

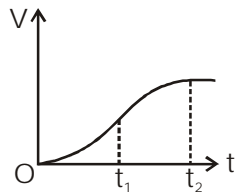
01. On the basis of dimensions, decide which of the following relations for the displacement of a particle undergoing simple harmonic motion is not correct:

- (1) $y = a \sin \frac{2\pi t}{T}$
- (2) $y = a \sin vt$
- (3) $y = a\sqrt{2} \left(\sin \frac{2\pi t}{T} - \cos \frac{2\pi t}{T} \right)$
- (4) None of these

02. A jet airplane travelling at a speed of 500 km/h ejects its products of combustion at the speed of 1500 km/h relative to the jet plane. What is the speed of the latter with respect to an observer on the ground :

- (1) 1000 km/h
- (2) 2000 km/h
- (3) 1250 km/h
- (4) 850 km/h

03. The velocity-time graph of a particle in one dimensional motion is shown in fig. below. Which of the following formulae are/is correct for describing the motion of the particle over the time interval t_1 to t_2 :

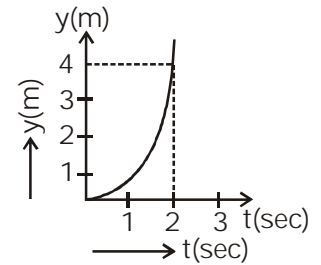
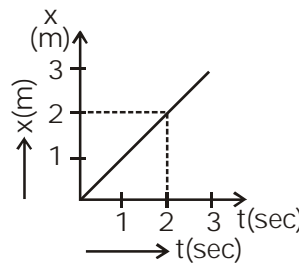


- (1) $x(t_2) = x(t_1) + V(t_1)(t_2 - t_1) + \frac{1}{2}a(t_2 - t_1)^2$
- (2) $V(t_2) = V(t_1) + a(t_2 - t_1)$
- (3) $x(t_2) = x(t_1) + V_{av}(t_2 - t_1) + \frac{1}{2}a_{av}(t_2 - t_1)^2$
- (4) $a_{av} = \frac{V(t_2) - V(t_1)}{t_2 - t_1}$

04. A man can swim with a speed of 4 km/h in still water. A river is 1 km wide and flows steadily 3 km/h. The man makes his strokes normal to the river current. How far down the river does he go when he reaches the other bank :

- (1) 600 m
- (2) 800 m
- (3) 750 m
- (4) 850 m

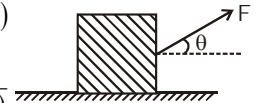
05. Fig given below, shows (x, t) , (y, t) diagram of a particle moving in 2-dimensions. If the particle has a mass of 500 g, find the force acting on the particle:



- (1) $\frac{\sqrt{3}}{2} N$
- (2) $\frac{\sqrt{2}}{3} N$
- (3) $\sqrt{12} N$
- (4) None of these

06. Pulling force making an angle θ to the horizontal is applied on a block of weight W placed on a horizontal table. If the angle of friction is ϕ , the magnitude of force required to move the body is equal to

- (1) $\frac{W \sin \phi}{\cos(\theta - \phi)}$
- (2) $\frac{W \cos \phi}{\sin(\theta - \phi)}$
- (3) $\frac{W \sin \phi}{\tan(\theta - \phi)}$
- (4) $\frac{W \cos \phi}{\tan(\theta - \phi)}$



07. Under the action of a force, a 2 kg body moves such that its position x as a function of time t is given by $x = (t^3/3)$, where x is in metres and t in sec. The work done by the force in first two seconds is

- (1) 12 J
- (2) 16 J
- (3) 18 J
- (4) 48 J

08. Two disc of moments of inertia I_1 and I_2 about their respective axis (normal to the disc and passing through the centre) and rotating with angular speed ω_1 and ω_2 are brought into contact face to face with their axis of rotation coincident. What is the angular speed of the two disc system:

- (1) $\frac{(I_1 + I_2)(\omega_1 + \omega_2)}{4}$
- (2) $\frac{I_1 \omega_2 + I_2 \omega_1}{I_1 + I_2}$
- (3) $\frac{I_1 \omega_1 + I_2 \omega_2}{I_1 + I_2}$
- (4) $\frac{(I_1 + I_2)(\omega_1 + \omega_2)}{2}$

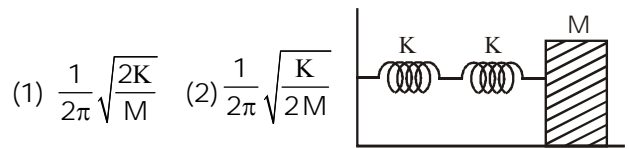
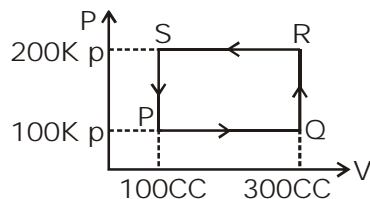
09. In the HCl molecule the separation between the nuclei of the two atoms is about 1.27 Å. Find the location of the centre of mass of the molecule from hydrogen atom :

- (1) 0.67 Å
- (2) 0.82 Å
- (3) 1.06 Å
- (4) 1.24 Å

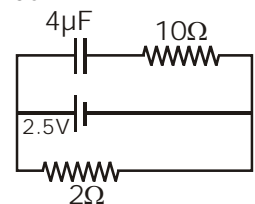
10. A satellite revolves around the earth in an elliptical orbit. Its speed is :z

- (1) same at all point in the orbit
- (2) greatest when it is closest to the earth
- (3) greatest when it is farthest from the earth
- (4) None of these

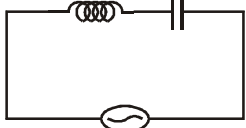
11. A liquid will not wet the surface of a solid, if the angle of contact is :
 (1) 0° (2) 45° (3) 75° (4) 105°
12. Water is flowing through a pipe under constant pressure. At some places the pipe is narrow. The pressure of water at these places ;
 (1) increases (2) decreases
 (3) remains same (4) None of these
13. A polyatomic gas with n degrees of freedom has a mean energy per molecule given by
 (1) $\frac{3nkT}{2N}$ (2) $\frac{nkT}{2N}$ (3) $\frac{nkT}{2}$ (4) $\frac{3nkT}{2}$
14. 80 gram of water at 30°C are poured on a large block of ice at 0°C . The mass of ice that melts is ;
 (1) 30 gm (2) 50 gm (3) 75 gm (4) 85 gm
15. The most appropriate material for a cooking pot is the one having
 (1) high specific heat and low conductivity
 (2) high specific heat and high conductivity
 (3) low specific heat and low conductivity
 (4) low specific heat and high conductivity
16. A bucket full of water is kept in a room and it cools from 70°C to 65°C in t_1 minutes and from 65°C to 60°C in t_2 minutes and from 60°C to 55°C in t_3 minutes then
 (1) $t_1 > t_2 > t_3$ (2) $t_1 = t_2 = t_3$
 (3) $t_1 < t_2 < t_3$ (4) $t_1 > t_2 < t_3$
17. The rectangular surface of area $8\text{ cm} \times 4\text{ cm}$ of a black body at temperature 127°C emits energy E per second. If the length and breadth are reduced to half of the initial value and the temperature is raised to 327°C , the rate of emission of energy becomes
 (1) $\frac{81}{16}E$ (2) $\frac{81}{32}E$ (3) $\frac{81}{64}E$ (4) $\frac{81}{128}E$
18. A thermodynamic system is taken through the cycle PQRS process. The net work done by the system is :
 (1) 20 J (2) -20 J
 (3) $2 \times 10^3\text{ J}$ (4) $-2 \times 10^3\text{ J}$



