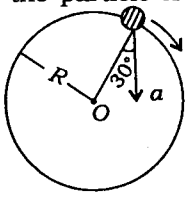
2. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $x_P(t) = at + bt^2$ and $x_Q(t) = ft - t^2$. At what time do the cars have the same velocity?

(1) $\frac{a-f}{1+b}$ (2) $\frac{a+f}{2(b-1)}$

(3) $\frac{a+f}{2(1+b)}$ (4) $\frac{f-a}{2(1+b)}$

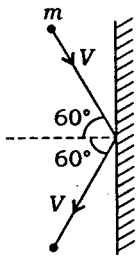
3. In the given figure, $a = 15\ m/s^2$ represents the total acceleration of a particle moving in the clockwise direction in a circle of radius $R = 2{\cdot}5$ m at a given instant of time. The speed of the particle is



(1) 4·5 m/s (2) 5·0 m/s

(3) 5·7 m/s (4) 6·2 m/s

4. A rigid ball of mass m strikes a rigid wall at 60° and gets reflected without loss of speed as shown in the figure below. The value of impulse imparted by the wall on the ball will be



(1) mV (2) $2mV$

(3) $\frac{mV}{2}$ (4) $\frac{mV}{3}$

(2) 80 m s^{-1}

(3) 120 m s^{-1}

(4) 160 m s^{-1}

6. Two identical balls A and B having velocities of 0·5 m/s and −0·3 m/s respectively collide elastically in one dimension. The velocities of B and A after the collision respectively will be

(1) −0·5 m/s and 0·3 m/s

(2) 0·5 m/s and −0·3 m/s

(3) −0·3 m/s and 0·5 m/s

(4) 0·3 m/s and 0·5 m/s

7. A particle moves from a point $(-2\hat{i} + 5\hat{j})$ to $(4\hat{j} + 3\hat{k})$ when a force of $(4\hat{i} + 3\hat{j})$ N is applied. How much work has been done by the force?

(1) 8 J

(2) 11 J

(3) 5 J

(4) 2 J

8. Two rotating bodies A and B of masses m and $2m$ with moments of inertia I_A and I_B ($I_B > I_A$) have equal kinetic energy of rotation. If L_A and L_B be their angular momenta respectively, then

(1) $L_A = \frac{L_B}{2}$

(2) $L_A = 2L_B$

(3) $L_B > L_A$

(4) $L_A > L_B$

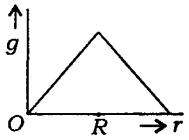
(4) 3 : 1

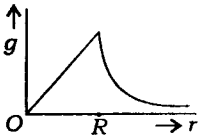
10. A light rod of length l has two masses m_1 and m_2 attached to its two ends. The moment of inertia of the system about an axis perpendicular to the rod and passing through the centre of mass is

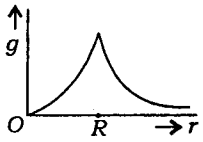
(1) $\frac{m_1 m_2}{m_1 + m_2} l^2$ (2) $\frac{m_1 + m_2}{m_1 m_2} l^2$

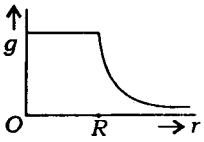
(3) $(m_1 + m_2) l^2$ (4) $\sqrt{m_1 m_2}\, l^2$

11. Starting from the centre of the earth having radius R, the variation of g (acceleration due to gravity) is shown by

(1) 

(2) 

(3) 

(4) 

12. A satellite of mass m is orbiting the earth (of radius R) at a height h from its surface. The total energy of the satellite in terms of g_0, the value of acceleration due to gravity at the earth's surface, is

(1) $\frac{mg_0R^2}{2(R+h)}$

(2) $-\frac{mg_0R^2}{2(R+h)}$

(3) $\frac{2mg_0R^2}{R+h}$

(4) $-\frac{2mg_0R^2}{R+h}$

(1) $\frac{\pi}{2} > \theta_1 > \theta_2 > \theta_3 \geq 0$

(2) $0 \leq \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$

(3) $\frac{\pi}{2} < \theta_1 < \theta_2 < \theta_3 < \pi$

(4) $\pi > \theta_1 > \theta_2 > \theta_3 > \frac{\pi}{2}$

15. Two identical bodies are made of a material for which the heat capacity increases with temperature. One of these is at 100 °C, while the other one is at 0 °C. If the two bodies are brought into contact, then, assuming no heat loss, the final common temperature is

(1) 50 °C

(2) more than 50 °C

(3) less than 50 °C but greater than 0 °C

(4) 0 °C

16. A body cools from a temperature $3T$ to $2T$ in 10 minutes. The room temperature is T. Assume that Newton's law of cooling is applicable. The temperature of the body at the end of next 10 minutes will be

(1) $\frac{7}{4}T$ (2) $\frac{3}{2}T$

(3) $\frac{4}{3}T$ (4) T

17. One mole of an ideal monatomic gas undergoes a process described by the equation PV^3 = constant. The heat capacity of the gas during this process is

(1) $\frac{3}{2}R$ (2) $\frac{5}{2}R$

(3) $2R$ (4) R

19. A given sample of an ideal gas occupies a volume V at a pressure P and absolute temperature T. The mass of each molecule of the gas is m. Which of the following gives the density of the gas?

