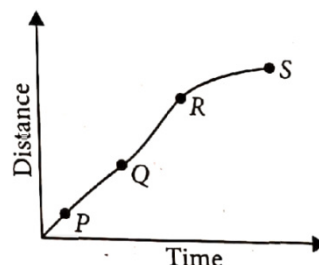


**PHYSICS**

- The energy equivalent to a substance of mass 1 gm is
(a) $18 \times 10^{13}J$ (b) $9 \times 10^{13}J$
(c) 18×10^6J (d) 9×10^6J
- The half-life of tritium is 12.5 years. What mass of tritium of initial mass 64 mg will remain undecayed after 50 years ?
(a) 32 mg (b) 8 mg
(c) 16 mg (d) 4 mg
- In a CE amplifier, the input ac signal to be amplified is applied across
(a) forward biased emitter-base junction
(b) reverse biased collector-base junction
(c) reverse biased emitter-base junction
(d) forward biased collector-base junction
- If $A=1$ & $B=0$, then in terms of Boolean algebra, $A + \bar{B}$ is equal
(a) B (b) \bar{B}
(c) A (d) \bar{A}
- The density of an electron – hole pair in a pure germanium is $3 \times 10^{16}m^{-3}$ at room temperature. On doping with aluminium, the hole density increases to ??? . Now the electron density (in m^{-3}) is doped germanium will be
(a) 1×10^{10} (b) 2×10^{10}
(c) 0.5×10^{10} (d) 4×10^{10}
- The dc common emitter current gain of a $n-p-n$ transistor is 50. The potential difference applied across the collector and emitter of a transistor used in CE configuration is $V_{CE} = 2V$. If the collector resistance $R_C = 4k\Omega$, the base current (I_B) are
(a) $I_B = 10 \mu A, I_C = 0.5 mA$
(b) $I_B = 0.5 \mu A, I_C = 10 mA$
(c) $I_B = 5 \mu A, I_C = 1 mA$
(d) $I_B = 1 \mu A, I_C = 0.5 mA$
- The radius of the Earth is 6400 km. If the height of an antenna is 500 m, then its range is

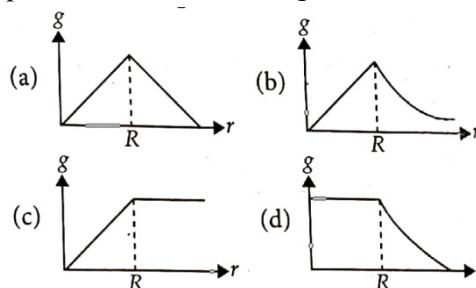
- (a) 800 km (b) 100 km
(c) 80 km (d) 10 km

- A Space station is at a height equal to the radius of the Earth. If v_E is the escape velocity on the surface of the Earth, the same on the space station is _____ times v_E .
(a) $\frac{1}{2}$ (b) $\frac{1}{4}$
(c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{\sqrt{3}}$
- A particle shows distance-time curve as shown in the figure. The maximum instantaneous velocity of the particle is around the point



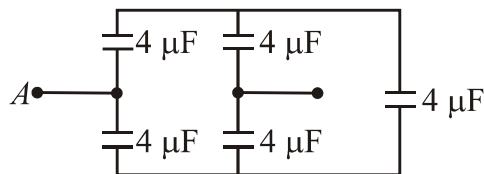
- (a) P (b) S
(c) R (d) Q

- Which of the following graphs correctly represents the variation of g on the Earth?



- A cu of tea cools from $65.5^\circ C$ in 1 minute in a room at $22.5^\circ C$. How long will it take to cool from $46.5^\circ C$ to $40.5^\circ C$ in the same room
(a) 4 minutes (b) 2 minutes
(c) 1 minute (d) 3 minutes
- The dimensions of the ratio of magnetic flux (ϕ) and permeability (μ) are
(a) $[M^0 L^1 T^0 A^1]$ (b) $[M^0 L^{-3} T^0 A^1]$
(c) $[M^0 L^1 T^0 A^{-1}]$ (d) $[M^0 L^2 T^0 A^1]$