- (1) $\frac{1}{2\pi} \sqrt{\frac{2K}{M}}$ (2) $\frac{1}{2\pi} \sqrt{\frac{K}{2M}}$
 (3) $\frac{1}{2\pi} \sqrt{\frac{3K}{2M}}$ (4) $\frac{1}{2\pi} \sqrt{\frac{2M}{K}}$
20. A stationary wave set up between the ends of a 2.5 m long string vibrates in 5 segments. The distance between first and third antinode is :
 (1) 100 cm (2) 125 cm (3) 75 cm (4) 150 cm
21. Two trains A and B approach a stationary observer from opposite sides with speed 15 m/s and 30 m/s respectively. Observer hears no beats. If frequency of whistle of train B is 504 Hz and the frequency of whistle of A is (speed of sound = 330 m/s):
 (1) 583 Hz (2) 612 Hz (3) 472 Hz (4) 529 Hz
22. $Y = 25 \cos(2\pi t - \pi x)$ is the wave equation. Find frequency of the wave :
 (1) 1 (2) 0.1 (3) 10 (4) 100
23. A positive charge particle is released from rest in an uniform electric field. The electric potential energy of the charge
 (1) remains a constant because the electric field is uniform
 (2) increases because the charge moves along the electric field
 (3) decreases because the charge moves along the electric field
 (4) None of these
24. A capacitor of $4\ \mu\text{F}$ is connected as shown in the circuit below. The internal resistance of the battery is $0.5\ \Omega$. The amount of charge on the capacitor plates will be :
 (1) $12\ \mu\text{C}$ (2) $\frac{32}{5}\ \mu\text{C}$
 (3) $8\ \mu\text{C}$ (4) $6\ \mu\text{C}$



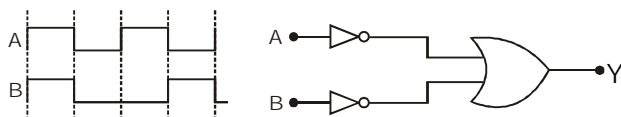
25. The capacity of an isolated conducting sphere of radius R is proportional to
 (1) R^2 (2) $\frac{1}{R^2}$ (3) $\frac{1}{R}$ (4) R
26. The resistance of a wire is $2\ \Omega$. The wire is stretched to double its length keeping volume constant. Now the resistance of the wire will become :
 (1) $2\ R\ \Omega$ (2) $4\ R\ \Omega$ (3) $8\ R\ \Omega$ (4) $16\ R\ \Omega$

27. The resistance of an ammeter whose scale is rated 12 A is 0.2Ω . Find the resistance of an additional shunt that should be used to measure current upto 60A :
 (1) 0.08Ω (2) 0.01Ω (3) 0.05Ω (4) 0.03Ω
28. The neutral temperature of copper-iron thermo couple is 270°C . If the temperature of the cold junction is 20°C then the temperature of inversion will be :
 (1) 490°C (2) 540°C (3) 500°C (4) 520°C
29. Current of 10A and 2A are passed through two parallel wires A and B respectively in opposite directions. If the wire A is infinitely long and the length of the wire B is 2 m the force on the conductor B which is situated at 10 cm distance from A will be
 (1) $4 \times 10^{-5}\text{ N}$ (2) $8 \times 10^{-5}\text{ N}$
 (3) $8\pi \times 10^{-7}\text{ N}$ (4) $4\pi \times 10^{-7}\text{ N}$
30. Flux ϕ (in weber) in a closed circuit of resistance 10Ω varies with time t (in sec.) according to the equation, $\phi = 6t^2 - 5t + 1$. What is the magnitude of the current at $t = 0.25$ sec.
 (1) 1.2 A (2) 0.6 A (3) 0.2 A (4) 0.8 A
31. In the circuit shown here, the voltage across L and C are
 (1) in phase
 (2) out of phase by $\pi/2$
 (3) out of phase by π
 (4) bear a phase difference which depends on the values of L and C
- 
32. A bar magnet has a magnetic moment of 2.5 J/T and is placed in a magnetic field of 0.2 T . Work done in turning the magnet from parallel to antiparallel position relative to the field direction is :
 (1) 1 J (2) 0.5 J (3) 2 J (4) zero
33. At certain place, horizontal component of earth's magnetic field is $\sqrt{3}$ times the vertical component. The angle of dip at the place is :
 (1) 60° (2) 30° (3) 45° (4) 90°
34. A concave spherical mirror forms a 40 cm high real image of an object whose height is 10 cm. The radius of the mirror is 60 cm. Find the distance from the object to its image :
 (1) 187.5 cm (2) 112.5 cm
 (3) 75 cm (4) 90 cm
35. Astigmatism can be corrected by using
 (1) bifocal lenses (2) concave lenses
 (3) convex lenses (4) cylindrical lenses
36. In Young's double slit exp. the spacing between two slits is 0.1 mm. If the screen is kept at a distance of 1 m from the slits and the wavelength of light is 5000 \AA the fringe width is given by :
 (1) 1.5 cm (2) 1 cm
 (3) 0.5 cm (4) 0.75 cm
37. Which of the following is not electromagnetic waves :
 (1) cosmic rays (2) gamma rays
 (3) β -rays (4) X-rays
38. An electron revolves about a proton in nucleus of hydrogen atom; in second excited state. The angular momentum of electron is:
 (1) h/π (2) $3h/2\pi$
 (3) $h/2\pi$ (4) $2h/\pi$
39. If an electron and a proton propagate in the form of waves having the same wavelength it implies that they have the same :
 (1) energy (2) velocity
 (3) angular momentum
 (4) linear momentum
40. In a photoelectric experiment, photons of energy 4.8 eV are incident on a metal surface. They liberate electrons which are just stopped by an electrode at a potential of -3.3 volt with respect to the metal. The work function of the metal surface in electron volt is :
 (1) 8.1 eV (2) 1.5 eV
 (3) 3.78 eV (4) 2.16 eV
41. The rate of disintegration of a fixed quantity of a radioactivity substance can be increased by:
 (1) increasing the temperature
 (2) increasing the pressure
 (3) chemical reaction
 (4) it is not possible
42. Fusion reaction takes place at high temperature because.
 (1) atoms are ionised at high temperature
 (2) molecules break up at high temperature
 (3) nuclei break up at high temperature
 (4) kinetic energy is high enough to overcome repulsion between nuclei
43. The forbidden energy band gap in conductors, semiconductors and insulators are EG_1 , EG_2 and EG_3 respectively. The relation among them is:
 (1) $EG_1 < EG_2 < EG_3$ (2) $EG_1 = EG_2 = EG_3$
 (3) $EG_1 > EG_2 > EG_3$ (4) $EG_1 < EG_2 > EG_3$

