaction can proceed spontaneously at _____

A) Low temperature

B) High temperature

C) All temperatures

D) Will never be spontaneous

38. Q.Id: 155401

If the binding energy of electron in a metal is 250 kJ/mol, what should be the threshold frequency of the striking photons in order to free an electron from the metal surface ?

A) $6.26 \times 10^{14}\ s^{-1}$

B) $12.4 \times 10^{14}\ s^{-1}$

C) $6.26 \times 10^{12}\ s^{-1}$

D) $12.4 \times 10^{12}\ s^{-1}$

39. Q.Id: 155400

Calculate the energy required to convert all atoms in 4.8 g of Mg to Mg^{2+} in the vapor state. IE_1 and IE_2 of Mg are 740 kJ/mol and 1450 kJ/mol respectively.

A) $+740\ kJ/mol$

B) $-740\ kJ/mol$

C) $-1450\ kJ/mol$

D) $+438\ kJ/mol$

40. Q.Id: 155398

In the Daniel cell, $Zn + Zn^{2+}||Cu^{2+}|Cu$, when an external voltage is applied such that $E_{external} > E_{cell}$, current flows from _____

A) Zn to Cu

B) Cu to Zn

C) No current flows

D) Data insufficient

41. Q.Id: 155397

A steel wire of length 20 cm and area of cross section $1\ mm^2$ is tied rigidly at both the ends. When the temperature of the wire is changed from $40^\circ C$ and $20^\circ C$. Find the change in its tension. Given, the coefficient of linear expansion for steel is $1.1 \times 10^{-5}\ K^{-1}$ and young's $2.0 \times 10^{11}\ N.m^{-2}$ modulus of steel is

A) 22 N

B) 44 N

C) 16 N

D) 8 N

42. Q.Id: 155395

When a capacitor is connected to a battery _____

A) An alternating current flow in the circuit

B) No current flows in the circuit

C) A current flow for some tome and finally it decreases to zero.

D) Current keeps on increasing and reaches maximum after some time

43. Q.Id: 155394

An electric dipole with dipole moment 'p' is placed with its axis is 30° to a uniform electric field. The work done in rotating the dipole to a position where its axis is perpendicular to the field is :

A) 2pE

B) $\frac{2pE}{\sqrt{3}}$

C) $\frac{\sqrt{3}\ pE}{2}$

D) 0

44. Q.Id: 155393

The magnitude of induced emf is directly proportional to the rate of change of magnetic flux linked with the coil. This statement is known as _____

A) Ohm's law

B) Lenz's law

C) Faraday's law

D) Ampere's law

45. Q.Id: 155391

A zener diode is made by _____

A) Heavily doping both p and n sides of a p-n junctiondiode

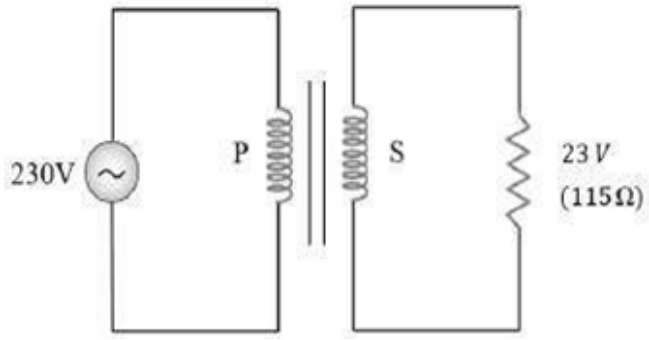
B) Heavily doping the p side and lightly doping the n side of a p-n junction

C) Lightly doping both p side and heavily doping the n side of a p-n junction diode

D) Lightly doping both p and n sides of a p-n junction diode

46. Q.Id: 155388

Find the current through the primary coil (P) of the transformer shown below _____



A) 0.08 A

B) 0.04 A

C) 0.02 A

D) 0.01A

47. Q.Id: 155386

A body is projected with a velocity greater than orbital velocity but less than escape velocity. Its path is _____

A) Circular

B) Elliptical

C) Parabolic

D) Hyperbolic

48. Q.Id: 155384

The minimum horizontal speed with which a body must be projected so that it goes around a smooth vertical circular track of radius 4 m is _____

$(g = 9.8\ m.s^{-2})$

A) $7\ m.s^{-1}$

B) $14\ m.s^{-1}$

C) $0.7\ m.s^{-1}$

D) $1.4\ m.s^{-1}$

49. Q.Id: 155382

A solid cylinder of mass 'M' and radius 'R' rolls down an inclined plane of length 'L' and height 'h'. without slipping. Find the speed of its centre of mass when the cylinder reaches its bottom ?

