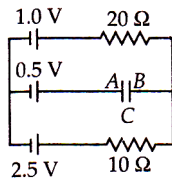
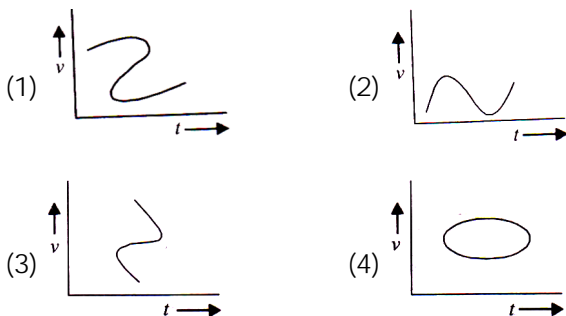


01. A light emitting diode (LED) has a voltage drop of 2V across it and a current of 10 mA passes when it operates with a 6V battery through a limiting resistor R. The value of R is
 (1) 40 k Ω (2) 4 k Ω
 (3) 200 Ω (4) 400 Ω
02. In the uranium radioactive series, the initial nucleus is ${}_{92}\text{U}^{238}$ and that the final nucleus is ${}_{82}\text{Pb}^{206}$. When uranium nucleus decays to lead, the number of α and β particles emitted are
 (1) 8 α , 6 β (2) 6 α , 7 β
 (3) 6 α , 8 β (4) 4 α , 3 β
03. If the wavelength of the first line of the Balmer series of hydrogen is 6561 \AA , the wavelength of the second line of the series should be
 (1) 1312 \AA (2) 3280 \AA
 (3) 4860 \AA (4) 2187 \AA
04. In a photoelectric experiment the stopping potential for the incident light of wavelength 4000 \AA is 2V. If the wavelength be changed to 3000 \AA , the stopping potential will be
 (1) 2 V (2) zero
 (3) less than 2V (4) more than 2 V
05. The fact that transverse property of wave can be easily explained by
 (1) Diffraction method
 (2) Polarisation method
 (3) Scattering
 (4) absorption
06. The two slits are 1 mm apart from each other and illuminated with a light of wavelength $5 \times 10^{-7} \text{ m}$. If the distance of the screen is 1 m from the slits, then the distance between third dark fringe and fifth bright fringes is
 (1) 1.5 mm (2) 0.75 mm
 (3) 1.25 mm (4) 0.625 mm
07. A ray is incident on a plane surface. If $\hat{i} + \hat{j} - \hat{k}$ represents a vector the direction of incident ray. $\hat{i} + \hat{j}$ is a vector normal on incident point in the plane of incident and reflected ray, then vector along the direction of reflected ray is
 (1) $-\frac{1}{\sqrt{19}}(-3\hat{i} + 3\hat{j} + \hat{k})$ (2) $\frac{1}{\sqrt{19}}(3\hat{i} + 3\hat{j} - \hat{k})$
 (3) $-\frac{1}{\sqrt{3}}(\hat{i} + \hat{j} + \hat{k})$ (4) \hat{k}
08. Magnifying power of a telescope in normal adjustment when final image of a star is formed at infinity is 5 while tube length is 36 cm. Focal length of objective is
 (1) 5 cm (2) 6 cm
 (3) 30 cm (4) 36 cm
09. What is the name given to that part of the electromagnetic spectrum which is used for taking photographs of earth under foggy conditions from great heights?
 (1) Ultraviolet rays (2) Visible rays
 (3) Infrared rays (4) Microwaves
10. A resistor of 500Ω , an inductance of 0.5H are in series with an ac voltage source which is given by $V = 100\sqrt{2} \sin(1000t)$. The power factor of the combination is
 (1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{\sqrt{3}}$ (3) 0.5 (4) 0.6
11. Two solenoids of equal number of turns have their lengths and the radii in the same ratio 1 : 2. The ratio of their self inductance will be
 (1) 1 : 2 (2) 2 : 1
 (3) 1 : 1 (4) 1 : 4
12. Lines of forces due to earth's horizontal magnetic field are
 (1) parallel and straight
 (2) concentric circles
 (3) elliptical
 (4) curve lines
13. A particle of mass m, charge Q and kinetic energy T enters a transverse uniform magnetic field \vec{B} . After 3 seconds the kinetic energy of the particle will be
 (1) T (2) 4T (3) 3T (4) 2T
14. Two long parallel wires carrying equal current separated by 1m, on exert a force of $2 \times 10^{-7} \text{ Nm}^{-1}$ on one meter of one another. The current flowing through them will be
 (1) 1.0 A (2) 2.2 A
 (3) 0.5 A (4) $2 \times 10^{-7} \text{ A}$

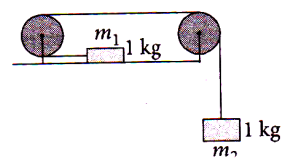
15. In the circuit shown below, the potential of A with respect to B of the capacitor C is



- (1) 2.00 V (2) -2.00 V
 (3) -1.50 V (4) + 1.50 V
16. A $4\mu\text{F}$ capacitor is charged by a 200 V supply. It is then disconnected from the supply and is connected to another unchanged $2\mu\text{F}$ capacitor. The energy lost in the process is
- (1) 3×10^{-2} J (2) 3×10^2 J
 (3) 2.67×10^{-2} J (4) 3.8×10^2 J
17. Two parallel metal plates having charges +Q and -Q face each other at certain distance between them. If the plates are now dipped in kerosene oil tank, the electric field between the plates will
- (1) becomes zero (2) increase
 (3) decrease (4) remain same
18. A body of mass 20.00 g have volume 5.0cm^3 . The maximum possible error in the measurement of mass and volume respectively are 0.01 g and 0.1cm^3 . The percentage error in the density will be nearest to
- (1) 1% (2) 2% (3) 11% (4) 25%
19. Using mass (M), length (L), time (T) and current (A) as fundamental quantities, the dimensions of permeability are
- (1) $[M^{-1}LT^{-2}A]$ (2) $[ML^2T^{-2}A^{-1}]$
 (3) $[MLT^{-2}A^{-2}]$ (4) $[ML^2T^{-1}A^{-1}]$
20. Which of the following velocity-time graphs shows a realistic situation for a body in motion ?



