BITSAT Question Paper 2018

Duration : 3 : 00 Hrs

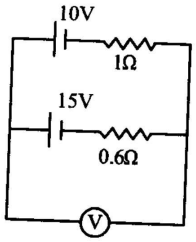
Exam BITSAT		Total Questions 180				
Marks for Correct Answer 3	Negative Marks 1	Physics 40	Chemistry 40	Mathematics 45	English 15	Logical Reasoning 10

Physics

1. A capillary tube of radius R is immersed in water and water rises in it to a height H. Mass of water in the capillary tube is M. If the radius of the tube is doubled, mass of water that will rise in the capillary tube will now be:
(a) M
(b) 2M
(c) M/2
(d) 4M

Correct: b

2. A 10V battery with internal resistance 1Ω and a 15V battery with internal resistance 0.6Ω are connected in parallel to a voltmeter (see figure). The reading in the voltmeter will be close to :



(a) 12.5 V
(b) 24.5V
(c) 13.1 V
(d) 11.9 V

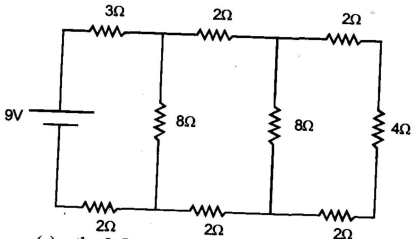
Correct: c

3. If the edge lengths of a cuboid are measured to be 1.2 cm, 1.5 cm and 1.8 cm, then the volume of the cuboid is

(a) 3.240 cm^3
(b) 3.24 cm^3
(c) 3.2 cm^3
(d) 3.0 cm^3

Correct: a

4. In the circuit shown in the figure, find the current through



(a) the 3Ω is 0.50 A
(b) the 3Ω is 0.25 A
(c) the 4Ω is 0.50 A
(d) the 4Ω is 0.25 A

Correct: d

5. The resistance of the wire at 20°C is 20 Ω and 500°C is 60 Ω. At which temperature its resistance will be 25 Ω ?
(a) 50°C
(b) 60°C
(c) 70°C
(d) 80°C

Correct: d

6. A particle moving along x-axis has acceleration f, at time t, given by f = $f_0\left(1-\frac{t}{T}\right)$, where f_0, and T are constants. The particle at t = 0 has zero velocity. In the time interval between t = 0 and the instant when f = 0, the particle's velocity (v_x) is
(a) $\frac{1}{2}f_0T^2$
(b) f_0T^2
(c) $\frac{1}{2}f_0T$
(d) f_0T

Correct: c

7. A charged particle enters in a uniform magnetic field with a certain velocity. The power delivered to the particle by the magnetic field depends on
(a) force exerted by magnetic field and velocity of the particle.
(b) angular speed ω and radius r of the circular path.
(c) angular speed ω and acceleration of the particle.

(d) None of these

Correct: d

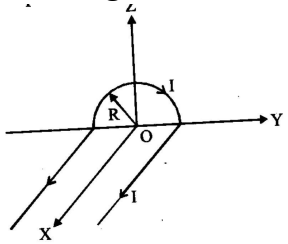
8. Given $\vec{\mathrm{P}} = 2\hat{\mathrm{i}} - 3\hat{\mathrm{j}} + 4\hat{\mathrm{k}}$ and $\vec{\mathrm{Q}} = \hat{\mathrm{j}} - 2\hat{\mathrm{k}}$. The magnitude of their resultant is
(a) $\sqrt{3}$
(b) $2\sqrt{3}$
(c) $3\sqrt{3}$
(d) $4\sqrt{3}$

Correct: b

9. Two projectiles A and B thrown with speeds in the ratio $1 : \sqrt{2}$ acquired the same heights. If A is thrown at an angle of 45° with the horizontal, the angle of projection of B will be
(a) 0°
(b) 60°
(c) 30°
(d) 450

Correct: c

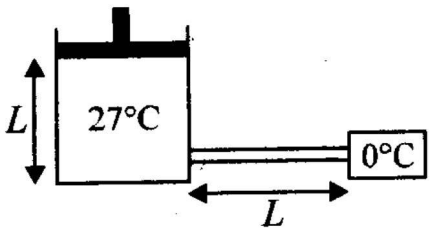
10. A wire carrying current I has the shape as shown in adjoining figure. Linear parts of the wire are very long and parallel to X-axis while semicircular portion of radius R is lying in Y-Z plane. Magnetic field at point O is:



(a) $\vec{\mathrm{B}} = -\frac{\mu_0}{4\pi}\frac{1}{\mathrm{R}}(\mu\hat{\mathrm{i}} \times 2\hat{\mathrm{k}})$
(b) $\vec{B} = -\frac{\mu_0}{4\pi}\frac{1}{R}(\hat{n}\hat{i} + 2\hat{k})$
(c) $\vec{\mathrm{B}} = \frac{\mu_0}{4\pi}\frac{\mathrm{I}}{\mathrm{R}}(\pi\hat{\mathrm{i}} - 2\hat{\mathrm{k}})$
(d) $\vec{\mathrm{B}} = \frac{\mu_0}{4\pi}\frac{1}{\mathrm{R}}(\mathrm{ni} + 2\hat{\mathrm{k}})$

Correct: b

11. 0.5 mole of an ideal gas at constant temperature 27°C kept inside a cylinder of length L and cross section area A closed by a massless piston.



The cylinder is attached with a conducting rod of length I, cross-section area (1/9) m2 and thermal conductivity k, whose other end is maintained at 0°C. If piston is moved such that rate of heat flow through the conducing rod is constant then velocity of piston when it is at height L/2 from the bottom of cylinder is : (Neglect any kind of heat loss from system)

(a) $\left(\frac{k}{R}\right) m/sec$

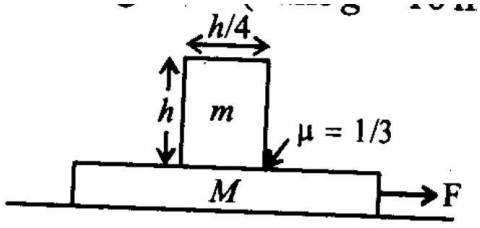
(b) $\left(\frac{\mathrm{k}}{10R}\right) \mathrm{m/sec}$

(c) $\left(\frac{k}{100R}\right) \mathrm{m/sec}$

(d) $\left(\frac{\mathrm{k}}{1000R}\right) \mathrm{m/sec}$

Correct: c

12. A block of mass m= 2 kg is placed on a plank of mass M = 10 kg which is placed on a smooth horizontal plane. The coefficient of friction between the block and the plank is $\mu = \frac{1}{3}$. If a horizontal force F is applied on the plank, then find the maximum value of F for which the block and the plank move together. (Take g= $10\mathrm{m/s^2}$)



(a) 30 N

(b) 40 N

(c) 120 N

(d) None of these

Correct: a

13. The susceptibility of a magnetism at 300 K is 1.2×10^{-5}. The temperature at which the susceptibility increases to 1.8×10^{-5}