A) $\sqrt{2gh}$

B) $\sqrt{\frac{3gh}{4}}$

C) $\sqrt{\frac{4gh}{3}}$

D) $\sqrt{4gh}$

50. Q.Id: 155381

Choose the wrong statement to complete : An ideal solenoid has

_____

A) The turns widely separated

B) The turns closely wound

C) The length is very much greater than the radius

D) The magnetic field inside almost uniform

51. Q.Id: 155379

A 0.5 kg block of brass (density $= 8 \times 10^3$ kg.m^{-3}**) is suspended from a string. What is the tension in the string if the block is completely immersed in water ?** ($g = 10$ m.s^{-2})

A) 5 N

B) $\frac{0.5}{8 \times 10^3}$ N

C) $\frac{5}{8}$ N

D) $\frac{35}{8}$ N

52. Q.Id: 155378

The maximum force acting on a particle executing simple harmonic motion is 10 N. The force on the particle when it is midway between mean and extreme position will be :

A) 10 N

B) 12 N

C) 5 N

D) 0

53. Q.Id: 155377

A 100 V battery is connected across the series combination of the two capacitors of $4\ \mu F$ **and** $8\ \mu F$**. The energy stored in the series combination is**

_____

A) 0.75×10^{-2} J

B) 1.33×10^{-2} J

C) 0.5 J

D) 1 J

54. Q.Id: 155375

The unit of magnetic induction is _____

A) $Wb\,m^{-2}$ **B)** $Wb\,m^{-1}$

C) $Wb\,A$ **D)** Wb

55. Q.Id: 155374

A shot is fired from a point at a distance of 400 m. from the foot of a tower 100 m high, So, that it just passes over it. The direction of shot with respect to the horizontal is :

A) $30°$ **B)** $60°$

C) $70°$ **D)** $45°$

56. Q.Id: 155372

If a pressure of $8\times10^{8}\ Nm^{-2}$ is applied to a lead block so that its volume reduces by 20 %. The Bulk modulus of lead block is _____

A) $4\times10^{7}\ N.m^{-2}$ **B)** $4\times10^{8}\ N.m^{-2}$

C) $4\times10^{9}\ N.m^{-2}$ **D)** $4\times10^{10}\ N.m^{-2}$

57. Q.Id: 155370

The wire of potentiometer has resistance 4Ω and length 1 m. It is connected to a cell of e.m.f 2 V and internal resistance 1Ω. The current flowing through the potentiometer wire is _____

A) 0.1 A **B)** 0.2 A

C) 0.4 A **D)** 0.8 A

58. Q.Id: 155368

A stone falls freely such that the distance covered by it in the last second of its motion is equal to the distancecovered by it in the first 5 seconds. It is in air for _____ seconds

A) 12 **B)** 13

C) 25 **D)** 26

59. Q.Id: 155365

A point mass of 10 kg is placed at the centre of earth. The weight of the point mass is

A) 0 **B)** 98 N

C) 49 N **D)** 10 N

60. Q.Id: 155360

A gas is compressed from a volume of $2\ m^3$ to a volume of $1\ m^3$ at a constant pressure of $100\ N\ m^{-2}$. Then it is heated at constant volume by supplying 150 J of energy. As a result, the internal energy of the gas _____

A) Increases by 250 J

B) Decreases by 250 J

C) Decreases by 50 J

D) Increases by 50 J

61. Q.Id: 155156

In a thermodynamics process pressure of a fixed mass of a gas is changed in such a manner that the gas releases 30 J of heat and 10 j of work was done on the gas. If the initial internal energy of the gas was 30 J, then the final internal energy will be

A) 2 J

B) - 18 J

C) 10 J

D) 58 J

62. Q.Id: 155154

A copper wire of radius 0.1 mm and resistance $2\ k\Omega$ is connected across a power supply of 40 V. The number of electrons transferred per second between the supply and the wire at one end is

A) 2.00×10^{16}

B) 1.25×10^{17}

C) 2.85×10^{17}

D) 3.25×10^{16}

63. Q.Id: 155152

The power utilized when a force of $(2\hat{i}+3\hat{j}+4\hat{k})\ N$ acts on a body for 4 seconds, producing a displacement of $(3\hat{i}+4\hat{j}+5\hat{k})\ m$, is _____

A) 9.5 W

B) 7.5 W

C) 6.5 W

D) 4.5 W

64. Q.Id: 155149

if a source is transmitting electromagnetic wave of frequency $8.2\times10^6\ Hz$, then wavelength of the electromagnetic waves transmitted from the source will be _____

A) 36.5 m

B) 40.5 m

C) 42.3 m

D) 50.9 m

65. Q.Id: 155147

The rate of radiation of a black body at 0° C is $E\ J.s^{-1}$. The rate of radiation of the black body at $273\ ^{\circ}C$ will be

A) $E\ J.s^{-1}$

B) $4E\ J.s^{-1}$

C) $\frac{E}{2}\ J.s^{-1}$

D) $16\ E\ J.s^{-1}$

66. Q.Id: 155140

In a rocket fuel burns at the rate of 1 kg/s. This fuel is ejected form the rocket with a velocity of 60 km/s. The force exerted on the rocket by this is _____

A) 60 N

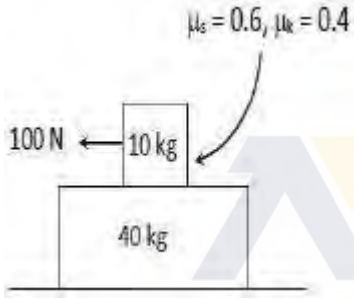
B) 600 N

C) 6000 N

D) 60000 N

67. Q.Id: 155138

If 100 N force is applied to 10 kg block as shown in the diagram, the accelerationof 40 kg slab is _____



A) $1.65\ ms^{-2}$

B) $0.98\ ms^{-2}$

C) $0.5\ ms^{-2}$

D) $0.25\ ms^{-2}$

68. Q.Id: 155134

A body of mass 5 kg acquires an acceleration of $10\ rad\ s^{-2}$ due to an applied torque of 2 Nm. Its radius of gyration is _____