21. A ball is dropped from the top of a building 100 m high. At the same instant another ball is thrown upwards with a velocity of 40 m/s from the bottom of the building. The two balls will meet after
- (1) 3s (2) 2s (3) 2.5s (4) 5s
22. What can be the angle between $\vec{P} + \vec{Q}$ and $\vec{P} - \vec{Q}$?
- (1) 0° (2) 90°
 (3) 180° (4) Between 0° & 180°
23. A particle is projected from the ground with an initial speed of v at angle θ with horizontal. The average velocity of the particle between its point of projection and height point of trajectory is
- (1) $\frac{v}{2}\sqrt{1+2\cos^2\theta}$ (2) $\frac{v}{2}\sqrt{1+\cos^2\theta}$
 (3) $\frac{v}{2}\sqrt{1+3\cos^2\theta}$ (4) $v\cos\theta$
24. If the radii of circular paths of two particles of same mass are in the ratio 1 : 2, then to have a constant centripetal force, their velocities should be in ratio of
- (1) 4 : 1 (2) $1 : \sqrt{2}$
 (3) 1 : 4 (4) $\sqrt{2} : 1$
25. A block of mass 2 kg is placed on the floor. The coefficient of static friction is 0.4. If a force of 2.8 N is applied on the block parallel to the floor, the force of friction between the block and the floor, the force of friction between the block and the floor is ($g = 10\text{ms}^{-2}$)
- (1) 2.8 N (2) 2 N
 (3) 8 N (4) zero
26. A gun of mass 10 kg fires 4 bullets per second. The mass of each bullet is 20 g and the velocity of the bullet when it leaves the gun is 300ms^{-1} . The force required to hold the gun when firing is
- (1) 6 N (2) 8 N (3) 24 N (4) 240 N
27. Consider the system shown in figure. The pulley and the string are light and all the surfaces are frictionless. The tension in the string is (take $g = 10\text{ms}^{-2}$)



28. If mass of an atom is M and is moving with speed v , what will be its speed after the emission of an α - particle if speed of α - particle is V .

- (1) $\frac{Mv}{M+2}$ (2) $\frac{Mv}{M-4}$
 (3) $\frac{Mv}{M+4}$ (4) $\frac{M-4}{Mv}$

29. A bomb of mass 3.0 kg explodes in air into two pieces of mass 2.0 kg and 1.0 kg. The smaller mass goes at a speed of 80 m/s. The total energy imparted to the two fragments is

- (1) 1.07 kJ (2) 2.14 kJ
 (3) 2.4 kJ (4) 4.8 kJ

30. When the axis of rotation passes through its centre of mass, then the moment of inertia of a rigid body is

- (1) reduced to its minimum value
 (2) zero
 (3) increased to its maximum value
 (4) infinity

31. If the earth is treated as a sphere of radius R and mass M , its angular momentum about the axis of its rotation with period T , is

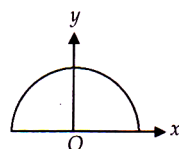
- (1) $\frac{MR^2T}{2\pi}$ (2) $\frac{4\pi MR^2}{5T}$
 (3) $\frac{\pi MR^3}{T}$ (4) $\frac{2\pi MR^2}{T}$

32. A child is standing with folded hands at a centre of a platform rotating about its central axis. The kinetic energy of the system is K . The child now stretches his arms so that the moment of inertia of the system doubled. The kinetic energy of the system now is

- (1) $2K$ (2) $\frac{K}{2}$
 (3) $\frac{K}{4}$ (4) $4K$

33. A wire of length ℓ and mass m is bent in the form of a semicircle. The gravitational field intensity at the centre of semicircle is

- (1) $\frac{Gm}{\pi\ell}$ along x-axis
 (2) $\frac{Gm}{\pi\ell}$ along y-axis



- (3) $\frac{2\pi Gm}{\ell^2}$ along y-axis
 (4) $\frac{2\pi Gm}{\ell^2}$ along x-axis

34. Young's modulus for a steel wire is 2×10^{11} Pa and its elastic limit is 2.5×10^8 Pa. by how much can a steel wire 3 m long and 2mm in diameter be stretched before the elastic limit exceeded ?

- (1) 3.75 mm (2) 7.50 mm
 (3) 4.75 mm (4) 4.00 mm

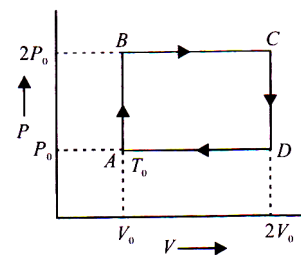
35. Surface temperature of star A and B are 727°C and 327°C respectively. What is the ratio $H_A : H_B$ for the heat radiated per second by the two stars ?

- (1) 5 : 3 (2) 25 : 9
 (3) 625 : 81 (4) 125 : 27

36. The latent heat vaporisation of a substance is always

- (1) greater than its latent heat of fusion
 (2) greater than its latent heat of sublimation
 (3) equal to its latent heat of sublimation
 (4) less than its latent heat of fusion

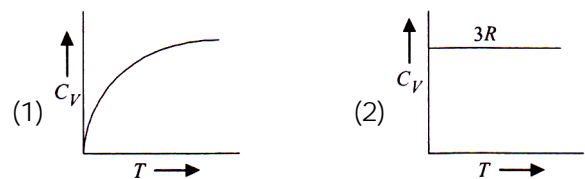
37. n moles of a monoatomic gas is carried round the reversible rectangular cycle ABCDA as shown in the diagram. The temperature at A is T_0 .

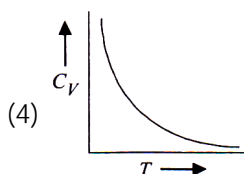
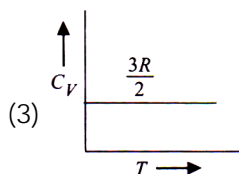


The thermodynamic efficiency of the cycle is

- (1) 15% (2) 50%
 (3) 20% (4) 25%

38. Graph of specific heat at constant volume for a monoatomic gas is





39. The time period of a particle undergoing SHM is 16 s. It starts motion from the mean position. After 2s, its velocity is 0.4 ms^{-1} . The amplitude is

(1) 1.44 m (2) 0.72 m
(3) 2.88 m (4) 0.36 m

40. A resonance air column of length 20 cm resonates with a tuning fork of frequency 450 Hz. Ignoring the end correction, the velocity of sound in air will be

(1) 920 m / s (2) 720 m / s
(3) 820 m / s (4) 360 m / s

41. An earthquake generates both transverse (S) and longitudinal (P) sound waves in the earth. The speed of S waves is about 4.5 km/s and that of P waves is about 8.0 km/s. A seismograph record P and S waves from an earthquake. The first P wave arrives 4.0 min before that first S wave. The epicenter of the earthquake is located at a distance about

(1) 25 km (2) 250 km
(3) 2500 km (4) 5000 km

42. Match the columns I and II.

Column I

- (a) Faraday's of induction
(b) Maxwell's law of electromagnetic induction
(c) Plank's law of quantisation
(d) Plank's law displacement