13. A mass m on the surface of the Earth is shifted to a target equal to the radius of the Earth. If R is the radius and M is the mass of the Earth, then work done in this process is
 (a) $\frac{mgR}{2}$ (b) mgR
 (c) $2mgR$ (d) $\frac{mgR}{4}$
14. First overtone frequency of a closed pipe of length l_1 is equal to the 2nd harmonic frequency of an open pipe of length l_2 . Then ratio $\frac{l_1}{l_2} =$
 (a) $\frac{3}{4}$ (b) $\frac{4}{3}$
 (c) $\frac{3}{2}$ (d) $\frac{2}{3}$
15. The resistance $R = \frac{V}{I}$ where $V = (10 \pm 5)V$ and $I = (10 \pm 0.2)A$. The percentage error in R is
 (a) 5.2% (b) 4.8%
 (c) 7% (d) 3%
16. A block rests on a rough inclined plane making an angle of 30° with the horizontal. The coefficient of static friction between the block and the plane is 0.8. If the frictional force on the block is 10 N , the mass of the block is ($g = 10\text{ ms}^{-2}$)
 (a) 1 Kg (b) 2 Kg
 (c) 3 Kg (d) 4 Kg
17. Two particles of masses m_1 and m_2 have equal kinetic energies. The ratio of their momenta is
 (a) $m_1 : m_2$ (b) $m_2 : m_1$
 (c) $\sqrt{m_1} : \sqrt{m_2}$ (d) $m_1^2 : m_2^2$
18. The pressure at the bottom of a liquid tank is not proportional to the
 (a) acceleration due to gravity
 (b) density of the liquid
 (c) height of the liquid
 (d) area of the liquid surface
19. A Carnot engine takes 300 calories of heat from a source at 500 K and rejects 150 calories of heat to the sink. The temperature of the sink is
 (a) 125 K (b) 250 K
 (c) 750 K (d) 1000 K
20. Pressure of an ideal gas is increased by keeping temperature constant. The kinetic energy of molecules
 (a) decreases (b) increases
 (c) remains same (d) increases or decreases depending on the nature of gas
21. A man weighing 60 kg is in a lift moving down with an acceleration of 1.8 ms^{-2} . The force exerted by the floor on him is
 (a) 588 N (b) 480 N
 (c) zero (d) 696 N
22. Moment of inertia of a body about two perpendicular axes X and Y in the plane of lamina are 20 kg m^2 and 25 kg m^2 respectively. Its moment of inertia about an axis perpendicular to the plane of the lamina and passing through the point of intersection of X and Y axes is
 (a) 5 kg m^2 (b) 45 kg m^2
 (c) 12.5 kg m^2 (d) 500 kg m^2
23. Two wires A and B are stretched by the same load. If the area of cross-section of wire A is double that of B , then the stress on B is
 (a) equal to that on A
 (b) twice that on A
 (c) half that on A
 (d) four times that on A
24. The magnitude of point charge due to which the electric field 30 cm away has the magnitude 2 N C^{-1} will be
 (a) $2 \times 10^{-11}\text{ C}$ (b) $3 \times 10^{-11}\text{ C}$
 (c) $5 \times 10^{-11}\text{ C}$ (d) $9 \times 10^{-11}\text{ C}$
25. A mass of 1 kg carrying a charge of 2 C is accelerated through a potential of 1 V. The velocity acquired by it is
 (a) $\sqrt{2}\text{ ms}^{-1}$ (b) 2 ms^{-1}
 (c) $\frac{1}{\sqrt{2}}\text{ ms}^{-1}$ (d) $\frac{1}{2}\text{ ms}^{-1}$
26. The force of repulsion between two identical positive charges when kept with a separation r in air is F . Half the gap between the two charges filled by a dielectric slab of dielectric constant = 4. Then the new force of repulsion between those two charges becomes
 (a) $\frac{F}{3}$ (b) $\frac{F}{2}$
 (c) $\frac{F}{4}$ (d) $\frac{4F}{9}$
27. For the arrangement of capacitors as shown in the circuit, the effective capacitance between the points A and B is (capacitance of each capacitor is $4\text{ }\mu\text{F}$)



- a) $4 \mu\text{F}$ b) $2 \mu\text{F}$
c) $1 \mu\text{F}$ d) $8 \mu\text{F}$

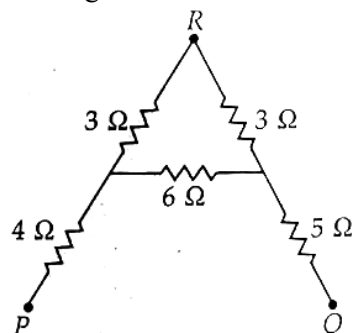
28. $8 \mu\text{F}$ 28. The work done to move a charge on an equipotential surface is (a) infinity
a) $4 \mu\text{F}$ b) less than 1
c) greater than 1 d) zero

29. Two capacitors of $3 \mu\text{F}$ and $6 \mu\text{F}$ are connected in series and a potential difference of 900 V is applied across the combination. They are then disconnected and reconnected in parallel. The potential difference across the combination is (a) zero
a) zero b) 100 V
c) 200 V d) 400 V

30. Ohm's law is applicable to
a) diode b) transistor
c) electrolyte d) conductor

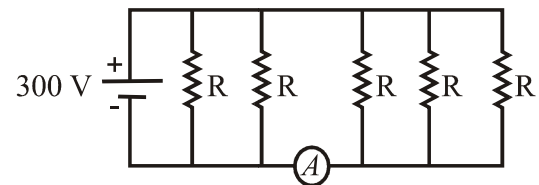
31. If the last band on the carbon resistor is absent, then the tolerance is
a) 5% b) 20%
c) 10% d) 15%

32. The effective resistance between P and Q for the following network is



- a) $\frac{1}{2} \Omega$ b) 21Ω
c) 12Ω d) $\frac{1}{21} \Omega$

33. Five identical resistors each of resistance $R = 1500 \Omega$ are connected to a 300 V battery as shown in the circuit. The reading of the ideal ammeter A is



- a) $\frac{1}{2} A$ b) $\frac{3}{5} A$
c) $\frac{2}{5} A$ d) $\frac{4}{5} A$

34. Two cells of internal resistances r_1 and r_2 and of same emf are connected in series across a resistor of resistance R . If the terminal potential difference across the cell of internal resistance r_1 is zero, then the value of R is
a) $R = 2(r_1 + r_2)$ b) $R = r_2 - r_1$
c) $R = r_1 - r_2$ d) $R = 2(r_1 - r_2)$

35. The $I - V$ graphs for two different electrical appliances P and Q are shown in the diagram. If R_p and R_Q be the resistances of the devices, then
a) $R_p = R_Q$ b) $R_p > R_Q$
c) $R_p < R_Q$ d) $R_p = \frac{R_Q}{2}$

36. The correct Biot-Savart Law in vector form is

- a) $d\vec{B} = \frac{\mu_0}{4\pi} \frac{I(d\vec{l} \times \vec{r})}{r^2}$ b) $d\vec{B} = \frac{\mu_0}{4\pi} \frac{I(d\vec{l} \times \vec{r})}{r^3}$
c) $d\vec{B} = \frac{\mu_0}{4\pi} \frac{Id\vec{l} \times \vec{r}}{r^2}$ d) $d\vec{B} = \frac{\mu_0}{4\pi} \frac{Id\vec{l} \times \vec{r}}{r^3}$

37. An electron moving in a circle of radius r in a uniform magnetic field B . Suddenly the field is reduced to $\frac{B}{2}$. The radius of the circular path now becomes

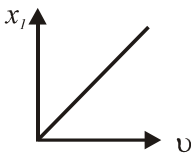
- a) $\frac{r}{2}$ b) $2r$
c) $\frac{r}{4}$ d) $4r$

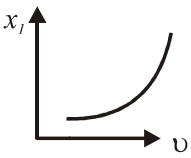
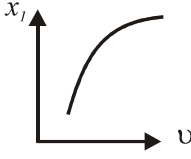
38. A charge q is accelerated through a potential difference V . It is then passed normally through a uniform magnetic field, where it moves in a circle of radius r . The potential difference required to move in a circle of radius $2r$ is