44. What is voltage gain in a common emitter amplifier when input resistance is 3Ω and the load resistance 24Ω with $\beta = 60$:

- (1) 480 (2) 7.5
(3) 278 (4) 354

45. In a given circuit as shown below, two inputs wave form A and B applied simultaneously.



The resultant wave form Y is:

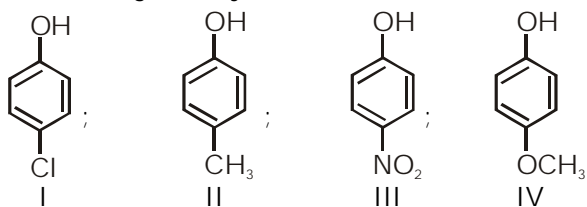
- (1) (2)
(3) (4)

46. A piston filled with 0.04 mole of an ideal gas expands reversibly from 50.0 mL to 375 mL at a constant temperature of 37°C . As it does so, it absorbs 208 J of heat. The values of q and W for the process will be

($R = 8.314 \text{ J/mol K}$, $\ln 7.5 = 2.01$)

- (1) $q = +208 \text{ J}$, $W = -208 \text{ J}$
(2) $q = -208 \text{ J}$, $W = -208 \text{ J}$
(3) $q = -208 \text{ J}$, $W = +208 \text{ J}$
(4) $q = +208 \text{ J}$, $W = +208 \text{ J}$

47. Arrange the following compounds in the order of decreasing acidity



- (1) $\text{II} > \text{IV} > \text{I} > \text{III}$ (2) $\text{I} > \text{II} > \text{III} > \text{IV}$
(3) $\text{III} > \text{IV} > \text{I} > \text{II}$ (4) $\text{IV} > \text{III} > \text{I} > \text{II}$

48. Which of the following arrangements does not represent the correct order of the property stated against it?

- (1) $\text{V}^{2+} < \text{Cr}^{2+} < \text{Mn}^{2+} < \text{Fe}^{2+}$: paramagnetic behaviour
(2) $\text{Ni}^{2+} < \text{Co}^{2+} < \text{Fe}^{2+} < \text{Mn}^{2+}$: ionic size
(3) $\text{Co}^{3+} < \text{Fe}^{3+} < \text{Cr}^{3+} < \text{Sc}^{3+}$: stability aqueous solution
(4) $\text{Sc} < \text{Ti} < \text{Cr} < \text{Mn}$: number of oxidation states

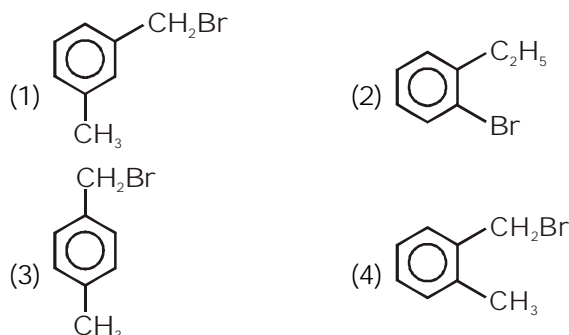
49. Which of the following is the wrong statement ?

- (1) ONCl and ONO^- are isoelectronic
(2) O_3 molecule is bent
(3) Ozone is violet-black in solid state
(4) Ozone is diamagnetic gas

50. A gaseous hydrocarbon gives upon combustion 0.72g of water and 3.08 g of CO_2 . The empirical formula of the hydrocarbon is

- (1) C_2H_4 (2) C_3H_4 (3) C_6H_5 (4) C_7H_8

51. Compound (A), $\text{C}_8\text{H}_9\text{Br}$ gives a light yellow ppt when warmed with alcoholic AgNO_3 . Oxidation of (A) gives an acid (B), $\text{C}_8\text{H}_6\text{O}_4$. (B) easily forms anhydride on heating. Identify the compound (A).



52. An organic compound A upon reacting with NH_3 gives B. On heating, B gives C. C in the presence of KOH reacts with Br_2 to give $\text{CH}_3\text{CH}_2\text{NH}_2$. Compound A is

- (1) CH_3COOH (2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$
(3) $\text{CH}_3-\text{CH}(\text{CH}_3)-\text{COOH}$ (4) $\text{CH}_3\text{CH}_2\text{COOH}$

53. An unknown alcohol is treated with the "Lucas reagent" to determine whether the alcohol is primary, secondary or tertiary. Which alcohol reacts fastest and by what mechanism?

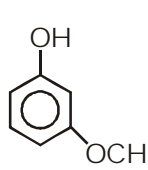
- (1) Secondary alcohol by $\text{S}_{\text{N}}1$
(2) Tertiary alcohol by $\text{S}_{\text{N}}1$
(3) Secondary alcohol by $\text{S}_{\text{N}}2$
(4) Tertiary alcohol by $\text{S}_{\text{N}}2$

54. Lithium forms body-centred cubic structure. The length of the side of its unit cell is 351 pm. Atomic radius of the lithium will be

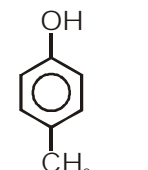
- (1) 75 pm (2) 300 pm (3) 240 pm (4) 152 pm

55. Which one of the following statements is correct?

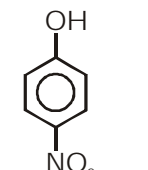
- (1) All amino acids except lysine are optically active.
(2) All amino acids are optically active.
(3) All amino acids except glycine are optically active.
(4) All amino acids except glutamic acids are optically active.