Column II

- (p) Energy of an oscillator is quantised
(q) Time varying magnetic field produces and electric field
(r) Frequency of most radiation is directly is directly proportional to the absolute temp. of the body
(s) Time varying electric field produces a magnetic field

a	b	c	d
(1) s	r	q	p
(2) q	s	r	p
(3) p	q	r	s
(4) s	r	p	q

43. Match the columns I and II.

Column I

- (a) Photoelectric effect
(b) X-rays
(c) Black body radiation
(d) Wave-particle duality

Column II

- (p) Momentum $p = \frac{h}{\lambda}$
(q) Emission of radiation from heated objects
(r) Emission of energetic radiation when fast moving electron hit the heavy metal targets
(s) Emission of electron when light (radiation) falls in a metal

a	b	c	d
(1) q	s	r	p
(2) p	s	r	q
(3) r	s	q	p
(4) s	r	q	p

44. Yellow light is used in a single slit diffraction experiment with slit width of 0.6 mm. If yellow light is replaced by X-rays, then the observed pattern will reveal

- (1) that the central maximum is narrower
(2) more number of fringes
(3) less number of fringes
(4) No diffraction pattern

45. One of the problems of in-air testing of nuclear weapons (or. even worse, the use of such weapons!) is the danger of radioactive fallout. One of the most problematic nuclides in such fallout strontium -90 (^{90}Sr), which breaks down

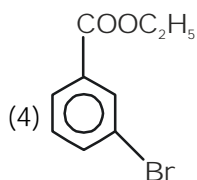
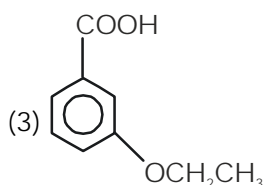
by β^- decay with a half-life of 28 years. It is chemically similar to calcium and therefore can be incorporated into bones and teeth, where, due to its rather long half-life, it remain for years as an internal source of radiation.

Select the correct statement

- (1) The daughter nucleus of the $^{90}_{38}\text{Sr}$ decay is $^{90}_{39}\text{Y}$
(2) 25% of the original level of ^{90}Sr is left after 56 years
(3) 6.25 % of $^{90}_{38}\text{Sr}$ remain after 112 year.
(4) All of the above

46. The measurement of the electron position is associated with an uncertainty in momentum, which is equal to $1 \times 10^{-18} \text{ g cm s}^{-1}$. The uncertainty in electron velocity is (mass of electron is $9 \times 10^{-28} \text{ g}$).
- (1) $1 \times 10^5 \text{ cm s}^{-1}$ (2) $1 \times 10^{11} \text{ cm s}^{-1}$
 (3) $1 \times 10^9 \text{ cm s}^{-1}$ (4) $1 \times 10^6 \text{ cm s}^{-1}$
47. Four diatomic species are listed below in different sequences. Which of these presents the correct order of their increasing bond order ?
- (1) $\text{C}_2^{2-} < \text{He}_2^+ < \text{NO} < \text{O}_2^-$
 (2) $\text{He}_2^+ < \text{O}_2^- < \text{NO} < \text{C}_2^{2-}$
 (3) $\text{O}_2^- < \text{NO} < \text{C}_2^{2-} < \text{He}_2^+$
 (4) $\text{NO} < \text{C}_2^{2-} < \text{O}_2^- < \text{He}_2^+$
48. If a stands for the edge length of the cubic system: simple cubic, body centred cubic and face centred cubic, then the ratio of radii of the spheres in these systems will be respectively.
- (1) $\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{2}}{2}a$ (2) $1a : \sqrt{3}a : \sqrt{2}a$
 (3) $\frac{1}{2}a : \frac{\sqrt{3}}{4}a : \frac{1}{2\sqrt{2}}a$ (4) $\frac{1}{2}a : \sqrt{3}a : \frac{1}{\sqrt{2}}a$
49. For the gas phase reaction,
- $$\text{PCl}_{5(g)} \rightleftharpoons \text{PCl}_{3(g)} + \text{Cl}_{2(g)}$$
- which of the following conditions are correct ?
- (1) $\Delta H < 0$ and $\Delta S < 0$ (2) $\Delta H > 0$ and $\Delta S < 0$
 (3) $\Delta H = 0$ and $\Delta S < 0$ (4) $\Delta H > 0$ and $\Delta S > 0$
50. The values of K_{p1} and K_{p2} for the reactions
- $$\text{X} \rightleftharpoons \text{Y} + \text{Z} \quad \dots \text{ (i)}$$
- $$\text{A} \rightleftharpoons 2\text{B} \quad \dots \text{ (ii)}$$
- are in the ratio 9 : 1. If degree of dissociation of X and A be equal, then total pressure at equilibrium (i) and (ii) are in the ratio
- (1) 36 : 1 (2) 1 : 1 (3) 3 : 1 (4) 1 : 9
51. How many stereoisomers does this molecule have?
- $$\text{CH}_3\text{CH} = \text{CHCH}_2\text{CHBrCH}_3$$
- (1) 8 (2) 2 (3) 4 (4) 6
52. A strong base can abstract an α -hydrogen from
- (1) Ketone (2) Alkane
 (3) Alkene (4) Amine
53. A 0.0020 m aqueous solution of an ionic compound $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)] \text{Cl}$ freezes at -0.00732°C . Number of moles of ions which 1 mol of ionic compound produces on being dissolved in water will be ($K_f = -1.86^\circ\text{C/m}$)
- (1) 3 (2) 4 (3) 1 (4) 2
54. The ionization constant of ammonium hydroxide is 1.77×10^{-5} at 298 K. Hydrolysis constant of ammonium chloride is
- (1) 6.50×10^{-12} (2) 5.65×10^{-13}
 (3) 5.65×10^{-12} (4) 5.65×10^{-10}
55. Oxidation numbers of P in PO_4^{3-} , of S in SO_4^{2-} and that of Cr in $\text{Cr}_2\text{O}_7^{2-}$ are respectively
- (1) +3, +6 and +5 (2) +5, +3 and +6
 (3) -3, +6 and +6 (4) +5, +6 and +6
56. The stability of +1 oxidation state increases in the sequence
- (1) $\text{Tl} < \text{In} < \text{Ga} < \text{Al}$ (2) $\text{In} < \text{Tl} < \text{Ga} < \text{Al}$
 (3) $\text{Ga} < \text{In} < \text{Al} < \text{Tl}$ (4) $\text{Al} < \text{Ga} < \text{In} < \text{Tl}$
57. The straight chain polymer is formed by
- (1) Hydrolysis of CH_3SiCl_3 followed by condensation polymerisation
 (2) Hydrolysis of $(\text{CH}_3)_4\text{Si}$ by addition polymerisation
 (3) Hydrolysis of $(\text{CH}_3)_2\text{SiCl}_2$ followed by condensation polymerisation
 (4) Hydrolysis of $(\text{CH}_3)_3\text{SiCl}$ followed by condensation polymerisation
58. The state of hybridisation of C_2 , C_3 , C_5 and C_6 of the hydrocarbon
- $$\begin{array}{ccccccc} & \text{CH}_3 & & & \text{CH}_3 & & \\ & | & & & | & & \\ \text{CH}_3 & - \text{C} & - \text{CH} = & \text{CH} & - \text{CH} & - \text{C} \equiv & \text{CH} \\ & | & & & | & & \\ & \text{CH}_3 & & & & & \end{array}$$
- 7 6 5 4 3 2 1
- is in the following sequence
- (1) $\text{sp}^3, \text{sp}^2, \text{sp}^2$ and sp (2) $\text{sp}, \text{sp}^2, \text{sp}^2$ and sp^3
 (3) $\text{sp}, \text{sp}^2, \text{sp}^3$ and sp^2 (4) $\text{sp}, \text{sp}^3, \text{sp}^2$ and sp^3

