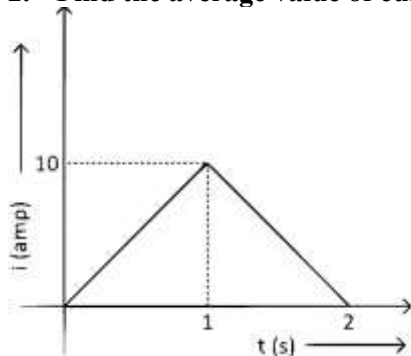


PART- I Physics

1. A body which is initially at rest at a height R above the surface of the Earth of radius R , falls freely towards the Earth, then its velocity on reaching the surface of the Earth is.

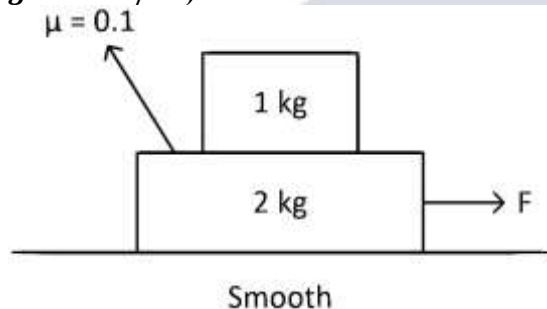
- (a) $\sqrt{2gR}$ (b) $\sqrt{gR}$
(c) $\sqrt{\frac{3}{2}gR}$ (d) $\sqrt{4gR}$

2. Find the average value of current shown graphically from $t = 0$ to $t = 2$ s.



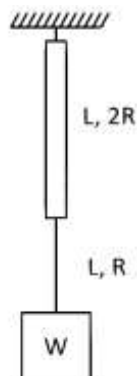
- (a) 3 A (b) 5 A
(c) 10 A (d) 4 A

3. A force of $F = 0.5$ N is applied on lower block as shown in figure. The work done by lower block on upper block for a displacement of 3 m of the upper block with respect to ground is (Take, $g = 10 \text{ m/s}^2$)



- (a) -0.5 J (b) 0.5 J
(c) 2 J (d) -2 J

4. Two wires of the same material (Young's modulus = Y) and same length L but radii R and $2R$ respectively, are joined end to end and a weight w is suspended from the combination as shown in the figure. The elastic potential energy in the system is.



- (a) $\frac{3w^2L}{4\pi R^2Y}$ (b) $\frac{3w^2L}{8\pi R^2Y}$
(c) $\frac{5w^2L}{8\pi R^2Y}$ (d) $\frac{w^2L}{\pi R^2Y}$

5. A parallel plate capacitor consists of two circular plates of radius $R =$

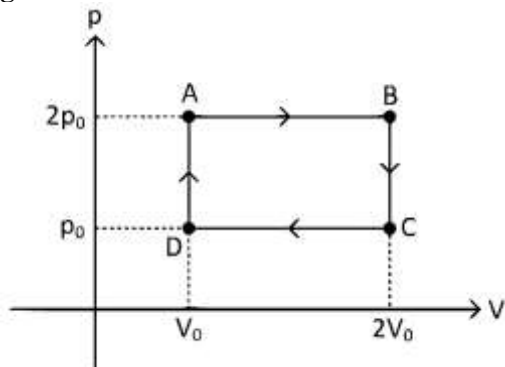
0.1 m. They are separated by a short distance. If electric field between the capacitor plates changes as $\frac{dE}{dt} = 6 \times 10^{13} \frac{\text{V}}{\text{m}\cdot\text{s}}$, then the value of displacement current is.

- (a) 15.25 A (b) 6.25 A
(c) 16.67 A (d) 4.69 A

6. Power of biconvex lens is P diopter. When it is cut into two symmetrical halves by a plane containing the principal axis. The ratio of power of two halves is.

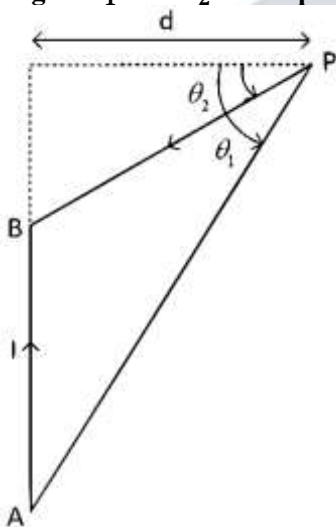
- (a) 1 : 2 (b) 2 : 1
(c) 1 : 4 (d) 1 : 1

7. In the given cycle $ABCD$, the heat required for an ideal monoatomic gas will be.



- (a) $p_0 V_0$ (b) $-\frac{13}{2} p_0 V_0$
(c) $\frac{11}{2} p_0 V_0$ (d) $4 p_0 V_0$

8. The straight wire AB carries a current I . The ends of the wire subtend angles θ_1 and θ_2 at the point P as shown in figure. The magnetic field at the point P is.



- (a) $\frac{\mu_0 I}{4\pi d} (\sin \theta_1 - \sin \theta_2)$
(b) $\frac{\mu_0 I}{4\pi d} (\sin \theta_1 + \sin \theta_2)$
(c) $\frac{\mu_0 I}{4\pi d} (\cos \theta_1 - \cos \theta_2)$
(d) $\frac{\mu_0 I}{4\pi d} (\cos \theta_1 + \cos \theta_2)$

9. Inside a solenoid of radius 0.5 m, magnetic field is changing at a rate of $50 \times 10^{-6} \text{ T/s}$. Acceleration of an electron placed at a distance of 0.3 m from axis of solenoid will be.

- (a) $23 \times 10^6 \text{ ms}^{-2}$ (b) $26 \times 10^6 \text{ m/s}^2$
(c) $1.3 \times 10^9 \text{ ms}^{-2}$ (d) $26 \times 10^9 \text{ m/s}^2$

10. Which of the following transitions of He^+ ion will give rise to spectral line which has same wavelength as the spectral line in hydrogen atom?

