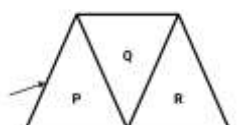


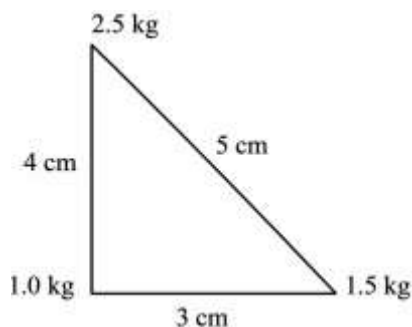
PART – I PHYSICS

- A car is moving on a horizontal curved road with radius 50 m . The approximate maximum speed of car will be, if friction between tyres and road is 0.34. [Take $g = 10 \text{ ms}^{-2}$]
 (a) 3.4 ms^{-1} (b) 22.4 ms^{-1}
 (c) 13 ms^{-1} (d) 17 ms^{-1}
- If the r.m.s. speed of chlorine molecule is 490 m/ s at 27°C , the r.m.s. speed of argon molecules at the same temperature will be (Atomic mass of argon = 39. 9u, molecular mass of chlorine = 70. 9u)
 (a) 751.7 m/s (b) 451.7 m/s
 (c) 651.7 m/s (d) 551.7 m/s
- A perfectly diamagnetic sphere has a small spherical cavity at its centre, which is filled with a paramagnetic substance. The whole system is placed in a uniform magnetic field $\vec{B}$. Then the field inside the paramagnetic substance is :

 (a) $\vec{B}$
 (b) zero
 (c) much large than $|\vec{B}|$ and parallel to $\vec{B}$
 (d) much large than $|\vec{B}|$ but opposite to $\vec{B}$
- The momentum of an electron revolving in n^{th} orbit is given by:
 (a) $\frac{nh}{2\pi r}$ (b) $\frac{nh}{2r}$
 (c) $\frac{nh}{2\pi}$ (d) $\frac{2\pi r}{nh}$
- There are two organ pipes of the same length and the same material but of different radii. When they are emitting fundamental notes
 (a) broader pipe gives note of smaller frequency
 (b) both the pipes give notes of the same frequency
 (c) narrower pipe gives note of smaller frequency
 (d) either of them gives note of smaller or larger frequency depending on the wavelength of the wave.
- Two long current carrying conductors are placed parallel to each other at a distance of 8 cm between them. The magnitude of magnetic field produced at mid-point between the two conductors due to current flowing in them is $300\mu \text{ T}$. The equal current flowing in the two conductors is :
 (a) 30 A in the same direction.
 (b) 30 A in the opposite direction.
 (c) 60A in the opposite direction.
 (d) 300 A in the opposite direction
- The critical angle of a medium for a specific wavelength, if the medium has relative permittivity 3 and relative permeability $\frac{4}{3}$ for this wavelength, will be:
 (a) 15° (b) 30°
 (c) 45° (d) 60°
- A steel rod of diameter 1.0 cm is clamped firmly at each end when its temperature is 25°C so that it cannot contract on cooling. The tension in the rod at 0°C is ($\alpha = 1 \times 10^{-5}/^\circ\text{C}$, $Y = 2 \times 10^{11} \text{ N/m}^2$):
 (a) 3925 N (b) 7000 N
 (c) 7400 N (d) 4700 N
- An object of mass 5 kg is thrown vertically upwards from the ground. The air resistance produces a constant retarding force of 10 N throughout the motion. The ratio of time of ascent to the time of descent will be equal to : [Use $g = 10 \text{ ms}^{-2}$]
 (a) 1: 1 (b) $\sqrt{2}:\sqrt{3}$

- (c) $\sqrt{3} : \sqrt{2}$ (d) 2 : 3
10. When a longitudinal wave propagates through a medium, the particles of the medium execute simple harmonic oscillations about their mean positions. These oscillations of a particle are characterised by an invariant
- (a) Kinetic energy
(b) Potential energy
(c) Sum of kinetic energy and potential energy
(d) Difference between kinetic energy and potential energy
11. A parallel plate capacitor of capacitance 2 F is charged to a potential V. The energy stored in the capacitor is E_1 . The capacitor is now connected to another uncharged identical capacitor in parallel combination. The energy stored in the combination is E_2 . The ratio E_2/E_1 is
- (a) 2 : 1 (b) 1 : 2
(c) 1 : 4 (d) 2 : 3
12. An electron moving along the x-axis has a position given by $x = 20te^{-t}$ m, where t is in second. How far is the electron from the origin when it momentarily stop?
- (a) 20 m (b) $20e$ m
(c) $\frac{20}{e}$ m (d) zero
13. A short electric dipole has a dipole moment of $16 \times 10^{-9} \text{ Cm}$. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is: $\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2/\text{C}^2\right)$
- (a) 200 V (b) 400 V
(c) zero (d) 50 V
14. In Young's double slit experiment intensity at a point is (1/4) of the maximum intensity. Angular position of this point is
- (a) $\sin^{-1}(\lambda/d)$ (b) $\sin^{-1}(\lambda/2d)$
(c) $\sin^{-1}(\lambda/3d)$ (d) $\sin^{-1}(\lambda/4d)$
15. The ranges and heights for two projectiles projected with the same initial velocity at angles 42° and 48° with the horizontal are R_1, R_2 and H_1, H_2 respectively. Choose the correct option :
- (a) $R_1 > R_2$ and $H_1 = H_2$
(b) $R_1 = R_2$ and $H_1 < H_2$
(c) $R_1 < R_2$ and $H_1 < H_2$
(d) $R_1 = R_2$ and $H_1 = H_2$
16. The displacement of a particle is represented by the equation $y = 3\cos\left(\frac{\pi}{4} - 2\omega t\right)$. The motion of the particle is
- (a) simple harmonic with period $2\pi/\omega$
(b) simple harmonic with period π/ω
(c) periodic but not simple harmonic
(d) non-periodic
17. A monochromatic neon lamp with wavelength of 670.5 nm illuminates a photo-sensitive material which has a stopping voltage of 0.48 V. What will be the stopping voltage if the source light is changed with another source of wavelength of 474.6 nm ?
- (a) 0.96 V (b) 1.25 V
(c) 0.24 V (d) 1.5 V
18. A stone of mass m tied to a string of length ℓ is rotating along a circular path with constant speed v . The torque on the stone is
- (a) $mv^2\ell$ (b) zero
(c) $m\ell v$ (d) mv^2/ℓ