A) 2.5 m

B) $\sqrt{2.5}$ m

C) $\sqrt{0.2}$ m

D) 0.2 m

69. Q.Id: 155131

An ideal heat engine has an efficiency $'\eta'$ the coefficient of performance of the engine when driven backward will be

A) $1-\left[\frac{1}{\eta}\right]$

B) $\eta-\left[\frac{1}{\eta}\right]$

C) $\left[\frac{1}{\eta}\right]-1$

D) $\frac{1}{1-\eta}$

70. Q.Id: 155130

If the wavelength of a photon is $4000\ \mathring{A}$, then its energy will be _____

A) 4.95×10^{-19} J

B) 5.95×10^{-19} J

C) 3.95×10^{-19} J

D) 6.95×10^{-19} J

71. Q.Id: 155127

Water is flowing through a horizontal pipe in stream line flow. At the narrowest part of the pipe _____

A) Velocity is max and pressure is min

B) Pressure is max and velocity is min

C) Both pressure and velocity are max

D) Both the velocity and pressure are min

72. Q.Id: 155124

Wein's displacementlaw states _____

A) $\lambda_m T = \text{Constant}$

B) $\frac{\lambda_m}{T} = \text{Constant}$

C) $\frac{T}{\lambda_m} = \text{Constant}$

D) $\lambda_m + T = \text{Constant}$

73. Q.Id: 155122

An automatic gun fires 360 bullets per minute with a speed of 360 kmph. If each bullet weighs 20 g, the power of the gun is :

A) 75 W

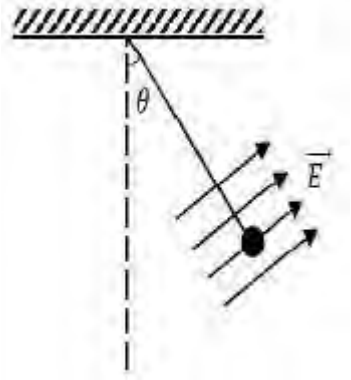
B) 150 W

C) 300 W

D) 600 W

74. Q.Id: 155120

A charged cork ball having mass 1 g and charge 'q' is suspended on a light string in a uniform electric field as shown in figure. The ball is in equilibrium at $\theta = 37°$, when value of electric field is $\vec{E} = (3\hat{i} + 5\hat{j}) \times 10^5\ NC^{-1}$. Assume T as tension in the string. Which of the following options are correct ? (given $\sin 37° = 0.60$ and $g = 10\ ms^{-2}$)



A) $q = 11 \times 10^{-8}\ C$

B) $T = 5.55 \times 10^{-3}\ N$

C) $q = 12 \times 10^{-9}\ C$

D) $T = 4.55 \times 10^{-3}\ N$

75. Q.Id: 155116

Two identical thin bar magnets, each of length 'l' and pole strength 'm', are placed at right angle to each other with north pole of one touching south pole of the other. The magnetic moment of the system is :

A) 0.5 lm

B) l m

C) 2 l m

D) $\sqrt{2}$ lm

76. Q.Id: 155111

A train of 150 m length is going towards north direction at an speed of $10\ ms^{-1}$. A parrot flies at the speed of $5\ ms^{-1}$ towards south direction parallel to the railway track. The time for which the parrot flies alongside the train is

A) 12 s

B) 30 s

C) 10 s

D) 5 s

77. Q.Id: 155108

The moment of inertia of a rectangular plate of mass M, length L and breadth B, about an axis passing through its centre and perpendicular to its plane is _____

A) $\frac{M(L+B)}{12}$

B) $\frac{M(L^2)}{12}$

C) $\frac{M(L^2+B^2)}{12}$

D) $\frac{M(B^2)}{12}$

78. Q.Id: 155104

Two balls X(2 kg) and Y(4 kg) approach each other with equal speeds of $10\ ms^{-1}$. If the collision is perfectly elastic, the new velocities of X and Y balls are respectively.

A) $\frac{50}{3}\ ms^{-1}, \frac{-10}{3}\ ms^{-1}$

B) $\frac{-50}{3}\ ms^{-1}, \frac{-10}{3}\ ms^{-1}$

C) $\frac{-50}{3}\ ms^{-1}, \frac{10}{3}\ ms^{-1}$

D) $\frac{50}{3}\ ms^{-1}, \frac{10}{3}\ ms^{-1}$

79. Q.Id: 155102

The central fringe in the interface pattern obtained in Young's double slit experiment will be a dark fringe when the phase difference between the waves from the two slits is :

A) 0

B) $\frac{\pi}{2}$

C) π

D) $\frac{\pi}{3}$

80. Q.Id: 155099

The S.I. unit of length is "meter". Suppose we adopt a new unit of length which equals x meter. Then, the area of $1\ m^2$ **expressed in terms of new unit has a magnitude _____**

A) x

B) x^2

C) $\frac{1}{x}$

D) $\frac{1}{x^2}$

81. Q.Id: 155086

$(-i+\sqrt{3})^{300}+(-i-\sqrt{3})^{300}=$

A) 2^{300}

B) 2^{301}

C) 2^{100}

D) -2^{300}

82. Q.Id: 155083

If the equation $x^2+2\sqrt{2}xy+2y^2+4x+4\sqrt{2}y+1=0$ **represents a pair of straight lines which are parallel to each other. Find the distance between them is**