(1) $P/(kT)$ (2) $Pm/(kT)$

(3) $P/(kTV)$ (4) mkT

20. A body of mass m is attached to the lower end of a spring whose upper end is fixed. The spring has negligible mass. When the mass m is slightly pulled down and released, it oscillates with a time period of 3 s. When the mass m is increased by 1 kg, the time period of oscillations becomes 5 s. The value of m in kg is

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

(3) $\frac{16}{9}$ (4) $\frac{9}{16}$

21. The second overtone of an open organ pipe has the same frequency as the first overtone of a closed pipe L metre long. The length of the open pipe will be

(1) L (2) $2L$

(3) $\frac{L}{2}$ (4) $4L$

22. Three sound waves of equal amplitudes have frequencies $(n-1)$, n, $(n+1)$. They superimpose to give beats. The number of beats produced per second will be

(1) 1 (2) 4

(3) 3 (4) 2

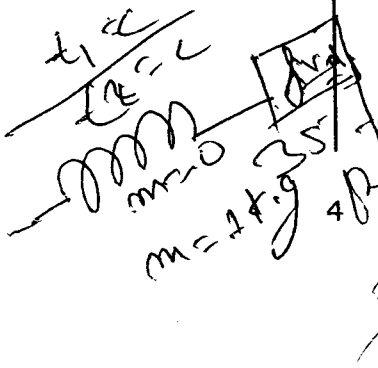
23. An electric dipole is placed at an angle of 30° with an electric field intensity 2×10^5 N/C. It experiences a torque equal to 4 N m. The charge on the dipole, if the dipole length is 2 cm, is

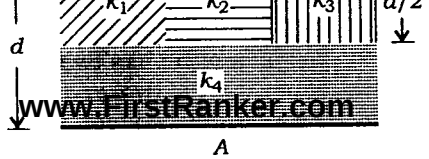
(1) 8 mC

(2) 2 mC

(3) 5 mC

(4) 7 μC





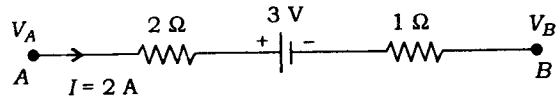
(1) $k = k_1 + k_2 + k_3 + 3k_4$

(2) $k = \frac{2}{3}(k_1 + k_2 + k_3) + 2k_4$

(3) $\frac{2}{k} = \frac{3}{k_1 + k_2 + k_3} + \frac{1}{k_4}$

(4) $\frac{1}{k} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3} + \frac{3}{2k_4}$

25. The potential difference $(V_A - V_B)$ between the points A and B in the given figure is



(1) −3 V (2) +3 V

(3) +6 V (4) +9 V

26. A filament bulb (500 W, 100 V) is to be used in a 230 V main supply. When a resistance R is connected in series, it works perfectly and the bulb consumes 500 W. The value of R is

(1) 230 Ω (2) 46 Ω

(3) 26 Ω (4) 13 Ω

27. A long wire carrying a steady current is bent into a circular loop of one turn. The magnetic field at the centre of the loop is B. It is then bent into a circular coil of n turns. The magnetic field at the centre of this coil of n turns will be

(1) nB (2) n^2B

(3) $2nB$ (4) $2n^2B$

29. An electron is moving in a circular path under the influence of a transverse magnetic field of $3{\cdot}57 \times 10^{-2}$ T. If the value of e/m is $1{\cdot}76 \times 10^{11}$ C/kg, the frequency of revolution of the electron is

(1) 1 GHz (2) 100 MHz

(3) 62·8 MHz (4) 6·28 MHz

30. Which of the following combinations should be selected for better tuning of an *L-C-R* circuit used for communication?

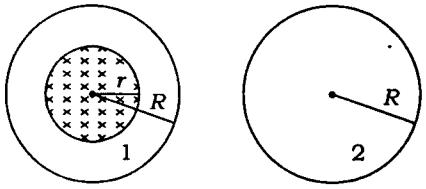
(1) $R = 20\ \Omega$, $L = 1{\cdot}5$ H, $C = 35\ \mu$F

(2) $R = 25\ \Omega$, $L = 2{\cdot}5$ H, $C = 45\ \mu$F

(3) $R = 15\ \Omega$, $L = 3{\cdot}5$ H, $C = 30\ \mu$F

(4) $R = 25\ \Omega$, $L = 1{\cdot}5$ H, $C = 45\ \mu$F

31. A uniform magnetic field is restricted within a region of radius r. The magnetic field changes with time at a rate $\frac{d\vec{B}}{dt}$. Loop 1 of radius $R > r$ encloses the region r and loop 2 of radius R is outside the region of magnetic field as shown in the figure below. Then the e.m.f. generated is



(1) zero in loop 1 and zero in loop 2

(2) $-\frac{d\vec{B}}{dt}\pi r^2$ in loop 1 and $-\frac{d\vec{B}}{dt}\pi r^2$ in loop 2

(3) $-\frac{d\vec{B}}{dt}\pi R^2$ in loop 1 and zero in loop 2

(4) $-\frac{d\vec{B}}{dt}\pi r^2$ in loop 1 and zero in loop 2

a 220 V source. When the capacitor is 50% charged, the peak value of the displacement current is

(1) 2·2 A (2)