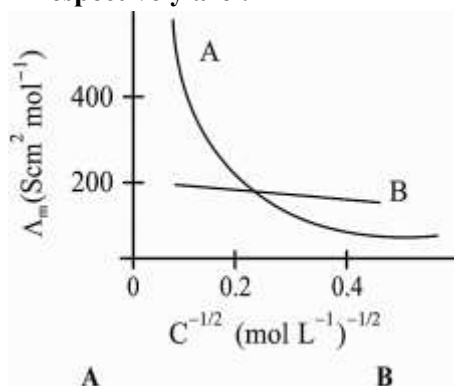
19. An ideal spring with spring-constant k is hung from the ceiling and a block of mass M is attached to its lower end. The mass is released with the spring initially unstretched. Then the maximum extension in the spring is
- (a) $4Mg/k$ (b) $2Mg/k$
(c) Mg/k (d) $Mg/2k$
20. If E , L , M and G denote the quantities as energy, angular momentum, mass and constant of gravitation respectively, then the dimensions of P in the formula $P = EL^2M^{-5}G^{-2}$ are:-
- (a) $[M^0 L^1 T^0]$ (b) $[M^{-1} L^{-1} T^2]$
(c) $[M^1 L^1 T^{-2}]$ (d) $[M^0 L^0 T^0]$
21. Two lighter nuclei combine to form a comparatively heavier nucleus by the relation given below:
 ${}^2_1X + {}^2_1X = {}^4_2Y$
 The binding energies per nucleon 2_1X and 4_2Y are 1.1 MeV and 7.6 MeV respectively. The energy released in this process is
- (a) 26 MeV (b) 56 MeV
(c) 78 MeV (d) 108 MeV
22. A particle moves under the effect of a force $F = Cx$ from $x = 0$ to $x = x_1$. The work done in the process is
- (a) Cx_1^2 (b) $\frac{1}{2}Cx_1^2$
(c) Cx_1 (d) Zero
23. A given ray of light suffers minimum deviation in an equilateral prism P . Additional prisms Q and R of identical shape and of same material as that of P are now combined as shown in figure. The ray will now suffer
- 
- (a) greater deviation
(b) no deviation
(c) same deviation as before
(d) total internal reflection
24. Polar molecules are the molecules
- (a) having a permanent electric dipole moment
(b) having zero dipole moment
(c) acquire a dipole moment only in the presence of electric field due to displacement of charges
(d) acquire a dipole moment only when magnetic field is absent
25. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :
- (a) adiabatic (b) isochoric
(c) isobaric (d) isothermal
26. In a Wheatstone's bridge, three resistances P , Q and R connected in the three arms and the fourth arm is formed by two resistances S_1 and S_2 connected in parallel. The condition for the bridge to be balanced will be
- (a) $\frac{P}{Q} = \frac{2R}{S_1+S_2}$ (b) $\frac{P}{Q} = \frac{R(S_1+S_2)}{S_1S_2}$
(c) $\frac{P}{Q} = \frac{R(S_1+S_2)}{2S_1S_2}$ (d) $\frac{P}{Q} = \frac{R}{S_1+S_2}$
27. Three point particles of masses 1.0 kg, 1.5 kg and 2.5 kg are placed at three corners of a right angle triangle of sides 4.0 cm, 3.0 cm and 5.0 cm as shown in the figure. The center of mass of the system is at a point:



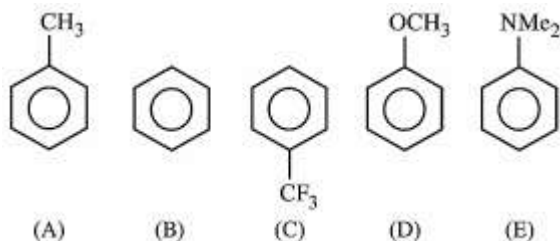
- (a) 0.6 cm right and 2.0 cm above 1 kg mass
 (b) 1.5 cm right and 1.2 cm above 1 kg mass
 (c) 2.0 cm right and 0.9 cm above 1 kg mass
 (d) 0.9 cm right and 2.0 cm above 1 kg mass
28. The potential energy of a satellite, having mass m and rotating at a height of 6.4×10^6 m from the earth surface, is
 (a) $-mgR_e$ (b) $-0.67mgR_e$
 (c) $-0.5mgR_e$ (d) $-0.33mgR_e$
29. A series LCR circuit consists of $R=80\Omega$, $X_L = 100\Omega$, and $X_C = 40\Omega$. The input voltage is $2500 \cos(100\pi t)$ V. The amplitude of current, in the circuit, is
 (a) 25 A (b) 50 A
 (c) 75 A (d) 100 A
30. A point charge $q_1 = 4q_0$ is placed at origin. Another point charge $q_2 = -q_0$ is placed at $x = 12$ cm. Charge of proton is q_0 . The proton is placed on x -axis so that the electrostatic force on the proton is zero. In this situation, the position of the proton from the origin is
 (a) 12 cm (b) 24 cm
 (c) 36 cm (d) 48 cm

PART – II CHEMISTRY

31. Electronic configuration of four elements A, B, C and D are given below:
 (A) $1s^2 2s^2 2p^3$ (B) $1s^2 2s^2 2p^4$
 (C) $1s^2 2s^2 2p^5$ (D) $1s^2 2s^2 2p^2$
 Which of the following is the correct order of increasing electronegativity (Pauling's scale) ?
 (a) $A < D < B < C$ (b) $A < C < B < D$
 (c) $A < B < C < D$ (d) $D < A < B < C$
32. The molar conductivity for electrolytes A and B are plotted against $C^{1/2}$ as shown below. Electrolytes A and B respectively are :