- (a) $n = 4$ to $n = 2$ (b) $n = 6$ to $n = 5$
(c) $n = 6$ to $n = 3$ (d) None of these

11. Young's double slit experiment is performed in a medium of

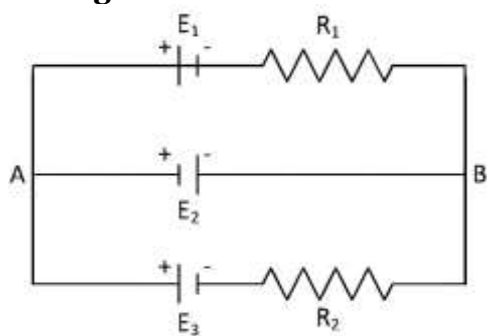
refractive index of 1.33 . The maximum intensity is I_0 . The intensity at a point on the screen, where path difference between the light coming out from slits is $\frac{\lambda}{4}$, is

- (a) 0 (b) $\frac{I_0}{2}$
(c) $\frac{3I_0}{8}$ (d) $\frac{2I_0}{3}$

12. The magnifying power of a telescope is 9 . When it is adjusted for parallel rays, the distance between the objective and eyepiece is 20 cm . The ratio of focal length of objective lens to focal length of eyepiece is found to be m , then the value of m is

- (a) 8 (b) 7
(c) 9 (d) 12

13. In the given circuit, $E_1 = E_2 = E_3 = 2\text{ V}$ and $R_1 = R_2 = 4\Omega$, then current flowing through the branch AB is



- (a) zero (b) 2A from A and B
(c) 2A from B to A (d) 5A from B to A

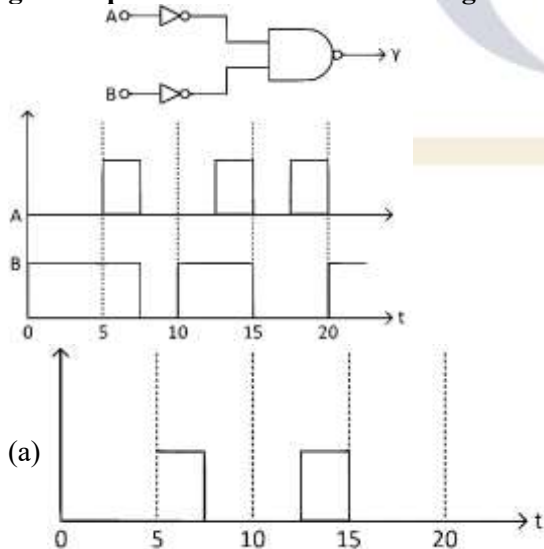
14. An oil drop of radius $1\mu\text{ m}$ is held stationary under a constant electric field of $3.65 \times 10^4\text{ N/C}$ due to some excess electrons presence on it. If the density of oil drop is 1.26 g/cm^3 , then number of excess electrons on the oil drop approximately are [Take, $g = 10\text{ ms}^{-2}$]

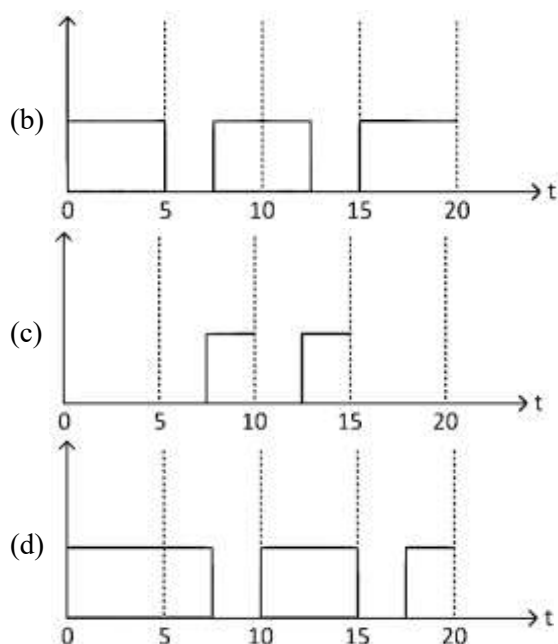
- (a) 7 (b) 12
(c) 9 (d) 8

15. In YDSE, monochromatic light falls on a screen 1.80 m from two slits separated by 2.08 mm . The first and second order bright fringes are separated by 0.553 mm . The wavelength of light used is

- (a) 520 nm (b) 639 nm
(c) 715 nm (d) None of these

16. Identify the correct output signal Y in the given combination of gates for the given inputs A and B shown in the figure.





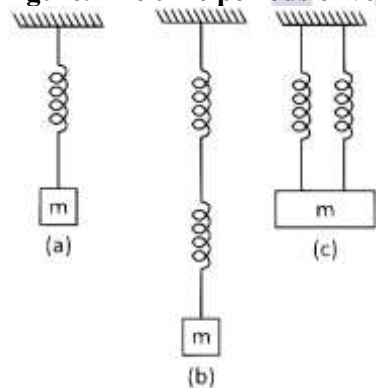
17. The moment of inertia of a cube of mass m and side a about one of its edges is equal to.

- (a) $\frac{2}{3}ma^2$ (b) $\frac{4}{3}ma^2$
(c) $3ma^2$ (d) $\frac{8}{3}ma^2$

18. The potential of a large liquid drop when eight liquid drops are combined is 20 V, then the potential of each single drop was

- (a) 10 V (b) 7.5 V
(c) 5 V (d) 2.5 V

19. Five identical springs are used in the three configurations as shown in figure. The time periods of vertical oscillations in configurations (a), (b) and (c) are in the ratio.