(3) 4·4 A (4) $11\sqrt{2}$ A

34. Two identical glass ($\mu_g = 3/2$) equiconvex lenses of focal length f each are kept in contact. The space between the two lenses is filled with water ($\mu_w = 4/3$). The focal length of the combination is

(1) $f/3$ (2) f

(3) $4f/3$ (4) $3f/4$

35. An air bubble in a glass slab with refractive index 1·5 (near normal incidence) is 5 cm deep when viewed from one surface and 3 cm deep when viewed from the opposite face. The thickness (in cm) of the slab is

(1) 8 (2) 10

(3) 12 (4) 16

36. The interference pattern is obtained with two coherent light sources of intensity ratio n. In the interference pattern, the ratio

$$\frac{I_{max} - I_{min}}{I_{max} + I_{min}}$$

will be

(1) $\frac{\sqrt{n}}{n+1}$

(2) $\frac{2\sqrt{n}}{n+1}$

(3) $\frac{\sqrt{n}}{(n+1)^2}$

(4) $\frac{2\sqrt{n}}{(n+1)^2}$

38. A linear aperture whose width is 0·02 cm is placed immediately in front of a lens of focal length 60 cm. The aperture is illuminated normally by a parallel beam of wavelength 5×10^{-5} cm. The distance of the first dark band of the diffraction pattern from the centre of the screen is

(1) 0·10 cm

(2) 0·25 cm

(3) 0·20 cm

(4) 0·15 cm

39. Electrons of mass m with de-Broglie wavelength λ fall on the target in an X-ray tube. The cutoff wavelength (λ_0) of the emitted X-ray is

(1) $\lambda_0 = \frac{2mc\lambda^2}{h}$

(2) $\lambda_0 = \frac{2h}{mc}$

(3) $\lambda_0 = \frac{2m^2c^2\lambda^3}{h^2}$

(4) $\lambda_0 = \lambda$

40. Photons with energy 5 eV are incident on a cathode C in a photoelectric cell. The maximum energy of emitted photoelectrons is 2 eV. When photons of energy 6 eV are incident on C, no photoelectrons will reach the anode A, if the stopping potential of A relative to C is

(1) +3 V

(2) +4 V

(3) −1 V

(4) −3 V

42. The half-life of a radioactive substance is 30 minutes. The time (in minutes) taken between 40% decay and 85% decay of the same radioactive substance is

(1) 15 (2) 30

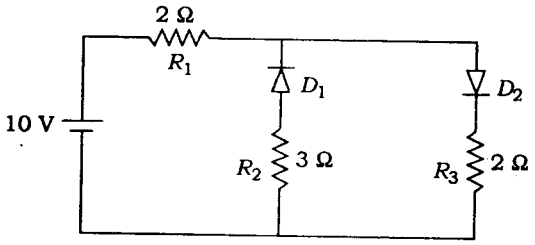
(3) 45 (4) 60

43. For CE transistor amplifier, the audio signal voltage across the collector resistance of 2 kΩ is 4 V. If the current amplification factor of the transistor is 100 and the base resistance is 1 kΩ, then the input signal voltage is

(1) 10 mV (2) 20 mV

(3) 30 mV (4) 15 mV

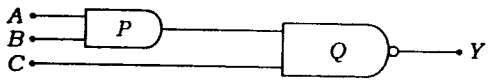
44. The given circuit has two ideal diodes connected as shown in the figure below. The current flowing through the resistance R_1 will be



(1) 2·5 A (2) 10·0 A

(3) 1·43 A (4) 3·13 A

45. What is the output Y in the following circuit, when all the three inputs A, B, C are first 0 and then 1?



(1) 0, 1 (2) 0, 0

(3) 1, 0 (4) 1, 1

solution of $AgNO_3$ with electrolytic conductivity of $5{\cdot}76 \times 10^{-3}$ S cm^{-1} at 298 K is

(1) 2·88 S cm^2 /mol

(2) 11·52 S cm^2 /mol

(3) 0·086 S cm^2 /mol

(4) 28·8 S cm^2 /mol

48. The decomposition of phosphine (PH_3) on tungsten at low pressure is a first-order reaction. It is because the

(1) rate is proportional to the surface coverage

(2) rate is inversely proportional to the surface coverage

(3) rate is independent of the surface coverage

(4) rate of decomposition is very slow

49. The coagulation values in millimoles per litre of the electrolytes used for the coagulation of As_2S_3 are given below :

I. (NaCl) = 52, II. ($BaCl_2$) = 0·69,

III. ($MgSO_4$) = 0·22

The **correct** order of their coagulating power is

(1) I > II > III (2) II > I > III

(3) III > II > I (4) III > I > II

50. During the electrolysis of molten sodium chloride, the time required to produce 0·10 mol of chlorine gas using a current of 3 amperes is

(1) 55 minutes

(2) 110 minutes

(3) 220 minutes

(4) 330 minutes

(2) $\Delta S = nR \ln \left(\frac{p_i}{p_f}\right)$

(3) $\Delta S = nRT \ln \left(\frac{p_f}{p_i}\right)$

(4) $\Delta S = RT \ln \left(\frac{p_i}{p_f}\right)$

53. The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is

(1) 0 (2) 1

(3) 2 (4) 3

54. The percentage of pyridine (C_5H_5N) that forms pyridinium ion ($C_5H_5N^+H$) in a 0·10 M aqueous pyridine solution (K_b for $C_5H_5N = 1{\cdot}7 \times 10^{-9}$) is

(1) 0·0060%

(2) 0·013%

(3) 0·77%

(4) 1·6%

55. In calcium fluoride, having the fluorite structure, the coordination numbers for calcium ion (Ca^{2+}) and fluoride ion (F^-) are

(1) 4 and 2

(2) 6 and 6

(3) 8 and 4

(4) 4 and 8

56. If the E°_{cell} for a given reaction has a negative value, which of the following gives the **correct** relationships for the values of ΔG° and K_{eq}?