- (a) Weak electrolyte weak electrolyte
 (b) Strong electrolyte strong electrolyte
 (c) Weak electrolyte strong electrolyte
 (d) Strong electrolyte weak electrolyte
33. Decreasing order of reactivity towards electrophilic substitution for the following compounds is :



- (a) $C > B > A > D > E$
 (b) $E > D > A > B > C$
 (c) $A > D > E > B > C$
 (d) $D > A > E > C > B$

34. The number of valence electrons present in the metal among Cr, Co, Fe and Ni which has the lowest enthalpy of atomisation is

- (a) 8 (b) 9
 (c) 6 (d) 10

35. The Zeta potential is related to which property of colloids"

- (a) Colour
 (b) Tyndall effect
 (c) Charge on the surface of colloidal particles
 (d) Brownian movement

36. Based on the data given below:

$$E_{\text{Cr}_2\text{O}_7^{2-}/\text{Cr}^{3+}}^0 = 1.33 \text{ V} \quad E_{\text{Cl}_2/\text{Cl}^-}^0 = 1.36 \text{ V}$$

$$E_{\text{MnO}_4^-/\text{Mn}^{2+}}^0 = 1.51 \text{ V} \quad E_{\text{Cr}^{3+}/\text{Cr}}^0 = -0.74 \text{ V}$$

the strongest reducing agent is :

- (a) Mn^{2+} (b) Cr
 (c) MnO_4^- (d) Cl^-

37. An evacuated glass vessel weighs 40.0 g when empty, 135.0 g when filled with a liquid of density 0.95 g mL^{-1} and 40.5 g when filled with an ideal gas at 0.82 atm at 250 K . The molar mass of the gas in gmol^{-1} is :

(Given : $R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$)

- (a) 35 (b) 50
 (c) 75 (d) 125

38. Which one of the following equations does not correctly represent the first law of thermodynamics for the given processes involving an ideal gas? (Assume non-expansion work is zero)

- (a) Cyclic process : $q = -w$
 (b) Adiabatic process : $\Delta U = -w$
 (c) Isochoric process: $\Delta U = q$
 (d) Isothermal process: $q = -w$

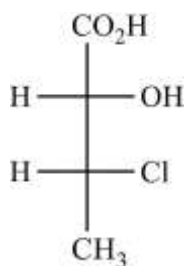
39. Half life of zero order reaction $A \rightarrow \text{product}$ is 1 hour, when initial concentration of reaction is 2.0 mol L^{-1} . The time required to decrease concentration of A from 0.50 to 0.25 mol L^{-1} is.

- (a) 0.5 hour (b) 4 hour
 (c) 15 min (d) 60 min

40. Which hydride among the following is less stable?

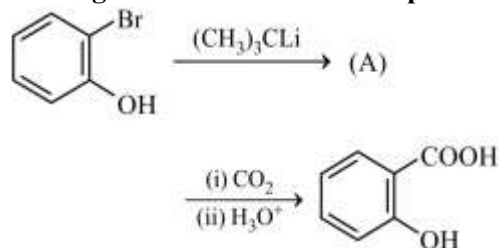
- (a) BeH_2 (b) NH_3
 (c) HF (d) LiH

41. The absolute configuration of is:



- (a) (2*S*, 3*S*) (b) (2*R*, 3*R*)
 (c) (2*R*, 3*S*) (d) (2*S*, 3*R*)

42. In the given conversion the compound A is :



- (a)
 (b)
 (c)
 (d)

43. Which type of isomerism is shown by 2, 3-dichlorobutane?

- (a) Structural (b) Geometric
 (c) Optical (d) Diastereo

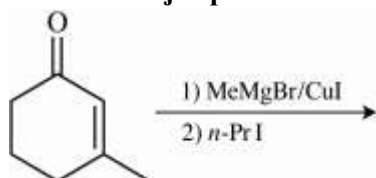
44. Suitable reaction condition for preparation of methyl phenyl ether is

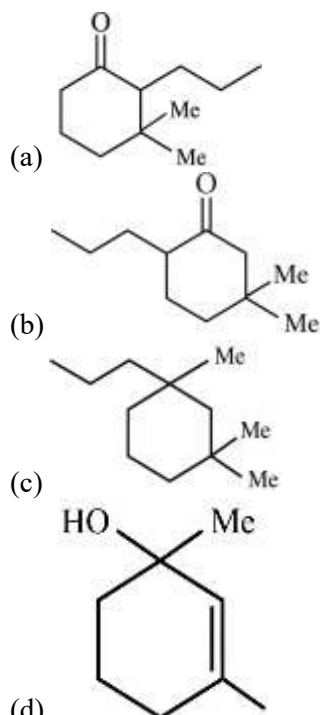
- (a) $\text{Ph} - \text{Br}, \text{MeO}^- \text{Na}^+$ (b) $\text{PhO}^- \text{Na}^+, \text{MeOH}$
 (c) $\text{PhO}^- \text{Na}^+, \text{MeBr}$ (d) Benzene, MeBr

45. The one giving maximum number of isomeric alkenes on dehydrohalogenation reaction is (excluding rearrangement)

- (a) 1-Bromo-2-methylbutane
 (b) 2-Bromopropane
 (c) 2-Bromopentane
 (d) 2-Bromo-3,3-dimethylpentane