59. Which of the following reactions is an example of nucleophilic substitution reaction ?
 (1) $2RX + 2 Na \rightarrow R - R + 2 NaX$
 (2) $RX + H_2 \rightarrow RH + HX$
 (3) $RX + Mg \rightarrow RMgX$
 (4) $RX + KOH \rightarrow ROH + KX$
60. Propionic acid with Br_2/P yields a dibromo product. Its structure would be
 (1) $\begin{array}{c} Br \\ | \\ H-C-CH_2COOH \\ | \\ Br \end{array}$
 (2) $CH_2(Br)-CH_2-COBr$
 (3) $\begin{array}{c} Br \\ | \\ CH_3-C-COOH \\ | \\ Br \end{array}$
 (4) $CH_2(Br) - CH(Br) - COOH$
61. Which of the following hormones contains iodine?
 (1) Testosterone
 (2) Adrenaline
 (3) Thyroxine
 (4) Insulin
62. S_N2 reaction readily occurs in
 (1) $CH_3CH_2-O-CH_3$
 (2) $\begin{array}{c} CH_3 \\ | \\ CH_3-C-O-CH_3 \\ | \\ CH_3 \end{array}$
 (3) $CH_2=CH-CH_2-O-CH_3$
 (4) $Ph-CH_2-O-CH_2-CH_3$
63. In which one of the following species the central atom has type of hybridization which is not the same as that present in the other three ?
 (1) SF_4 (2) I_3^- (3) $SbCl_5^{2-}$ (4) PCl_5
64. AB crystallizes in a body centred cubic lattice with edge length 'a' equal to 387 pm. The distance between oppositely charged ions in the lattice is
 (1) 335 pm (2) 250 pm
 (3) 200 pm (4) 300 pm
65. Standard entropies of X_2 , Y_2 and XY_3 are 60, 40 and $50 J K^{-1} mol^{-1}$ respectively. For the reaction $1/2X_2 + 3/2Y_2 \rightleftharpoons XY_3$, $\Delta H = -30 kJ$, to be at equilibrium, the temperature should be
 (1) 750 K (2) 1000 K (3) 1250 K (4) 500 K
66. In which of the following equilibrium K_c and K_p are not equal ?
 (1) $2NO(g) \rightleftharpoons N_2(g) + O_2(g)$
 (2) $SO_2(g) + NO_2(g) \rightleftharpoons SO_3(g) + NO(g)$
 (3) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$
 (4) $2C(s) + O_2(g) \rightleftharpoons 2CO_2(g)$
67. For the reduction of silver ions with copper metal, the standard cell potential was found to be +0.46 V at $25^\circ C$. The value of standard Gibbs energy, ΔG° will be ($F = 96500 C mol^{-1}$)
 (1) -89.0 kJ (2) -89.0 J
 (3) -44.5 kJ (4) -98.0 kJ
68. Which of the following represents the correct order of increasing electron gain enthalpy with negative sign for the elements O, S, F and Cl?
 (1) $Cl < F < O < S$ (2) $O < S < F < Cl$
 (3) $F < S < O < Cl$ (4) $S < O < Cl < F$
69. The existence of two different coloured complexes with the composition of $[Co(NH_3)_4Cl_2]^+$ is due to
 (1) Linkage isomerism
 (2) Geometrical isomerism
 (3) Coordination isomerism
 (4) Ionization isomerism
70. In a set of reactions, ethylbenzene yielded a product D.
 $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_3 \xrightarrow[\text{KOH}]{\text{KMnO}_4} \text{B} \xrightarrow[\text{FeCl}_3]{\text{Br}_2} \text{C} \xrightarrow[\text{H}^+]{\text{C}_2\text{H}_5\text{OH}} \text{D}$
 D would be
 (1) $\begin{array}{c} \text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{Br})\text{COOC}_2\text{H}_5 \end{array}$
 (2) $\begin{array}{c} \text{Br} \\ | \\ \text{C}_6\text{H}_4(\text{Br})\text{CH}_2\text{COOC}_2\text{H}_5 \end{array}$



71. Given are cyclohexanol (I), acetic acid (II), 2, 4, 6-trinitrophenol (III) and phenol (IV). In these the order of decreasing acidic character will be

- (1) III > II > IV > I (2) II > III > I > IV
(3) II > III > IV > I (4) III > IV > II > I

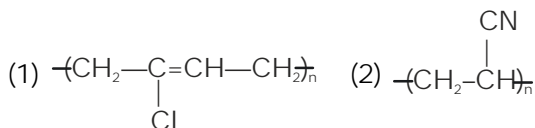
72. Among the given compounds, the most susceptible to nucleophilic attack at the carbonyl group is

- (1) CH₃COOCH₃ (2) CH₃CONH₂
(3) CH₃COOCOCH₃ (4) CH₃COCl

73. Which of the following statements about primary amines is false ?

- (1) Alkyl amines are stronger bases than aryl amines
(2) Alkyl amines react with nitrous acid to produce alcohols
(3) Aryl amines react with nitrous acid to produce phenols
(4) Alkyl amines are stronger bases than ammonia

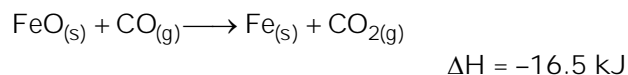
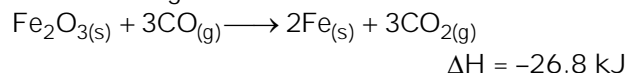
74. Which of the following structures represents neoprene polymer?