(a) 150K

(b) 200K

(c) 250K

(d) 20K

Correct: b

14. Magnetic moment of bar magnet is M. The work done to turn the magnet by 90° of magnet in direction of magnetic field B will be

(a) zero

(b) $\frac{1}{2}MB$

(c) 2MB

(d) MB

Correct: d

15. If M is magnetic moment and B is the magnetic field, then the torque is given by
(a) $\overline{\mathrm{M}}.\vec{\mathrm{B}}$
(b) $\frac{|\overline{\mathrm{M}}|}{|\vec{\mathrm{B}}|}$
(c) $\vec{\mathrm{M}} \times \vec{\mathrm{B}}$
(d) $|\vec{M}|\vec{B}|$

Correct: c

16. A copper rod of length l rotates about its end with angular velocity ω in uniform magnetic field B. The emf developed between the ends of the rod if the field is normal to the plane of rotation is
(a) $B\omega\ell^2$
(b) $\frac{1}{2}B\omega\ell^2$
(c) $2B\omega\ell^2$
(d) $\frac{1}{4}B\omega\ell^2$

Correct: b

17. Consider elastic collision of a particle of mass m moving with a velocity u with another particle of the same mass at rest. After the collision the projectile and the struck particle move in directions making angles , and , respectively with the initial direction of motion. The sum of the angles $\theta_1 + \theta_2$, is:
(a) 45°
(b) 90°
(c) 135°
(d) 180°

Correct: b

18. A particle of mass m executes simple harmonic motion with amplitude a and frequency v. The average kinetic energy during its motion from the position of equilibrium to the end is
(a) $2\pi^2ma^2v^2$
(b) $\pi^2ma^2v^2$
(c) $\frac{1}{4}mu^2v^2$
(d) $4\pi^2ma^2v^2$

Correct: b

19. An elastic string of unstretched length L and force constant k is stretched by a small length x. It is further stretched by another small length y. The work done in the second stretching is

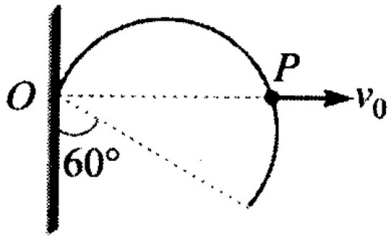
(a) $1/2\mathrm{Ky}^2$
(b) $1/2\mathrm{Ky}(2\mathrm{x}+\mathrm{y})$
(c) $1/2\mathrm{K}\left(\mathrm{x}^2+\mathrm{y}^2\right)$
(d) $1/2\mathrm{k}(\mathrm{x}+\mathrm{y})^2$

Correct: b

20. A coil 10 turns and a resistance of 20Ω is connected in series with B.G of resistance 30Ω. The coil is placed with its plane perpendicular to the direction of a uniform magnetic field of induction $10^{-2}\mathrm{T}$. If it is now turned through an angle of 60° about an axis in its plane. Find the charge in duced in the coil. (Area of a coil $=10^{-2}\mathrm{m}^2$))
(a) $2\times10^{-5}\mathrm{C}$
(b) $3.2\times10^{-5}\mathrm{C}$
(c) $1\times10^{-5}\mathrm{C}$
(d) $5.5\times10^{-5}\mathrm{C}$

Correct: c

21. A thin but rigid semicircular wire frame of radius r is hinged at O and can rotate in its own vertical plane. A smooth peg P starts from O and moves horizontally with constant speed v_0, lifting the frame upwards as shown in the figure.



Find the angular velocity of the frame when its diameter makes an angle of 60° with the vertical:
(a) v_0/r
(b) $v_0/2r$
(c) $2v_0/r$
(d) $v_0 r$

Correct: a

22. A resistor and an inductor are connected to an ac supply of 120 V and 50 Hz. The current in the circuit is 3 A. If the power consumed in the circuit is 108 W, then the resistance in the circuit is
(a) 12Ω
(b) 40Ω
(c) $\sqrt{(52\times25)}\Omega$
(d) 360Ω

Correct: a

23. Infinite number of masses, each 1 kg are placed along the x-axis at $x = \pm 1m, \pm 2m, \pm 4m, \pm 8m \pm 16m$ ..... the magnitude of the resultant gravitational potential in terms of gravitational constant G at the origin (x=0) is
(a) $G/2$
(b) G
(c) 2G
(d) 4G

Correct: c

24. A resistor of resistance R, capacitor of capacitance C and inductor of inductance L are connected in parallel to AC power source of voltage ε_0, sin ωt. The maximum current through the resistance is half of the maximum current through the power source. The value of R is
(a) $\frac{\sqrt{3}}{\left|\omega C - \frac{1}{\omega L}\right|}$
(b) $\sqrt{3}\left|\frac{1}{\omega C} - \omega L\right|$
(c) $\sqrt{5}\left|\frac{1}{\omega C} \quad \omega L\right.$
(d) None of these

Correct: a

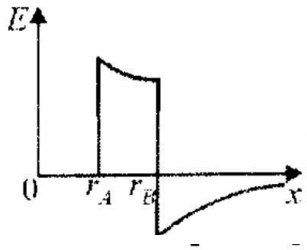
25. A direct current of 5A is superposed on an alternating current I = 10sinωt flowing through the wire. The effective value of the resulting current will be
(a) (15A/2)
(b) $5\sqrt{3}\mathrm{A}$
(c) $5\sqrt{5}\mathrm{A}$
(d) 15A

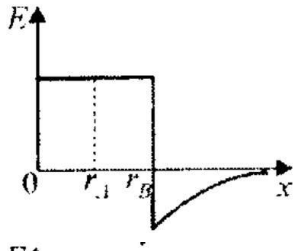
Correct: b

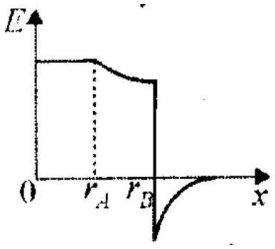
26. The electric and the magnetic field associated with an E.M. wave, propagating along the+z axis, can be represented by
(a) $\left[\vec{\mathbf{E}} = \mathbf{E}_0\hat{\mathbf{i}} \cdot \vec{\mathbf{B}} = \mathbf{B}_0\hat{\mathbf{j}}\right]$
(b) $\left[\vec{\mathbf{E}} = \mathbf{E}_0\vec{\mathbf{k}}, \overline{\mathbf{B}} = \mathbf{B}_0\hat{\mathbf{i}}\right]$
(c) $\left[\vec{\mathrm{E}} = \mathrm{E}_0\hat{\mathrm{i}}, \vec{\mathrm{B}} = \mathrm{B}_0\mathrm{i}\right]$
(d) $\left[\vec{\mathbf{E}} = \mathbf{E}_0\hat{\mathbf{j}}, \vec{\mathbf{B}} = \mathbf{B}_0\hat{\mathbf{k}}\right]$