46. Find out the major product from the following reaction

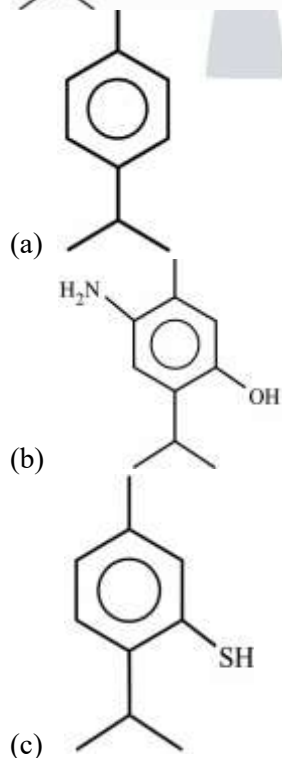
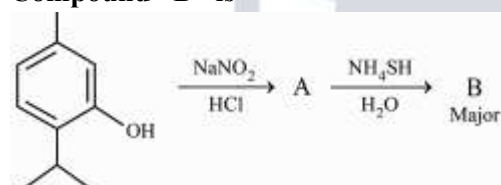


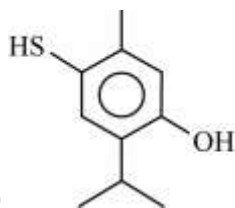


47. Which of the following compounds is likely to show both Frenkel and Schottky defects in its crystalline form?

- (a) AgBr (b) CsCl
(c) KBr (d) ZnS

48. Compound 'B' is





(d)

49. The radius of the 2nd orbit of Li^{2+} is x . The expected radius of the 3rd orbit of Be^{3+} is

- (a) $\frac{9}{4}x$ (b) $\frac{4}{9}x$
 (c) $\frac{27}{16}x$ (d) $\frac{16}{27}x$

50. Among SO_2 , NF_3 , NH_3 , XeF_2 , ClF_3 and SF_4 , the hybridization of the molecule with non-zero dipole moment and highest number of lone-pairs of electrons on the central atom is

- (a) sp^3 (b) dsp^2
 (c) $\text{sp}^3 \text{d}^2$ (d) $\text{sp}^3 \text{d}$

51. Which of these reactions is not a part of breakdown of ozone in stratosphere?

- (a) $\text{ClO}(\text{g}) + \text{O}(\text{g}) \rightarrow \text{Cl}(\text{g}) + \text{O}_2(\text{g})$
 (b) $\text{Cl}(\text{g}) + \text{O}_3(\text{g}) \rightarrow \text{ClO}(\text{g}) + \text{O}_2(\text{g})$
 (c) $2\text{ClO} \rightarrow \text{ClO}_2(\text{g}) + \text{Cl}(\text{g})$
 (d) $\text{CF}_2\text{Cl}_2(\text{g}) \xrightarrow{\text{uv}} \text{Cl}(\text{g}) + \text{CF}_2\text{Cl}(\text{g})$

52. Which of the following compounds will give silver mirror with ammoniacal silver nitrate?

- (A) Formic acid (B) Formaldehyde
 (C) Benzaldehyde (D) Acetone

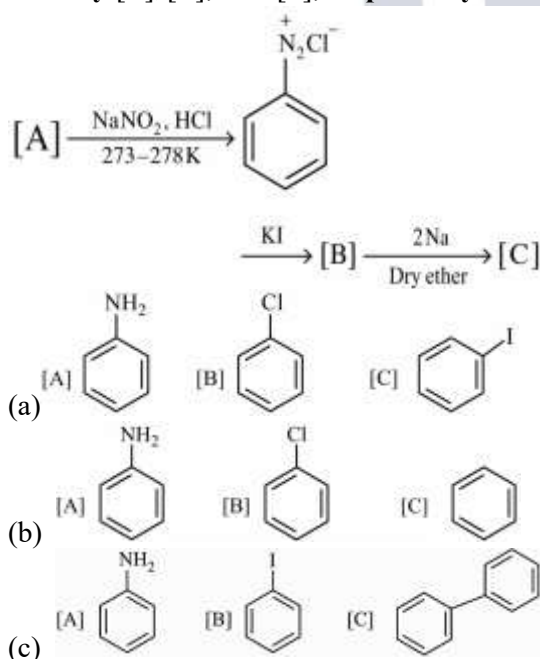
Choose the correct answer from the options given below:

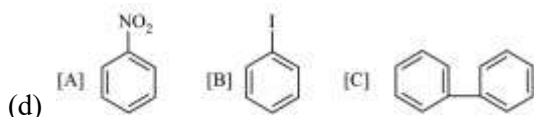
- (a) C and D only (b) A, B and C only
 (c) A only (d) B and C only

53. An antiseptic dettol is a mixture of two compounds 'A' and 'B' where A has 6π electrons and B has 2π electrons. What is 'B'?

- (a) Bithionol (b) Terpineol
 (c) Chloroxylenol (d) Chloramphenicol

54. Identify [A], [B], and [C], respectively in the following reaction sequence :





55. A vessel at 1000 K contains CO_2 with a pressure of 0.5 atm. Some of CO_2 is converted into CO on addition of graphite. If total pressure at equilibrium is 0.8 atm, then K_p is:

- (a) 0.18 atm (b) 1.8 atm
(c) 0.3 atm (d) 3 atm

56. Which of the following is NOT a correct method of the preparation of benzylamine from cyanobenzene ?

- (a) H_2/Ni
(b) (i) LiAlH_4 (ii) H_3O^+
(c) (i) $\text{SnCl}_2 + \text{HCl}$ (gas) (ii) NaBH_4
(d) (i) $\text{HCl}/\text{H}_2\text{O}$ (ii) NaBH_4

57. The molar solubility(s) of zirconium phosphate with molecular formula $(\text{Zr}^{4+})_3(\text{PO}_4^{3-})_4$ is given by relation:

- (a) $\left(\frac{K_{sp}}{6912}\right)^{\frac{1}{7}}$ (b) $\left(\frac{K_{sp}}{5348}\right)^{\frac{1}{6}}$
(c) $\left(\frac{K_{sp}}{8435}\right)^{\frac{1}{7}}$ (d) $\left(\frac{K_{sp}}{9612}\right)^{\frac{1}{3}}$

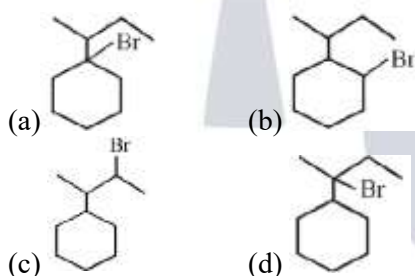
58. The large difference between the melting and boiling points of oxygen and sulphur may be explained on the basis of