A) 4 units

B) 2 units

C) $2\sqrt{3}$ units

D) $4\sqrt{3}$ units

83. Q.Id: 155081

$\int_0^{\frac{\pi}{4}} \tan^2(x)\,dx =$

A) $\frac{\pi}{4}$

B) $\frac{\pi}{4}-1$

C) $1-\frac{\pi}{4}$

D) 0

84. Q.Id: 155078

If the pair of straight line given by $Ax^2+2Hxy+By^2=0$**, where** $(H^2>AB)$**, forms an equilateral triangle with the line** $ax+by+c=0$ **then** $(A+3B)(3A+B)=$

A) $4H^2$

B) $2H^2$

C) $-2H^2$

D) $-4H^2$

85. Q.Id: 155077

In $\Delta ABC, \angle 90°$ **and co-ordinates of points B and C are** $(2, -4)$ **and** $(1, 5)$**. Then the equation of the circumcircle of** ΔABC **is**

A) $x^2+y^2+3x+y+18=0$

B) $x^2+y^2-3x+y-18=0$

C) $x^2+y^2-3x-y-18=0$

D) $x^2+y^2+3x-y+18=0$

86. Q.Id: 155076

The possible values of $\sin^6(\theta)+\cos^6(\theta)-3\cos^4(\theta)$ **is**

A) 2

B) -2

C) -3

D) 3

87. Q.Id: 155075

The locus of the point whose ratio of distance from the origin to its distance from $(-2, -3)$ **is** $5:7$ **is given by** _____

A) $24(x^2+y^2)-100x-150y-325=0$

B) $24(x^2+y^2)+100x+150y-325=0$

C) $24(x^2+y^2)-100x+150y+325=0$

D) $2x^2+2y^2=325$

88. Q.Id: 155074

If $(2+i)$ **is a root of the equation** $x^3-5x^2+9x-5=0$**, then the other roots are**

A) $1 \& (2-i)$

B) $-1 \& (3+i)$

C) $0 \& 1$

D) $-1 \& (-2+i)$

89. Q.Id: 155073

The locus of a point P such that $PA + PB = 4$ where $A(2, 3, 4), B(-2, 3, 4)$ is

A) $y^2+z^2+6y+8z+25=0$

B) $y^2-z^2+6y+8z-25=0$

C) $y^2+z^2-6y-8z+25=0$

D) $y^2+z^2-6y-8z-25=0$

90. Q.Id: 155072

$$\int \frac{(x+1)^2}{x(x^2+1)}\,dx =$$

A) $\log\left[x(x^2+1)\right]+c$

B) $\log|x|+c$

C) $\log|x|+2\tan^{-1}(x)+c$

D) $2\log|x|+\tan^{-1}(x)+c$

91. Q.Id: 155071

The direction cosines of the vector $\vec{a} = -2\hat{i}+\hat{j}-5\hat{k}$ are

A) $\frac{-2}{\sqrt{8}}, \frac{1}{\sqrt{8}}, \frac{-5}{\sqrt{8}}$

B) $\frac{-2}{\sqrt{30}}, \frac{1}{\sqrt{30}}, \frac{-5}{\sqrt{30}}$

C) $\frac{2}{\sqrt{8}}, \frac{-1}{\sqrt{8}}, \frac{5}{\sqrt{8}}$

D) $\frac{-2}{\sqrt{30}}, \frac{-1}{\sqrt{30}}, \frac{-5}{\sqrt{30}}$

92. Q.Id: 155070

If $f(x) = e^x$; $g(x) = \ln(x)$ for all $x \in [1, \infty)$, then fog is _____

A) A one - one function

B) An on - to function

C) Not a function

D) Bijective

93. Q.Id: 155068

If the chord of contact of tangents from a point A to a given circle passes through B, then the circle with AB as a diameter will _____

A) Touch the given circle internally

B) Cut the given circle Orthogonally

C) Touch the given circle externally

D) Neither intersect nor touch the given circle

94. Q.Id: 155066

The value of $\begin{vmatrix} \log_5 729 & \log_3 5 \\ \log_5 27 & \log_9 25 \end{vmatrix} \times \begin{vmatrix} \log_3 5 & \log_{27} 5 \\ \log_5 9 & \log_5 9 \end{vmatrix}$ **is**

A) 1

B) 6

C) $\log_5 9$

D) $\left(\log_3^5\right) \times \left(\log_5^{81}\right)$

95. Q.Id: 155062

Reduction of proper function $\frac{f(x)}{g(x)}$ into a sum of partial fraction depends up on factorization of _____.

A) $f(x)$ alone

B) $g(x)$ alone

C) Both $f(x)$ and $g(x)$

D) Factors of $f(x)$ and $g(x)$

96. Q.Id: 155061

If $2f(\sin x)+f(\cos x)=x$ **then** $f'(x)=$

A) $\frac{1}{\sqrt{1-x^2}}$

B) $\frac{-1}{\sqrt{1-x^2}}$

C) $\frac{x}{\sqrt{1-x^2}}$

D) $\frac{-x}{\sqrt{1-x^2}}$

97. Q.Id: 155059

A circle passing through the centre of another circle $x^2+y^2-3x-4y-1=0$ **and whose centre is (5, 2). Then the equation of this circle is _____**

A) $4x^2+4y^2-40x-16y+67=0$

B) $3x^2+3y^2-40x-16y+67=0$

C) $2x^2+2y^2-40x-16y+67=0$

D) $x^2+y^2-10x-4y+67=0$

98. Q.Id: 155055

If the lines $3x+y-2=0$, $px+2y-3=0$ **and** $2x-y-3=0$ **are concurrent, then** $p=$