- (a) $1: \sqrt{2}: \frac{1}{\sqrt{2}}$ (b) $2: \sqrt{2}: \frac{1}{\sqrt{2}}$
(c) $\frac{1}{\sqrt{2}}: 2: 1$ (d) $2: \frac{1}{\sqrt{2}}: 1$

20. A pendulum of mass 1 kg and length $l = 1$ m is released from rest at angle $\theta = 60^\circ$. The power delivered by all the forces acting on the bob at angle $\theta = 30^\circ$ will be (Take, $g = 10 \text{ m/s}^2$)

- (a) 13.4 W (b) 20.4 W
(c) 24.6 W (d) zero

21. A projectile is projected with velocity of 40 m/s at an angle θ with the horizontal. If R be the horizontal range covered by the projectile and after t seconds, its inclination with horizontal becomes zero, then the value of $\cot \theta$ is [Take, $g = 10 \text{ m/s}^2$]

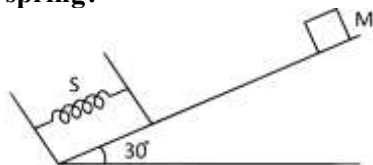
- (a) $\frac{R}{20t^2}$ (b) $\frac{R}{10t^2}$
(c) $\frac{5R}{t^2}$ (d) $\frac{R}{t^2}$

22. A dust particle of mass $4 \times 10^{-12} \text{ mg}$ is suspended in air under the influence of an

electric field of 50 N/C directed vertically upwards. How many electrons were removed from the neutral dust particle? [Take, $g = 10 \text{ m/s}^2$]

- (a) 15 (b) 8
(c) 5 (d) 4

23. An ideal massless spring S can be compressed 1 m by a force of 100 N in equilibrium. The same spring is placed at the bottom of a frictionless inclined plane inclined at 30° to the horizontal. A 10 kg block M is released from rest at the top of the incline and is brought to rest momentarily after compressing the spring by 2 m . If $g = 10 \text{ m/s}^2$, what is the speed of mass just before it touches the spring?



- (a) $\sqrt{20} \text{ m/s}$ (b) $\sqrt{30} \text{ m/s}$
(c) $\sqrt{10} \text{ m/s}$ (d) $\sqrt{40} \text{ m/s}$

24. You measure two quantities as $A = 1.0 \text{ m} \pm 0.2 \text{ m}$, $B = 2.0 \text{ m} \pm 0.2 \text{ m}$. We should report correct value for $\sqrt{AB}$ as

- (a) $1.4 \text{ m} \pm 0.4 \text{ m}$ (b) $1.41 \text{ m} \pm 0.15 \text{ m}$
(c) $1.4 \text{ m} \pm 0.3 \text{ m}$ (d) $1.4 \text{ m} \pm 0.2 \text{ m}$

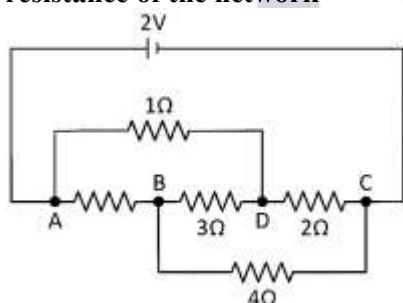
25. A rigid body rotates about a fixed axis with variable angular velocity equal to $\alpha - \beta t$, at the time t , where α, β are constants. The angle through which it rotates before it stops is.

- (a) $\frac{\alpha^2}{2\beta}$ (b) $\frac{\alpha^2 - \beta^2}{2\alpha}$
(c) $\frac{\alpha^2 - \beta^2}{2\beta}$ (d) $\frac{(\alpha - \beta)\alpha}{2}$

26. Electric field at point $(30, 30, 0)$ due to a charge of $0.008 \mu\text{C}$ placed at origin will be, (coordinates are in cm)

- (a) 8000 NC^{-1} (b) $4000(\hat{i} + \hat{j}) \text{ NC}^{-1}$
(c) $200\sqrt{2}(\hat{i} + \hat{j}) \text{ NC}^{-1}$ (d) $400\sqrt{2}(\hat{i} + \hat{j}) \text{ NC}^{-1}$

27. In the following circuit diagram, when 3Ω resistor is removed, then equivalent resistance of the network



- (a) increases (b) decreases
(c) remains same (d) None of these

28. A conducting wire is stretched by applying a deforming force, so that its diameter decreases to 40% of original value. The percentage change in its resistance will be.

- (a) 0.9% (b) 0.12%
(c) 1.6% (d) 0.5%

29. A ball falling freely from a height of 4.9 m/s , hits a horizontal surface.

If $e = \frac{3}{4}$, then the ball will hit the surface, second time after.

- (a) 1.0 s (b) 1.5 s
(c) 2.0 s (d) 3.0 s

30. In a mixture of gases, the average number of degree of freedoms per molecule is 6 . The rms speed of the molecule of the gas is c , then the velocity of sound in the gas is.

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

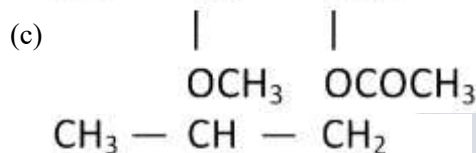
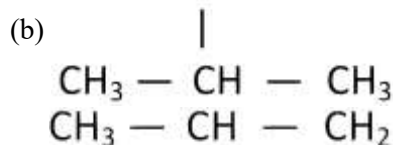
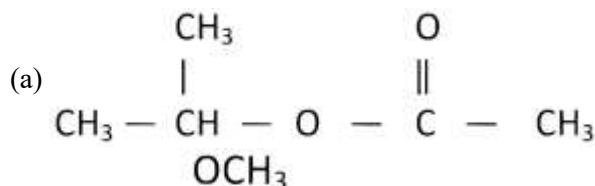
PART-II Chemistry

31. The degeneracy of hydrogen atom that has energy equal to $-\frac{R_H}{9}$ is

(where, R_H = Rydberg constant)

- (a) 6 (b) 8
(c) 5 (d) 9

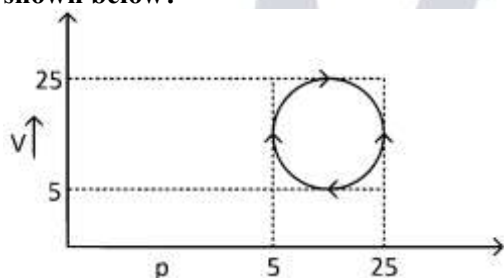
32. The final product in following reaction Y is, $\text{CH}_3\text{CH}=\text{CH}_2 \xrightarrow[\text{(ii) NaBH}_4]{\text{(i) (CH}_3\text{COO)}_2\text{Hg} \cdot \text{CH}_3\text{OH}} Y$.