- (a) Atomic size (b) Atomicity
(c) Electronegativity (d) Electron gain enthalpy

59. Transition metal complex with highest value of crystal field splitting (Δ_0) will be

- (a) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ (b) $[\text{Mo}(\text{H}_2\text{O})_6]^{3+}$
(c) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ (d) $[\text{Os}(\text{H}_2\text{O})_6]^{3+}$

60. When sec-butylcyclohexane reacts with bromine in the presence of sunlight, the major product is:



PART - III (A):

ENGLISH PROFICIENCY

DIRECTION (Q. 61): In the following question, four alternatives are given for the Idiom/Phrase underlined in the sentence. Choose the alternative which best expresses the meaning of the Idiom/Phrase.

61. By criticizing the local authorities, the journalist stirred a hornet's nest.

- (a) Discovered a beehive
(b) Got himself into a comfortable situation
(c) Helped resolve a major conflict
(d) Created a troublesome or chaotic situation

DIRECTIONS (Qs. 62-63): Read the passage carefully and answer the questions based on it.

In the rapidly evolving world of technology, the concept of digital minimalism has emerged as a counterbalance to the growing dependency on digital devices. Digital minimalism promotes a conscious and intentional approach to technology use encouraging individuals to focus only on tools and platforms that add genuine value to their lives. The philosophy does not advocate the rejection of technology altogether but argues against mindless scrolling, constant notifications, and the compulsion to stay perpetually connected. Supporters claim that excessive screen time reduces productivity, impairs mental health, and fragments attention. By contrast, digital minimalists prioritize quality interactions, deep work, and solitude.

This approach demands clarity about personal values and the discipline to align one's digital habits accordingly. In an age where algorithms are designed to exploit attention, the ability to resist digital distractions becomes a form of self-mastery. Interestingly, more people are now experimenting with "digital detoxes," time-blocked use, and the deliberate uninstallation of non-essential apps. As awareness spreads, digital minimalism is gaining ground not just as a lifestyle trend but as a necessary mindset for sustainable digital well-being in the 21st century.

62. What is the main goal of digital minimalism according to the passage?

- (a) To eliminate all use of digital devices
- (b) To promote increased use of social media responsibly
- (c) To encourage purposeful and mindful use of technology
- (d) To create new algorithms that reduce screen time

63. According to the passage, how is attention treated in the digital age?

- (a) It is protected by apps and platforms
- (b) It is considered a limited resource exploited by algorithms
- (c) It is irrelevant in modern multitasking
- (d) It is enhanced through constant connectivity

64. Choose the word opposite in meaning to the word given in capital.

BRUSQUE

- (a) Affable
- (b) Abrupt
- (c) Stern
- (d) Terse

65. Choose the word which is nearest in meaning to the given word.

Finicky

- (a) Easy-going
- (b) Punctual
- (c) Fussy
- (d) Polite

DIRECTIONS (Qs. 66-67): Choose the most effective word from the given options to fill in the blank and to make the sentence meaningfully complete.

66. Despite being an expert in her field, she remained___ and always credited her team for the success.

- (a) arrogant
- (b) modest
- (c) boastful
- (d) dominant

67. Though the evidence was circumstantial, the lawyer skilfully ___ doubts about the witness's credibility during cross-examination.

- (a) concealed
- (b) fabricated
- (c) instilled
- (d) neglected

DIRECTIONS (Qs. 68-69): In the questions given below, find out the part of sentence which contains an error.

68. (a) She insisted / (b) to meet the committee members / (c) before making / (d) the final decision.

- (a) She insisted
- (b) to meet the committee members
- (c) before making
- (d) the final decision

69. (a) The professor discussed / (b) about the new policy / (c) in detail / (d) during the seminar.

- (a) The professor discussed
- (b) about the new policy
- (c) in detail
- (d) during the seminar

DIRECTION (Q. 70): In a question below, a part of the sentence is underlined . Below are given alternatives to the underlined part at (a), (b),(c) which may improve the sentence. Choose the correct alternative. In case no improvement is needed, mark your answer as option (d).

70. Walking through the forest the chirping of birds soothed her nerves.

- (a) As she walked through the forest,
- (b) Walking through the forest, hearing the chirping of birds soothing her nerves.
- (c) The chirping of birds, while walking through the forest, soothed her nerves.
- (d) No improvement

PART - III (B) : LOGICAL REASONING

DIRECTIONS (Qs. 71-72): On the following question select the related words/letters/ numbers from the attractive.

71. TTT : 777 :: RRR :?

- (a) 555 (b) 666
(c) 888 (d) 999

72. xxyzyy : ccbabb :: xyyzzy :

- (a) abbacc (b) bbacca
(c) abbcca (d) cbbaab

73. Three of the following four words are alike in a certain way and one is different. Find the odd one out.

- (a) Hexagon (b) Ellipse
(c) Parallelogram (d) Rhombus

74. From the given alternative words, select the word which cannot be formed using the letters of the given word:

Given : IMPASSIONABLE

- (a) IMPASSABLE (b) IMPOSSIBLE
(c) IMPASSIVE (d) IMPASSION

75. In a certain code, '253' means 'books are old'; ' 546 ' means 'man is old' and ' 378 ' means 'buy good books'. What stands for "are" in that code?

- (a) 2 (b) 4
(c) 5 (d) 6

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

BECD, FIGH, KNLM, ?

XAYZ

- (a) QWSU (b) ORPQ
(c) PSQR (d) QTRS

77. Select the missing number from the given responses.

	8			12			14		
6	54	7		8	51	4	9	?	5
	4				7			9	

- (a) 53 (b) 71
(c) 76 (d) 68

DIRECTIONS (Qs. 78-79) : In these questions, two statements followed by two conclusions numbered I and II have been given. You have to take the two 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 follows from the given statements disregarding commonly know facts.