A) -5

B) 5

C) 3

D) -3

99. Q.Id: 155053

Find the equation of circle having normals $(x-1)(y-2)=0$ **and a tangent** $3x+4y=6$ **?**

A) $(x-1)^2+(y-2)^2=1$

B) $(x-2)^2+(y-1)^2=1$

C) $(x+1)^2+(y+2)^2=1$

D) $(x+2)^2+(y+1)^2=1$

100. Q.Id: 155049

$$\int \frac{dx}{\cos^2(x)+\sin(2x)} =$$

A) $\frac{1}{2}\log\left|1+2\cos(x)\right|+c$

B) $\frac{1}{2}\log\left|1-2\tan(x)\right|+c$

C) $\frac{1}{2}\log\left|1+2\tan(x)\right|+c$

D) $\frac{1}{2}\log\left|1+2\cot(x)\right|+c$

101. Q.Id: 155047

Let $\vec{u} = \hat{i} - 2\hat{j}$ and $\vec{v} = -3\hat{i} + 5\hat{j}$. Consider three points P, Q and R having position vectors $\frac{-1}{7}\hat{i}, \frac{-1}{4}\hat{j}$ and $-2\hat{i} + 3\hat{j}$ respectively. Among these, the points in the line segment passing through $\vec{u}$ and $\vec{v}$ are

A) Only P and Q

B) Only P and R

C) Only Q and R

D) All P, Q and R

102. Q.Id: 155040

If $y = \sqrt{3}x + k_1$ and $y = \sqrt{3}x + k_2$ are two parallel tangents of a circle of radius 2 units, then $|k_1 - k_2|$ is equal to

A) 1

B) 8

C) 4

D) 2

103. Q.Id: 155036

Let $a, b \in R - \{0\}$, and I_2 be the identity matrix of order 2. Then the rank of the (block) matrix $\begin{bmatrix} aI_2 & bI_2 \\ aI_2 & bI_2 \end{bmatrix}$ is

A) 2

B) 1

C) 4

D) 3

104. Q.Id: 155033

Maximum area of the rectangle that can be formed with the fixed perimeter 'p' cm ____

A) $\frac{P^2}{8}\ cm^2$

B) $\frac{P^2}{16}\ cm^2$

C) $\frac{P^2}{64}\ cm^2$

D) $\frac{P^2}{32}\ cm^2$

105. Q.Id: 155029

If r = in radius, Δ = Area of ΔABC, s = semi - perimeter then which of the following is true ?

A) $\Delta = r + s$

B) $\Delta = \frac{r}{s}$

C) $\Delta = (rs)^2$

D) $\Delta = rs$

106. Q.Id: 155021

The mean of 5 observations is 15 and variance is 9. If two observations having values - 5 and 13 are combined with these observations, then what will be the new variance ?

A) $\frac{6259}{7}$

B) $\frac{6259}{49}$

C) $\frac{2659}{7}$

D) $\frac{2659}{49}$

107. Q.Id: 155017

For the ellipse $\frac{x^2}{18}+\frac{y^2}{32}=1$**, if a tangent with slope** $\frac{-4}{3}$ **intersects the major and minor axes at P and Q respectively. find P and Q**

A) $P(6, 0), Q(0, 8)$

B) $P(0, 6), Q(8, 0)$

C) $P(3\sqrt{2}, 0), Q(0, 4\sqrt{2})$

D) $P(0, 3\sqrt{2}), Q(4\sqrt{2}, 0)$

108. Q.Id: 155011

Find the degree of the differential equation $y_3^{2/3}+2+3y_2+y_1=0$

A) 4

B) 2

C) 3

D) 1

109. Q.Id: 155009

$\lim\limits_{n\to\infty}\frac{2^2+4^2+6^2+\ldots+(2n)^2}{n^3}=$

A) $\frac{2}{3}$

B) $\frac{4}{3}$

C) $\frac{3}{2}$

D) $\frac{8}{7}$

110. Q.Id: 155007

If ${}_nC_r$ **denotes the number of combinations of 'n' things taken 'r' at a time, then the expression** ${}_nC_{r+1}+{}_nC_{r-1}+2\,{}_nC_r$ **equals,**

A) ${}_{n+2}C_r$

B) ${}_{n+2}C_{r+1}$

C) ${}_{n+1}C_r$

D) ${}_{n+1}C_{r+1}$

111. Q.Id: 155005

$\tan\left(-\frac{23\pi}{3}\right)-\cot\left(\theta-\frac{13\pi}{3}\right)=$

A) $\sqrt{3}+\cot\theta$

B) $\sqrt{3}-\tan\left(\frac{\pi}{6}+\theta\right)$

C) $\sqrt{3}+\tan\theta$

D) $\sqrt{3}+\cot\left(\frac{\pi}{3}-\theta\right)$

112. Q.Id: 155002

What is the formula for finding co - efficient of variation, given $\sigma=$ standard deviation and $\bar{x}=$ mean $\neq 0$?