56. Aspirin is known as
 (1) acetyl salicylic acid
 (2) phenyl salicylate
 (3) acetyl salicylate
 (4) methyl salicylic acid
57. Ortho-nitrophenol is less soluble in water than p- and m-nitrophenols because
 (1) o-nitrophenol is more volatile than those of m- and p-isomers.
 (2) o-nitrophenol shows intramolecular H-bonding
 (3) o-nitrophenol shows intermolecular H-bonding
 (4) melting point of o-nitrophenol is lower than those of m- and p-isomers
58. How many chiral compounds are possible on monochlorination of 2-methyl butane?
 (1) 8 (2) 2 (3) 4 (4) 6
59. Very pure hydrogen (99.9%) can be made by which of the following processes?
 (1) Reaction of methane with steam.
 (2) Mixing natural hydrocarbons of high molecular weight.
 (3) Electrolysis of water.
 (4) Reaction of salts like hydrides with water.
60. Which branched chain isomer of the hydrocarbon with molecular mass 72u gives only one isomer of mono substituted alkyl halide?
 (1) Tertiary butyl chloride
 (2) Neopentane
 (3) Isohexane
 (4) Neohexane
61. The strained tetracyclic alkane is isomerized thermally to the cyclic alkene. The reaction involves
 (1) free radical (2) carbocation
 (3) carbanion (4) carbene
62. The correct decreasing order of pK_a is
- 

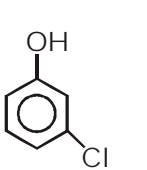
(I)

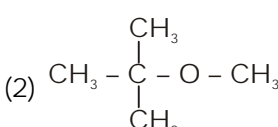
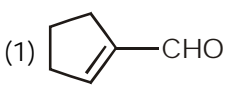


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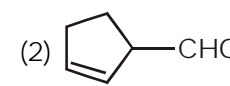


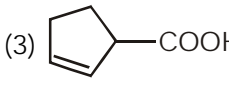
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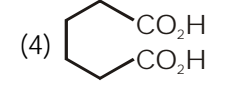
(IV)
- (1) II > IV > I > III (2) IV > II > III > I
 (3) III > II > IV > I (4) IV > I > II > III
63. S_N2 reaction readily occurs in
 (1) $CH_3CH_2-O-CH_3$
 (2) 
 (3) $CH_2=CH-CH_2-O-CH_3$
 (4) $Ph-CH_2-O-CH_2-CH_3$
64. The enthalpy change (ΔH) for the process $N_2H_4(g) \rightarrow 2N(g) + 4H(g)$ is 1724 kJ mol⁻¹. If the bond energy of N-H bond in ammonia is 391 kJ mol⁻¹. What is the bond energy of N-N bond in N_2H_4 .
 (1) 160 kJ mol⁻¹ (2) 391 kJ mol⁻¹
 (3) 1173 kJ mol⁻¹ (4) 320 kJ mol⁻¹
65. 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
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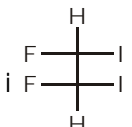
(1)



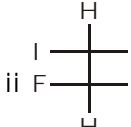
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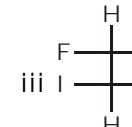


(4)
66. Which of the following compounds are optically active?
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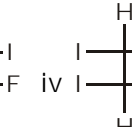
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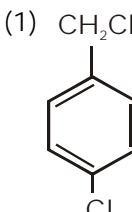


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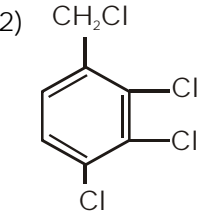


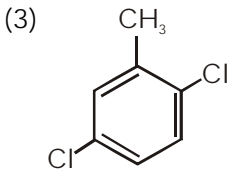
iii



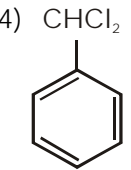
iv
- (1) i and ii (2) ii and iii
 (3) iii and iv (4) i and iv
67. An aromatic compound $C_7H_6Cl_2$ (A), gives AgCl on boiling with alcoholic $AgNO_3$ solution and yields C_7H_7OCl on treatment with sodium hydroxide. (A) on oxidation gives monochlorobenzoic acid. The compound (A) is
- 

(1)



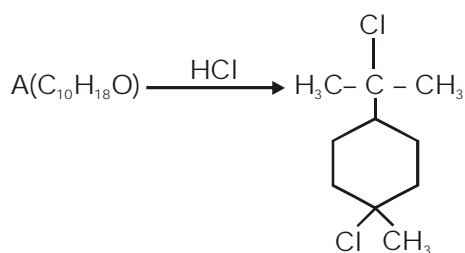
(2)
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(3)

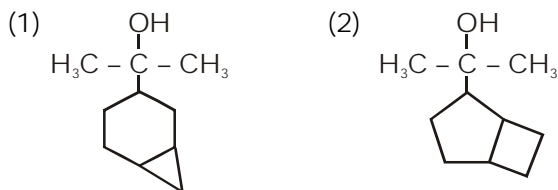


(4)

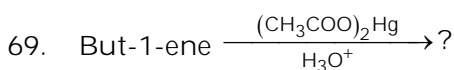
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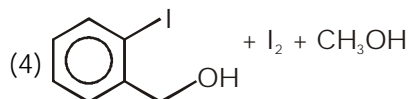
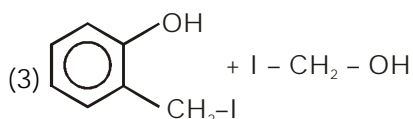
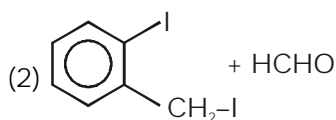
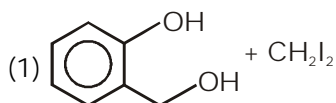
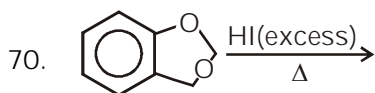
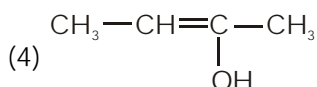
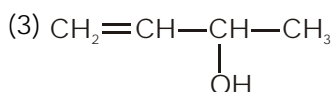
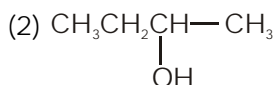
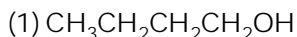
Degree of unsaturation of A = 2, it contains no double or triple bonds.