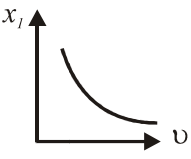
- a) $2V$ b) $4V$
c) $1V$ d) $3V$

39. A cyclotron's oscillator frequency is 10 MHz and the operating magnetic field is 0.66 T . If the radius of its dees is 60 cm . then the kinetic energy of the proton beam produced by the accelerator is

- a) 9 MeV b) 10 MeV
c) 7 MeV d) 11 MeV

40. Needles N_1 , N_2 and N_3 are made of a ferromagnetic, a paramagnetic and a diamagnetic substance respectively. A magnet when brought close to them will
- attract all three of them
 - attract N_1 strongly. N_2 weakly and repel N_3 weakly
 - attract N_1 strongly but repel N_2 and N_3 weakly
 - attract N_1 and N_2 strongly but repel N_3
41. The strength of the Earth's magnetic field is
- constant everywhere
 - zero everywhere
 - having very high value
 - varying from place to place on the Earth's surface
42. A jet plane having a wing-span of 25 m is travelling horizontally towards east with a speed of 3600 km/hour. If the Earth's magnetic field at the location is $4 \times 10^{-4} T$ and the angle of dip is 30° then the potential difference between the ends of the wing is
- 4 V
 - 5 V
 - 2 V
 - 2.5 V
43. Which of the following represents the variation of inductive reactance (X_L) with the frequency of voltage source (ν) ?
- (a) 

(b) 
- (c) 

(d) 
44. The magnetic flux linked with a coil varies as $\phi = 3t^2 + 4t + 9$. The magnitude of the emf induced at $t = 2$ seconds is
- 8 V
 - 16 V
 - 32 V
 - 64 V
45. A 100 W bulb is connected to an AC source of 220 V, 50 Hz. Then the current flowing through the bulb is
- $\frac{5}{11} A$
 - $\frac{1}{2} A$
 - 2 A
 - $\frac{3}{4} A$
46. In the series LCR circuit. the power dissipation
- R
 - L
 - C
 - both L and C
47. In Karnataka, the normal domestic power supply AC is 220 V, 50 Hz. Here 220 V and 50 Hz refer to
- peak value of voltage and frequency
 - rms value of voltage and frequency
 - mean value of voltage and frequency
 - peak value of voltage and angular frequency
48. A step-up transformer operates on a 230 V line and a load current of 2 A. The ratio of primary and secondary windings is 1:25. Then the current in the primary is
- 25 A
 - 50 A
 - 15 A
 - 12.5 A
49. The number of photons falling per second on a completely darkened plate to produce a force of $6.62 \times 10^{-5} N$ is n . If the wavelength of the light falling is $5 \times 10^{-7} m$, then $n = ____ \times 10^{22}$. ($h = 6.62 \times 10^{-34} Js$)
- 1
 - 5
 - 0.2
 - 3.3
50. An object is placed at the principal focus of a convex mirror. The image will be at
- centre of curvature
 - principal focus
 - infinity
 - no image will be formed
51. An object is placed at a distance of 20 cm from the pole of a concave mirror of focal length 10 cm. The distance of the image formed is
- +20 cm
 - 20 cm
 - 10 cm
 - 10 cm
52. A candle placed 25 cm from a lens forms an image on a screen placed 75 cm on the other side of the lens. The focal length and type of the lens should be
- 18.75 cm and convex lens
 - 18.75 cm and concave lens
 - 20.25 cm and convex lens
 - 20.25 cm and concave lens
53. A plane wavefront of wavelength λ is incident on a single slit of width a . The angular width of principal maximum is



- (a) $\frac{\lambda}{a}$ (b) $\frac{2\lambda}{a}$
 (c) $\frac{a}{\lambda}$ (d) $\frac{a}{2\lambda}$

54. In a Fraunhofer diffraction at a single slit, if yellow light illuminating the slit is replaced by blue light, then diffraction bands

- (a) remain unchanged
 (b) become wider
 (c) disappear
 (d) become narrower

55. In Young's double slit experiment, two wavelengths $\lambda_1 = 7800 \text{ nm}$ and $\lambda_2 = 520 \text{ nm}$ are used to obtain interference fringes. If the n^{th} bright band due to λ_1 coincides with $(n + 1)^{\text{th}}$ bright band due to λ_2 , then the value of n is

- a) 4 (b) 3
 c) 2 (d) 6

56. In Young's double slit experiment, slits are separated by 2 mm and the screen is placed at a distance of 1.2 m from the slits. Light consisting of two wavelengths 6500 \AA and 5200 \AA are used to obtain interference fringes. Then the separation between the fourth bright fringes of two different patterns produced by the two wavelengths is

- (a) 0.312 mm (c) 0.213 mm
 (b) 0.123 mm (d) 0.412 mm

57. The maximum kinetic energy of emitted photoelectrons depends on

- (a) intensity of incident radiation
 (b) frequency of incident radiation
 (c) speed of incident radiation.
 (d) number of photons in the incident rotation

58. A proton and an α particle are accelerated through the same potential difference V . The ratio of their de Broglie wavelengths is

- (a) $\sqrt{2}$ (b) $2\sqrt{2}$
 (c) $\sqrt{3}$ (d) $2\sqrt{3}$

59. The total energy of an electron revolving in the second orbit of hydrogen atom is

- (a) -13.6 eV (b) -1.51 eV
 (c) -3.4 eV (d) zero

60. The period of revolution of an electron in the ground state of hydrogen atom is T . The period of revolution of the electron in the first excited state is

- (a) $27T$ (b) $4T$
 (c) $6T$ (d) $8T$

CHEMISTRY

61. 1.0 g of Mg is burnt with 0.28 g of O_2 in a closed vessel. Which reactant is left in excess and how much?

- (a) Mg, 5.8 g (b) Mg, 0.58 g
 (c) O_2 , 0.24 g (d) O_2 , 2.4 g

62. The orbital nearest to the nucleus is

- (a) $4f$ (b) $5d$
 (c) $4s$ (d) $7p$.