(1) $\Delta G^\circ > 0$; $K_{eq} < 1$

(2) $\Delta G^\circ > 0$; $K_{eq} > 1$

(3) $\Delta G^\circ < 0$; $K_{eq} > 1$

(4) $\Delta G^\circ < 0$; $K_{eq} < 1$

product $1 \cdot 6 \times 10^{-10}$ in $0 \cdot 1$ *M* NaCl solution would be

(1) $1 \cdot 26 \times 10^{-5}$ *M*

(2) $1 \cdot 6 \times 10^{-9}$ *M*

(3) $1 \cdot 6 \times 10^{-11}$ *M*

(4) zero

59. Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2. When $0 \cdot 1$ mole of XY_2 weighs 10 g and $0 \cdot 05$ mole of X_3Y_2 weighs 9 g, the atomic weights of X and Y are

(1) 40, 30 (2) 60, 40

(3) 20, 30 (4) 30, 20

60. The number of electrons delivered at the cathode during electrolysis by a current of 1 ampere in 60 seconds is (charge on electron = $1 \cdot 60 \times 10^{-19}$ C)

(1) 6×10^{23} (2) 6×10^{20}

(3) $3 \cdot 75 \times 10^{20}$ (4) $7 \cdot 48 \times 10^{23}$

61. Boric acid is an acid because its molecule

(1) contains replaceable H^+ ion

(2) gives up a proton

(3) accepts OH^- from water releasing proton

(4) combines with proton from water molecule

62. AlF_3 is soluble in HF only in presence of KF. It is due to the formation of

(1) $K_3[AlF_3H_3]$ (2) $K_3[AlF_6]$

(3) AlH_3 (4) $K[AlF_3H]$

potential than iron

64. The suspension of slaked lime in water is known as

(1) limewater

(2) quicklime

(3) milk of lime

(4) aqueous solution of slaked lime

65. The hybridizations of atomic orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ respectively are

(1) *sp*, sp^3 and sp^2

(2) sp^2, sp^3 and *sp*

(3) *sp*, sp^2 and sp^3

(4) sp^2, *sp* and sp^3

66. Which of the following fluoro-compounds is most likely to behave as a Lewis base?

(1) BF_3 (2) PF_3

(3) CF_4 (4) SiF_4

67. Which of the following pairs of ions is isoelectronic and isostructural?

(1) CO_3^{2-}, NO_3^- (2) ClO_3^-, CO_3^{2-}

(3) SO_3^{2-}, NO_3^- (4) ClO_3^-, SO_3^{2-}

68. In context with beryllium, which one of the following statements is **incorrect**?

(1) It is rendered passive by nitric acid.

(2) It forms Be_2C.

(3) Its salts rarely hydrolyze.

(4) Its hydride is electron-deficient and polymeric.

have electron density along the axes?

(1) d_{z^2}, d_{xz}

(2) d_{xz}, d_{yz}

(3) d_{z^2}, $d_{x^2-y^2}$

(4) d_{xy}, $d_{x^2-y^2}$

71. The **correct** geometry and hybridization for XeF_4 are

(1) octahedral, sp^3d^2

(2) trigonal bipyramidal, sp^3d

(3) planar triangle, sp^3d^3

(4) square planar, sp^3d^2

72. Among the following, which one is a **wrong** statement?

(1) PH_5 and $BiCl_5$ do not exist.

(2) $p\pi$-$d\pi$ bonds are present in SO_2.

(3) SeF_4 and CH_4 have same shape.

(4) I_3^+ has bent geometry.

73. The **correct** increasing order of *trans*-effect of the following species is

(1) $NH_3 > CN^- > Br^- > C_6H_5^-$

(2) $CN^- > C_6H_5^- > Br^- > NH_3$

(3) $Br^- > CN^- > NH_3 > C_6H_5^-$

(4) $CN^- > Br^- > C_6H_5^- > NH_3$

74. Which one of the following statements related to lanthanons is **incorrect**?

(1) Europium shows +2 oxidation state.

(2) The basicity decreases as the ionic radius decreases from Pr to Lu.

(3) All the lanthanons are much more reactive than aluminium.

(4) Ce(+4) solutions are widely used as oxidizing agent in volumetric analysis.

reaction?