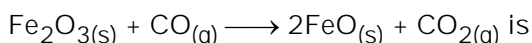
75. The pressure exerted by 6.0g of methane gas in a 0.03 m³ vessel at 129°C is (Atomic masses : C = 12.01, H = 1.01 and R = 8.314 J K⁻¹ mol⁻¹)

- (1) 215216 Pa (2) 13409 Pa
(3) 41648 Pa (4) 31684 Pa

76. The following two reactions are known



The value of ΔH for the following reaction



- (1) +10.3 kJ (2) -43.3 kJ
(3) -10.3 kJ (4) +6.2 kJ

77. Which of the following expressions correctly represents the equivalent conductance at infinite dilution of Al₂(SO₄)₃. Given that $\Lambda_{\text{Al}^{3+}}$ and $\Lambda_{\text{SO}_4^{2-}}$ are the equivalent conductances at infinite dilution of the respective ions?

- (1) $2\Lambda_{\text{Al}^{3+}} + 3\Lambda_{\text{SO}_4^{2-}}$ (2) $\Lambda_{\text{Al}^{3+}} + \Lambda_{\text{SO}_4^{2-}}$
(3) $(\Lambda_{\text{Al}^{3+}} + \Lambda_{\text{SO}_4^{2-}}) \times 6$ (4) $\frac{1}{3}\Lambda_{\text{Al}^{3+}} + \frac{1}{2}\Lambda_{\text{SO}_4^{2-}}$

78. Some statements about heavy water are given below :

- (i) Heavy water is used as a moderator in nuclear reactors
(ii) Heavy water is more associated than ordinary water
(iii) Heavy water is more effective solvent than ordinary water

Which of the above statements are correct?

- (1) (i) and (ii) (2) (i), (ii) and (iii)
(3) (ii) and (iii) (4) (i) and (iii)

79. How many bridging oxygen atoms are present in P₄O₁₀?

- (1) 6 (2) 4 (3) 2 (4) 5

80. Which one of the following complexes is not expected to exhibit isomerism?

- (1) [Ni(NH₃)₄(H₂O)₂]²⁺ (2) [Pt(NH₃)₂Cl₂]
(3) [Ni(NH₃)₂Cl₂] (4) [Ni(en)₃]²⁺

81. Bleaching powder does not contain

- (1) CaCl₂ (2) Ca(OH)₂
(3) Ca(OCl)₂ (4) Ca(ClO₃)₂

82. For a reaction X → Y, the graph of the product concentration (x) versus time (t) came out to be a straight line passing through the origin. Hence

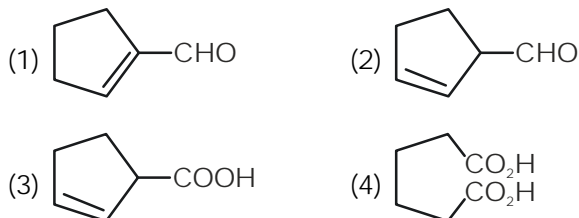
the graph of $\frac{-d[X]}{dt}$ and time would be

- (1) straight line with a negative slope and an intercept on y-axis
(2) straight line with a positive slope and an intercept on y-axis
(3) a straight line parallel to x-axis
(4) a hyperbola

83. A catalyst

- (1) changes the equilibrium constant
(2) lowers the activation energy
(3) increases the forward and backward reactions at different speeds
(4) follows same mechanism for the reaction

84. Cyclohexene on ozonolysis followed by reaction with zinc dust and water gives compound E. Compound E on further treatment with aqueous KOH yields compound F. Compound F is



85. The strained tetracyclic alkane is isomerized thermally to the cyclic alkene. The reaction involves

- (1) freely radical (2) carbocation
(3) carbanion (4) carbene

86. 25 mL, 0.2 M $\text{Ca}(\text{OH})_2$ is neutralised by 10 mL of 1 M HCl. Then pH of resulting solution is

- (1) 1.37 (2) 9 (3) 12 (4) 7

87. Which of the following is not hygroscopic?

- (1) CsCl (2) MgCl_2 (3) CaCl_2 (4) LiCl

88. Decreasing order of nucleophilicity is

- (1) $\text{OH}^- > \text{NH}_2^- > \text{CH}_3\text{O}^- > \text{RNH}_2$
(2) $\text{NH}_2^- > \text{OH}^- > \text{CH}_3\text{O}^- > \text{RNH}_2$
(3) $\text{NH}_2^- > \text{CH}_3\text{O}^- > \text{OH}^- > \text{RNH}_2$
(4) $\text{CH}_3\text{O}^- > \text{NH}_2^- > \text{OH}^- > \text{RNH}_2$

89. The number of σ - and π - bonds present in pent-4-ene 1-yne is

- (1) 10, 3 (2) 4, 9 (3) 3, 10 (4) 9, 4

90. Find the hydrolysis product when a phosphodiester bond of nucleotide breaks

- (1) 3 - OH - deoxyribose - 5 - PO_4^{3-}
(2) 5 - OH - deoxyribose - 3 - PO_4^{3-}
(3) 2 - OH - deoxyribose - 2 - PO_4^{3-}
(4) 4 - OH - deoxyribose - 2 - PO_4^{3-}

91. The transparent lens is the human eye in held in its place by

- (1) ligaments attached to the ciliary body
(2) ligaments attached to the iris
(3) smooth muscles attached to the iris
(4) smooth muscles attached to the ciliary body

92. Which of the following animals does not undergo metamorphosis ?

- (1) Earthworm (2) Tunicate
(3) Moth (4) Starfish

93. Which of the following organisms are known as chief producers in the oceans ?

- (1) Dinoflagellates (2) Diatoms
(3) Cyanobacteria (4) Euglenoids

94. Ciliates differs from all other protozoans in

- (1) using flagella for locomotion
(2) having a contractile vacuole for removing

excess water

- (3) using pseudopodia for capturing prey
(4) having two types of nuclei

95. Which of the following features is used to identify a male cockroach from a female cockroach ?

- (1) Presence of boat - shaped sternum on the 9th abdominal segment
(2) Presence of caudal styles
(3) Forewings with darker tegmina
(4) Presence of anal cerci

96. Which of the following options correctly represents the lung conditions in asthma and emphysema, respectively ?

- (1) Inflammation of bronchioles; Decreased respiratory surface
(2) Increased number of bronchioles; Increased respiratory surface
(3) Increased respiratory surface; Inflammation of bronchioles
(4) Decreased respiratory surface; Inflammation of bronchioles