A) $\frac{\bar{x}}{\sigma}\times 100$

B) $\frac{\bar{x}}{\sigma}$

C) $\frac{\sigma}{\bar{x}}$

D) $\frac{\sigma}{\bar{x}}\times 100$

113. Q.Id: 155000

The parabola with directrix $x+2y-1=0$ and focus $(1, 0)$ is _____

A) $4x^2-4xy+y^2-8x+4y+4=0$

B) $4x^2+4xy+y^2-8x+4y+4=0$

C) $4x^2+4xy+y^2-8x-4y+4=0$

D) $4x^2-4xy+y^2-8x-4y+4=0$

114. Q.Id: 154997

If $\frac{{}^{n+1}C_{r+1}}{{}^{n+1}C_r}=\frac{n-r+1}{m}$ **, then** $m=$

A) r

B) $r-1$

C) $r+1$

D) $1-r$

115. Q.Id: 154995

The coefficient of x^{50} in $(1+x)^{101}\,(1-x+x^2)^{100}$ is _____

A) 1

B) - 1

C) 0

D) 2

116. Q.Id: 154993

For a right - angled triangle having the lengths of two sides as $2\sqrt{2}$ and 5, Find the length of the third side.

A) $4\sqrt{2}$

B) $\sqrt{15}$

C) $\sqrt{17}$

D) $\sqrt{13}$

117. Q.Id: 154990

If $f:R \to R$ **is defined as** $f(x)=\frac{2020^x}{2020^x+\sqrt{2020}},\ \forall x \in R$ **, then** $\sum_{r=1}^{4039} 2f\left(\frac{r}{4040}\right)=$

A) 4040 **B)** 4039

C) 2020 **D)** 1010

118. Q.Id: 154987

If a random variable X take the values $x_1, x_2, x_3, \ldots, x_{100}$ **with probability** $P(X=x_i)=K\ i(i+1)$**, then** $200\ K=$

A) $\frac{1}{1707}$ **B)** $\frac{1}{1717}$

C) $\frac{1}{1727}$ **D)** $\frac{1}{1777}$

119. Q.Id: 154986

Find the sum of the order and degree of the differential equation

$y=x\left(\frac{dy}{dx}\right)^3+\frac{d^2y}{dx^2}$

A) 2 **B)** 3

C) 4 **D)** 5

120. Q.Id: 154984

Let $\vec{u}=-2\hat{i}+2\hat{j}+\hat{k}$ **and** $\vec{v}=\hat{i}-2\hat{j}+2\hat{k}$**. Then angle between** $\vec{u}$ **and** $\vec{v}$ **is ____**

A) $\cos^{-1}\left(\frac{4}{9}\right)$ **B)** $\cos^{-1}\left(\frac{-4}{3}\right)$

C) $\cos^{-1}\left(\frac{4}{3}\right)$ **D)** $\sin^{-1}\left(\frac{-4}{9}\right)$

121. Q.Id: 154979

If ${}_nP_4=1680$**, then** $n=$

A) 6 **B)** 12

C) 10 **D)** 8

122. Q.Id: 154977

Let $P(n)=1^2+2^2+3^2+\ldots+n^2=\frac{6(n-1)(n-2)\ldots(n-2020)+2n^3+3n^2+n}{6}$**, for all** $n \in N$**.**
Then which of the following is correct ?

A) $P(n)$ is true for all $n \in N$ **B)** $P(n)$ is true for all $n > 2020$

C) $P(n)$ is true for all $n \leq 2020$ **D)** $P(n)$ is not true for any $n \in N$

123. Q.Id: 154971

$\lim_{x \to 0} \frac{a^x - 1}{\sin(x)} =$

A) $\log(a)$

B) $\frac{1}{2}\log(a)$

C) 0

D) 1

124. Q.Id: 154970

The centre of a circle is $(2, -3)$ **and the circumference is** 10π**. Then its equation is**

A) $x^2+y^2+4x+6y+12=0$

B) $x^2+y^2-4x+6y+12=0$

C) $x^2+y^2-4x+6y-12=0$

D) $x^2+y^2-4x-6y-12=0$

125. Q.Id: 154967

Let O denotes the Origin. If $M(1, 2)$, $N(0, 1)$ **and** $A(x, y)$ **are points such that** $xy > 0$ **and** $x+y<1$**, then choose the correct statement.**

A) A cannot lie inside ΔOMN

B) A lies inside ΔOMN

C) A lies in the first quadrant

D) A lies inside ΔOMN or in the third quadrant

126. Q.Id: 154961

Angle between the lines of intersection of the planes $x-y=0, 2x+y+z=0$ **and** $2x-z=0, x+y-3z=0$ **is**

A) 60°

B) 45°

C) 30°

D) 90°

127. Q.Id: 154958

If $y = \text{cosec}^{-1}(x)$ **and** $\frac{dy}{dx} = \frac{-1}{|x|\sqrt{x^2-1}}$ **, then**

A) $y \in \left(-\frac{\pi}{2}, 0\right)$

B) $y \in \left(-\frac{\pi}{2}, 2\pi\right)$

C) $y \in \left(-\frac{\pi}{2}, 0\right) \cup \left(0, \frac{\pi}{2}\right)$

D) $y \in R$

128. Q.Id: 154955

If $\vec{a}$ **and** $\vec{b}$ **are unit vectors such that** $\vec{a}+\vec{b}$ **is also a unit vector, then the angle between** $\vec{a}$ **and** $\vec{b}$ **is ____**