33. A dimolar solution potassium ferrocyanide is 50% dissociated at 300 K. The osmotic pressure of solution is ($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$)

- (a) 7.48 atm (b) 4.99 atm
(c) 3.74 atm (d) 6.23 atm

34. What would be the amount of heat absorbed in the cyclic process shown below?



- (a) 5π J (b) 15π J
(c) 25π J (d) 100π J

35. What is the stoichiometric coefficient of SO_2 in the following balance reaction? $\text{MnO}_4^-(aq) + \text{SO}_2(g) \rightarrow \text{Mn}^{2+}(aq) + \text{HSO}_4^-(aq)$ (in acidic solution)

- (a) 5 (b) 4
(c) 3 (d) 2

36. If the de-broglie wavelength of a particle of mass (m) is 100 times its velocity. Then, its value in terms of its mass (m) and plank constant (h) is.

- (a) $\frac{1}{10} \sqrt{\frac{m}{h}}$ (b) $10 \sqrt{\frac{h}{m}}$
(c) $\frac{1}{10} \sqrt{\frac{h}{m}}$ (d) $10 \sqrt{\frac{m}{h}}$

37. Electron affinity is positive, when

- (a) O^{2-} changes into O^-

- (b) O^- changes to O^{2-}
 (c) O changes into O^+
 (d) O changes to O^{2+}

38. The bond dissociation energy of X_2 , Y_2 and XY are in the ratio of 1: 0.5: 1. ΔH for the formation of XY is -200 kJ/mol. The bond dissociation energy of X_2 will be.

- (a) 200 kJ/mol (b) 100 kJ/mol
 (c) 400 kJ/mol (d) 800 kJ/mol

39. The pH of 1 N aqueous solutions of HCl , CH_3COOH and $HCOOH$ follows the order:

- (a) $HCl > HCOOH > CH_3COOH$
 (b) $HCl = HCOOH > CH_3COOH$
 (c) $CH_3COOH > HCOOH > HCl$
 (d) $CH_3COOH = HCOOH > HCl$

40. The ionic radii in Å of N^{3-} , O^{2-} and F^- are respectively.

- (a) 1.71, 1.40 and 1.36
 (b) 1.71, 1.36 and 1.40
 (c) 1.36, 1.40 and 1.71
 (d) 1.36, 1.71 and 1.40

41. 20 mL of 0.1 M acetic acid is mixed with 50 mL of potassium acetate.

K_a of acetic acid = 1.8×10^{-5} at $27^\circ C$. Calculate the concentration of potassium acetate if pH of mixture is 4.8

- (a) 0.1 M (b) 0.04 M
 (c) 0.4 M (d) 0.02 M

42. 58.5 g of $NaCl$ and 180 g of glucose were separately dissolved in 1000 mL

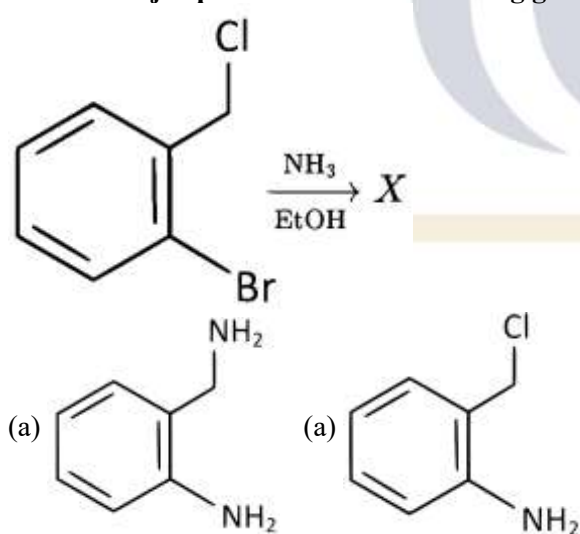
of water. Identify the correct statement regarding the elevation of boiling point of the resulting solution.

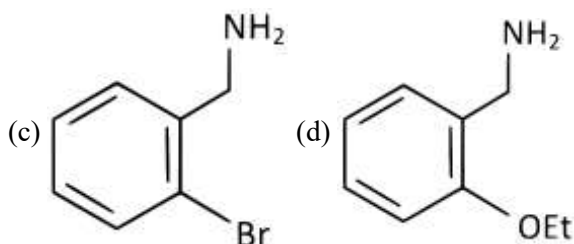
- (a) $NaCl$ solution will show higher elevation of boiling point.
 (b) Glucose solution will show higher elevation of boiling point.
 (c) Both the solution will show equal elevation of boiling point.
 (d) None will show boiling point elevation.

43. The number of geometrical isomers possible for the compound, $CH_3CH = CH - CH = CH_2$ is.

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

44. The major product X in the following given reaction is.





45. The pH of 0.5 L of 1.0 M NaCl solution after electrolysis for 965 s using 5.0 A current is,

- (a) 1.0 (b) 12.7
(c) 1.30 (d) 13.0

46. Intramolecular hydrogen bonding is found in.

- (a) o-nitrophenol (b) m-nitrophenol
(c) p-nitrophenol (d) pheno

47. Calculate the molarity of a solution containing 5 g of NaOH dissolved in the product of $H_2 - O_2$ fuel cell operated at 1 A current for 595.1 hours. (Assume $F = 96500 C/mol$ of electron and molecular weight of NaOH as $40 g mol^{-1}$).

- (a) 0.625 M (b) 0.05 M
(c) 0.1 M (d) 6.25 M

48. The hybridisation scheme for the central atom includes a d-orbital contribution in.

- (a) I_3^- (b) PCl_3
(c) NO_3^- (d) H_2Se

49. Which of the following compounds will undergo self aldol condensation in the presence of cold dilute alkali?

- (a) $CH_2 = CH - CHO$ (b) $CH \equiv C - CHO$
(c) C_6H_5CHO (d) CH_3CH_2CHO

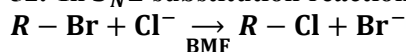
50. Volume of $M/8KMnO_4$ solution required to react completely with $25.0 cm^3$ of $M/4FeSO_4$ in acidic medium is.