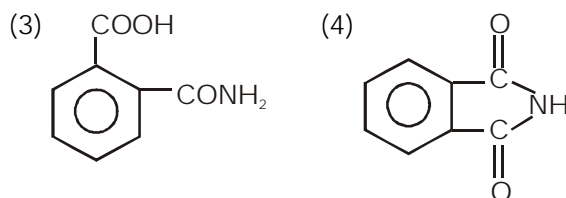
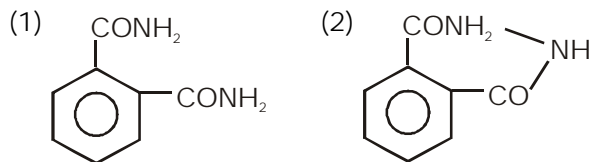
(3)  (4) none of these



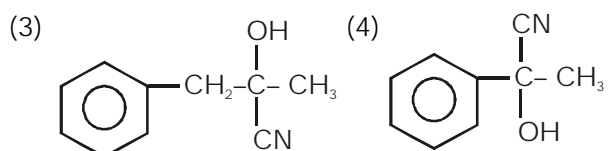
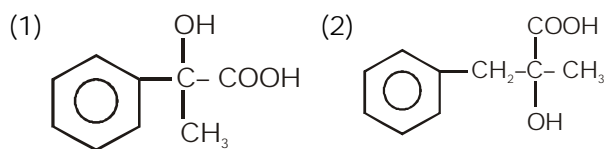
The product in the above reaction is



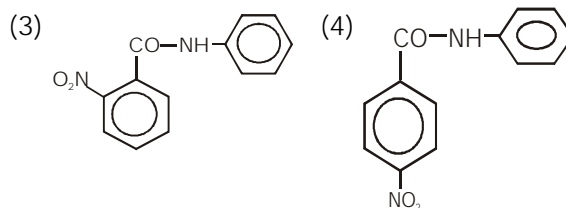
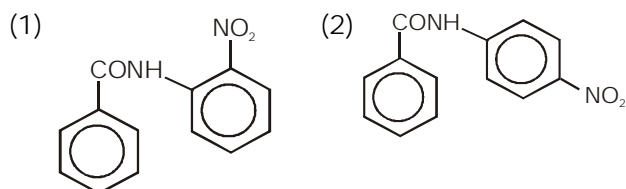
71. If phthalic acid is treated with NH_3 and then it is first heated weakly then strongly, the final product formed is



72. In a set of reactions, acetic acid yielded a product S.

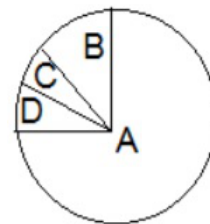


73. Which is the major product formed when $\text{C}_6\text{H}_5\text{CONHC}_6\text{H}_5$ undergoes nitration?

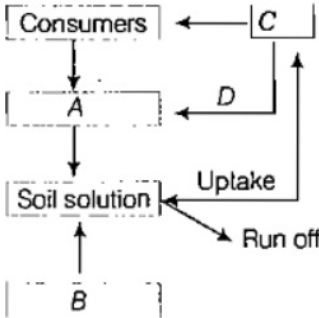


74. $\text{PhCH}_2\text{Cl} \xrightarrow{\text{aq. NaCN}} ?$
 $\xrightarrow{\text{Catalytic hydrogenation}} (U)$
 The final product (U) is :
 (1) $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{NH}_2$ (2) $\text{C}_6\text{H}_5\text{CH}_2\text{CONH}_2$
 (3) $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$ (4) $\text{C}_6\text{H}_5\text{CH}_2\text{NHCH}_3$
75. 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-}
76. Which is correct example of condensation polymer?
 (1) Nylon, Buna-S (2) Teflon, Buna-N
 (3) Nylon 6,6 Dacron (4) Neoprene, Buna-S
77. Which is not stable under ambient condition?
 (1) TiO_2 , Ti^{+4} (2) VO , V^{+4}
 (3) VO_2 , V^{+5} (4) Cu_2O , Cu^{+2}
78. Which of the following is the correct statement for PH_3 ?
 (1) It is less poisonous than NH_3 .
 (2) It is less basic than NH_3 .
 (3) Electronegativity of $\text{PH}_3 > \text{NH}_3$.
 (4) It does not show reducing properties.
79. $\text{S}_2\text{O}_8^{2-}$ have
 (1) S-S bond
 (2) S-O bridge
 (3) O-O bridge
 (4) All S-O bond length are same.
80. A complex $\text{PtCl}_4 \cdot 5\text{NH}_3$ shows a molar conductance of $402 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ in water and precipitates three moles of AgCl with AgNO_3 solution. The formula of the complex is
 (1) $[\text{Pt}(\text{NH}_3)_6]\text{Cl}_4$ (2) $[\text{Pt}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}_2$
 (3) $[\text{Pt}(\text{NH}_3)_5\text{Cl}]\text{Cl}_3$ (4) $[\text{Pt}(\text{NH}_3)_3\text{Cl}_3]\text{Cl}$
81. The wavelength of light absorbed is highest in
 (1) $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$ (2) $[\text{Co}(\text{NH}_3)_5\text{H}_2\text{O}]^{3+}$
 (3) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (4) $[\text{Co}(\text{en})_3]^{3+}$
82. According to Hardy schulze law, the flocculating power of an ion increases with
 (1) decreases in size
 (2) increase in size
 (3) decrease in charge
 (4) increase in charge
83. For a first order gas phase reaction—
 $\text{A}_{(g)} \rightarrow 2\text{B}_{(g)} + \text{C}_{(g)}$
 P_0 be initial pressure of A and P_t the total pressure at time 't'. Integrated rate equation is
 (1) $\frac{2.303}{t} \log \left(\frac{P_0}{P_0 - P_t} \right)$ (2) $\frac{2.303}{t} \log \left(\frac{2P_0}{3P_0 - P_t} \right)$
 (3) $\frac{2.303}{t} \log \left(\frac{P_0}{2P_0 - P_t} \right)$ (4) $\frac{2.303}{t} \log \left(\frac{2P_0}{2P_0 - P_t} \right)$
84. For a reaction, $r = k(\text{CH}_3\text{COCH}_3)^{3/2}$ then unit of rate of reaction and rate constant respectively is
 (1) $\text{mol L}^{-1} \text{ s}^{-1}$, $\text{mol}^{-1/2} \text{ L}^{1/2} \text{ s}^{-1}$
 (2) $\text{mol}^{-1} \text{ L}^{-1} \text{ s}^{-1}$, $\text{mol}^{-1/2} \text{ L}^{-1/2} \text{ s}^{-1}$
 (3) $\text{mol L}^{-1} \text{ s}^{-1}$, $\text{mol}^{+1/2} \text{ L}^{1/2} \text{ s}^{-1}$
 (4) mol Ls , $\text{mol}^{+1/2} \text{ L}^{1/2} \text{ s}$
85. The standard half-cell reduction potential for $\text{Ag}^+|\text{Ag}$ is 0.7991 V at 25°C. Given the experimental value $K_{sp} = 1.56 \times 10^{-10}$ for AgCl , calculate the standard half-cell reduction potential for the $\text{Ag}|\text{AgCl}$ electrode.
 (1) 0.2192 V (2) -0.2192 V
 (3) -1.2192 V (4) 1.2192 V
86. Stomach acid, a dilute solution of HCl in water, can be neutralized by reaction with sodium hydrogen carbonate,
 $\text{NaHCO}_3(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
 How many milliliters of 0.125 M NaHCO_3 solution are needed to neutralize 18.0 mL of 0.100 M HCl ?
 (1) 14.4 mL (2) 12.0 mL
 (3) 14.0 mL (4) 13.2 mL
87. CsCl has bcc arrangement. Its unit cell degree length is 400 pm. Its inter-ionic distance is
 (1) 400 pm (2) 800 pm
 (3) $\sqrt{3} \times 100 \text{ pm}$ (4) $\frac{\sqrt{3}}{2} \times 400 \text{ pm}$