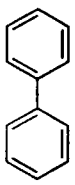
(1) Chlorobenzene

(2) Bromobenzene

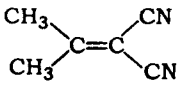
(3) Chloroethene

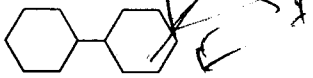
(4) Isopropyl chloride

77. In which of the following molecules, all atoms are coplanar?

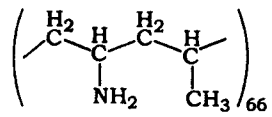
(1) 

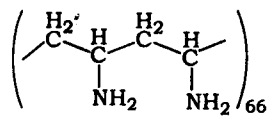
(2) 

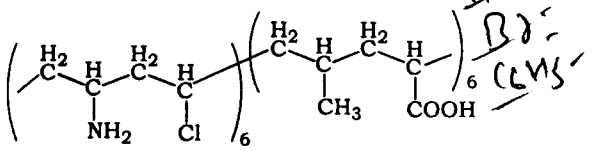
(3) 

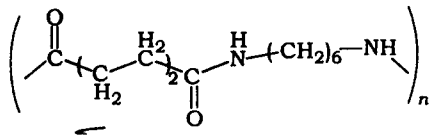
(4) 

78. Which one of the following structures represents nylon 6,6 polymer?

(1) 

(2) 

(3) 

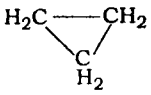
(4) 

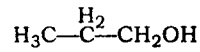
(2) 3 and 4

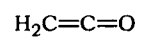
(3) 2 and 4

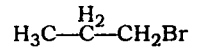
(4) 2 and 5

80. Which of the following compounds shall **not** produce propene by reaction with HBr followed by elimination or direct only elimination reaction?

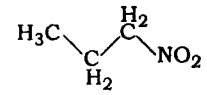
(1) 

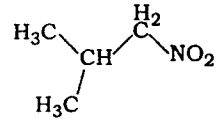
(2) 

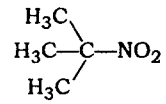
(3) 

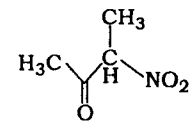
(4) 

81. Which one of the following nitro-compounds **does not** react with nitrous acid?

(1) 

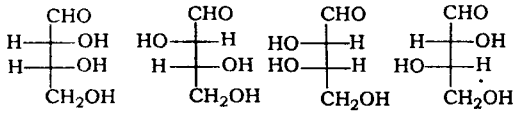
(2) 

(3) 

(4) 

(4) DNA → RNA → Carbohydrates

83. The **correct** corresponding order of names of four aldoses with configuration given below



respectively, is

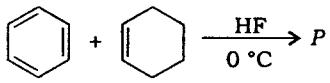
(1) L-erythrose, L-threose, L-erythrose, D-threose

(2) D-threose, D-erythrose, L-threose, L-erythrose

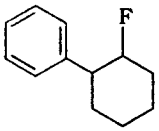
(3) L-erythrose, L-threose, D-erythrose, D-threose

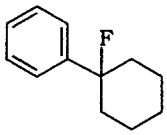
(4) D-erythrose, D-threose, L-erythrose, L-threose

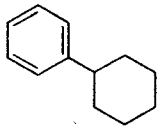
84. In the given reaction

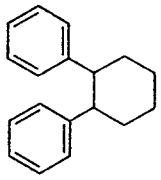


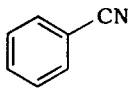
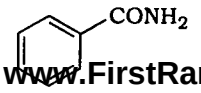
the product *P* is

(1) 

(2) 

(3) 

(4) 

(3)  (4) 

86. Consider the reaction

$$CH_3CH_2CH_2Br + NaCN \rightarrow CH_3CH_2CH_2CN + NaBr$$

This reaction will be the fastest in

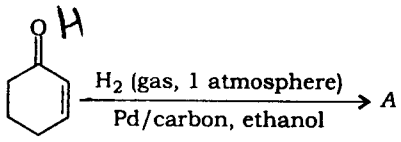
(1) ethanol

(2) methanol

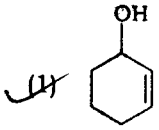
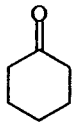
(3) *N*,*N*′-dimethylformamide (DMF)

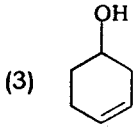
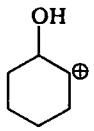
(4) water

87. The **correct** structure of the product *A* formed in the reaction



is

(1)  (2) 

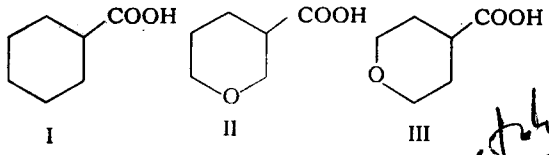
(3)  (4) 

(2) Both I and III

(3) Both I and II

(4) Both II and III

89. The **correct** order of strengths of the carboxylic acids



I II III

is

(1) I > II > III

(2) II > III > I

(3) III > II > I

(4) II > I > III

90. The compound that will react most readily with gaseous bromine has the formula

(1) C_3H_6

(2) C_2H_2

(3) C_4H_{10}

(4) C_2H_4

92. Methanogens belong to
(1) Eubacteria
(2) Archaebacteria
(3) Dinoflagellates
(4) Slime moulds

93. 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.

94. The label of a herbarium sheet **does not** carry information on
(1) date of collection
(2) name of collector
(3) local names
(4) height of the plant

95. Conifers are adapted to tolerate extreme environmental conditions because of
(1) broad hardy leaves
(2) superficial stomata
(3) thick cuticle
(4) presence of vessels

96. 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 carrageenan from brown algae.
(3) Agar-agar is obtained from *Gelidium* and *Gracilaria*.
(4) *Laminaria* and *Sargassum* are used as food.