63. Which of the following is the correct order of radius?

- (a) $\text{H}^- > \text{H} > \text{H}^+$
 (b) $\text{Na}^+ > \text{F}^- > \text{O}^{2-}$

(c) $\text{F}^- > \text{O}^{2-} > \text{Na}^+$

- (d) $\text{Al}^{3+} > \text{Mg}^{2+} > \text{Mn}^{3+}$

64. The intramolecular hydrogen bond is present in

- a) phenol (b) *o*-nitrophenol
 c) *p*-nitrophenol (d) *p*-cresol

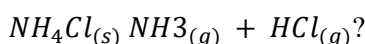
65. The state of hybrid orbitals of carbon in CO_2 , CH_4 and CO_3^{2-} respectively is

- (a) sp^3, sp^2 and sp (b) sp^3, sp and sp^2
 (c) sp, sp^3 and sp^2 (d) sp^2, sp^3 and sp .

66. For an ideal gas, compressibility factor is (a) 0

- (b) 1
 (c) -1 (d) +2

67. The relationship between K_p and K_c is $K_p = K_c(RT)^{\Delta n}$. What would be the value of Δn for the reaction.

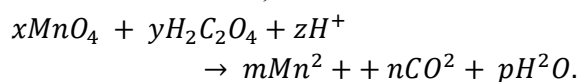


- (a) 1 (b) 0.5
 (c) 1.5 (d) 2

68. Acidity of BF_3 can be explained on which of the following concepts?

- (a) Arrhenius concept
 (b) Bronsted Lowry concept
 (c) Lewis concept
 (d) Bronsted Lowry as well as Lewis concept.

69. For the redox reaction,





The values of x, y, m and n are

- (a) 10, 2, 5, 2 (b) 2, 5, 2, 10
(c) 6, 4, 2, 4 (d) 3, 5, 2, 10

70. H_2O_2 is

- (a) an oxidising agent
(b) a reducing agent
(c) both oxidising and reducing agent
(d) neither oxidising nor reducing agent.

71. Dead burnt plaster is

- (a) $CaSO_4$ (c) $CaSO_4 \cdot \frac{1}{2} H_2O$
(c) $CaSO_4 \cdot H_2O$ (d) $CaSO_4 \cdot 2H_2O$

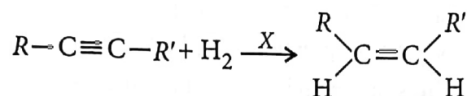
72. Identify the following compound which exhibits geometrical isomerism

- (a) But-2-ene (b) But-1-ene
(c) Butane (d) Iso-butane

73. During the fusion organic compound with sodium metal, nitrogen present in the organic compound is converted into

- (a) $NaNO_2$ (b) $NaNH_2$
(c) $NaCN$ (d) $NaNC$

74. The reagent 'X' used for the following reaction is



- a) Ni b) Pd/C
c) $LiAlH_4$ d) Na/liquid NH_3

75. Which of the following ions will cause hardness in water?

- a) Ca^{2+} b) Na^+
c) Cl^- d) K^+

76. Which of the following oxides show electrical properties like metals?

- a) SiO_2 b) MgO
c) $SO_{2(s)}$ d) CrO_2

77. Which of the following oxides show electrical properties like metals?

- a) 1.0 M $NaOH$ b) 1.0 M Na_2SO_4
c) 1.0 M NH_2NO_3 d) 1.0 M KNO_3

78. The charge required for the reduction of 1 mole of MnO_4^- to MnO_2 is

- a) 1 F b) 3 F
c) 5 F d) 7 F

79. For the reaction $2SO_2 + O_2 \rightleftharpoons 2SO_3$, the rate of disappearance of O_2 is $2 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$. The rate of appearance of SO_3 is

- a) $2 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$
b) $4 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$
c) $1 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$
d) $6 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$

80. Which of the following electrolytes will have maximum coagulating value for AgI/Ag^+ sol?

- a) Na_2S b) Na_3PO_4
c) Na_2SO_4 d) $NaCl$

81. Electrolytic refining is used to purify which of the following metals?

- (a) Cu and Zn (b) Ge and Si
(c) Zr and Ti (d) Zn and Hg

82. Dry ice is

- a) Solid CO (b) solid SO_2
c) Solid CO_2 (d) solid O_2

83. Which of the following is an amphoteric oxide?

- (a) V_2O_5, Cr_2O_3 (b) Mn_2O_7, Cr_2O_3
(c) CrO, V_2O_5 (d) V_2O_5, V_2O_4

84. The IUPAC name of $[Co(NH_3)_4Cl(NO_2)]Cl$ is

- (a) tetraaminechloridonitrito-N-cobalt(III) chloride
(b) tetraaminechloridonitriocobalt(II) chloride
(c) tetraaminechloridonitriocobalt(I) chloride
(d) tetraaminechloridodinitrocobalt(III) chloride.

85. Which of the following statements is true in case of alkyl halides?

- (a) They are polar in nature.
(b) They can form hydrogen bonds.
(c) They are highly soluble in water.
(d) They undergo addition reactions.

86. Phenol can be distinguished from ethanol by the reagent

- (a) bromine water (b) sodium metal
(c) iron metal (d) chlorine water.