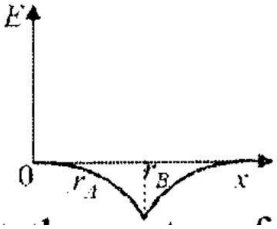
Correct: a

27. Two concentric conducting thin spherical shells A, and B having radii r_A and r_B $((r_B > r_A)$ are charged to Q_A and $-Q_B$ $(\mathcal{Q}_B| > |Q_A]$. The electric field along a line passing through the centre is

(a) 

(b) 

(c) 

(d) 

Correct: a

28. An electromagnetic wave passes through space and its equation is given by $E = E_0 \sin(\omega t - kx)$ where E is electric field. Energy density of electromagnetic wave in space is

(a) $\frac{1}{2}\varepsilon_0 \mathbf{E}_0^2$

(b) $\frac{1}{4}\varepsilon_0 \mathrm{E}_0^2$

(c) $\varepsilon_0 \mathbf{E}_0^2$

(d) $2\varepsilon_0 \mathrm{E}_0^2$

Correct: a

29. The magnetic field in a travelling electromagnetic wave has a peak value of 20 nT. The peak value of electric field strength is

(a) 3V/m

(6) 6V/m

(c) 9V/m

(d) 12V/m

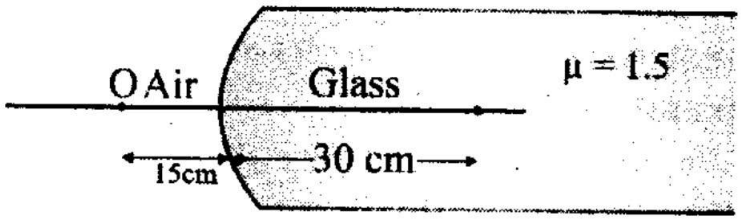
Correct: b

30. Four point charges -Q, -q, 2q and 2Q are placed, one at each corner of the square. The

relation between Q and q for which the potential at the centre of the square is zero is :
(a) Q = -q
(b) $Q = -\frac{1}{q}$
(c) Q = q
(d) $Q = \frac{1}{q}$

Correct: a

31. A point object O is placed in front of a glass rod having spherical end of radius of curvature 30 cm. The image would be formed at



(a) 30 cm left
(b) ∞
(c) 1 cm to the right
(d) 18 cm to the left

Correct: a

32. A cube is subjected to a uniform volume compression. If the side of the cube decreases by 2% the bulk strain is
(a) 0.02
(b) 0.03
(c) 0.04
(d) 0.06

Correct: d

33. The focal length of thin convex lens for blue rays are 100 cm and 96.8 cm respectively. Then, the dispersive power of the material of the lens is
(a) 0.968
(b) 0.98
(c) 0.0325
(d) 0.325

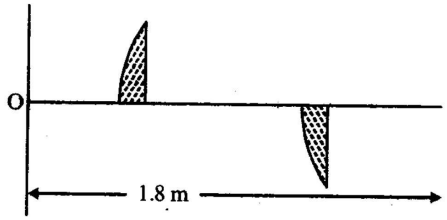
Correct: c

34. A biconvex lens has a radius of curvature of magnitude 20 cm. Which one of the following options best describe the image formed of an object of height 2 cm placed 30 cm from the lens?
(a) Virtual, upright, height=1 cm
(b) Virtual, upright, height=0.5 cm

(c) Real, inverted, height=4 cm
(d) Real, inverted, height = 1cm

Correct: c

35. A thin plano-convex lens of focal length f is split into two halves: one of the halves is shifted along the optical axis. The separation between object and image planes is 1.8 m. The magnification of the image formed by one of the half-lenses is 2. If f and d be the focal length of the lens and separation between the two halves respectively then,



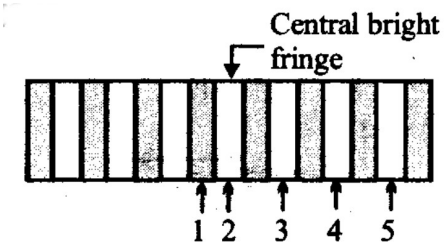
(a) f=0.4 m
(b) f=0.6 m
(c) d=0.5 m
(d) d=0.9 m

Correct: a

36. In Young's double slit experiment, $\lambda = 500\text{nm}$, d=1mm, D=1m. Minimum distance from the central maximum for which intensity is half of the maximum intensity is
(a) $2.5 \times 10^{-4}\text{m}$
(b) $1.25 \times 10^{-4}\text{m}$
(c) $0.625 \times 10^{-4}\text{m}$
(d) $0.3125 \times 10^{-4}\text{m}$

Correct: b

37. The figure shows the interference pattern obtained in a double-slit experiment using light of wavelength 600 nm. 1, 2, 3, 4 and 5 are marked on five fringes. The third order bright fringe is



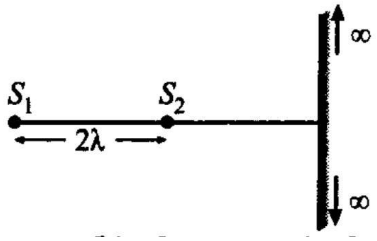
(a) 2
(b) 3
(c) 4
(d) 5

Correct: d

38. What is the minimum energy required to launch a satellite of mass m from the surface of a planet of mass M and radius R in a circular orbit at an altitude of 2R?
(a) $\frac{5GmM}{6R}$
(b) $\frac{2GmM}{3R}$
(c) $\frac{GmM}{2R}$
(d) $\frac{GmM}{2R}$

Correct: a

39. There are two sources kept at distances 2λ. A large screen is perpendicular to line joining the sources. Number of maximas on the screen in this case is (\lambda \) = wavelength of light)



(a) 1
(b) 3
(c) 5
(d) 7

Correct: b

40. An interference pattern the position of zeroth order maxima is 4.8 mm from a certain point P on the screen. The fringe width is 0.2 mm. The position of second order minima from point P is
(a) 5.1 mm
(b) 5 mm
(c) 40 mm
(d) 5.2 mm

Correct: a

Chemistry

41. On passing a current of 1.0 ampere for 16 min and 5 sec through one litre solution of $CuCl_2$ all copper of the solution was deposited at cathode. The strength of $CuCl_2$, solution was (Molar mass of Cu=63.5; Faraday constant=96,500 $Cmol^{-1}$)
(a) 0.01 N
(b) 0.01 M

(c) 0.02 M
(d) 0.2 N

Correct: a

42. A 100.0 mL dilute solution of Ag^+ is electrolysed for 15.0 minutes with a current of 1.25 mA and the silver is removed completely. What was the initial [Ag^+]?
(a) 2.32×10^{-1}
(b) 2.32×10^{-4}
(c) 2.32×10^{-3}
(d) 1.16×10^{-4}

Correct: d

43. On electrolysis of water, a total of 1 mole of gases is evolved. The amount of water decomposed is
(a) 1 mol
(b) 2 mol
(c) ⅓ mol
(d) ⅔ mol