- (a) 8.0 mL (b) 5.0 mL
(c) 15.0 mL (d) 10.0 mL

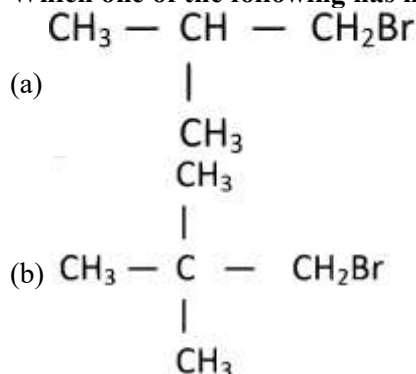
51. Cheilosis and digestive disorders are due to deficiency of.

- (a) Vitamin A (b) Thiamine
(c) Riboflavin (d) Ascorbic acid

52. In S_N2 substitution reaction of the type



Which one of the following has highest relative rate?



- (c) CH_3CH_2Br
(d) $CH_3CH_2CH_2Br$

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

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

(d) $6 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$

54. If for a first order reaction, the value of A and E_a are $4 \times 10^{13} \text{ s}^{-1}$ and

98.6 kJ mol^{-1} respectively, then at what temperature will its half life period be 10 minutes?

- (a) 330 K (b) 300 K
(c) 330.95 K (d) 311.15 K

55. A tetrapeptide is made of naturally occurring alanine, serine, glycine

and valine. If the C-terminal amino acid is alanine and N terminal amino acid is chiral, the number of possible sequence of the tetrapeptide is.

- (a) 4 (b) 8
(c) 6 (d) 12

56. In the following species, how many species have same magnetic moment?

(i) Cr^{2+} (ii) Mn^{3+}

(iii) Ni^{3+} (iv) Sc^{2+}

(v) Zn^{2+} (vi) V^{3+}

(vii) Ti^{+}

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

57. The spin only magnetic moment of Fe^{3+} ion (in BM) is approximately.

- (a) 4 (b) 5
(c) 6 (d) 7

58. Hybridisation and geometry of $[\text{Ni}(\text{CN})_4]^{2-}$ are.

- (a) sp^3d and tetrahedral
(b) sp^3 and square planar
(c) sp^3 and tetrahedral
(d) dsp^2 and square planar

59. Match List I with List II.

List I (Complex)	List II (Oxidation number of metal)
A. $\text{Ni}(\text{CO})_4$	I. +1
B. $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]^{2+}$	II. Zero
C. $[\text{Co}(\text{CO})_5]^{2-}$	III. -1
D. $[\text{Cr}_2(\text{CO})_{10}]^{2-}$	IV. -2

Choose the correct answer from the options given below:

- (a) A-II, B-I, C-IV, D-III
(b) A-II, B-IV, C-I, D-III
(c) A-II, B-III, C-I, D-IV
(d) A-I, B-II, C-IV, D-III

60. The major product of the reaction between $\text{CH}_3\text{CH}_2\text{ONa}$ and $(\text{CH}_3)_3\text{CCl}$ in ethanol is

- (a) $\text{CH}_3\text{CH}_2\text{OC}(\text{CH}_3)_3$ (b) $\text{CH}_2 = \text{C}(\text{CH}_3)_2$
(c) $\text{CH}_3\text{CH}_2\text{C}(\text{CH}_3)_3$ (d) $\text{CH}_3\text{CH} = \text{CHCH}_3$

PART- III (A) ENGLISH PROFICIENCY

61. Select the one which best expresses the same sentence in Passive/Active Voice. It is your duty to help the poor people in your parish.

- (a) The poor people in your parish are to be helped by you.
(b) It is suggested. that you do your duty to help the poor in your parish.
(c) The poor people in the parish are helped by you as duty.
(d) You may be allowed to help the poor people in your parish.

62. Directions Choose the word opposite in meaning to the given word.

Jeopardy

- (a) Precaution (b) Risk
(c) Danger (d) Safety

63. Directions Choose the word opposite in meaning to the given word.

Cacophony

- (a) Colophony (b) Symphony
(c) Polyphony (d) Antiphony

64. Directions In the following questions, choose the one which can be substituted for the given words/ sentences. A formal statement testifying to someone's character and qualifications.

- (a) Testimonial (b) Manuscript
(c) Document (d) Affidavit

65. Directions In the following questions, choose the one which can be substituted for the given words/ sentences. Symbols of royalty

- (a) Sceptre (b) Relic
(c) Emblem (d) Regalia

66. Choose the sentence that means the same as the given sentence. I woke up early lest I should be late for office.

- (a) I got late for office as I didn't wake up early.
(b) In order to avoid getting late for office, I woke up early.
(c) I could get late for office so I tried to wake up early.
(d) Getting late for office can be avoided by waking up early.

67. Directions Given below are four jumbled sentences. Select the option that gives their correct order forming a meaningful and coherent paragraph.

- A. Unfortunately, it is narrowly defined as protecting water sources in the immediate vicinity.
B. The larger dimensions are often left out.
C. Source sustainability also needs to be made a convergence priority.
D. Prioritising drinking water source sustainability is one of the essential priorities identified.

- (a) DABC (b) DBCA
(c) ADBC (d) BCAD

68. Directions Given below are four jumbled sentences. Select the option that gives their correct order forming a meaningful and coherent paragraph.

- A. Green managements are about the environment and sustainability.
B. Adopting green innovation by companies and organisations keeps the environment healthy and clean.
C. It can cause enormous changes in companies operations to green their products, operations, and facilities.
D. It can change their sustainability business to competitive advantages.

- (a) ACDB (b) ADCB
(c) BADC (d) BDAC

69. Directions Choose the word which best expresses the meaning of the underlined word. The soldiers showed fortitude and resilience while facing the opponents.

- (a) Ingenuity (b) Atrocity
(c) Bravery (d) Conscientiousness

70. Directions Choose the word which best expresses the meaning of the underlined word. As the effect of anesthesia dissipated, the patient regained consciousness.

- (a) Enhanced (b) Heightened
(c) Returned (d) Disappeared

PART- III (B) Logical Reasoning

71. Which number will replace the question mark (?) in the given series?

47, 51, 55, 63, 87, ?

- (a) 190 (b) 183
(c) 121 (d) 155

72. Select the number that is related to the third number in the same way as the second number is related to the first number.

19: 12 :: 23: ?