97. Match the items given in column - I with those in column -II and select the correct option given below .

Column - I

Column - II

A. Tricuspid valve

(i) Between left atrium and left ventricle

B. Bicuspid valve

(ii) Between right ventricle and pulmonary artery

C. Semilunar valve

(iii) Between right atrium and right ventricle

- | A | B | C |
|-----------|-------|-------|
| (1) (iii) | (i) | (ii) |
| (2) (i) | (iii) | (ii) |
| (3) (i) | (ii) | (iii) |
| (4) (ii) | (i) | (iii) |

98. Match the items given in column I with those in column II and select the correct option given below.

Column - I

Column - II

A. Tidal volume

(i) 2500 - 3000 mL

B. Inspiratory reserve volume

(ii) 1100 - 1200 mL

C. Expiratory reserve volume

(iii) 500 - 550 mL

D. Residual volume

(iv) 1000 - 1100 mL

- | A | B | C | D |
|-----------|-------|------|-------|
| (1) (iii) | (ii) | (i) | (iv) |
| (2) (iii) | (i) | (iv) | (ii) |
| (3) (i) | (iv) | (ii) | (iii) |
| (4) (iv) | (iii) | (ii) | (i) |

99. AGGTATCGCAT is a sequence from the coding strand of a gene. What will be the corresponding sequence of the transcribed mRNA ?

- (1) AGGUAUCGCAU (2) UGGTUTCGCAT
(3) ACCUAUGCGAU (4) UCCAUAGCGUA
100. According to Hugo de Vries, the mechanism of evolution is
(1) multiple step mutations
(2) saltation
(3) phenotypic variations
(4) minor mutations
101. Match the items given in column I with those in column II and select the correct option given below.
- | | |
|------------------------|-------------------------------------|
| Column - I | Column - II |
| A. Proliferative phase | (i) Breakdown of endometrial lining |
| B. Secretory phase | (ii) Follicular phase |
| C. Menstruation | (iii) Luteal phase |
- | | | |
|-----------|-------|------|
| A | B | C |
| (1) (iii) | (ii) | (i) |
| (2) (i) | (iii) | (ii) |
| (3) (ii) | (iii) | (i) |
| (4) (iii) | (i) | (ii) |
102. A woman has an X - linked condition on one of her X chromosomes. This chromosome can be inherited by
(1) only daughters (2) only sons
(3) only grandchildren
(4) both sons and daughters
103. Which of the following gastric cells indirectly help in erythropoiesis ?
(1) Chief cells (2) Mucous cells
(3) Goblet cells (4) Parietal cells
104. Match the items given in column I with those in column II and select the correct option given below.
- | | |
|---------------|-------------------------|
| Column - I | Column - II |
| A. Fibrinogen | (i) Osmotic balance |
| B. Globulin | (ii) Blood clotting |
| C. Albumin | (iii) Defence mechanism |
- | | | |
|-----------|-------|-------|
| A | B | C |
| (1) (iii) | (ii) | (i) |
| (2) (i) | (ii) | (iii) |
| (3) (i) | (iii) | (ii) |
| (4) (ii) | (iii) | (i) |
105. Calcium is important in skeletal muscle contraction because it
(1) binds to troponin to remove the masking of active sites on actin for myosin
(2) activates the myosin ATPase by bindings to it
(3) detaches the myosin head from the actin filament
(4) prevents the formation of bonds between the myosin cross bridges and the actin filament.
106. Which of the following would appear as the pioneer organisms on bare rocks ?
(1) Mosses (2) Green algae
(3) Lichens (4) Liverworts
107. Water vapour comes out from the plant leaf through the stomatal opening. Through the same stomatal opening carbon dioxide diffuses into the plant during photosynthesis. Reason out the above statements using one of following options
(1) The above process happen only during night time
(2) One process occurs during day time and the other at night
(3) Both process cannot happen simultaneously
(4) Both processes can happen together because the diffusion coefficient of water and CO₂ is different
108. Lack of relaxation between successive stimuli in sustained muscle contraction is known as
(1) tetanus (2) tonus
(3) spasm (4) fatigue
109. Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers ?
(1) Ammonia (2) Methane
(3) Nitrous oxide (4) Ozone
110. Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature ?
(1) The names are written in Latin and are italicised
(2) When written by hand the names are to be underlined
(3) Biological names can be written in any language
(4) The first word in a biological name represents the genus name and the second is a specific epithet
111. A cell at telophase stage is observed by a student in a plant brought from the field. He tells his teacher that this cell is not like other cells at telophase stage. There is no formation of cell plate and thus the cell is containing more number of chromosomes as compared to other dividing cells. This would result in
(1) somaclonal variation (2) polyteny
(3) aneuploidy (4) polyploidy
112. The two polypeptides of human insulin are linked together by
(1) covalent bond
(2) disulphide bridges
(3) hydrogen bonds
(4) phosphodiester bond
113. Reduction in pH of blood will
(1) decrease the affinity of haemoglobin with oxygen
(2) release bicarbonate ions by the liver
(3) reduce the rate of heart beat
(4) reduce the blood supply to the brain