Correct: d

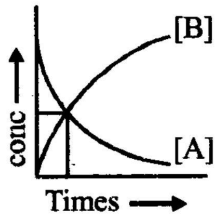
44. What is the freezing point of a 10% (by weight) solution of $\mathrm{CH_3OH}$ in water?
$\left[K_f \text{ of } CH_3OH = \text{-1.86°C/m}\right]$
(a) 90°C
(b) 10°C
(c) 6.45°C
(d) -6.45°C

Correct: d

45. Which one the following removes temporary hardness of water?
(a) Slaked lime
(b) Plaster of Paris
(c) Epsom
(d) Hydrolith

Correct: a

46. The accompanying figure depicts a change in concentration of species A and B for the reaction $A \rightarrow B$, as a function of time. The point of intersection of the two curves represents



(a) $t_{1/2}$
(b) $t_{3/4}$
(c) $t_{2/3}$
(d) Data insufficient to predict

Correct: a

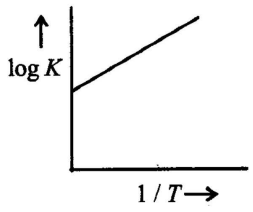
47. The rate constant of a reaction is 1.5×10^{-3} at 25°C and 2.1×10^{-2} at 60°C. The activation energy is:
(a) $\frac{35}{333} R \log_e \frac{2.1 \times 10^{-2}}{1.5 \times 10^{-2}}$
(b) $\frac{298 \times 333}{35} R \log_e \frac{21}{1.5}$
(c) $\frac{298 \times 333}{35} R \log_e 2.1$
(d) $\frac{298 \times 333}{35} R \log_e \frac{2.1}{1.5}$

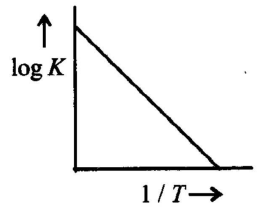
Correct: b

48. Beryllium shows diagonal relationship with aluminium. Which of the following similarity is incorrect?
(a) Be forms beryllates and Al forms aluminates
(b) $\mathrm{Be(OH)_2}$, like $\mathrm{Al(OH)_3}$ is basic.
(c) Be like Al is rendered passive by $\mathrm{HNO_3}$
(d) $\mathrm{Be_2C}$ like $\mathrm{Al_4C_3}$ yields methane on white due to formation of

Correct: b

49. A graph is ploted between log K virsus 1/T for calculation of activation energy (E_a). The correct plot is

(a)


(b)


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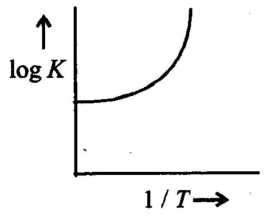
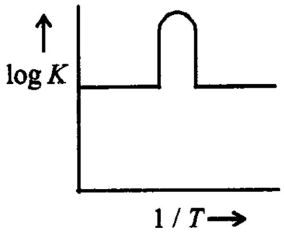


(d)


Correct: b

50. Clathrates are
(a) non-stoichiometric compounds
(b) complex compounds
(c) interstitial compounds
(d) ionic compounds

Correct: a

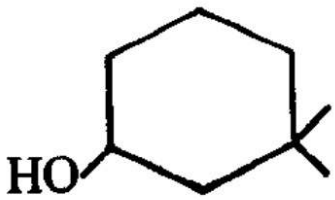
51. Freundlich equation for adsorption of gases (in amount of x g) on a solid (in amount of m g) at constant temperature can be expressed as
(a) $\log \frac{x}{m} = \log p + \frac{1}{n} \log K$
(b) $\log \frac{x}{m} = \log K + \frac{1}{n} \log p$
(c) $\frac{x}{m} \propto p^n$
(d) $\frac{x}{m} = \log p + \frac{1}{n} \log K$

Correct: b

52. Which of the following feature of catalysts is described in reactions given below?
(i) $\mathrm{CO(g) + 2H_2(g) \xrightarrow{Cu/ZnO-C_2O_3} CH_3OH(g)}$
(ii) $\mathrm{CO(g) + H_2(g) \xrightarrow{Cu} HCHO(g)}$
(iii) $\mathrm{CO(g) + 3H_2(g) \xrightarrow{Ni} CH_4(g) + H_2O(g)}$
(a) Activity
(b) Selectivity
(c) Catalytic promoter
(d) Catalytic poison

Correct: b

53. The IUPAC name of the compound is



(a) 3,3-dimethyl - 1- cyclohexanol
(b) 1, 1-dimethyl-3-hydroxy cyclohexane
(c) 3,3-dimethyl-1-hydroxy cyclohexane
(d) 1, 1-dimethyl-3-cyclohexanol

Correct: a

54. The isoelectric-point of a colloidially dispersed material is the pH value at which
(a) the dispersed phase migrate in an electric field.
(b) the dispersed phase does not migrate in an electric field.
(c) the dispersed phase has pH equal to 7.
(d) the dispersed phase has pH equal to zero.

Correct: b

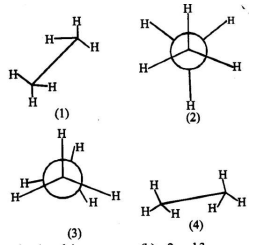
55. Which of the following contain plane of symmetry?
(a) trans-1,3 dichloro cyclohexane
(b) trans-1,2 dichloro cyclohexane
(c) cis-1,2 dichloro cyclohexane
(d) trans-1,3 cyclopentane

Correct: c

56. Which of the following metal is leached by cyanide proces
(a) Ag
(b) Na
(c) Al
(d) Cu

Correct: a

57. In the following structures, which two forms are staggered conformations of ethane ?



(a) 1 and 4
(b) 2 and 3
(c) 1 and 2

(d) 1 and 3

Correct: c

58. Metal which can be extracted from all three dolomite, magnesite and carnallite is
(a) Na
(b) K
(c) Mg
(d) Ca

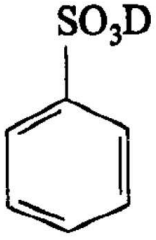
Correct: c

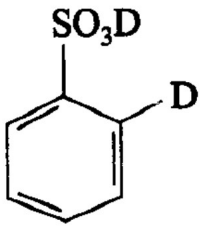
59. Semiconductor materials like Si and Ge are usually purified by
(a) distillation
(b) zone refining
(c) liquation
(d) electrolytic refining

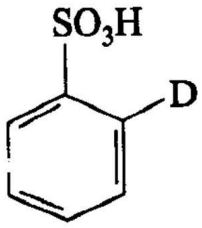
Correct: b

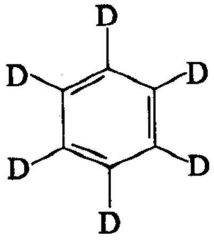
60. Give the possible structure of X in the following reaction :

$C_6H_6 + D, SO_4 \xrightarrow{D_2O} x$

(a) 

(b) 

(c) 

(d) 

Correct: d

61. Which of the following is not a member of chalcogens?
(a) O
(b) S
(c) Se
(d) Po

Correct: d

62. Pick out the wrong statement.
(a) Nitrogen has the ability to form pt-pt bonds with itself
(b) Bismuth forms metallic bonds in elemental
(c) Catenation tendency is higher in nitrogen when compared with other elements of the same group.
(d) Nitrogen has higher first ionisation enthalpy when compared with other elements of the same group.