97. *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

99. Radial symmetry is found in the flowers of
(1) *Brassica*
(2) *Trifolium*
(3) *Pisum*
(4) *Cassia*

100. Free-central placentation is found in
(1) *Dianthus*
(2) *Argemone*
(3) *Brassica*
(4) *Citrus*

101. Cortex is the region found between
(1) epidermis and stele
(2) pericycle and endodermis
(3) endodermis and pith
(4) endodermis and vascular bundle

102. The balloon-shaped structures called tyloses
(1) originate in the lumen of vessels
(2) characterize the sapwood
(3) are extensions of xylem parenchyma cells into vessels
(4) are linked to the ascent of sap through xylem vessels

(2) Large central vacuoles—Animal cells

(3) Protists—Eukaryotes

(4) Methanogens—Prokaryotes

105. 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.

106. A cell organelle containing hydrolytic enzymes is

(1) lysosome

(2) microsome

(3) ribosome

(4) mesosome

107. During cell growth, DNA synthesis takes place in

(1) S phase

(2) G_1 phase

(3) G_2 phase

(4) M phase

108. Which of the following biomolecules is common to respiration-mediated breakdown of fats, carbohydrates and proteins?

(1) Glucose-6-phosphate

(2) Fructose 1,6-bisphosphate

(3) Pyruvic acid

(4) Acetyl CoA

110. You are given a tissue with its potential for differentiation in an artificial culture. Which of the following pairs of hormones would you add to the [illegible] to induce shoots as well as roots?

(1) IAA and gibberellin

(2) Auxin and cytokinin

(3) Auxin and abscisic acid

(4) Gibberellin and abscisic acid

111. Phytochrome is a

(1) flavoprotein

(2) glycoprotein

(3) lipoprotein

(4) chromoprotein

112. Which is essential for the growth of root tip?

(1) Zn (2) Fe

(3) Ca (4) Mn

113. The process which makes major difference between C_3 and C_4 plants is

(1) glycolysis

(2) Calvin cycle

(3) photorespiration

(4) respiration

114. Which one of the following statements is **not** correct?

(1) Offspring produced by the asexual reproduction are called clone.

(2) Microscopic, motile asexual reproductive structures are called zoospores.

(3) In potato, banana and ginger, the plantlets arise from the internodes present in the modified stem.

(4) Water hyacinth, growing in the standing water, drains oxygen from water that leads to the death of fishes.

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

Codes :

	a	b	c	d
(1)	(iv)	(iii)	(i)	(ii)
(2)	(ii)	(i)	(iv)	(iii)
(3)	(i)	(ii)	(iv)	(iii)
(4)	(iii)	(i)	(iv)	(ii)

117. In majority of angiosperms

(1) egg has a filiform apparatus

(2) there are numerous antipodal cells

(3) reduction division occurs in the megaspore mother cells

(4) a small central cell is present in the embryo sac

118. Pollination in water hyacinth and water lily is brought about by the agency of

(1) water

(2) insects or wind

(3) birds

(4) bats

119. The ovule of an angiosperm is technically equivalent to

(1) megasporangium

(2) megasporophyll

(3) megaspore mother cell

(4) megaspore

120. 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

122. The equivalent of a structural gene is

(1) muton

(2) cistron

(3) operon

(4) recon

123. A true breeding plant is

(1) one that is able to breed on its own

(2) produced due to cross-pollination among unrelated plants

(3) near homozygous and produces offspring of its own kind

(4) always homozygous recessive in its genetic constitution

124. Which of the following rRNAs acts as structural RNA as well as ribozyme in bacteria?

(1) 5 S rRNA

(2) 18 S rRNA

(3) 23 S rRNA

(4) 5·8 S rRNA

125. 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

127. Which of the following is **not** a component of downstream processing?

(1) Separation

(2) Purification

(3) Preservation

(4) Expression

128. Which of the following restriction enzymes produces blunt ends?

(1) *Sal* I

(2) *Eco* RV

(3) *Xho* I

(4) *Hind* III

129. Which kind of therapy was given in 1990 to a four-year-old girl with adenosine deaminase (ADA) deficiency?

(1) Gene therapy

(2) Chemotherapy

(3) Immunotherapy

(4) Radiation therapy

130. How many hot spots of biodiversity in the world have been identified till date by Norman Myers?

(1) 17

(2) 25

(3) 34

(4) 43

132. Which of the following is **correct** for *r*-selected species?

(1) Large number of progeny with small size

(2) Large number of progeny with large size

(3) Small number of progeny with small size

(4) Small number of progeny with large size

133. If '+' sign is assigned to beneficial interaction, '–' sign to detrimental and '0' sign to neutral interaction, then the population interaction represented by '+' '–' refers to

(1) mutualism

(2) amensalism

(3) commensalism

(4) parasitism

134. Which of the following is **correctly** matched?

(1) Aerenchyma—*Opuntia*

(2) Age pyramid—Biome

(3) *Parthenium hysterophorus*—Threat to biodiversity

(4) Stratification—Population

135. Red List contains data or information on

(1) all economically important plants

(2) plants whose products are in international trade

(3) threatened species

(4) marine vertebrates only

a. Family	(i)	Diptera
b. Order	(ii)	Arthropoda
c. Class	(iii)	Muscidae
d. Phylum	(iv)	Insecta

Codes :

	a	b	c	d
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iii)	(ii)	(iv)	(i)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(iv)	(ii)	(i)	(iii)

138. Choose the **correct** statement.
(1) All mammals are viviparous.
(2) All cyclostomes do not possess jaws and paired fins.
(3) All reptiles have a three-chambered heart.
(4) All Pisces have gills covered by an operculum.