114. In a chloroplast the highest number of protons are found in
 (1) intermembrane space
 (2) antennae complex
 (3) stroma
 (4) lumen of thylakoids
115. Which of the following pairs of hormones are not antagonistic (having opposite effects) to each other ?
 (1) Aldosterone Atrial Natriuretic Factor
 (2) Relaxin Inhibin
 (3) Parathormone Calcitonin
 (4) Insulin Glucagon
116. In mammals, which blood vessel would normally carry largest amount of urea?
 (1) Hepatic Vein (2) Hepatic Portal Vein
 (3) Renal Vein (4) Dorsal Aorta
117. Pick out the correct statements.
 (I) Haemophilia is sex – linked recessive disease
 (II) Down's syndrome is due to aneuploidy
 (III) Phenylketonuria is an autosomal recessive gene disorder.
 (IV) Sickle cell anaemia is an X – linked recessive gene disorder.
 (1) (I), (III) and (IV) are correct
 (2) (I), (II) and (III) are correct
 (3) (I) and (IV) are correct
 (4) (II) and (IV) are correct
118. Which of the following approaches does not give the defined action of contraceptive ?
 (1) Hormonal contraceptives Prevent/retard entry of sperms, prevent ovulation and fertilisation
 (2) Vasectomy Prevents spermatogenesis
 (3) Barrier methods Prevent fertilisation
 (4) Intra uterine devices Increase phagocytosis of sperms, suppress sperm motility and fertilising capacity of sperms
119. Emersons enhancement effect and Red drop have been instrumental in the discovery of
 (1) photophosphorylation and cyclic electron transport
 (2) oxidative phosphorylation
 (3) photophosphorylation and non – cyclic electron transport
 (4) two photosystems operating simultaneously
120. In which of the following all three are macronutrients ?
 (1) Molybdenum, magnesium, manganese
 (2) Nitrogen, nickel, phosphorus
 (3) Boron, zinc, manganese
 (4) None of these
121. Changes in GnRH pulse frequency in females is controlled by circulating levels of
 (1) progesterone only
 (2) progesterone and inhibin
 (3) estrogen and progesterone
 (4) estrogen and inhibin
122. Which of the following guards the opening of hepatopancreatic duct into the duodenum ?
 (1) Pyloric sphincter (2) Sphincter of Oddi
 (3) Semilunar valve (4) Ileocaecal valve
123. Which one of the following is the starter codon ?
 (1) UAA (2) UAG
 (3) AUG (4) UGA
124. Spindle fibres attach on to
 (1) centromere of the chromosome
 (2) kinetosome of the chromosome
 (3) telomere of the chromosome
 (4) kinetochore of the chromosome
125. A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the F_1 plants were selfed the resulting genotypes were in the ratio of
 (1) 3 : 1 :: Tall : Dwarf
 (2) 3 : 1 :: Dwarf : Tall
 (3) 1 : 2 : 1 : Tall homozygous : Tall heterozygous : Dwarf
 (4) 1 : 2 : 1 :: Tall heterozygous : Tall homozygous : Dwarf
126. A typical fat molecule is made up of
 (1) one glycerol and one fatty acid molecule
 (2) three glycerol and three fatty acid molecules
 (3) three glycerol molecules and one fatty acid molecule
 (4) one glycerol and three fatty acid molecules
127. A system of rotating crops with legume or grass pasture to improve soil structure and fertility is called
 (1) strip farming (2) shifting agriculture
 (3) ley farming (4) contour farming
128. Which of the following is not a stem modification ?
 (1) Tendrils of cucumber
 (2) Flattened structures of Opuntia
 (3) Pitcher of Nepenthes
 (4) Thorns of citrus
129. Which of the following features is not present in *Periplaneta americana* ?
 (1) Exoskeleton composed of N – acetylglucosamine
 (2) Metamerically segmented body
 (3) Schizocoelom as body cavity
 (4) Indeterminate and radial cleavage during embryonic development
130. Name the chronic respiratory disorder caused mainly by cigarette smoking

- (1) Respiratory acidosis
 (2) Respiratory alkalosis
 (3) Emphysema
 (4) Astham
131. Which one of the following is wrong for fungi ?
 (1) They are eukaryotic
 (2) All fungi possess a purely cellulosic cell wall
 (3) They are heterotrophic
 (4) They are both unicellular and multicellular
132. Select the wrong statement
 (1) The walls of diatoms are easily destructible
 (2) 'Diatomaceous earth' is formed by the cell walls of diatoms.
 (3) Diatoms are chief producers in the oceans.
 (4) Diatoms are microscopic and float passively in water
133. Conifers are adapted to tolerate extreme environmental conditions because of
 (1) broad hardly leaves
 (2) superficial stomata
 (3) thick cuticle
 (4) presence of vessels
134. Which one of the following statements is wrong ?
 (1) Algae increase the level of dissolved oxygen in the immediate environment
 (2) Algin is obtained from red algae, and carrageen from brown algae
 (3) Agar – agar is obtained from Gelidium and Gracilaria
 (4) Laminaria and Sargassum are used as food.
135. The term 'polyadelphous' is related to
 (1) gynoecium (2) androecium
 (3) corolla (4) Calyx
136. How many plants among Indigofera, Sesbania, Salvia, Allium, Aloe, mustard, groundnut, radish, gram and turnip have stamens with different lengths in their flowers ?
 (1) Three (2) Four
 (3) Five (4) Six
137. Free – central placentation is found in
 (1) Dianthus (2) Argemone
 (3) Brassica (4) Citrus.
138. The balloon – shaped structures called tyloses
 (1) originate in the lumen of vessels
 (2) characterise the sapwood
 (3) are extensions of xylem parenchyma cells into vessels
 (4) are linked to the ascent of sap through xylem vessels
139. Select the mismatch
 (1) Gas vacuoles – Green bacteria
 (2) Large central vacuoles – Animals cells
 (3) Protists – Eukaryotes
 (4) Methanogens – Prokaryotes
140. Select the wrong statement
 (1) Bacterial cell wall is made up of peptidoglycan
 (2) Pili and fimbriae are mainly involved in motility of bacterial cells
 (3) Cyanobacteria lack flagellated cells
 (4) Mycoplasma is a wall – less microorganism
141. Which of the following biomolecules is common to respiration – mediated breakdown of fats, carbohydrates and proteins ?
 (1) Glucose –6 – phosphate
 (2) Fructose 1, 6 – biphosphate
 (3) Pyruvic acid
 (4) Acetyl CoA
142. A few drops of sap were collected by cutting across a plant stem by a suitable method. The sap was tested chemically. Which one of the following test results indicates that it is phloem sap ?
 (1) Acidic (2) Alkaline
 (3) Low refractive index (4) Absence of sugar
143. You are given a tissue with its potential for differential in an artificial culture. Which of the following pairs hormones would you add to the medium to secure shoots as well as roots ?
 (1) IAA and gibberellin
 (2) Auxin and cytokinin
 (3) Auxin and abscisic acid
 (4) Gibberellin and abscisic acid
144. Phytochrome is a
 (1) flavoprotein (2) glycoprotein
 (3) lipoprotein (4) chromoprotein
145. The process which makes major difference between C_3 and C_4 plants is
 (1) glycolysis (2) Calvin cycle
 (3) photorespiration (4) respiration
146. Which one of the following statements is not correct ?
 (1) Offspring produced by the asexual reproduction called clone
 (2) Microscopic, motile, asexual reproductive structure are called zoospores
 (3) In potato, banana and ginger, the plantlets arise from, the internodes present in the modified stem
 (4) Water haycinth, growing in the standing water, drains oxygen from water that leads to the death of fishes
147. Match column I with column II and select the correct option using the codes given below.
 Column – I Column – II
 A. Pistils fused together (i) Gametogenesis
 B. Formation of gametes (ii) Pistillate
 C. Hyphae of higher Ascomycetes (iii) Syncarpous
 D. Unisexual female flower (iv) Dikaryotic
 (1) A – (iv), B – (iii), C – (i), D – (ii)
 (2) A – (ii), B – (i), C – (iv), D – (iii)
 (3) A – (i), B – (ii), C – (iv), D – (iii)
 (4) A – (iii), B – (i), C – (iv), D – (ii)