A) $60°$

B) $90°$

C) $30°$

D) $120°$

129. Q.Id: 154949

If $x = e^{y+e^{y+e^{y+\cdots}}}$, **then** $\frac{dy}{dx} =$

A) $\frac{1-x}{x}$

B) $\frac{1}{x}$

C) $\frac{x}{1+x}$

D) $\frac{1+x}{x}$

130. Q.Id: 154946

$$\int \frac{\sin^3(x)+\cos^3(x)}{\sin^2(x).\cos^2(x)}\,dx =$$

A) $\sec(x)-\operatorname{cosec}(x)+c$

B) $\tan(x)+\cot(x)+c$

C) $\operatorname{cosec}(x)-\cot(x)+c$

D) $\tan(x)-\cot(x)+c$

131. Q.Id: 154943

Let M and N be two invertible square matrices over R of order 2 such that N is diagonal. Then MNM^{-1} **is diagonal ___**

A) For all M

B) Only when M is a scalar matrix

C) For all diagonal matrices M

D) M must be an null matrix

132. Q.Id: 154940

Let u and v be two vectors in a plane. then any vector w in the plane can be written as $w = au + bv$ **for some scalars 'a' and 'b' if and only if**

A) None of u and v is a scalar multiple of the other

B) None of $|u|$ and $|v|$ is a scalar multiple of the other

C) u and v have different direction

D) u and v are perpendicular to each other

133. Q.Id: 154937

Find the equation of pair of straight lines that bisect the angles between the lines represented by $ax^2+2hxy+by^2=0$

A) $\frac{x^2+y^2}{a+b}=\frac{xy}{h}$

B) $\frac{x^2+y^2}{a-b}=\frac{xy}{h}$

C) $\frac{x^2+y^2}{a-b}=\frac{h}{xy}$

D) $\frac{x^2-y^2}{a-b}=\frac{xy}{h}$

134. Q.Id: 154931

If α, β and γ are angles that satisfy the following conditions, find the value of xyz

a) $\tan(\alpha)+\tan(\beta)+\tan(\gamma)$
$=\tan(\alpha).\tan(\beta).\tan(\gamma)$

b) $x=\cos(\alpha)+i\sin(\alpha)$

c) $y=\cos(\beta)+i\sin(\beta)$

d) $z=\cos(\gamma)+i\sin(\gamma)$

A) 1 but not -1

B) - 1 but not 1

C) ± 1

D) 0

135. Q.Id: 154927

If $2+4i$ is one of the roots of $x^2+bx+c=0$ with $b, c \in R$, then $(b, c)=$

A) $(4, -20)$

B) $(4, 20)$

C) $(-4, -20)$

D) $(-4, 20)$

136. Q.Id: 154924

The equation of the line through the intersection of $3x-4y+1=0$ and $5x+y-1=0$ which cuts off equal intercepts on the axes is given by

A) $23x+23y-11=0$

B) $23x+23y+11=0$

C) $23x-23y-11=0$

D) $23x-23y+11=0$

137. Q.Id: 154920

What is the quotient of x^3-5x^2+2x+7 when divided with $(x-1)$?

A) x^2+4x-2

B) x^2-4x+2

C) x^2+4x+2

D) x^2-4x-2

138. Q.Id: 154918

Find the maximum distance of the point $K(10, 7)$ from the circle $x^2+y^2-4x-2y-20=0$

A) 25

B) 10

C) 15

D) 5

139. Q.Id: 154913

If the area bounded by the parabola $y^2 = 16ax$ and the line $y = mx$ is $\frac{a^2}{12}$ sq.units. then the value of 'm' is

A) -1 **B)** 1

C) 0 **D)** 2

140. Q.Id: 154911

If $x \neq 0$, then $\frac{\sin(\pi + x)\cos\left(\frac{\pi}{2} + x\right)\tan\left(\frac{3\pi}{2} + x\right)\cot(2\pi - x)}{\sin(2\pi - x)\cos(2\pi + x)\operatorname{cosec}(-x)\sin\left(\frac{3\pi}{2} + x\right)} =$

A) 0 **B)** -1

C) 1 **D)** 2

141. Q.Id: 154907

If α, β, γ are the roots of $f(x) = x^3 - 9x^2 + 26x - 24$, then $\frac{1}{\alpha}, \frac{1}{\beta}, \frac{1}{\gamma}$ are the roots of

A) $24x^3 + 26x^2 + 9x - 1$ **B)** $24x^3 - 26x^2 + 9x - 1$

C) $24x^3 + 26x^2 - 9x - 1$ **D)** $24x^3 - 26x^2 + 9x + 1$

142. Q.Id: 154904

Bill and George go target shooting together. Both shoot at a target at the same time. Suppose Bill hits the target with probability 0.7 where as George, independently, hits the target with probability0.4. Given that exactly one shot hit the target, what is the probability that it was George's shot ?

A) $\frac{2}{3}$ **B)** $\frac{2}{9}$

C) $\frac{1}{9}$ **D)** $\frac{8}{9}$

143. Q.Id: 154900

If $\vec{a} = 2\hat{i} - 3\hat{j} - 4\hat{k}$, $\vec{b} = \hat{i} + 4\hat{j} - 2\hat{k}$, $\vec{c} = 3\hat{i} - \hat{j} + 4\hat{k}$ then, $\left[\vec{a} \times \vec{b} \quad \vec{b} \times \vec{c} \quad \vec{c} \times \vec{a}\right] =$

A) 4900 **B)** 6400

C) 8100 **D)** 12100

144. Q.Id: 154896

The interval in which $y = \ln(\ln(x))$, $x > 1$ is decreasing is

A) $(-\infty, 0) \cup (2, \infty)$ **B)** $(0, 2)$

C) $(0, 1)$ **D)** $(-1, 0)$

145. Q.Id: 154893

Let the equation of the curve passing through the point (0, 1) be given by $y=\int x^3 e^{x^4} dx$. If the equation of the curve is written in the form $x=f(y)$, then $f(y)=$