- (a) 21 (b) 17
(c) 14 (d) 13

73. 'Bat' is related to 'Mammal' in the same way as 'Spiders' is related to

- (a) Reptile (b) Arthropoda
(c) Amphibian (d) Vertebrate

74. Select the word-pair in which the two words are related in the same way as are the two words in the following word-pair. Grapes Bunch

- (a) Tree-Forest (b) Sheep-Herd
(c) Flower-Garden (d) Star-Galaxy

75. Select the option in which the number are related in the same way as are the number in the following set. 47: 56: 29

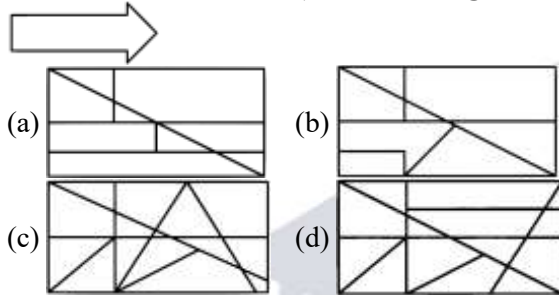
- (a) 31: 40: 24 (b) 43: 35: 8
(c) 97: 105: 78 (d) 21: 30: 3

76. Which letter-cluster will replace the question mark (?) in the given series.

ZKPE, BOVM, DSBV, FWHC, ?

- (a) HANK (b) HVNK
(c) HXZA (d) AVOS

77. Select the option that is embedded in the given figure as its part (rotation is not allowed). Question Figure



78. 'P # Q' means 'P' is the brother of 'Q'. 'P @ Q' means 'P' is the daughter of 'Q'.

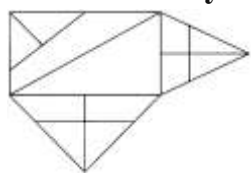
P % Q' means 'P' is the father of 'Q'.

'P \& Q' means 'P' is the mother of 'Q'.

If 'A @ B # C \& E @ F 1% R, then which of the following statement is correct.

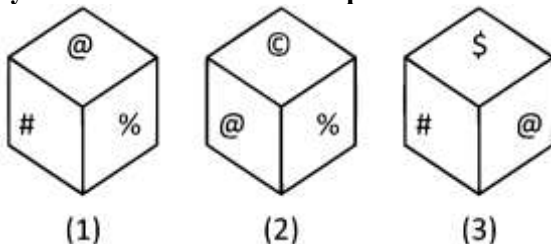
- (a) C is the brother of B.
(b) A is the cousin of E.
(c) F is the brother of R.
(d) B is the maternal aunt of E.

79. How many triangles are there in the following figure?



- (a) 14 (b) 17
(c) 16 (d) 13

80. Three different positions of the same dice are shown below. Select the symbol that will be at the top if '%' is at the bottom.



- (a) # (b) (c)
(c) @ (d) \$

81. In a row all the women are facing South, Monika is 29 th from the left end and in the right side of Monika, there are only 19 women. Find the total number of women in this queue?

- (a) 51 (b) 48
(c) 43 (d) 53

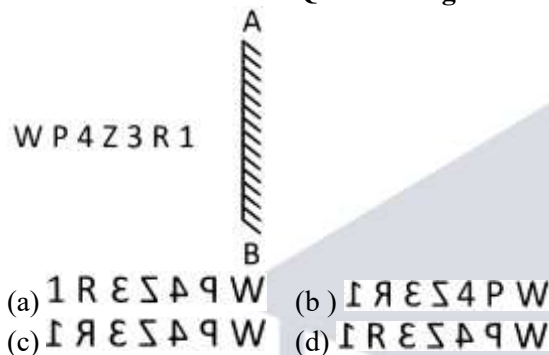
82. In a code language, if 'VERTEX' is written as '3 – 20 – 7 – 5 – 20 – 1', then how will 'CONDUCT' be written in same language.

- (a) 22 – 9 – 11 – 21 – 4 – 22 – 5
(b) 22 – 10 – 11 – 21 – 4 – 22 – 5
(c) 22 – 10 – 11 – 20 – 4 – 21 – 6
(d) 22 – 10 – 11 – 21 – 5 – 23 – 5

83. Pritam, Queen, Rani, Sachin, Tinu, Uri, Vineet and Sohan are sitting round the circular table, all are facing the center. Pritam is second to the right of Tinu who is the neighbor of Rani and Vineet. Sachin is not the neighbor of Pritam. Vineet is the neighbour of Uri. Queen is not between Sachin and Sohan. Sohan is not between Uri and Sachin. Who is sitting immediate right to the Vineet?

- (a) Tinu (b) Sachin
(c) Sohan (d) Pritam

84. Select the correct mirror image of the given combination when the mirror is placed at AB as shown below. Question Figures



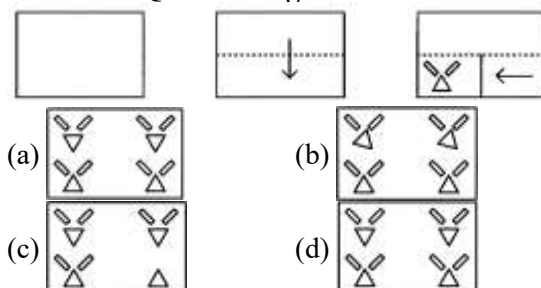
85. In the given question below are given some statements followed by two conclusions numbered I and II. You have to take the given statements to be true even if they seem to be at variance from commonly known facts. Read all the conclusions and then decide which of the given conclusions logically follow.

Statements
All facebook are whatsapp.
Some whatsapp are Paytm.
No Paytm is Telegram.

Conclusions
Some Telegram is a Facebook.
Some Whatapp is not Telegram.

- (a) Only I follows
(b) Only II follows
(c) Neither I nor II follows
(d) Both I and II follow.

86. A paper is folded and cut as shown below. How will it appear when unfolded? Question Figure



87. In the given question a statement is followed by two conclusions I and II. Taking the statement to be true decide which of the given conclusions definitely follows from the given statement.

Statement The team manager humiliated Satish in front of his colleagues on a Monday Morning.

Conclusions

I. The team manager did not like Satish.

II. Satish was not as popular as his other colleagues.

(a) Only Conclusion I is true.

(b) Only Conclusion II is true.