87. Which of the following compounds undergo haloform reaction?

- (a) CH_3COCH_3 (b) $HCHO$
(c) CH_2CH_2Br (d) CH_3-O-CH_3

88. Which of the following will be the most stable diazonium salt ($RN_2^+ X^-$)?

- (a) $CH_3N_2^+ X^-$ (b) $C_6H_6N_2^+ X^-$
(c) $CH_3CH_2N_2^+ X^-$ (d) $C_6H_5CH_2N_2^+ X^-$

89. Which of the following bases is not present in DNA?

- (a) Adenine (b) Guanine



- (c) Cytosine (d) Uracil
90. Which one of the following is a polyamide polymer?
 (a) Terylene (b) Nylon-6,6
 (c) Buna-S (d) Bakelite
91. In f.c.c. the unit cell is shared equally by how many unit cell?
 (a) 10 (b) 8
 (c) 6 (d) 2
92. At a particular temperature, the ratio of molar conductance to specific conductance of 0.01 M NaCl solution is
 (a) $10^5 \text{ cm}^3 \text{ mol}^{-1}$ (b) $10^3 \text{ cm}^3 \text{ mol}^{-1}$
 (c) $10 \text{ cm}^3 \text{ mol}^{-1}$ (d) $10^5 \text{ cm}^2 \text{ mol}^{-1}$
93. Isotonic solutions are having the same
 (a) surface tension
 (b) vapour pressure
 (c) osmotic pressure
 (d) viscosity.
94. The temperature coefficient of a reaction is 2. When the temperature is increased from 30 °C to 90 °C, the rate of reaction is increased by
 (a) 150 times (b) 410 times
 (c) 72 times (d) 64 times
95. Gold sol is not a
 (a) lyophobic sol
 (b) negatively charged sol
 (c) macromolecular sol
 (d) multimolecular colloid.
96. The common impurity present in bauxite is
 (a) CuO (b) ZnO (c) Fe_2O_3 (d) Cr_2O_3
97. Very pure N_2 can be obtained by
 (a) thermal decomposition of ammonium dichromate.
 (b) treating aqueous solution of NH_4Cl and NaNO_2
 (c) liquefaction and fractional distillation of liquid air
 (d) thermal decomposition of sodium azide.
98. Which of the following oxidation states is common for all lanthanides?
 (a) +2 (b) +3
 (c) +4 (d) +5
99. The electronic configuration of transition element X, is +3, oxidation state is $[\text{Ar}]3d^5$. What is its atomic number?
 (a) 25 (b) 26
 (c) 27 (d) 24
100. *n*-Propyl chloride reacts with sodium metal in dry ether to give
 (a) $\text{CH}_3\text{-CH}_2\text{CH}_2\text{-CH}_2\text{-CH}_3$
 (b) $\text{CH}_3\text{-CH}_2\text{-CH}_3$
 (c) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_3$
 (d) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_3$
101. 101. When the vapours of tertiary butyl alcohol are passed through heated copper at 573 K, the product formed is
 (a) but-2-ene
 (b) 2-butanone
 (c) 2-methyl propene
 (d) butanal.
102. What is the increasing order of acidic strength among the following?
 (i) p-methoxy phenol
 (ii) p-methyl phenol
 (iii) p-nitrophenol
 (a) ii < iii < i (b) iii < ii < i
 (c) i < ii < iii (d) i < iii < ii
103. Which of the following is more basic than aniline?
 (a) Diphenylamine
 (b) Triphenylamine
 (c) p-Nitroaniline
 (d) Benzylamine
104. The two forms of D-glucopyranose are called
 (a) diastereomers (b) anomers
 (c) epimers (d) enantiomers.
105. Among the following, the branched chain polymer is
 (a) polyvinyl chloride
 (b) Bakelite
 (c) low density polythene
 (d) high density polythene.
106. Edge length of a cube is 300 pm. Its body diagonal would be
 (a) 600 pm (b) 423 pm
 (c) 519.6 pm (d) 450.5 pm
107. Which of the following is not a conductor of electricity?
 (a) Solid NaCl (b) Cu
 (c) Fused NaCl (d) Brine solution

108. For a cell involving two electron changes, $E_{\text{cell}} = 0.3 \text{ V}$ at 25°C . The equilibrium constant of the reaction is

- (a) 10-10 (b) 3×10^{-2}
(c) 10 (d) 10^{10}

109. The value of rate constant of pseudo first order reaction

- (a) depends only on temperature
(b) depends on the concentration of reactants present in small amounts
(c) depends on the concentration of reactants present in excess
(d) is independent of the concentration of reactants.

110. $(\text{CH}_3)_3\text{SiCl}$ is used during polymerisation of organosilicons because

- (a) the chain length of organosilicon polymers can be controlled by adding $(\text{CH}_3)_3\text{SiCl}$
(b) $(\text{CH}_3)_3\text{SiCl}$ improves the quality and yield of the polymer
(c) $(\text{CH}_3)_3\text{SiCl}$ does not block the end terminal of silicone polymer
(d) $(\text{CH}_3)_3\text{SiCl}$ acts as a catalyst during polymerisation.

111. When PbO_2 reacts with concentrated HNO_3 , the gas evolved is

- (a) NO_2 (b) O_2
(c) N_2 (d) NgO

112. KMnO_4 acts as an oxidising agent in alkaline medium. When alkaline KMnO_4 is treated with KI , iodide ion is oxidised to

- (a) I_2 (b) IO^-

(c) IO_3^- (d) IO_4^-

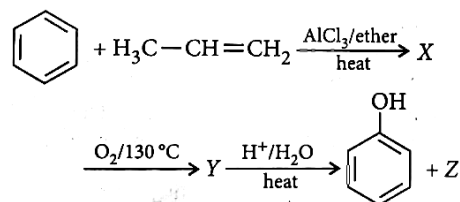
113. $[\text{Fe}(\text{NO}_2)_3\text{Cl}_3]$ and $[\text{Fe}(\text{O} - \text{NO})_3\text{Cl}_3]$ shows

- (a) linkage isomerism
(b) geometrical isomerism
(c) optical isomerism
(d) hydrate isomerism.

114. Tertiary alkyl halide is practically inert to substitution by $\text{S}_{\text{N}}2$ mechanism because of

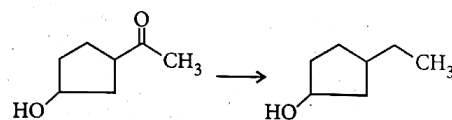
- (a) insolubility (b) instability
(c) inductive effect (d) steric hindrance.

115. The products X and Z in the following sequence are



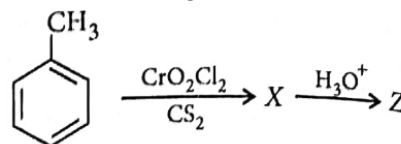
- (a) *iso*-propyl benzene and acetone
(b) cumene peroxide and acetone
(c) *iso*-propyl benzene and *iso*-propyl alcohol
(d) phenol and acetone.