139. Study the four statements (A–D) given below and select the two correct ones out of them :
A. Definition of biological species was given by Ernst Mayr.
B. Photoperiod does not affect reproduction in plants.
C. Binomial nomenclature system was given by R. H. Whittaker.
D. In unicellular organisms, reproduction is synonymous with growth.

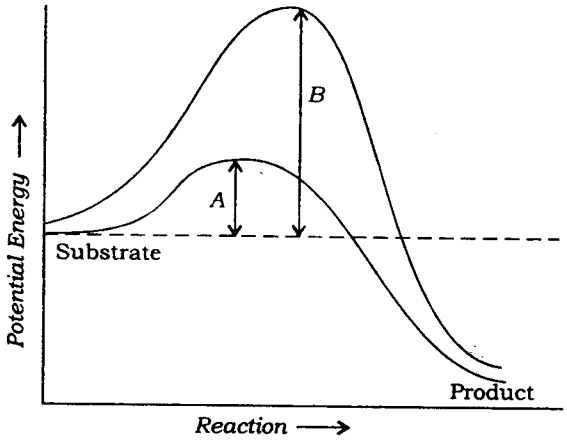
The two **correct** statements are
(1) B and C (2) C and D
(3) A and D (4) A and B

140. In male cockroaches, sperms are stored in which part of the reproductive system?
(1) Seminal vesicles
(2) Mushroom glands
(3) Testes
(4) Vas deferens

141. Smooth muscles are
(1) involuntary, fusiform, non-striated
(2) voluntary, multinucleate, cylindrical
(3) involuntary, cylindrical, striated
(4) voluntary, spindle-shaped, uninucleate

142. Which of the following is involved in stabilizing the three-dimensional folding of most proteins?
(1) Hydrogen bonds
(2) Electrostatic interaction
(3) Hydrophobic interaction
(4) Ester bonds

144. Which of the following describes the given graph **correctly**?



(1) Endothermic reaction with energy *A* in presence of enzyme and *B* in absence of enzyme
(2) Exothermic reaction with energy *A* in presence of enzyme and *B* in absence of enzyme
(3) Endothermic reaction with energy *A* in absence of enzyme and *B* in presence of enzyme
(4) Exothermic reaction with energy *A* in absence of enzyme and *B* in presence of enzyme

145. When cell has stalled DNA replication fork, which checkpoint should be predominantly activated?
(1) G_1/S
(2) G_2/M
(3) M
(4) Both G_2/M and M

d. Zygotene (iv) Chromosomes align at equatorial plate

Codes :

	a	b	c	d
(1)	(iii)	(iv)	(ii)	(i)
(2)	(i)	(iv)	(ii)	(iii)
(3)	(ii)	(iv)	(iii)	(i)
(4)	(iv)	(iii)	(ii)	(i)

147. Which hormones do stimulate the production of pancreatic juice and bicarbonate?
(1) Angiotensin and epinephrine
(2) Gastrin and insulin
(3) Cholecystokinin and secretin
(4) Insulin and glucagon

148. The partial pressure of oxygen in the alveoli of the lungs is
(1) equal to that in the blood
(2) more than that in the blood
(3) less than that in the blood
(4) less than that of carbon dioxide

149. Choose the **correct** statement.
(1) Nociceptors respond to changes in pressure.
(2) Meissner's corpuscles are thermo-receptors.
(3) Photoreceptors in the human eye are depolarized during darkness and become hyperpolarized in response to the light stimulus.
(4) Receptors do not produce graded potentials.

150. Graves' disease is caused due to
(1) hyposecretion of thyroid gland
(2) hypersecretion of thyroid gland
(3) hyposecretion of adrenal gland
(4) hypersecretion of adrenal gland

(3) Neutrophils
(4) Thrombocytes

152. Name a peptide hormone, which acts mainly on hepatocytes, adipocytes and enhances cellular glucose uptake and utilization.
(1) Insulin (2) Glucagon
(3) Secretin (4) Gastrin

154. Osteoporosis, an age-related disease of skeletal system, may occur due to
(1) immune disorder affecting neuro-muscular junction leading to fatigue
(2) high concentration of Ca^{++} and Na^{+}
(3) decreased level of estrogen
(4) accumulation of uric acid leading to inflammation of joints

155. Serum differs from blood in
(1) lacking globulins
(2) lacking albumins
(3) lacking clotting factors
(4) lacking antibodies

156. Lungs do not collapse between breaths and some air always remains in the lungs which can never be expelled because
(1) there is a negative pressure in the lungs
(2) there is a negative intrapleural pressure pulling at the lung walls
(3) there is a positive intrapleural pressure
(4) pressure in the lungs is higher than the atmospheric pressure