(c) Both Conclusions I and II are true.

(d) Neither conclusion I nor II is true.

88. The product of the ages of Anil and Bishnu is 240 . If twice the age of Bishnu is more than Anil's age by 4 yr . What was Bishnu's age 2 years ago?

(a) 10 year (b) 15 year

(c) 11 year (d) 13 year

89. Number of solutions of equations $\sin 9\theta = \sin \theta$ in the interval $[0, 2\pi]$

Is.

(a) 16

(b) 17

(c) 18

(d) 15

90. The probability of getting 10 in a single throw of three fair dice is.

(a) $\frac{1}{6}$ (b) $\frac{1}{8}$

(c) $\frac{1}{9}$ (d) $\frac{1}{5}$

PART-IV Mathematics

91. Roots of the equation $x^2 + bx - c = 0 (b, c > 0)$ are.

(a) both positive (b) both negative

(c) of opposite sign (d) None of the above

92. If $a > 0, b > 0, c > 0$ and a, b, c are distinct, then $(a + b)(b + c)(c + a)$ is greater than

(a) $2(a + b + c)$

(b) $3(a + b + c)$

(c) $6abc$

(d) $8abc$

93. The locus of the point of intersection of the lines $x = a \left(\frac{1-t^2}{1+t^2} \right)$ and $y = \frac{2at}{1+t^2}$ represent

(t being a parameter)

(a) Circle

(b) Parabola

(c) Ellipse

(d) Hyperbola

94. Let A, B and C are the angles of a triangle and $\tan \frac{A}{2} = \frac{1}{3}, \tan \frac{B}{2} = \frac{2}{3}$. Then,

$\tan \frac{C}{2}$ is equal to.

(a) $\frac{7}{9}$ (b) $\frac{2}{9}$

(c) $\frac{1}{3}$ (d) $\frac{2}{3}$

95. If $A = \frac{1}{3} \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is an orthogonal matrix, then.

(a) $a = -2, b = -1$ (b) $a = 2, b = 1$

(c) $a = 2, b = -1$ (d) $a = -2, b = 1$

96. The points represented by the complex number $1 + i, -2 + 3i, \frac{5}{3}i$ on the argand plane are.

(a) Vertices of an equilateral triangle

(b) Vertical of an isosceles triangle

(c) Collinear

(d) None of the above

97. Let $\mathbf{a} = \hat{i} - \hat{k}, \mathbf{b} = x\hat{i} + \hat{j} + (1 - x)\hat{k}$ and $\mathbf{c} = y\hat{i} + x\hat{j} + (1 + x - y)\hat{k}$. Then, $[abc]$ depends on

(a) only y

(b) only x

(c) both x and y

(d) neither x nor y

98. The magnitude of projection of line joining $(3, 4, 5)$ and $(4, 6, 3)$ on

the line joining $(-1, 2, 4)$ and $(1, 0, 5)$ is.

- (a) $\frac{4}{3}$ (b) $\frac{2}{3}$
(c) $\frac{8}{3}$ (d) $\frac{1}{3}$

99. The Boolean expression $\sim (p \vee q) \vee (\sim p \wedge q)$ is equivalent to.

- (a) p (b) $\sim q$
(c) q (d) $\sim pa$

100. If $\sum_{k=1}^n k(k+1)(k-1) = pn^4 + qn^3 + tn^2 + sn$, where p, q, t and s are constants, then the value of s is equal to.

- (a) $-\frac{1}{4}$ (b) $-\frac{1}{2}$
(c) $\frac{1}{2}$ (d) $\frac{1}{4}$

101. In a binomial distribution, the mean is 4 and variance is 3. Then, its mode is

- (a) 5 (b) 6
(c) 4 (d) None of these

102. The maximum area of rectangle inscribed in a circle of diameter R is.

- (a) R^2 (b) $\frac{R^2}{2}$
(c) $\frac{R^2}{4}$ (d) $\frac{R^2}{8}$

103. In a statistical investigation of 1003 families of Calcutta, it was found that 63 families has neither a radio nor a TV, 794 families has a radio and 187 has TV. The number of families in that group having both a radio and a TV is.

- (a) 36 (b) 41
(c) 32 (d) None of these

104. The foci of hyperbola $4x^2 - 9y^2 - 1 = 0$ are.

- (a) $(\pm\sqrt{13}, 0)$ (b) $(\pm\frac{\sqrt{13}}{6}, 0)$
(c) $(0, \pm\frac{\sqrt{3}}{6})$ (d) None of these

105. Let $[x]$ denote the greatest integer $\leq x$. If $f(x) = [x]$ and $g(x) = |x|$, then the value of $f\left(g\left(\frac{8}{5}\right)\right) - g\left(f\left(-\frac{8}{5}\right)\right)$ is.

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

106. Let f be the function defined by

$$f(x) = \begin{cases} \frac{x^2 - 1}{x^2 - 2|x - 1| - 1}, & x \neq 1 \\ \frac{1}{2}, & x = 1 \end{cases}$$

- (a) The function is continuous for all values of x
(b) The function is continuous only for $x > 1$
(c) The function is continuous at $x = 1$
(d) The function is not continuous at $x = 1$.

107. If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, then $\frac{dy}{dx} =$

- (a) $\frac{x+1}{x-1}$ (b) $\frac{1}{1+x}$
(c) $\frac{-1}{(1+x)^2}$ (d) $\frac{x}{1+x}$

108. Consider the function $f(x) = \frac{|x-1|}{x^2}$, then $f(x)$ is.

- (a) increasing in $(0,1) \cup (2, \infty)$
(b) increasing in $(-\infty, 0) \cup (0,1)$
(c) decreasing in $(-\infty, 0) \cup (2, \infty)$
(d) decreasing in $(0,1) \cup (2, \infty)$

109. There are four numbers of which the first three are in GP and the last three are in

AP, whose common difference is 6 . If the first and the last numbers are equal, then two other numbers are.

- (a) -2,4 (b) -4,2
(c) 2,6 (d) None of the above

110. $\int_0^{\infty} \frac{dx}{(x^2+a^2)(x^2+b^2)}$ is.