116. The appropriate reagent for the following transformation is



- (a) Zn-Hg/HCl
(b) $\text{H}_2\text{N-NH}_2$, KOH /ethylene glycol
(c) Ni/H_2 (d) NaBH_4

117. In the following reaction,



the compound Z is

- (a) benzoic acid (b) benzaldehyde
(c) acetophenone (d) benzene.

118. The reaction of benzenediazonium chloride with aniline yields yellow dye. The name of the yellow dye is

- (a) *p*-hydroxyazobenzene
(b) *p*-aminoazobenzene
(c) *p*-nitroazobenzene
(d) *o*-nitroazobenzene.

119. The glycosidic linkage involved in linking the glucose units in amylase part of starch is

- (a) $\text{C}_1\text{-C}_4$ B-linkage (b) $\text{C}_1 - \text{C}_6$ α -linkage
(c) $\text{C}_1\text{-C}_6$ B-linkage (d) $\text{C}_1\text{-C}_4$ α -linkage.

120. Ziegler-Natta catalyst is used to prepare

- (a) low-density polythene
(b) Teflon
(c) high-density polythene
(d) nylon-6.

MATHEMATICS

121. For the LPP, maximise $z = x + 4y$ subject to the constraints $x + 2y \leq 2$, $x + 2y \geq 8$, $x, y \geq 0$

- a) $z_{\text{max}} = 4$ (b) $z_{\text{max}} = 8$
c) $z_{\text{max}} = 16$ (d) has no feasible solution



122. For the probability distribution given by

$X = x_1$	0	1	2
P_1	$\frac{25}{36}$	$\frac{5}{18}$	$\frac{1}{36}$

the standard deviation σ is

- a) $\frac{\sqrt{1}}{3}$ b) $\frac{1\sqrt{5}}{3 \cdot 2}$
 c) $\frac{\sqrt{5}}{36}$ d) None of the above

123. A bag contains 17 tickets numbered from 1 to 17. A ticket is drawn at random, then another ticket is drawn without replacing the first one. The probability that both the tickets may shown even number is

- a) $\frac{7}{34}$ b) $\frac{8}{17}$
 c) $\frac{7}{16}$ d) $\frac{7}{17}$

124. A flashlight has 10 batteries out of which 4 are dead. If 3 batteries are selected without replacement and tested, then the probability that all 3 are dead is

- a) $\frac{1}{30}$ b) $\frac{2}{8}$
 c) $\frac{1}{15}$ d) $\frac{1}{10}$

125. if $|x + 5| \geq 10$, then

- a) $x \in (-15, 5)$ b) $x \in (-5, 5)$
 c) $x \in (-\infty, -15] \cup [5, \infty)$
 d) $x \in [-\infty, -15] \cup [5, \infty)$

126. Everybody in a room shakes hands with everybody else. The Total number of handshakes is 45. The total number of persons in the room is

- a) 9 b) 10
 c) 5 d) 15

127. The constant term in the expansion of

- $\left(x^2 - \frac{1}{x^2}\right)^{16}$ is
 a) ${}^{16}C_8$ b) ${}^{16}C_7$
 c) ${}^{16}C_9$ d) ${}^{16}C_{10}$

128. If $P(n)$: " $2^{2n} - 1$ is divisible by k for all $n \in \mathbb{N}$ " is true, then the value of ' k ' is

- a) 6 b) 3
 c) 7 d) 2

129. The equation of the line parallel to the line $3x - 4y + 2 = 0$ and passing through $(-2, 3)$ is

- a) $3x - 4y + 18 = 0$
 b) $3x - 4y - 18 = 0$

c) $3x + 4y + 18 = 0$

d) $3x + 4y - 18 = 0$

130. If $\left(\frac{1-i}{1+i}\right)^{96} = a + ib$, then (a, b) is

- a) (1, 1) b) (1, 0)
 c) (0, 1) d) (0, -1)

131. The distance between the foci of a hyperbola is 16 and its eccentricity is $\sqrt{2}$. Its equation is

- a) $x^2 - y^2 = 32$ b) $\frac{x^2}{4} - \frac{y^2}{9} = 1$
 c) $2x^2 - 3y^2 = 7$ d) $y^2 - x^2 = 32$

132. The number of ways in which 5 girls and 3 boys can be seated in a row so that no two boys are together is

- a) 14040 b) 14440
 b) 14000 d) 14400

133. If a, b, c are three consecutive terms of an A.P. and x, y, z are three consecutive terms of a G.P., then the value of $x^{b-c} \cdot y^{c-a} \cdot z^{a-b}$ is

- a) 0 b) xyz
 c) -1 d) 1

134. The Value of $\lim_{x \rightarrow 0} \frac{|x|}{x}$ is

- a) 1 b) -1
 c) 0 d) Does not exist

135. Let $f(x) = x - \frac{1}{x}$, then $f'(-1)$ is

- a) 0 b) 2
 c) 1 d) -2

136. The negation of the statement "72 is divisible by 2 and 3" is

- a) 72 is not divisible by 2 or 72 is not divisible by 3
 b) 72 is divisible by 2 or 72 is divisible by 3
 c) 72 is divisible by 2 and 72 is divisible by 3
 d) 72 is not divisible by 2 & 3

137. The probability of happening of an event A is 0.5 and that of B is 0.3. If A and B are mutually exclusive events, then the probability of neither A nor B is