88. Which of the following is not hygroscopic?
 (1) CsCl (2) MgCl₂
 (3) CaCl₂ (4) LiCl
89. What is the PH of 0.01 M glycine solution ? For glycine $K_{a1} = 4.5 \times 10^{-3}$ and $K_{a2} = 1.7 \times 10^{-10}$ at 298K.
 (1) 3.0 (2) 10.0
 (3) 7.06 (4) 8.2
90. Which of the following is not a characteristic of equilibrium ?
 (1) Rate is equal in both directions
 (2) Measurable quantities are constant at equilibrium
 (3) Equilibrium occurs in reversible condition
 (4) Equilibrium occurs only in open vessel at constant temperature
91. Match the Column I and II.
- | Column I | | Column II | |
|--------------------|---|-----------------------|---|
| A. Bulliform cells | | 1. Stomata | |
| B. Guard cells | | 2. Aerating pore | |
| C. Lenticels | | 3. Accessory cells | |
| D. Subsidiary cell | | 4. Isobilateral cells | |
| A | B | C | D |
| (1) 1 | 2 | 3 | 4 |
| (2) 3 | 1 | 2 | 4 |
| (3) 4 | 1 | 2 | 3 |
| (4) 4 | 3 | 2 | 1 |
92. To obtain virus-free healthy plants from a diseased one by tissue culture technique, which part/parts of the diseased plant will be taken ?
 (1) Apical meristem only
 (2) Palisade parenchyma
 (3) Both apical and axillary meristems
 (4) Epidermis only
93. You are given a fairly old piece of dicot stem and a dicot root. Which of the following anatomical structures will you use to distinguish between the two ?
 (1) Secondary xylem
 (2) Secondary phloem
 (3) Protoxylem
 (4) Cortical cells
94. An example of ex situ conservation is :-
 (1) National Park
 (2) Seed Bank
 (3) Wildlife Sanctuary
 (4) Sacred Grove
95. An alga which can be employed as food for human being is :-
 (1) Ulothrix (2) Chlorella
 (3) Spirogyra (4) Polysiphonia
96. In vitro clonal propagation in plants characterised by :-
 (1) PCR and RAPD
 (2) Northern blotting
 (3) Electrophoresis and HPLC
 (4) Microscopy
97. Which one of the following fungi contains hallucinogens ?
 (1) Morchella esculenta
 (2) Amanita muscaria
 (3) Neurospora sp.
 (4) Ustilago sp.
98. Archaeobacteria differ from eubacteria in :-
 (1) cell membrane structure
 (2) mode of nutrition
 (3) cell shape
 (4) mode of reproduction
99. Which of the following shows coiled RNA strand and capsomeres ?
 (1) Polio virus
 (2) Tobacco mosaic virus
 (3) Measles virus
 (4) Retrovirus
100. Which of the following statement is not true?
 (1) The biodiversity decreases with increasing altitude.
 (2) The biodiversity decreases with increasing pollution.
 (3) The fishes show greatest biodiversity among vertebrates.
 (4) The biodiversity of bryophytes is greater than that of angiosperms.
101. Given below is the representation of the extent of global diversity of invertebrates. What groups the four portions (A-D) represent respectively ?



- (1) A-insects, B-Crustaceans, C-Other animal, D-Molluscs
 (2) A-Insects, B-Other animal groups, C-Crustaceans, D-Molluscs
 (3) A-Molluscs, B-Other animal groups, C-Crustaceans, D-Insects
 (4) A-Insects, B-Molluscs, C-Crustaceans, D-Other animal groups
102. Viruses have :-
 (1) DNA enclosed in a protein coat
 (2) prokaryotic nucleus
 (3) single chromosome
 (4) Both DNA and RNA

103. During which phase(s) of cell cycle, amount of DNA in a cell remains at 4C level if the initial amount is denoted as 2C?
- G_0 and G_1
 - G_1 and S
 - Only G_2
 - G_2 and M
104. In S-phase of the cell cycle :-
- amount of DNA doubles in each cell
 - amount of DNA remains same in each cell
 - chromosome number is increased
 - amount of DNA is reduced to half in each cell
105. The enzyme recombinase is required at which stage of meiosis ?
- Pachytene
 - Zygotene
 - Diptotene
 - Diakinesis
106. Desert can be converted into a lush green land by planting :-
- terrestrial plant
 - xerophytic plant
 - halophytes
 - psammophytes
107. Pollen tablets are available in the market for :-
- In vitro fertilisation
 - breeding programmes
 - supplementing food
 - Ex situ conservation
108. Given below is a simplified model of phosphorus cycling in a terrestrial ecosystem with four blanks (A-D). Identify the blanks.
- 
109. Function of filiform apparatus is to :-
- recognise the suitable pollen at stigma
 - stimulate division of generative cell
 - produce nectar
 - guide the entry of pollen tube
110. Transformation was discovered by :-
- Meselson and Stahl
 - Hershey and Chase
 - Griffith
 - Watson and Crick
111. A man whose father was colourblind marries a woman, who has a colourblind mother and normal father. What percentage of male children of this couple will be colourblind ?
- 25%
 - 0%
 - 50%
 - 75%
112. What gases are produced in anaerobic sludge digesters ?
- Methane and CO_2 only
 - Methane, Hydrogen sulphide and CO_2
 - Methane, hydrogen sulphide and O_2
 - Hydrogen sulphide and CO_2
113. A human female with Turner's syndrome :-
- has 45 chromosomes with XO
 - has one additional X-chromosome
 - exhibits male characters
 - is able to produce children with normal husband
114. Which one of the following is wrong about Chara ?
- Upper oogonium, and lower round antheridium
 - Globule and nucule present on the same plant
 - Upper antheridium and lower oogonium
 - Globule is male reproductive structure
115. Deficiency symptoms of nitrogen and potassium are visible first in :-
- senescent leaves
 - young leaves
 - roots
 - buds
116. A scrubber in the exhaust of a chemical industrial plant removes :-
- Gases like sulphur dioxide
 - Particulate matter of the size 5 micrometer or above
 - Gases like ozone and methane
 - Particulate matter of the size 2.5 micrometer or less
117. The first stable product of fixation of atmospheric nitrogen in leguminous plants is
- NO_2^-
 - ammonia
 - NO_3^-
 - glutamate
118. Which one of the following growth regulators is known as "stress hormone" ?
- abscisic acid
 - Ethylene
 - GA_3
 - Indole acetic acid