Correct: c

63. Which of the following shows nitrogen with its increasing order of oxidation number?
(a) $NO < N_2O < NO_2 < NO_3- < NH_4^+$
(b) $NH_4^+ < N_2O < NO_2 < NO_3^- < NO$
(c) $NH_4^+ < N_2O < NO < NO_2 < NO_3^-$
(d) $NH_4^+ < NO < N_2O < NO_2 < NO_3^-$

Correct: c

64. Two elements A and B have electronegativities 1.2 and 3.0 respectively. The nature of bond between A and B would be
(a) ionic
(b) covalent
(c) co-ordinate
(d) metallic

Correct: a

65. Laughing gas is
(a) nitrogen pentoxide
(b) nitrous oxide
(c) nitrogen trioxide
(d) nitric oxide

Correct: b

66. Which of the following is not involved in the formation of photochemical smog?

(a) Hydrocarbon
(b) NO
(c) so_2
(d) O_3

Correct: c

67. The colour of $_{62}Sm^{3+}$ is yellow. The expected colour of $_{66}Dy^{3+}$ is
(a) Yellow
(b) Red
(c) Blue
(d) Green

Correct: a

68. Identify the wrong statement in the following:
(a) Chlorofluorocarbons are responsible for ozone layer depletion.
(b) Greenhouse effect is responsible for global warming
(c) Acid rain is mostly because of oxides of nitrogen and sulphur.
(d) Ozone layer does not permit infrared radiation from the sun to reach the earth.

Correct: d

69. The number of elements present in the d-block of the periodic table is
(a) 40
(b) 41
(c) 45
(d) 46

Correct: a

70. Al (at. wt 27) crystallizes in the cubic system with a cell edge of 4.05 Å. Its density is 2.7 g per cm^3. Determine the unit cell type & calculate the radius of the Al atom.
(a) fcc, 2.432 Å
(b) bcc, 2.432 Å
(c) bcc, 1.432 Å
(d) fcc, 1.432 Å

Correct: d

71. Which of the following element do not form complex with EDTA?
(a) Ca
(b) Mg
(c) Be
(d) Sr

Correct: c

72. Which one of the following cyano complexes would exhibit the lowest value of paramagnetic behaviour ?
(a) $[Co(CN)_6]^{3-}$
(b) $[Fe(CN)_6]^{3-}$
(c) $[Mn(CN)_6]^{3-}$
(d) $[Cr(CN)_6]^{3-}$
(At. Nos : Cr=24, Mn=25, Fe=26, Co=27)

Correct: a

73. Equal weights of NaCl and KCl are dissolved separately in equal volumes of solutions Molarity of the two solutions will be
(a) Equal
(b) That of NaCl will be less than that of KCI
(c) That of NaCl will be more than that of KCI
(d) That of NaCl will be about half of that of KCl solution

Correct: c

74. Which of the following complexes has square planar structure?
(a) $Ni(CO)_4$
(b) $[Ni(CN)_4]^{-2}$
(c) $[Ni(Cl)_4]^{-2}$
(d) $\left[Zn(NH_3)_4\right]^{+2}$

Correct: b

75. When N_2O_5 is heated at certain temperature, it dissociates as
$N_2O_5(g) \rightleftharpoons N_2O_3\ g\ (+O_2)(g); K_c = 2.5$
At the same time also decomposes as:
$N_2O_3(g) \rightleftharpoons N_2O\ g\ (+O_2)\ (g)$

If initially 4.0 moles of N_2O_3 are taken in 1.0 litre flask and allowed to dissociate. Concentration of O_2 fata equilibrium is 2.5 M. Equilibrium concentration of N_2O_5 is:
(a) 1.0M
(b) 1.5M
(c) 2.166M
(d) 1.846M

Correct: d

76. An aromatic compound has molecular formula C_7H_7Br .Give the possible isomers and the appropriate method to distinguish them.

(a) 3 isomers; by heating with $AgNO_3$ solution
(b) 4 isomers; by treating with $AgNO_3$ solution
(c) 4 isomers; by oxidation
(d) 5 isomers, by oxidation

Correct: c

77. Which of the following can act as both Bronsted acid and Bronsted base?
(a) Na_2CO_3
(b) OH
(c) HCO_3^-
(d) NH_3

Correct: c

78. The number of double bonds in gammexane is :
(a) 0
(b) 1
(c) 2
(d) 3

Correct: a

79. Which of the following is less acidic among the given halogen compounds?
(a) CHF_3
(b) CHI_3
(c) $CHCl_3$
(d) $CHBr_3$

Correct: a

80. The oxidation state of sulphur in is
(a) +6
(b) +3/2
(c) +5/2
(d) -2

Correct: c

Mathematics

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

(a) vertices of an equilateral triangle
(b) vertices of an isosceles triangle
(c) collinear
(d) None of these

Correct: c

82. A and B are any two non-empty sets and A is proper subset of B. If n(A) = 5, then find the minimum possible value of $n(A \Delta B)$.
(a) 1
(b) 5
(c) Cannot be determined
(d) none of these

Correct: a

83. If x, y, z are complex numbers, and $\Delta = \begin{vmatrix} 0 & -y & -2 \\ \overline{y} & 0 & -x \\ \overline{z} & \overline{x} & 0 \end{vmatrix}$ then Δ is
(a) purely real
(b) purely imaginary
(c) complex
(d) 0

Correct: b

84. Let A and B be two sets such that $A \cap X = B \cap X = \phi$ and $A \cup X = B \cup X$ for same set X. Then
(a) A = B
(b) A = X
(c) B = X
(d) $A \cup B = X$

Correct: a

85. If $\begin{vmatrix} p & q-y & r-z \\ p-x & q & r-z \\ p-x & q-y & r \end{vmatrix} = 0$ then the value of $\frac{p}{x} + \frac{q}{y} + \frac{r}{z}$ is
(a) 0
(b) 1
(c) 2
(d) 4pqr

Correct: c

86. If x is real number, then $\frac{x}{x^2-5x+9}$ must lie between
(a) 1/11 and 1
(b) 1 and 1/11
(c) -11 and 1
(d) -1/11 and 1

Correct: d

87. If $f(x) = \begin{cases} 1, \text{ when } 0 < x \leq \frac{3\pi}{4} \\ 2\sin\frac{2}{9}x, \text{ when } \frac{3\pi}{4} < x < \pi \end{cases}$
(a) f(x) is continuous at x = 0
(b) f(x) is continuous at $x = \pi$
(c) f(x) is continuous at $x = \frac{3\pi}{4}$
(d) f(x) is discontinuous at $x = \frac{3\pi}{4}$