Give Answer :

- (a) If only conclusion I is true
(b) If neither conclusions I nor II is true
(c) If both conclusions I and II are true
(d) If only conclusion II is true
(e) If either conclusion I or II is true

78. Statements :

Some jars are bowls.

Some spoons are jars.

Conclusions :

- (I) No bowl is a spoon.
(II) Some jars are definitely not bowls.

79. Statements:

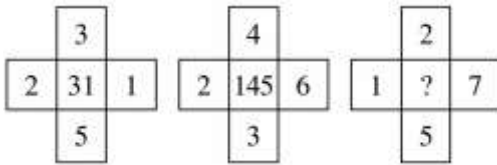
Some paints are brushes.

No brush is a canvas.

Conclusions :

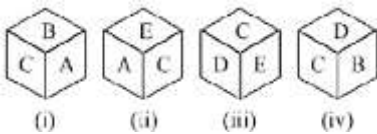
- (I) No paint is a canvas.
(II) All brushes can be paints is a possibility.

80. In the following question, select the number which can be placed at the sign of question non marking the given alternatives.



- (a) 43 (b) 49
(c) 59 (d) 71

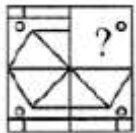
81. Four forms of a dice are shown below. In this dice which word will be on the surface opposite to the word *D* ?



- (a) *D* (b) *A*
(c) *B* (d) *C*

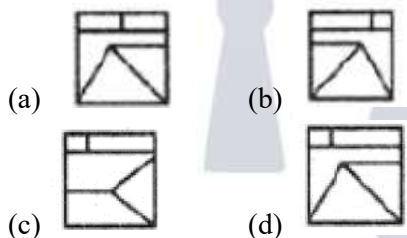
DIRECTION(Qs. 82): Which answer figure complete the form in question figure?

82. Question Figure:



X

Answer Figures:

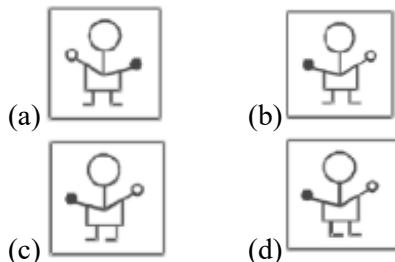


DIRECTIONS: In questions 83, there is a problem figure and four answer figures marked (a), (b), (c), (d) are given. Select the answer figure which is exactly the mirror image of the problem figure.

83. Question figure :



Answer Figures:

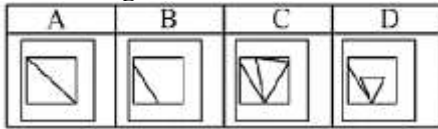


84. Which of the answer figures is formed from the shapes given the problem figure?

Problem Figure:



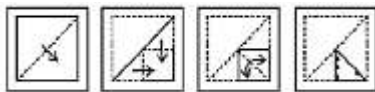
Answer figure :



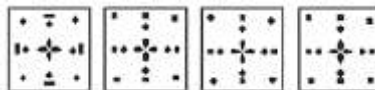
- (a) C (b) B
(c) D (d) A

85. A piece of paper is folded and punched as shown below in the question figures. From the given answer figures, indicate how it will appear when opened.

Question Figure:

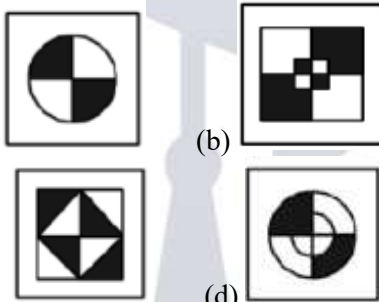


Answer figure:



- (a) (b) (c) (d)

DIRECTIONS: Four figures (a),(b),(c),(d) have been given in each question of these four figure these figure are similar in some way and one figure different select the figure which is different

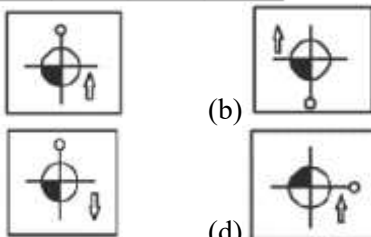
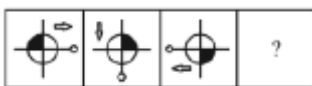


86. (a) (b)
(c) (d)

87. Select the correct option that indicates the arrangement of the given words in the order in which they appear in an English dictionary.

- (1) Industry (2) Indent
(3) Indoor (4) Indolent
(5) Index
(a) 1,2,3,5,4 (b) 2,4,5,3,1
(c) 2,5,4,3,1 (d) 2,1,3,5,4

88. Select the figure that will replace the question mark (?) in the following figure series.



- (a) (b)
(c) (d)

89. X told Y, "Though I am the son of your father, you are not my brother". How is X related to Y ?

- (a) Son (b) Daughter
(c) Father (d) None of these

90. If DANGER is coded as 11-8-21-14-12-25, then how will be coded the word MACHINE?

- (a) 10 - 21 - 15 - 14 - 26 - 17 - 18
- (b) 20 - 8 - 10 - 16 - 17 - 22 - 13
- (c) 20 - 10 - 8 - 12 - 15 - 16 - 7
- (d) 20 - 8 - 10 - 15 - 16 - 21 - 12

PART - IV : MATHEMATICS

91. If $A = \{a, \{b\}\}$, then $P(A)$ equals.

- (a) $\{\phi, \{a\}, \{\{b\}\}, \{a, \{b\}\}\}$
- (b) $\{\phi, \{a\}\}$
- (c) $\{\{a\}, \{b\}, \phi\}$
- (d) None of these

92. The relation R defined on the set of natural numbers as $\{(a, b): a \text{ differs from } b \text{ by } 3\}$ is given

- (a) $\{(1,4), (2,5), (3,6), \dots\}$
- (b) $\{(4,1), (5,2), (6,3), \dots\}$
- (c) $\{(1,3), (2,6), (3,9), \dots\}$
- (d) None of these