- a) 0.4 b) 0.5
 c) 0.2 d) 0.9

138. In a simultaneous throw of a pair of dice, the probability of getting a total more than 7 is

- a) $\frac{7}{12}$ b) $\frac{5}{36}$
 c) $\frac{5}{12}$ d) $\frac{7}{36}$



139. If A and B are mutually exclusive events, given that $P(A) = \frac{3}{5}$, $P(B) = \frac{1}{5}$, then $P(A \text{ or } B)$ is
 a) 0.8 b) 0.6
 c) 0.4 d) 0.2
140. Let $f, g: R \rightarrow R$ be two functions defined as $f(x) = |x| + x$ and $g(x) = |x| - x \forall x \in R$ then $(f \circ g)(x)$ for $x < 0$ is
 a) 0 b) $4x$
 c) $-4x$ d) $2x$
141. A is a set having 6 distinct elements, The number of distinct functions from A to A which are not bijections is
 a) $6! - 6$ b) $6^6 - 6$
 c) $6^6 - 6!$ d) $6!$
142. Let $f: R \rightarrow R$ be defined by

$$f(x) = \begin{cases} 2x & ; & x > 3 \\ x^2 & ; & 1 < x \leq 3 \\ 3x & ; & x \leq 1 \end{cases}$$
 Then $f(-1) + f(2) + f(4)$
 a) 9 b) 14
 c) 5 d) 10
143. If $\sin^{-1} x + \cos^{-1} y = \frac{2\pi}{5}$, then $\cos^{-1} x + \sin^{-1} y$ is
 a) $\frac{2\pi}{5}$ b) $\frac{3\pi}{5}$
 c) $\frac{4\pi}{5}$ d) $\frac{3\pi}{10}$
144. The value of the expression $\tan\left(\frac{1}{2}\cos^{-1}\frac{2}{\sqrt{5}}\right)$ is
 a) $2 - \sqrt{5}$ b) $\sqrt{5} - 2$
 c) $\frac{\sqrt{5}-2}{2}$ d) $5 - \sqrt{2}$
145. If $A = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$, then $A^n = 2^k A$, where $k =$
 a) 2^{n-1} b) $n + 1$
 c) $n - 1$ d) $2(n - 1)$
146. If $\begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 4 \end{bmatrix}$ then the value of x and y respectively are
 a) -3, -1 b) 1, 3
 c) 3, 1 d) -1, 3
147. If $A = \begin{bmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{bmatrix}$, then $AA' =$
 a) A b) zero matrix
 c) A' d) I
148. If $x, y, z \in R$, then the value of the determinant

$$\begin{vmatrix} (5^x + 5^{-x})^2 & (5^x - 5^{-x})^2 & 1 \\ (6^x + 6^{-x})^2 & (6^x - 6^{-x})^2 & 1 \\ (7^x + 7^{-x})^2 & (7^x - 7^{-x})^2 & 1 \end{vmatrix}$$
 is
 a) 10 b) 12
 c) 1 d) 0
149. The value of determinant $\begin{vmatrix} a-b & b+c & a \\ b-a & c+a & b \\ c-a & a+b & c \end{vmatrix}$ is
 a) $a^3 + b^3 + c^3$ b) $3abc$
 c) $a^3 + b^3 + c^3 - 3abc$
 d) $a^3 + b^3 + c^3 + 3abc$
150. If (x_1, y_1) , (x_2, y_2) and (x_3, y_3) are the vertices of a triangle whose area is k square units, then

$$\begin{vmatrix} x_1 & y_1 & 4 \\ x_2 & y_2 & 4 \\ x_3 & y_3 & 4 \end{vmatrix}$$
 is
 a) $32k^2$ b) $16k^2$
 c) $64k^2$ d) $45k^2$
151. Let A be a square matrix of order 3×3 , then $|5A| =$
 a) $5|A|$ b) $125|A|$
 c) $25|A|$ d) $15|A|$
152. If $f(x) = \begin{cases} \frac{\sqrt{1+kx}-\sqrt{1-kx}}{x} & \text{if } -1 \leq x < 0 \\ \frac{2x+1}{x-1} & \text{if } 0 \leq x \leq 1 \end{cases}$
 is continuous at $x = 0$, then the value of k is
 a) $k = 1$ b) $k = -1$
 c) $k = 0$ d) $k = 2$
153. If $\cos y = x \cos(a + y)$ with $\cos a \neq \pm 1$, then $\frac{dy}{dx}$ is equal to
 a) $\frac{\sin a}{\cos^a(a+y)}$ b) $\frac{\cos^2(a+y)}{\sin a}$
 c) $\frac{\cos a}{\sin^2(a+y)}$ d) $\frac{\cos^2(a+y)}{\cos a}$
154. If $f(x) = |\cos x - \sin x|$, then $f'(\pi/6)$ is equal to
 a) $-\frac{1}{2}(1 + \sqrt{3})$ b) $\frac{1}{2}(1 + \sqrt{3})$
 c) $-\frac{1}{2}(1 - \sqrt{3})$ d) $\frac{1}{2}(1 - \sqrt{3})$
155. if $f = \sqrt{x + \sqrt{x + \sqrt{x + \dots \infty}}}$, then $\frac{dy}{dx} =$
 (a) $\frac{1}{y^2-1}$ b) $\frac{1}{2y+1}$
 c) $\frac{2y}{y^2-1}$ d) $\frac{1}{2y-1}$



156. If $f(x) = \begin{cases} \log_e x & ; x \neq 1 \\ k & : x = 1 \end{cases}$ is continuous at $x = 1$, then the value of k is
- a) e b) 1
c) -1 d) 0

157. Approximate change in the volume V of a cube of side x metres caused by increasing the side by 3% is
- a) $0.09x^3 m^3$ b) $0.03x^3 m^3$
c) $0.06x^3 m^3$ d) $0.049x^3 m^3$

158. The maximum value of $\left(\frac{1}{x}\right)^x$ is
- a) e b) e^e
c) $e^{1/e}$ d) $\left(\frac{1}{e}\right)^{1/e}$

159. $f(x) = x^x$ has stationary point at
- a) $x = e$ b) $x = \frac{1}{e}$
c) $x = 1$ d) $x = \sqrt{e}$

160. The maximum area of a rectangle inscribed in the circle $(x+1)^2 + (y-3)^2 = 64$ is
- a) 64 sq. units b) 72 sq. units
c) 128 sq. units d) 8 sq. units

161. $\int \frac{1}{1+e^x} dx$ is equal to
- a) $\log_e \left(\frac{e^x+1}{e^x}\right) + c$ b) $\log_e \left(\frac{e^x-1}{e^x}\right) + c$
c) $\log_e \left(\frac{e^x}{e^x+1}\right) + c$ d) $\log_e \left(\frac{e^x}{e^x-1}\right) + c$