A) $\log|4y-3|$

B) $(\log|4y-3|)^{1/4}$

C) $\left(\log\left|\frac{3-4y}{4}\right|\right)^{1/4}$

D) $\log\left|\frac{4y-3}{4}\right|$

146. Q.Id: 154889

$$f(x)=\begin{cases}\frac{x-4}{|x-4|}+a, & x<4\\ a+b, & x=4\\ \frac{x-4}{|x-4|}+b, & x>4\end{cases}$$

If $f(x)$ given above is continuous at $x=4$, then find the values of 'a' and 'b'

A) $a=1, b=-1$

B) $a=-1, b=1$

C) $a=1, b=1$

D) $a=-1, b=-1$

147. Q.Id: 154884

The derivative of $y=\tan^{-1}\left[\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right]$ with respect to x is equal to

A) -1

B) 0

C) ± 2

D) $\pm\frac{1}{2}$

148. Q.Id: 154880

If $\theta\in\left(0, \frac{\pi}{2}\right)$, then $\begin{vmatrix}(\sin\theta+\operatorname{cosec}\theta)^2 & (\sin\theta-\operatorname{cosec}\theta)^2 & 2020\\ (\cos\theta+\sec\theta)^2 & (\cos\theta-\sec\theta)^2 & 2020\\ (\tan\theta+\cot\theta)^2 & (\tan\theta-\cot\theta)^2 & 2020\end{vmatrix}=$

A) 1

B) - 1

C) 0

D) 2020

149. Q.Id: 154876

Solve the equation $3^{x^2-x}=25-4^{x^2-x}$

A) - 1 Only

B) 2 Only

C) Both -1 and 2

D) No Solution

150. Q.Id: 154874

The feet of perpendicular from, the point $A(1, 0, 3)$ **to the join of the points** $B(4, 7, 1)$ **and** $C(3, 5, 3)$ **is**

A) $\left(\frac{5}{3}, \frac{7}{3}, \frac{17}{3}\right)$

B) $\left(\frac{10}{3}, \frac{17}{3}, \frac{6}{3}\right)$

C) $\left(0, \frac{1}{2}, \frac{3}{2}\right)$

D) $\left(\frac{1}{5}, \frac{3}{5}, \frac{7}{5}\right)$

151. Q.Id: 154865

Find the eccentricity of an ellipse, if the length of its latus rectum is 4 units and the distance between its vertex and the nearest focus is $3/2$ **units.**

A) $\frac{1}{3}$

B) $\frac{2}{3}$

C) $\frac{1}{9}$

D) $\frac{3}{4}$

152. Q.Id: 154863

All the words that can be formed using alphabets A, H, L, U, R are written as in dictionary (no alphabet is repeated). Then the rank of the word RAHUL is ____

A) 70

B) 71

C) 73

D) 74

153. Q.Id: 154860

If the probability for A to fail in an exam is 0.2 and that for B is 0.3, then the probability that either A or B fails is $\leq$ ___

A) 0.2

B) 0.4

C) 0.5

D) 0.3

154. Q.Id: 154858

Geometrically, the set $\{z \in \mathbb{C} : |z-2-2i| \leq 1\}$ **represents _____**

A) A closed circular disc with center at (- 2, - 2) and with radius 1

B) A closed circular disc with center at (2, 2) and with radius 1

C) A closed circular disc with center at (1, 1) and with radius 0.5

D) A closed circular disc with center at $(-1, -1)$ and with radius 0.5

155. Q.Id: 154851

Find the equation of the right bisector of the line segment joining the points (3, 4) and (-1, 2)

A) $2x+y-5=0$

B) $2x-y+5=0$

C) $2x+y+5=0$

D) $2x-y-5=0$

156. Q.Id: 154848

The point to which the origin should be shifted so that the equation $y^2-6y-4x+13=0$ **is transformed to the form** $y^2+Ax=0$ **is**

A) $(3, 1)$

B) $(-1, -1)$

C) $(1, 3)$

D) $(-1, 3)$

157. Q.Id: 154846

In a bank, the principal increases continuously at the rate of 6% per year. Then the time required to double 6000 rupees is ____ (in years)

A) $\frac{50}{3}\log 2$

B) $\frac{50}{3}\log 6$

C) $\frac{50}{3}\log 3$

D) $\frac{50}{3}\log 12$

158. Q.Id: 154843

By neglecting x^4 **and higher powers of x, find approximate value of** $\sqrt[3]{x^2+64}-\sqrt[3]{x^2+27}$

A) $1-\frac{7}{234}x^2$

B) $1-\frac{7}{432}x^2$

C) $1-\frac{7}{32}x^2$

D) $1-\frac{7}{42}x^2$

159. Q.Id: 154840

If the coefficient of x^9 **and** x^{10} **in the binomial expansion of** $\left(3+\frac{x}{2}\right)^n$ **are equal, then** $n=$

A) 69

B) 96

C) 66

D) 99

160. Q.Id: 154839

$\sin\left(\frac{5\pi}{3}\right)+\sec\left(\frac{13\pi}{3}\right)=$

A) $2-\frac{\sqrt{3}}{2}$

B) $2+\frac{\sqrt{3}}{2}$

C) $\sqrt{3}+\frac{1}{\sqrt{2}}$

D) $\sqrt{3}-\frac{1}{\sqrt{2}}$