93. The value of $\sin 765^\circ$ is $\frac{1}{\sqrt{n}}$. Value of n is

- (a) 2
- (b) 3
- (c) 4
- (d) 0

94. If $\tan \theta = -\frac{1}{\sqrt{3}}$, then general solution of the equation is

- (a) $2n\pi + \frac{\pi}{6}, n \in \mathbb{I}$
- (b) $n\pi + \frac{\pi}{6}, n \in \mathbb{I}$
- (c) $2n\pi - \frac{\pi}{6}, n \in \mathbb{I}$
- (d) $n\pi - \frac{\pi}{6}, n \in \mathbb{I}$

95. The real part of the complex number $\frac{(1+2i)^8 \cdot (1-2i)^2}{(3+2i) \cdot (4-6i)}$ is equal to:

- (a) $\frac{500}{13}$
- (b) $\frac{110}{13}$
- (c) $\frac{55}{6}$
- (d) $\frac{550}{13}$

96. If α, β are the roots of the equation $ax^2 + bx + c = 0$, then $\frac{\alpha}{a\beta+b} + \frac{\beta}{a\alpha+b} =$

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

97. If α, β be the roots of the equation $2x^2 - 35x + 2 = 0$, then the value of $(2\alpha - 35)^3 \cdot (2\beta - 35)^3$ is equal to

- (a) 1
- (b) 64
- (c) 8
- (d) None of these

98. Which of the following is the solution set of $3x - 7 > 5x - 1 \forall x \in \mathbb{R}$?

- (a) $(-\infty, -3)$
- (b) $(-\infty, -3]$
- (c) $(-3, \infty)$
- (d) $(-3, 3)$

99. The number of four digit numbers with distinct digits is :

- (a) $9 \times {}^9C_3$
- (b) $9 \times {}^9P_3$
- (c) ${}^{10}C_3$
- (d) ${}^{10}P_3$

100. On a railway route there are 20 stations. What is the number of different tickets required in order that it may be possible to travel from every station to every other station?

- (a) 40
- (b) 380
- (c) 400
- (d) 420

101. If $\left(2 + \frac{x}{3}\right)^{55}$ is expanded in the ascending powers of x and the coefficients of powers of x in two consecutive terms of the expansion are equal, then these terms are:

- (a) 7th and 8th (b) 8th and 9th
(c) 28th and 29th (d) 27th and 28th

102. The sum of n terms of two arithmetic series are in the ratio $2n + 3 : 6n + 5$, then the ratio of their 13th terms is

- (a) 53:155 (b) 27:87
(c) 29:83 (d) 31:89

103. The value of x in $(0, \pi)$ which satisfy the equation $8^{1+|\cos x|+|\cos^2 x|+|\cos^3 x|+\dots \text{to } \infty} = 4^3$ is

- (a) $\left\{\frac{\pi}{2}, \frac{3\pi}{4}\right\}$ (b) $\left\{\frac{\pi}{4}, \frac{3\pi}{4}\right\}$
(c) $\left\{\frac{\pi}{3}, \frac{2\pi}{3}\right\}$ (d) $\left\{\frac{\pi}{6}, \frac{5\pi}{6}\right\}$

104. Let $\alpha_1, \alpha_2 (\alpha_1 < \alpha_2)$ be the values of α for the points $(\alpha, -3)$, $(2, 0)$ and $(1, \alpha)$ to be collinear. Then the equation of the line, passing through (α_1, α_2) and making an angle of $\frac{\pi}{3}$ with the positive direction of the x -axis, is:

- (a) $x - \sqrt{3}y - 3\sqrt{3} + 1 = 0$
(b) $\sqrt{3}x - y + \sqrt{3} + 3 = 0$
(c) $x - \sqrt{3}y + 3\sqrt{3} + 1 = 0$
(d) $\sqrt{3}x - y + \sqrt{3} - 3 = 0$

105. If $(-4, 5)$ is one vertex and $7x - y + 8 = 0$ is one diagonal of a square, then the equation of second diagonal is

- (a) $x + 3y = 21$ (b) $2x - 3y = 7$
(c) $x + 7y = 31$ (d) $2x + 3y = 21$

106. The angle between the pair of straight lines $y^2 \sin^2 \theta - x y \sin^2 \theta + x^2 (\cos^2 \theta - 1) = 0$ is

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

107. The set of values of k for which the circle $C: 4x^2 + 4y^2 - 12x + 8y + k = 0$ lies inside the fourth quadrant and the point $\left(1, -\frac{1}{3}\right)$ lies on or inside the circle C is :

- (a) An empty set (b) $\left(6, \frac{95}{9}\right]$
(c) $\left[\frac{80}{9}, 10\right)$ (d) $\left(9, \frac{92}{9}\right]$

108. Let P be the point $(1, 0)$ and Q a point on the locus $y^2 = 8x$. The locus of mid point of PQ is

- (a) $y^2 - 4x + 2 = 0$ (b) $y^2 + 4x + 2 = 0$
(c) $x^2 + 4y + 2 = 0$ (d) $x^2 - 4y + 2 = 0$

109. What is the shortest distance of the point $(1, 2, 3)$ from x -axis ?

- (a) 1 (b) $\sqrt{6}$
(c) $\sqrt{13}$ (d) $\sqrt{14}$

110. If value of $\lim_{x \rightarrow a} \frac{\sqrt{a+2x} - \sqrt{3x}}{\sqrt{3a+x} - 2\sqrt{x}}$ is equal to $\frac{2\sqrt{3}}{m}$, where m is equal to

- (a) 2 (b) 8
(c) 9 (d) 3

111. Find the mean deviation about the mean for the data.

x_i	5	10	15	20	25
f_i	7	4	6	3	5

- (a) 6 (b) 7.3
(c) 8 (d) 6.32

112. Let $S = \{1, 2, 3, \dots, 2022\}$. Then the probability, that a randomly chosen number n from the set S such that $\text{HCF}(n, 2022) = 1$, is :