Correct: c

88. The value of c in (0, 2) satisfying the mean value theorem for the function $f(x) = x(x-1)^2, x \in [0, 2]$ is equal to
(a) 3/4
(b) 7/8
(c) 1/4
(d) -7/8

Correct: b

89. If $e^x + e^{f(x)} = e$ then the domain of f(x) is
(a) (-∞ , 1)
(b) (- ∞, 0)
(c) (1, ∞)
(d) None

Correct: a

90. Let $y = e^{2x}$ .Then $\left(\frac{d^2y}{dx^2}\right)\left(\frac{d^2x}{dy^2}\right)$ is
(a) 1
(b) e^{-2x}
(c) $2e^{2x}$
(d) $-2e^{-2x}$

Correct: d

91. A ball is dropped from a platform 19.6m high. Its position function is –
(a) $x = -4.9t^2 + 19.6(0 \leq t \leq 1)$

(b) $x = -4.9t^2 + 19.6 (0 \leq t \leq 2)$
(c) $x = -9.8t^2 + 19.6 (0 \leq t \leq 2)$
(d) $x = -4.9t^2 - 19.6 (0 \leq t \leq 2)$

Correct: b

92. Number of solutions of equation $\sin 9\theta = \sin \theta$ in the interval $[0, 2\pi]$ is
(a) 16
(b) 17
(c) 18
(d) 15

Correct: b

93. A cylindrical gas container is closed at the top and open at the bottom. if the iron plate of the top is 5/4 time as thick as the plate forming the cylindrical sides. The ratio of the radius to the height of the cylinder using minimum material for the same capacity is
(a) 2/3
(b) 1/2
(c) 4/5
(d) 1/3

Correct: c

94. If A and B are positive acute angles satisfying
$3\cos^2 A + 2\cos^2 B = 4$ and $\frac{3\sin A}{\sin B} = \frac{2\cos B}{\cos A}$
Then the value of A + 2B is equal to
(a) π/6
(b) π/2
(c) π/3
(d) π/4

Correct: b

95. The set of all values of a for which the function
$f(x) = \left(a^2 - 3a + 2\right)\left(\cos^2 x/4 - \sin^2 x/4\right) + (a-1)x + \sin 1$ does not possess critical points is
(a) [1 , ∞)
(b) $(0, 1) \cup (1, 4)$
(c) $(-2, 4)$
(d) $(1, 3) \cup (3, 5)$

Correct: b

96. $2^{3x} - 7n - 1$ is divisible by

(a) 64
(b) 36
(c) 49
(d) 25

Correct: c

97. $\int \frac{e^{x^2}\left(2x+x^3\right)}{\left(3+x^2\right)^2}dx$ is equal to
(a) $\frac{e^{x^2}}{\left(3+x^2\right)}+k$
(b) $\frac{1}{2}\frac{e^{x^2}}{\left(3+x^2\right)^2}+k$
(c) $\frac{1}{4}\frac{e^{x^2}}{\left(3+x^2\right)^2}+k$
(d) $\frac{1}{2}\frac{e^{x^2}}{\left(3+x^2\right)}+k$

Correct: d

98. If :p Raju is tall and q: Raju is intelligent, then the symbolic statement $-p \vee q$ means
(a) Raju is not tall or he is intelligent.
(b) Raju is tall or he is intelligent
(c) Raju is not tall and he is intelligent .
(d) Raju is not tall implies he is intelligent

Correct: a

99. If $\int \frac{\cos x-1}{\sin x+1}e^x dx$ is equal to
(a) $\frac{e^x \cos x}{1+\sin x}+C$
(b) $C-\frac{e^x \sin x}{1+\sin x}$
(c) $C-\frac{e^x}{1+\sin x}$
(d) $C-\frac{e^x \cos x}{1+\sin x}$

Correct: a

100. For $n \in N, x^{n+1}+(x+1)^{2n-1}$ is divisible by
(a) x
(b) x+1
(c) x^2+x+1
(d) x^2-x+1

Correct: c

101. The area enclosed by the curves $y=x^3$ and $y=\sqrt{x}$ is
(a) 5/3 sq units

(b) 5/4 sq units
(c) 5/12 sq units
(d) 12/5 sq units

Correct: c

102. The roots of the equation $5, -4, \frac{1\pm5\sqrt{-3}}{2}$ are:
(a) $5, -4, \frac{1\pm5\sqrt{-3}}{2}$
(b) $-5, 4, \frac{-1\pm5\sqrt{-3}}{2}$
(c) $5, 4, \frac{-1\pm5\sqrt{-3}}{2}$
(d) $-5, -4, \frac{1\pm5\sqrt{-3}}{2}$

Correct: a

103. Let the straight line x = b divide the area enclosed by $y = (1-x)^2, y = 0$ and x=0 into two parts $R_1(0 \leq x \leq b)$ and $R_2(b \leq x \leq 1)$ such that $R_2(b \leq x \leq 1)$ Then b equals
(a) 3/4
(b) 1/2
(c) 1/3
(d) 1/4

Correct: b

104. If $f(z) = \frac{7-z}{1-z^2}$ where z=1+2i then $|f(z)|$ is
(a) $\frac{|z|}{2}$
(b) $|z|$
(c) $2|z|$
(d) None of these

Correct: a

105. The area of the region bounded by the x-axis the curve y=f(x) and the lines x=1,x=b, is equal to for all b>1 ,then f(x) is
(a) $\sqrt{x-1}$
(b) $\sqrt{x+1}$
(c) $\sqrt{x^2+1}$
(d) $\frac{x}{\sqrt{1+x^2}}$

Correct: d

106. An integrating factor of the differential equation $\sin x\frac{dy}{dx} + 2y\cos x = 1$ is
(a) $\sin^2 x$

(b) $\frac{2}{\sin x}$
(c) $\log|\sin x|$
(d) $\frac{1}{\sin^2 x}$

Correct: a

107. The expression satisfying the differential equation $\left(x^2-1\right)\frac{dy}{dx}+2xy=1$ is
(a) $x^2y-xy^2=c$
(b) $\left(y^2-1\right)x=y+c$
(c) $\left(x^2-1\right)y=x+c$
(d) none of these

Correct: c

108. The solution of $\frac{dy}{dx}=\cos(x+y)+\sin(x+y)$ is
(a) $\log\left[1+\tan\left(\frac{x+y}{2}\right)\right]+C=0$
(b) $\log\left[1+\tan\left(\frac{x+y}{2}\right)\right]=x+C$
(c) $\left[1-\tan\left(\frac{x+y}{2}\right)\right]=x+C$
(d) none of these

Correct: b

109. Let $f:(1\infty)\to(2\infty)$ be differentiable function such that $f(1)=2$. If $6\int_1^x f(t)dt=3xf(x)-x^3$ for all $x\geq 1$ then the value of f(2) is
(a) 3
(b) 4
(c) 5
(d) 6