148. Pollination in water hyacinth and water lily is brought about by the agency of
 (1) water (2) insects or wind
 (3) birds (4) bats.
149. The ovule of an angiosperm is technically equivalent to
 (1) megasporangium
 (2) megasporophyll
 (3) megaspore mother cell
 (4) megaspore
150. Taylor conducted the experiments to prove semiconservative mode of chromosome replication on
 (1) *Vinca rosea*
 (2) *Vicia faba*
 (3) *Drosophila melanogaster*
 (4) *E. coli*.
151. The mechanism that causes a gene to move from one linkage group to another is called
 (1) inversion (2) duplication
 (3) translocation (4) crossing-over.
152. The equivalent of a structural gene is
 (1) muton (2) cistron
 (3) operon (4) recon.
153. Which of the following rRNAs acts as structural RNA as well as ribozyme in bacteria?
 (1) 5S rRNA (2) 18S rRNA
 (3) 23S rRNA (4) 5.8S rRNA
154. Stirred-tank bioreactors have been designed for
 (1) purification of product
 (2) addition of preservatives to the product
 (3) availability of oxygen throughout the process
 (4) ensuring anaerobic conditions in the culture vessel
155. A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using
 (1) EcoRI (2) Taq polymerase
 (3) polymerase III (4) ligase.
156. Which of the following statements is correct with reference to enzymes?
 (1) Holoenzyme = Apoenzyme + Coenzyme
 (2) Coenzyme = Apoenzyme + Holoenzyme
 (3) Holoenzyme = Coenzyme + Co-factor
 (4) Apoenzyme = Holoenzyme + Coenzyme
157. A decrease in blood pressure/ volume will not cause the release of
 (1) atrial natriuretic factor
 (2) aldosterone
 (3) ADH
 (4) renin
158. Which cells of 'crypts of Lieberkuhn' secrete antibacterial lysozyme?
 (1) Paneth cells (2) Zymogen cells
 (3) Kupffer cells (4) Argentaffin cells
159. Which of the following are not polymeric?
 (1) Proteins (2) Polysaccharides
 (3) Lipids (4) Nucleic acids
160. Functional megaspore in an angiosperm develops into an
 (1) endosperm (2) embryo sac
 (3) embryo (4) ovule
161. Myelin sheath is produced by
 (1) astrocytes and Schwann cells
 (2) oligodendrocytes and osteoclasts
 (3) osteoclasts and astrocytes
 (4) Schwann cells and oligodendrocytes
162. Attractants and rewards are required for
 (1) entomphily (2) hydrophily
 (3) cleistogamy (4) anemophily
163. Receptor sites for neurotransmitters are present on
 (1) pre-synaptic membrane
 (2) tips of axons
 (3) post-synaptic membrane
 (4) membranes of synaptic vesicles
164. Coconut fruit is a
 (1) berry (2) nut
 (3) capsule (4) drupe
165. Adult human RBCs are enucleate. Which of the following statement (s) is/are most appropriate explanation for this feature?
 (I) They do not need to reproduce
 (II) They are somatic cells
 (III) They do not metabolise
 (IV) All their internal space is available for oxygen transport.
 (1) Only I (2) (I), (III) and (IV)
 (3) (II) and (III) (4) Only IV
166. Capacitation occurs in
 (1) epididymis
 (2) vas deferens
 (3) female reproductive tract
 (4) rete testis
167. Asymptote in a logistic growth curve is obtained when
 (1) $K = N$ (2) $K > N$
 (3) $K < N$
 (4) the value of 'r' approaches zero
168. Artificial selection to obtain cows yielding higher milk output represents
 (1) directional as it pushes the mean of the character in one direction
 (2) disruptive as it splits the population into two, one yielding higher output and the other lower output
 (3) stabilising followed by disruptive as it stabilises the population to produce higher yielding cows
 (4) stabilising selection as it stabilises this character in the population.

169. Select the mismatch.
 (1) Rhodospirillum – Mycorrhiza
 (2) Anabaena – Nitrogen fixer
 (3) Rhizobium – Alfalfa
 (4) Frankia – Alnus
170. Good vision depends on adequate intake of carotene rich food. Select the best option from the following statements.
 (I) Vitamin A derivatives are formed from carotene
 (II) The Photopigments are embedded in the membrane discs of the inner segment
 (III) Retinal is a derivative of vitamin A
 (IV) Retinal is a light absorbing part of all the visual photopigments
 (1) (I), (III) and (IV) (2) (I) and (III)
 (3) (II), (III) and (IV) (4) (I) and (II)
171. The hepatic portal vein drains blood to liver from.
 (1) stomach (2) kidneys
 (3) intestine (4) Both (1) and (3)
172. The vascular cambium normally gives rise to
 (1) primary phloem (2) secondary xylem
 (3) periderm (4) phelloderm
173. Thalassemia and sickle cell anaemia are caused due to a problem in globin molecule synthesis. Select the correct statement.
 (1) Both are due to quantitative defect in globin chain synthesis
 (2) Thalassemia is due to less synthesis of globin molecules
 (3) Sickle cell anaemia is due to a quantitative problem of globin molecules
 (4) Both are due to a qualitative defect in globin chain synthesis
174. The genotypes of a husband and wife are $I^A I^B$ and $I^A i$. Among the blood types of their children, how many different genotypes and phenotypes are possible ?
 (1) 3 genotypes; 4 phenotypes
 (2) 4 genotypes; 3 phenotypes
 (3) 4 genotypes; 4 phenotypes
 (4) 3 genotypes; 3 phenotypes
175. Which of the following facilitates opening of stomatal aperture ?
 (1) Decrease in turgidity of guard cells
 (2) Radial orientation of cellulose microfibrils in the cell wall of guard cells
 (3) Longitudinal orientation of cellulose microfibrils in the cell wall of guard cells
 (4) Contraction of outer wall of guard cells
176. In Bougainvillea, thorns are the modifications of
 (1) adventitious root (2) stem
 (3) leaf (4) stipules
177. A disease caused by an autosomal primary non – disjunction is
 (1) Klinefelter's syndrome
 (2) Turner's syndrome
 (3) sickle cell anaemia
 (4) Down's syndrome
178. The water potential of pure water is
 (1) less than zero
 (2) more than zero but less than one
 (3) more than one
 (4) zero
179. Which of the following options give the correct sequence of events during mitosis ?
 (1) Condensation → Nuclear membrane disassembly → Arrangement at equator → Centromere division → Segregation → Telophase
 (2) Condensation → Crossing over → Nuclear membrane disassembly → Segregation → Telophase
 (3) Condensation → Arrangement at equator → Centromere division → Segregation → Telophase
 (4) Condensation → Nuclear membrane disassembly → Crossing over → Segregation → Telophase
180. A temporary endocrine gland in the human body is
 (1) corpus cardiacum (2) corpus luteum
 (3) corpus allatum (4) pineal gland