162. $\int \frac{1}{\sqrt{3-6x-9x^2}} dx$ is equal to
- a) $\sin^{-1} \left(\frac{3x+1}{2}\right) + c$ b) $\sin^{-1} \left(\frac{3x+1}{6}\right) + c$
c) $\frac{1}{3} \sin^{-1} \left(\frac{3x+1}{2}\right) + c$ d) $\sin^{-1} \left(\frac{2x+1}{3}\right) + c$

163. $\int e^{\sin x} \cdot \left(\frac{\sin x+1}{\sec x}\right) dx$ is equal to
- a) $\sin x \cdot e^{\sin x} + c$ b) $\cos x \cdot e^{\sin x} + c$
c) $e^{\sin x} + c$ d) $e^{\sin x} (\sin x + 1) + c$

164. $\int_{-2}^2 |x \cos \pi x| dx$ is equal to
- a) $\frac{8}{\pi}$ b) $\frac{4}{\pi}$
c) $\frac{2}{\pi}$ d) $\frac{1}{\pi}$

165. $\int_0^1 \frac{dx}{e^x + e^{-x}}$ is equal to
- a) $\frac{\pi}{4} - \tan^{-1}(e)$ b) $\tan^{-1}(e) - \frac{\pi}{4}$
c) $\tan^{-1}(e) + \frac{\pi}{4}$ d) $\tan^{-1}(e)$

166. $\int_0^1 \frac{dx}{(1+x^2)\sqrt{1-x^2}}$ is equal to

- a) $\frac{1}{\sqrt{2}} \tan^{-1} \sqrt{\frac{2}{3}}$ b) $\frac{2}{\sqrt{2}} \tan^{-1} \left(\frac{3}{\sqrt{2}}\right)$
c) $\frac{\sqrt{2}}{2} \tan^{-1} \left(\frac{3}{2}\right)$ d) $\frac{\sqrt{2}}{2} \tan^{-1} \left(\frac{\sqrt{3}}{2}\right)$

167. The area of the region bounded by the curve $y = \cos x$ between $x = 0$ and $x = \pi$ is
- a) 1 sq. unit b) 4 sq. unit
c) 2 sq. unit d) 3 sq. unit

168. The area bounded by the line $y = x$, x -axis and ordinates $x = -1$ and $x = 2$ is
- a) $3/2$ sq. units b) $5/2$ sq. units
c) 2 sq. units d) 3 sq. units

169. The degree and order of the differential equation

$$\frac{d^2 y}{dx^2} = \sqrt[3]{1 + \left(\frac{dy}{dx}\right)^2}$$
 respectively are

- a) 2 and 3 b) 3 and 2
c) 2 and 2 d) 3 and 3

170. The solution of the differential equation

$$x \frac{dy}{dx} - y = 3$$
 represents a family of

- a) straight lines b) circles
c) parabolas d) ellipses

171. The integrating factor of $\frac{dy}{dx} + y = \frac{1+y}{x}$ is

- a) xe^x b) $xe^{1/x}$
c) $\frac{e^x}{x}$ d) $\frac{x}{e^x}$

172. If $|\vec{a} \times \vec{b}|^2 + |\vec{a} \cdot \vec{b}|^2 = 144$ and $|\vec{a}| = 4$, then the value of $|\vec{b}|$ is

- a) 1 b) 2
c) 3 d) 4

173. If \vec{a} and \vec{b} are mutually perpendicular unit vectors, then $(3\vec{a} + 2\vec{b}) \cdot (5\vec{a} - 6\vec{b}) =$

- a) 5 b) 3
c) 6 d) 12

174. If the vectors $a\hat{i} + \hat{j} + \hat{k}$, $\hat{i} + b\hat{j} + \hat{k}$ and

$\hat{i} + \hat{j} + c\hat{k}$ are coplanar ($a \neq b \neq c \neq 1$), then the value of $abc - (a + b + c) =$



- a) 2 b) -2
c) 0 d) -1

175. If $\vec{a} = \hat{i} + \lambda\hat{j} + 2\hat{k}$; $\vec{b} = \mu\hat{i} + \hat{j} - \hat{k}$ are orthogonal and $|\vec{a}| = |\vec{b}|$, then $(\lambda, \mu) =$

- a) $\left(\frac{1}{4}, \frac{7}{4}\right)$ b) $\left(\frac{7}{4}, \frac{1}{4}\right)$
c) $\left(\frac{1}{4}, \frac{9}{4}\right)$ d) $\left(\frac{-1}{4}, \frac{9}{4}\right)$

176. The image of the point (1,6,3) in the line

$$\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3} \text{ is}$$

- a) (1, 0, 7) b) (7, 0, 1)
c) (2, 7, 0) d) (-1, -6, -3)

177. The angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$ is

- a) 0° b) 45°
c) 90° d) 30°

178. The value of k such that the line

$$\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{2} \text{ lies on the plane } 2x -$$

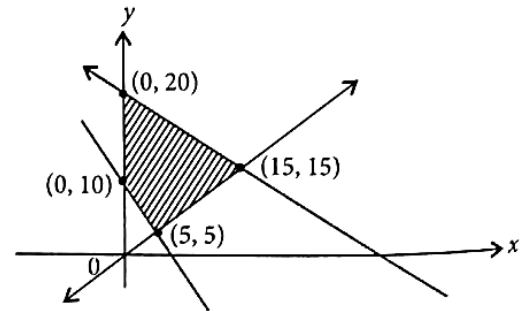
$$4y + z = 7 \text{ is}$$

- a) -7 b) 4
c) -4 d) 7

179. The locus represented by $xy + yz = 0$ is

- a) a pair of perpendicular lines
b) a pair of parallel lines
c) a pair of parallel planes
d) a pair of perpendicular planes

180. The feasible region of an LPP is shown in the figure. If $z = 3x + 9y$, then the minimum value of z occurs at



- a) (5, 5) b) (0, 10)
c) (0, 20) d) (15, 15)