119. Select the correct option :-
 (1) Direction of RNA synthesis \rightarrow 5'-3' and Direction of reading of the template DNA strand \rightarrow 3'-5'
 (2) Direction of RNA synthesis \rightarrow 3'-5' and Direction of reading of the template DNA strand \rightarrow 5'-3'
 (3) Direction of RNA synthesis \rightarrow 5'-3' and Direction of reading of the template DNA strand \rightarrow 5'-3'
 (4) Direction of RNA synthesis \rightarrow 3'-5' and Direction of reading of the template DNA strand \rightarrow 3'-5'
120. Male gametophyte with least number of cells is :-
 (1) Pteris (2) Funaria
 (3) Liliium (4) Pinus
121. When the margins of sepals or petals overlap one another without any particular direction, the condition is termed as :-
 (1) vexillary (2) imbricate
 (3) twisted (4) valvate
122. Fruit color in squash is an example of :-
 (1) recessive epistatis
 (2) dominant epistatis
 (3) complementary genes
 (4) inhibitory genes
123. An example of edible underground stem is :-
 (1) carrot (2) groundnut
 (3) sweet potato (4) potato
124. An aggregate fruit is one which develops from
 (1) multicarpellary syncarpous gynoecium
 (2) multicarpellary apocarpus gynoecium
 (3) complete inflorescence
 (4) multicarpellary superior ovary
125. Just as a person moving from Delhi to Shimla to escape the heat for the duration of hot summer, thousands of migratory birds from Siberia and other extremely cold Northern regions move to :-
 (1) Western Ghat
 (2) Meghalaya
 (3) Corbett National Park
 (4) Keolado National Park
126. Which of the following associations shows mutualism ?
 (1) Fig and wasp
 (2) Barnacles on whale
 (3) Roundworms in human intestine
 (4) Orchids on mango tree
127. Anoxygenic photosynthesis is characteristic of
 (1) Rhodospirillum (2) Spirogyra
 (3) Chlamydomonas (4) Ulva
128. C_4 plants have better productivity because :-
 (1) C_4 plants absorb more light
 (2) C_4 plants absorb more CO_2
 (3) C_4 plants does not carry photorespiration
 (4) C_4 plants have more amount of RuBisCO
129. Geitonogamy involves :-
 (1) Fertilisation of a flower by the pollen from another flower of the same plant
 (2) Fertilisation of a flower by the pollen from the same flower
 (3) Fertilisation of a flower by the pollen from a flower of another plant in the same population
 (4) Fertilisation of a flower by the pollen from a flower of another plant belonging to a distant population
130. Dr. F Went noted that if coleoptile tips were removed and placed on agar for one hour, the agar would produce a bending when placed on one side of freshly cut coleoptile stumps. Of what significance is this experiment ?
 (1) It made possible the isolation of auxin
 (2) It is the basis for quantitative determination of small amounts of growth-promoting substances
 (3) It demonstrated polar movement of auxins
 (4) Both a and c
131. A few normal seedlings of tomato were kept in a dark room. After a few days they were found to have become white-coloured like albinos. Which of the following terms will you use to describe them ?
 (1) Mutated (2) Embolised
 (3) Etiolated (4) Defoliated
132. An analysis of chromosomal DNA using the Southern hybridisation technique does not use :-
 (1) electrophoresis (2) blotting
 (3) autoradiography (4) PCR
133. Which one of the following shows isogamy with non-flagellated gametes ?
 (1) Sargassum (2) Ectocarpus
 (3) Ulothrix (4) Spirogyra
134. Which of the following is responsible for peat formation ?
 (1) Marchantia (2) Riccia
 (3) Funaria (4) Sphagnum
135. Commonly used vectors for human genome sequencing are :-
 (1) T-DNA
 (2) BAC and YAC
 (3) Expression vectors
 (4) T/A cloning vectors

136. Which one of the following statement is correct ?
(1) The seed in grasses is not endospermic
(2) Mango is a parthenocarpic fruit
(3) A proteinaceous aleurone layer is present in maize grain
(4) A sterile pistil is called a staminode
137. In which one of the following processes CO_2 is not released ?
(1) Aerobic respiration in plants
(2) Aerobic respiration in animals
(3) Alcoholic fermentation
(4) Lactate fermentation
138. Placenta and pericarp are both edible portions in :-
(1) apple (2) banana
(3) tomato (4) potato
139. Kranz anatomy is usually associated with :-
(1) C_3 plants
(2) C_4 plants
(3) CAM plants
(4) C_3 - C_4 intermediate plants.
140. Osmosis is a type of :-
(1) imbibition of solution
(2) diffusion of solvent
(3) evaporation of water
(4) diffusion of solute
141. Which of the following statement is correct ?
(1) $\text{DPD} = \text{OP} - \text{WP}$
(2) $\text{DPD} = \text{OP} + \text{WP}$
(3) $\text{DPD} = \text{WP} - \text{OP}$
(4) $\text{DPD} = \text{TP} + \text{OP}$
142. Which structures perform the function of mitochondria in bacteria?
(1) Nucleoid
(2) Ribosomes
(3) Cell wall
(4) Mesosomes
143. The solid linear cytoskeletal elements having a diameter of 6nm and made up of a single type of monomer are known as :-
(1) microtubules
(2) microfilaments
(3) intermediate filaments
(4) lamins
144. The osmotic expansion of a cell kept in water is chiefly regulated by :-
(1) mitochondria (2) vacuoles
(3) plastids (4) ribosomes
145. The motile bacteria are able to move by :-
(1) fimbriae (2) flagella
(3) cilia (4) pili
146. The introduction of tDNA into plants involves :-
(1) infection of the plant by *Agrobacterium tumefaciens*
(2) altering the pH of soil, heat-shocking the plants
(3) exposing the plants to cold for a brief period
(4) allowing the plant roots to stand in water
147. Golden rice is a genetically modified crop plant where the incorporated gene is meant for biosynthesis of :-
(1) vitamin-B (2) omega 3
(3) vitamin-C (4) vitamin-A
148. Body having meshwork of cells, internal cavities lined with food filtering flagellated cells and indirect development are the characteristics of phylum ?
(1) Coelenterata (2) Porifera
(3) Mollusca (4) Protozoa
149. Metagenesis refers to :-
(1) the presence of different morphic forms
(2) alternation of generation between asexual and sexual phases of an organism
(3) occurrence of a drastic change in form during post embryonic development
(4) the presence of a segmented body and parthenogenetic mode of reproduction
150. A jawless fish, which lays eggs in fresh water and whose ammocoetes larvae after metamorphosis return to the ocean is :-
(1) *Eptatretus* (2) *Myxine*
(3) *Neomyxine* (4) *Petromyzon*
151. Which one of the following statement is incorrect ?
(1) A competitive inhibitor reacts reversibly with the enzyme to form an enzyme-inhibitor.
(2) In competitive inhibition the inhibitor molecule is not chemically changed by the enzyme.
(3) The competitive inhibitor does not affect the rate of breakdown of the enzyme-substrate complex.
(4) The presence of the competitive inhibitor decreases the k_m of the enzyme for the substrate.
152. In Bt cotton, the Bt toxin present in plant tissue as pro-toxin is converted into active toxin due to :-
(1) Alkaline pH of the insect gut
(2) acidic pH of the insect gut
(3) action of gut microorganisms
(4) presence of conversion factors in insect gut
153. The cutting of DNA at specific locations became possible with the discovery of :-
(1) restriction enzymes
(2) probes
(3) selectable markers
(4) ligases