- (a) $\frac{\pi ab}{a+b}$ (b) $\frac{ab}{2(a+b)}$
(c) $\frac{\pi}{2ab(a+b)}$ (d) $\frac{\pi(a+b)}{2ab}$

111. The line $y = mx$ bisects the area enclosed by lines $x = 0, y = 0$ and $x = \frac{3}{2}$ and the curve $y = 1 + 4x - x^2$. Then, the value of m is.

- (a) $\frac{13}{6}$ (b) $\frac{13}{2}$
(c) $\frac{13}{5}$ (d) $\frac{13}{7}$

112. The solution of the differential equation $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$ is.

- (a) $y = (x+1)e^{3x} + C$
(b) $3y = (x+1) + e^{3x} + C$
(c) $\frac{3y}{x+1} = e^{3x} + C$
(d) $ye^{-3x} = 3(x+1) + C$

113. Number of real solution of $\sqrt{5 - \log_2 |x|} = 3 - \log_2 |x|$ is equal to.

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

114. The value of definite integral $\int_0^{\pi/2} \log(\tan x) dx$ is .

- (a) 0 (b) $\frac{\pi}{4}$
(c) $\frac{\pi}{2}$ (d) π

115. If the number of available constraints is 3 and the number of parameters to be optimize is 4 , then

- (a) the objective function can be optimized
(b) the constraint are short in number
(c) the solution is problem oriented
(d) None of the above

116. The locus of the mid-point of a chord of the circle $x^2 + y^2 = 4$, which subtends a right angle at the origin is.

- (a) $x + y = 2$ (b) $x^2 + y^2 = 1$
(c) $x^2 + y^2 = 2$ (d) $x + y = 1$

117. A person invites a party of 10 friends at dinner and place so that 4 are on one round table and 6 on the other round table. The number of ways in which he can arrange the guests is.

- (a) $\frac{10!}{6!}$ (b) $\frac{10!}{24}$
(c) $\frac{9!}{24}$ (d) None of these

118. From the top of a cliff 50 m high, the angles of depression of the top and bottom of a tower are observed to be 30° and 45° . The height of tower is

- (a) 50 m (b) $50\sqrt{3}$ m
(c) $50(\sqrt{3} - 1)$ m (d) $50\left(1 - \frac{\sqrt{3}}{3}\right)$ m

119. If $y = \tan^{-1}\left(\frac{\sqrt{x}-x}{1+x^2}\right)$, then $y'(1)$ is equal to

- (a) 0 (b) $\frac{1}{2}$
(c) -1 (d) $-\frac{1}{4}$

120. The coefficient of x^2 term in the binomial expansion of $\left(\frac{1}{3}x^{\frac{1}{2}} + x^{\frac{-1}{4}}\right)^{10}$ is.

(a) $\frac{70}{243}$
(c) $\frac{50}{13}$

(b) $\frac{60}{423}$

(d) None of these

121. If a, c, b are in GP, then the area of the triangle formed by the lines $ax + by + c = 0$ with the coordinates axes is equal to.

(a) 1 (b) 2

(c) $\frac{1}{2}$ (d) None of these

122. Suppose $p, q, r \neq 0$ and system of equation $(p + a)x + by + cz = 0, ax + (q + b)y + cz = 0, ax + by + (r + c)z = 0$, has a non-trivial solution, then the value of $\frac{a}{p} + \frac{b}{q} + \frac{c}{r}$ is.

(a) -1 (b) 0

(c) 1 (d) 2

123. The coefficient of x^n in the expansion of $\frac{e^{7x} + e^x}{e^{3x}}$ is.

(a) $\frac{4^{n-1} + (-2)^n}{n!}$

(b) $\frac{4^{n-1} + 2^n}{n!}$

(c) $\frac{4^n + (-2)^n}{n!}$

(d) $\frac{4^{n-1} + (-2)^{n-1}}{n!}$

124. The modulus of the complex number z such that $|z + 3 - i| = 1$ and $\arg(z) = \pi$ is equal to.

(a) 3 (b) 2

(c) 9 (d) 4

125. ABC is a triangular park with $AB = AC = 100$ m. A TV tower stands at the mid-point of BC . The angles of elevation of the top of the tower at A, B, C are $45^\circ, 60^\circ, 60^\circ$ respectively. The height of the tower is

(a) 50 m (b) $50\sqrt{3}$ m

(c) $50\sqrt{2}$ m (d) $50(3 - \sqrt{3})$ m

126. How many different nine digit numbers can be formed from the number 223355888 by rearranging its digits so that the odd digits occupy even positions

(a) 16 (b) 36

(c) 60 (d) 100

127. If matrix $A = \begin{bmatrix} 3 & -2 & 4 \\ 1 & 2 & -1 \\ 0 & 1 & 1 \end{bmatrix}$ and $A^{-1} = \frac{1}{k} \text{adj}(A)$,

(a) 7 (b) -7

(c) 15 (d) -11

128. The area enclosed by the curves $y = x^3$ and $y = \sqrt{x}$ is.

(a) $\frac{5}{3}$ sq. units (b) $\frac{5}{4}$ sq. units

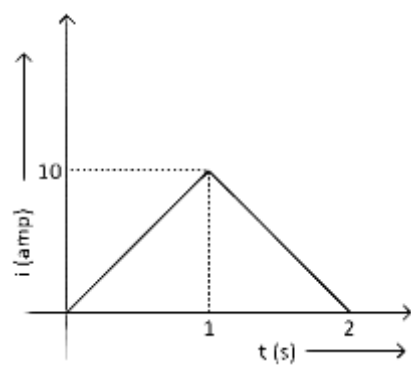
(c) $\frac{5}{12}$ sq. unit (d) $\frac{12}{5}$ sq. units then k is

129. A body which is initially at rest at a height R above the surface of the Earth of radius R , falls freely towards the Earth, then its velocity on reaching the surface of the Earth is.

(a) $\sqrt{(2gR)}$ (b) $\sqrt{(gR)}$

(c) $\sqrt{\frac{3}{2}gR}$ (d) $\sqrt{(4gR)}$

130. Find the average value of current shown graphically from $t = 0$ to $t = 2$ s.



- (a) 3 A (b) 5 A
(c) 10 A (d) 4 A