- (a) $\frac{128}{1011}$ (b) $\frac{166}{1011}$
 (c) $\frac{127}{337}$ (d) $\frac{112}{337}$

113. Let $f: (4, 6) \rightarrow (6, 8)$ be a function defined by $f(x) = x + \left[\frac{x}{2} \right]$ (where $[.]$ denotes the greatest integer function), then $f^{-1}(x)$ is equal to

- (a) $x - \left[\frac{x}{2} \right]$ (b) $-x - 2$
 (c) $x - 2$ (d) $\frac{1}{x + \left[\frac{x}{2} \right]}$

114. The value of x satisfying the equation $3\tan^{-1} \frac{1}{2+\sqrt{3}} - \tan^{-1} \frac{1}{x} = \tan^{-1} \frac{1}{3}$ is

- (a) $x = 2$ (b) $x = \frac{1}{2}$
 (c) $x = \frac{1}{2-\sqrt{3}}$ (d) none of these

115. Let A be a 3×3 invertible matrix. If $|\text{adj}(24A)| = \text{adj}[(3\text{adj}(2A))]$, then $|A|^2$ is equal to:

- (a) 6^6 (b) 2^{12}
 (c) 2^6 (d) 1

116. If the system of equations

$$x + y + z = 16$$

$$2x + 5y + \alpha z = \beta$$

$$x + 2y + 3z = 14$$

has infinitely many solutions, then $\alpha + \beta$ is equal to :

- (a) 8 (b) 36
 (c) 44 (d) 48

117. If $f(x) = \begin{cases} \frac{\sqrt{1+kx}-\sqrt{1-kx}}{x} & \text{for } -1 \leq x < 0 \\ 2x^2 + 3x - 2, & \text{for } 0 \leq x \leq 1 \end{cases}$ is continuous at $x = 0$, then $k =$

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

118. If $\sin y = x \sin(a + y)$, then value of dy/dx is

- (a) $\frac{\sin(a+y)}{\sin a}$ (b) $\frac{\sin^2(a+y)}{\sin a}$
 (c) $\sin^2(a + y)$ (d) $\frac{\cos^2(a+y)}{\sin a}$

119. The maximum value of $(\log x)/x$ is

- (a) e (b) $2e$
 (c) $1/e$ (d) $2/e$

120. If $\int \frac{6x+7}{\sqrt{(x-5)(x-4)}} dx = A\sqrt{x^2 - 9x + 20} + B \log \left| x + \sqrt{x^2 - 9x + 20} - \frac{9}{2} \right| + C$ Then the values of A and B are

- (a) 6,34 (b) 3,9
 (c) 12,17 (d) None of these

121. The value of $\int_0^\pi \frac{e^{\cos x} \sin x}{(1+\cos^2 x)(e^{\cos x} + e^{-\cos x})} dx$ is equal to

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

122. The area enclosed between the graph of $y = x^3$ and the lines $x = 0, y = 1, y = 8$ is

- (a) $\frac{45}{4}$ (b) 14
 (c) 7 (d) None

123. The solution of the differential equation $\left(1 + e^{\frac{x}{y}}\right) dx + e^{\frac{x}{y}} \left(1 + \frac{x}{y}\right) dy = 0$ is

- (a) $ye^x + x = C$ (b) $xe^y + y = C$
(c) $ye^x + y = C$ (d) $ye^y + y = C$

124. Statement 1: Integrating factor of $\frac{dy}{dx} + y = x^2$ is e^x

Statement 2: Integrating factor of $\frac{dy}{dx} + P(x)y = Q(x)$ is $e^{\int P(x)dx}$

- (a) Statement-1 is false, Statement-2 is true
(b) Statement -1 is true, Statement-2 is true; Statement -2 is a correct explanation for Statement-1
(c) Statement -1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1
(d) Statement-1 is true, Statement-2 is false

125. If $\vec{a}, \vec{b}, \vec{c}$ are three non-coplanar vectors, then $[\vec{a} + \vec{b} + \vec{c}, \vec{a} - \vec{b}, \vec{a} - \vec{c}]$ is equal to

- (a) 0 (b) $2[\vec{a}\vec{b}\vec{c}]$
(c) $-3[\vec{a}\vec{b}\vec{c}]$ (d) $2[\vec{a}\vec{b}\vec{c}]$

126. If the position vectors of the vertices A, B, C of a triangle ABC are $7\hat{j} + 10\hat{k}, -\hat{i} + 6\hat{j} + 6\hat{k}$ and $-4\hat{i} + 9\hat{j} + 6\hat{k}$ respectively, the triangle is :

- (a) equilateral (b) isosceles
(c) scalene (d) right angled and isosceles also

127. Under what condition do $\left\langle \frac{1}{\sqrt{2}}, \frac{1}{2}, k \right\rangle$ represent direction cosines of a line?

- (a) $k = \frac{1}{2}$ (b) $k = -\frac{1}{2}$
(c) $k = \pm \frac{1}{2}$ (d) k can take any value

128. If the plane $x - 3y + 5z = d$ passes through the point $(1, 2, 4)$, then the length of intercepts cut by it on the axes of X, Y, Z are respectively, is

- (a) 15, -5, 3 (b) 1, -5, 3
(c) -15, 5, -3 (d) 1, -6, 20

129. If A and B are two events such that $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{5}$ and $P(A \cup B) = \frac{1}{2}$, then $P(A | B') + P(B | A')$ is equal to

- (a) $\frac{3}{4}$ (b) $\frac{5}{8}$
(c) $\frac{5}{4}$ (d) $\frac{7}{8}$

130. For a biased dice, the probability for the different faces to turn up are

Face	P
1	0.10
2	0.32
3	0.21
4	0.15
5	0.05
6	0.17

The dice is tossed and it is told that either the face 1 or face 2 has shown up, then the probability that it is face 1, is

- (a) $\frac{16}{21}$ (b) $\frac{1}{10}$
(c) $\frac{5}{16}$ (d) $\frac{5}{21}$