157. The posterior pituitary gland is **not** a 'true' endocrine gland because
(1) it is provided with a duct
(2) it only stores and releases hormones
(3) it is under the regulation of hypo-thalamus
(4) it secretes enzymes

(4) Cu7

160. Which of the following is **incorrect** regarding vasectomy?

(1) No sperm occurs in seminal fluid
(2) No sperm occurs in epididymis
(3) Vasa deferentia is cut and tied
(4) Irreversible sterility

161. Embryo with more than 16 blastomeres formed due to *in vitro* fertilization is transferred into
(1) uterus
(2) fallopian tube
(3) fimbriae
(4) cervix

162. Which of the following depicts the **correct** pathway of transport of sperms?
(1) Rete testis → Efferent ductules → Epididymis → Vas deferens
(2) Rete testis → Epididymis → Efferent ductules → Vas deferens
(3) Rete testis → Vas deferens → Efferent ductules → Epididymis
(4) Efferent ductules → Rete testis → Vas deferens → Epididymis

163. Match **Column—I** with **Column—II** and select the correct option using the codes given below :

Column—I	**Column—II**
a. Mons pubis	(i) Embryo formation
b. Antrum	(ii) Sperm
c. Trophectoderm	(iii) Female external genitalia
d. Nebenkern	(iv) Graafian follicle

Codes :

	a	b	c	d
(1)	(iii)	(iv)	(ii)	(i)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(i)	(iv)	(iii)	(ii)

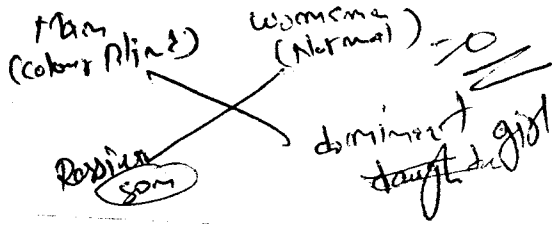
probability of their son being colour-blind i
(1) 0
(2) 0·5
(3) 0·75
(4)

166. Genetic drift operates in
(1) small isolated population
(2) large isolated population
(3) non-reproductive population
(4) slow reproductive population

167. In Hardy-Weinberg equation, the frequenc of heterozygous individual is represented by
(1) p^2
(2) $2pq$
(3) pq
(4) q^2

168. The chronological order of human evolution from early to the recent is
(1) *Australopithecus* → *Ramapithecus* → *Homo habilis* → *Homo erectus*
(2) *Ramapithecus* → *Australopithecus* → *Homo habilis* → *Homo erectus*
(3) *Ramapithecus* → *Homo habilis* → *Australopithecus* → *Homo erectus*
(4) *Australopithecus* → *Homo habilis* → *Ramapithecus* → *Homo erectus*

169. Which of the following is the **correct** sequence of events in the origin of life?
I. Formation of protobionts
II. Synthesis of organic monomers
III. Synthesis of organic polymers
IV. Formation of DNA-based genetic systems
(1) I, II, III, IV
(2) I, III, II, IV
(3) II, III, I, IV
(4) II, III, IV, I



171. DNA-dependent RNA polymerase catalyzes transcription on one strand of the DNA which is called the

(1) template strand

(2) coding strand

(3) alpha strand

(4) antistrand

172. Interspecific hybridization is the mating of

(1) animals within same breed without having common ancestors

(2) two different related species

(3) superior males and females of different breeds

(4) more closely related individuals within same breed for 4–6 generations

173. Which of the following is **correct** regarding AIDS causative agent HIV?

(1) HIV is enveloped virus containing one molecule of single-stranded RNA and one molecule of reverse transcriptase.

(2) HIV is enveloped virus that contains two identical molecules of single-stranded RNA and two molecules of reverse transcriptase.

(3) HIV is unenveloped retrovirus.

(4) HIV does not escape but attacks the acquired immune response.

174. Among the following edible fishes, which one is a marine fish having rich source of omega-3 fatty acids?

(1) Mystus

(2) Mangur

(3) Mrigala

(4) Mackerel

(1) (iii) (i) (iv) (ii)

(2) (iii) (i) (iv) (ii)

(3) (i) (iv) (ii) (iii)

(4) (iii) (iv) (i) (ii)

176. Biochemical Oxygen Demand (BOD) may **not** be a good index for pollution for water bodies receiving effluents from

(1) domestic sewage

(2) dairy industry

(3) petroleum industry

(4) sugar industry

177. The principle of competetive exclusion was stated by

(1) C. Darwin

(2) G. F. Gause

(3) MacArthur

(4) Verhulst and Pearl

178. Which of the following National Parks is home to the famous musk deer or hangul?

(1) Keibul Lamjao National Park, Manipur

(2) Bandhavgarh National Park, Madhya Pradesh

(3) Eaglenest Wildlife Sanctuary, Arunachal Pradesh

(4) Dachigam National Park, Jammu & Kashmir

179. A lake which is rich in organic waste may result in

(1) increased population of aquatic organisms due to minerals

(2) drying of the lake due to algal bloom

(3) increased population of fish due to lots of nutrients

(4) mortality of fish due to lack of oxygen

180. The highest DDT concentration in aquatic food chain shall occur in

(1) phytoplankton

(2) seagull

(3) crab

(4) eel