154. The DNA molecule to which the gene of interest is integrated for cloning is called :-
(1) Transformer (2) Vector
(3) Template (4) Carrier
155. Doctors use a stethoscope to hear the sounds produced during each cardiac cycle. The second sound is heard when :-
(1) AV valves open up
(2) Ventricular walls vibrate due to gushing in of blood from atria
(3) Semilunar valves close down after the blood flows into vessels from ventricles
(4) AV node receives the signal from SA node
156. Erythropoiesis starts in :-
(1) kidney (2) liver
(3) spleen (4) red bone marrow
157. Blood pressure in the mammalian aorta is maximum during :-
(1) systole of the left atrium
(2) diastole of the right ventricle
(3) systole of the left ventricle
(4) diastole of the right atrium
158. Which one of the following is correct ?
(1) Plasma = Blood - Lymphocytes
(2) Serum = Blood + Fibrinogen
(3) Lymph = Plasma + RBC + WBC
(4) Blood = Plasma + RBC + WBC + Platelets
159. Name the pulmonary disease in which alveolar surface area involved in gas exchange is drastically reduced due to damage in the alveolar walls.
(1) Pleurisy (2) Pneumonia
(3) Emphysema (4) Asthma
160. Which of the following immunoglobulins does constitute the largest percentage in human milk?
(1) IgD (2) IgM
(3) IgA (4) IgG
161. If you suspect major deficiency of antibodies in a person, to which of the following would you look for confirmatory evidence ?
(1) Fibrinogen in plasma
(2) Serum albumins
(3) Haemocytes
(4) Serum globulins
162. Grafted kidney may be rejected in a patient due to :-
(1) Humoral immune response
(2) Cell-mediated immune response
(3) Passive immune response
(4) Innate immune response
163. Which of the following diseases is caused by a protozoan ?
(1) Syphilis (2) Influenza
(3) Babesiosis (4) Blastomycosis
164. Which of the following viruses is not transferred through semen of an infected male?
(1) Hepatitis-B virus
(2) Human immunodeficiency virus
(3) Chikungunya virus
(4) Ebola virus
165. The active form of *Entamoeba histolytica* feed upon :-
(1) Erythrocytes, mucosa and submucosa of colon
(2) Mucosa and submucosa of colon only
(3) Food in intestine
(4) Blood only
166. Which one of the following hormones is not involved in sugar metabolism ?
(1) Cortisone (2) Aldosterone
(3) Insulin (4) Glucagon
167. Which one of the following hormones though synthesised elsewhere, is stored and released by the master gland ?
(1) Antidiuretic hormone
(2) Luteinizing hormone
(3) Prolactin
(4) Melanocyte stimulating hormone
168. A chemical signal that has both endocrine and neural roles is ; -
(1) melatonin (2) calcitonin
(3) epinephrine (4) cortisol
169. The primary dentition in human differs from permanent dentition in not having one of the following type of teeth :-
(1) Canine (2) Premolars
(3) Molars (4) Incisors
170. Which of the following statement is not correct ?
(1) Brunner's glands are present in the submucosa of stomach and secrete pepsinogen.
(2) Goblet cells are present in the mucosa of intestine and secrete mucus.
(3) Oxyntic cells are present in the mucosa of stomach and secrete HCl.
(4) Acinic are present in the pancreas and secrete carboxypeptidase
171. Gastric juice of infants contains ?
(1) maltase, pepsinogen, rennin
(2) nuclease, pepsinogen, lipase
(3) pepsinogen, lipase, rennin
(4) amylase, rennin, pepsinogen
172. Ectopic pregnancies are referred to as :-
(1) pregnancies with genetic abnormality
(2) implantation of embryo at site other than uterus
(3) implantation of defective embryo in the uterus
(4) pregnancies terminated due to the hormonal imbalance

173. Which of the following events is not associated with ovulation in human female?
(1) Decrease in oestradiol
(2) Full development of Graafian follicle
(3) Release of secondary oocyte
(4) LH surge
174. Which of the following layers in an antral follicle is acellular ?
(1) Granulosa
(2) Theca interna
(3) Stroma
(4) Zona pellucida
175. Which of the following is not a sexually transmitted disease ?
(1) Syphilis
(2) Acquired ImmunoDeficiency Syndrome (AIDS)
(3) Trichomoniasis
(4) Encephalitis
176. A childless couple can be assisted to have a child through a technique called GIFT. The full form of this technique is :-
(1) Gamete Inseminated Falloopian Transfer
(2) Gamete Intra Falloopian Transfer
(3) Gamete Internal Fertilization and Transfer
(4) Germ Cell Internal Falloopian Transfer
177. The function of the gap junction is to :-
(1) performing cementing to keep neighbouring cells together
(2) faciliate communication between adjoining cells by connecting the cytoplasm for rapid transfer of ions, small molecules and some large molecules
(3) seperate two cells from each other
(4) stop substance from leaking across a tissue
178. The terga sterna and pleura of cockroach body are joined by :-
(1) cementing glue
(2) muscular issue
(3) arthrodial membrane
(4) cartilage
179. Industrial melanism is an example of
(1) Neo Darwinism (2) Natural selection
(3) Mutation (4) Neo Lamarckism
180. Which is the most common mechanism of genetic variation in the population of a sexually reproducing organism ?
(1) Transduction
(2) Chromosomal aberrations
(3) Genetic drift
(4) Recombination