Correct: d

110. If $\phi(x)$ is a differential function then the solution of the differential equation $\mathrm{dy}+\{\mathrm{y}\phi(\mathrm{x})-\phi(\mathrm{x})\phi'(\mathrm{x})\}\,\mathrm{dx}=0$
(a) $y=\{\phi(x)-1\}+Ce^{-\phi(x)}$
(b) $\mathrm{y}\phi(\mathrm{x})=\{\phi(\mathrm{x})\}^2+\mathrm{C}$
(c) $ye^{\phi(x)}=\phi(x)e^{\phi(x)}+C$
(d) $y-\phi(x)=\phi(x);^{-\phi(x)}$

Correct: a

111. The area of the region $R=\{(x,y);|x|\leq b|$ and $x^2+y^2\leq 1\}$ is

(a) $\frac{3\pi}{8}$ sq units
(b) $\frac{5\pi}{8}$ sq units
(c) $\frac{\pi}{2}$ sq units
(d) $\frac{\pi}{8}$ sq units

Correct: c

112. If $\hat{i}+\hat{j}, \hat{j}+\dot{k}, \hat{i}+\hat{k}$ are the position vector of the vertices of triangle ABC taken in order then $\angle \mathrm{A}$ is equal to
(a) $\frac{\pi}{2}$
(b) $\frac{\pi}{5}$
(c) $\frac{\pi}{6}$
(d) $\frac{\pi}{3}$

Correct: d

113. Let $\overline{a}, \vec{b} \& \overline{c}$ be non-coplanar unit vectors equally inclined to one another at an acute angle θ . Then $|[\vec{a} \vec{b} \overline{c}]|$ in terms of θ is equal to
(a) $(1+\cos \theta) \sqrt{\cos 2 \theta}$
(b) $(1+\cos \theta) \sqrt{1-2 \cos 2 \theta}$
(c) $(1-\cos \theta) \sqrt{1+2 \cos 2 \theta}$
(d) None of these

Correct: c

114. Let $\hat{a}$ and $\hat{b}$ be two non -collinear unit vector .If \(u=\hat{a}-(\hat{a}-\hat{b}) \hat{b}, \) and $v=\hat{a} \times \hat{b}$ then $|v|$ is equal to
(a) $|u|$
(b) $|u|+|(v+\hat{a})|$
(c) $2|v|$
(d) $|v|+u .(\hat{a}+\hat{b})$

Correct: a

115. The number of times the digit 5 will be written when listing the integers from 1 to 1000, is
(a) 271
(b) 272
(c) 300
(d) None of these

Correct: c

116. The 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) 1/3

Correct: a

117. Let $f(x) = \frac{ax+b}{cx+d}$ then fof (x) , provided that:
(a) d=-a
(b) d=a
(c) a=b=1
(d) a=b=c=d=1

Correct: a

118. The distance of the point (1, -5,9) from the plane x + y + z = 5 measured along a straight line $x = y - z$ is $2\sqrt{3}k$ then the value of k is
(a) 5
(b) 6
(c) $\sqrt{3}$
(d) 4

Correct: a

119. The coefficient of x^5 in the expansion of $(1+x)^{21} + (1+x)^{22} + \ldots + (1+x)^{30}$ is
(a) ${}^{51}C_5$
(b) ${}^{9}C_5$
(c) ${}^{31}C_6 {}^{-21}C_6$
(d) ${}^{30}C_5 - {}^{20}C_5$

Correct: c

120. The equation of the plan through the interaction of the planes $x + y + z = 1$ and $2x + 3y - z + 4 = 0$ parallel to x axis, is
(a) y - 3z + 6 = 0
(b) 3y - 2+ 6 = 0
(c) y + 3z + 6 = 0
(d) 3y - 2z + 6 =0

Correct: a

121. Let R= {(3,3), (6,6), (9,9), (12, 12),(6,12), (3,9),(3, 12), (3,6)} be a relation on the set A= {3,6,9,12). Then, the relation is
(a) an equivalence relation

(b) reflexive and symmetric
(c) reflexive and transitive
(d) only reflexive

Correct: c

122. One mapping is selected at random from all mappings of the set S= {1, 2, 3, ...} into itself. The probability that it is one-one is 3/32 . Then the value of n is
(a) 3
(b) 4
(c) 5
(d) 6

Correct: b

123. A random variable X has the probability distribution

X	1	2	3	4	5	6	7	8
$p(X)$	0.15	0.23	0.12	0.10	0.20	0.08	0.07	0.05

For the events E={ X is a prime number} and F={X<4},then $P(E \cup F)$
(a) 0.50
(b) 0.77
(c) 0.35
(d) 0.87

Correct: b

124. A man takes a step forward
(a) $\frac{2^5 \cdot 3^5}{5^{10}}$
(b) $462 \times \left(\frac{6}{25}\right)^5$
(c) $231 \times \frac{3^5}{5^{10}}$
(d) None of these

Correct: b

125. Let X denote the number of times head occur in n tosses of a fair coin, If $P(X = 6)$ are in AP, then the value of n is
(a) 7,14
(b) 10,14
(c) 12,7
(d) 14, 12

Correct: a

126. In each ot the following questions, out of the four alternatives, choose the one which can be substituted for the given words/sentence.
A person who believes that pleasure is the chief good.
(a) Stoic
(b) Hedonist
(c) Epicure
(d) Sensual

Correct: c

127. Choose the word opposite in meaning to the given word, METICULOUS
(a) Forgetful
(b) Destructive
(c) Careless
(d) Flagrant

Correct: c

128. Out of the four alternatives, choose the one which express the correct meaning of the word, CONSOLATION
(a) Comfort
(b) Problem
(c) Sadness
(d) Solution

Correct: a

129. Choose the word opposite in meaning to the given word, FLAGITIOUS
(a) Innocent
(b) Vapid
(c) Ignorant
(d) Frivolous

Correct: a

130. A person who is incharge of museum.
(a) caretaker
(b) warden
(c) supervisor
(d) curator

Correct: d

131. Choose the word opposite is meaning to the given word, AUSPICIOUS
(a) Prosperous
(b) Unfavourable
(c) Improper
(d) New

Correct: b

132. Which of the following phrases (I), (II), and (III) given below each sentence should replace the phrase printed in bold letters to make the sentence grammatically correct? Choose the best option among the five given alternatives that reflect the correct use of phrase in the context of the grammatically correct sentence. If the sentence is correct as it is, mark (d) ie., "No correction required" as the answer.
By working part-time and looking after his old mother, he managed to get the best for both worlds.
(I) the best at both worlds
(II) the best of both worlds
(III) the best on both worlds
(a) Only (I) is correct
(b) Only (II) is correct
(c) Only (III) is correct
(d) No correction required

Correct: b

133. Choose the word opposite is meaning to the given word, IMPEDE
(a) Block
(b) Delay
(c) Push
(d) Freeze

Correct: c

134. Read the following passage carefully and answer the questions given below it.
The likelihood of at least 600,000 deaths being caused annually in India by fine particulate matter pollution in the air is cause for worry, even if the data released by the World Health Organisation are only a modelled estimate. The conclusion that so many deaths could be attributed to particulate matter 2.5 micrometres a or less in size is, of course, caveated, sincero comprehensive measurement of PM2.5 is not yet being n done and the linkages between pollution, disease and in deaths need further study. What is not in doubt is that 1 residents in many urban areas are forced to breathe unhealthy levels of particulates, and the smallest of these - PM10 and less - can penetrate and get lodged deep in the lungs. The WHO Global Burden of Disease study has been working to estimate pollution-linked health impacts, such as stroke and ischaemic heart disease, acute lower respiratory infection and chronic obstructive pulmonary disease. Data on fine particulates in India show that in several

locations the pollutants come from burning of biomass, such as coal, fuel wood, farm litter and cow dung cakes. In highly built-up areas, construction debris, road dust and vehicular exhaust add to the problem. The Prime Minister launched an Air Quality Index last year aimed at improving pollution control. The new data, which the WHO says provide the best evidence available on the terrible toll taken by particulates, should lead to intensified action. A neglected aspect of urban air pollution control is the virtual discarding of the Construction and Demolition 3 Waste Management Rules, notified to sustainably manage debris that is dumped in the cities, creating ·severe particulate pollution.
The Environment Ministry has highlighted the role that debris can play as a resource. Municipal and government contracts are, under the rules, required to utilise up to 20 per cent materials made from construction and demolition waste, and local authorities must place containers to hold debris. This is is dumped in the cities ,creating severe particulate pollution. must be implemented without delay. Providing cleaner fuels and scientifically designed cookstoves to those who have no option but to burn biomass, would have a big impact on reducing particulate matter in the northern and eastern States, which are the worst-hit during winter, when biomass is also used for heating. Greening the cities could be made a mission, involving civil society, with a focus on landscaping open spaces and paving all public areas to reduce dust. These measures can result in lower PM10 and PM2.5 levels. measurement of these particulates is currently absent in many cities, a lacuna that needs to be addressed.
Which of the following is/are not true in the context of the passage?
(a) Eastern and Southern states are worst hit in winter by burning of biomass.
(b) The smallest particulate matter PM2.5 penetrates and gets lodged in lungs.
(c) Data on fine particulates in India show that in several locations the pollutants come from the smoke emitted by vehicles.
(d) None is true

Correct: d

135. A part of sentence is underlined. Balance are given alternatives to the underlined part a, b, c and d which may improve the sentence. Choose the correct alternative.
She did not <u>believe</u> me.
(a) believing
(b) believe to
(c) believe
(d) No improvement

Correct: d

136. Choose the correct alternative option out of four
China is big country ,in area it is bigger than any other country _____ Russia?
(a) accept
(b) except
(c) expect
(d) access

Correct: b

137. Out of the four alternatives, choose the one which express the correct meaning of the word, SAGACIOUS
(a) Shameless
(b) Wise
(c) Powerless
(d) Foolish

Correct: b

138. A part of sentence is underlined. Below are given alternatives to the underlined part (a), (b), (c) and (d) which may improve the sentence. Choose the correct alternative.
It was not possible to drag any conclusion so he left the case.
(a) Fetch
(b) Find
(c) Draw
(d) No improvement

Correct: c

139. In each of the following questions choose the alternative which is mostly nearly the same in meaning to the word given capital letters
EMPHERIAL
(a) Uneral
(b) Mythical
(c) Short-living
(d) Pliable

Correct: c

140. A part of sentence is underlined. Below are given alternatives to the underlined part (a), (b), (c) and (d) which may improve the sentence. Choose the correct alternative.
"Mind your language !" he shouted.
(a) change
(b) inspect
(c) hold
(d) No improvement

Correct: d

Logical Reasoning

141. In a code language, if REGAINS is coded as QDFZHMR, then the word PERIODS will be

coded as
(a) ODQNHCR
(b) ODDOHCR
(c) ODQHNCR
(d) ODQHNRC

Correct: c

142. The average age of 8 men is increased by 2 yr when one of them whose age is 20 yr is replaced by a new man. What is the age of the new man
(a) 28 yr
(b) 36 yr
(c) 34 yr
(d) 35 yr

Correct: a

143. Select the related letter/word/ number from the given alternatives. Distance: Odometer :: ?: Barometer
(a) Humidity
(b) Pressure
(c) Thickness
(d) Wind

Correct: b

144. In a queue of children, Arun is fifth from the left and Suresh is sixth from the right. When they interchange their places among themselves, Arun becomes thirteenth from the left. Then, what will be Suresh's position from the right?
(a) 8th
(b) 14th
(c) 15th
(d) 16th

Correct: c

145. Choose the correct alternatives from the given ones that will complete the series.
22,26,53,69, 194, ?
(a) 230
(b) 260
(c) 250
(d) 245

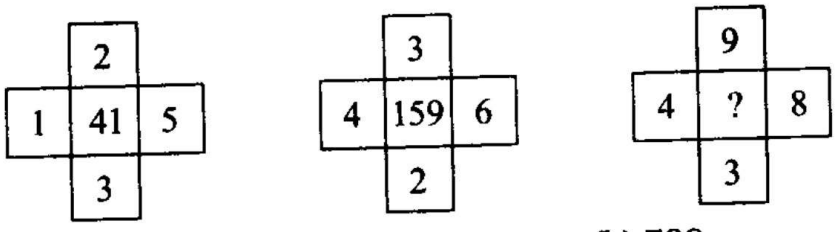
Correct: d

146. Which of the following will fill the series?

2, 9, 28, __ , 126
(a) 64
(b) 65
(c) 72
(d) 56

Correct: a

147. Select the missing number from the given responses.



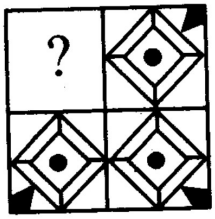
(a) 888
(b) 788
(c) 848
(d) 842

Correct: b

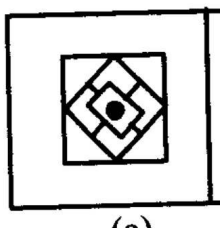
148. Today is Thursday. The day after 59 days will be
(a) Sunday
(b) Monday
(c) Tuesday
(d) Wednesday

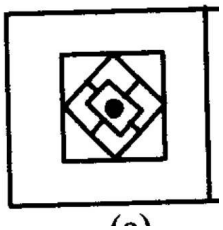
Correct: c

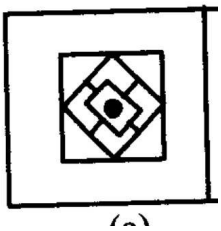
149. Which answer figure complete the form in question figure ?
Question figure :

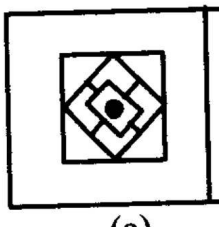


Answer Figure:

(a) 

(b) 

(c) 

(d) 

Correct: d

150. In a code language, if SUMMER is coded as SDNLVR, then the word WINTER will be coded as:
(a) SDUMJV
(b) SDMUJV
(c) SUUMVJ
(d) VJMUDS

Correct: a