NTPL

PERIODIC TEST

Batch - 2004(M) [Medical]

Time : 3 Hours ***Maximum Marks : 720***

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

You are not allowed to leave the Examination Hall before the end of the test.

INSTRUCTIONS

1. This booklet is your Question Paper containing **180 questions**.
2. The test is of **3 hours** duration. The question paper consists of **3 sections** (Physics, Chemistry & Biology).
3. Each question carries **4 marks**. For each correct response the candidate will get **4 marks**. For each incorrect response, **one mark** will be deducted. The maximum marks are **720.**
4. Fill the bubbles completely and properly using a **Blue/Black Ball Point Pen** only.
5. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers, and electronic gadgets in any form are not allowed to be carried inside the examination hall.
6. The answer sheet, a machine-readable Optical mark recognition sheet (OMR Sheet), is provided separately.
7. DO NOT TAMPER WITH / MUTILATE THE OMR OR THE BOOKLET.
8. Do not break the seals of the question-paper booklet before being instructed to do so by the invigilator.

Name of the Candidate (in Capitals) _____

Test Centre _____ Centre Code _____

Candidate's Signature _____ Invigilator's Signature _____

1. The force on a charged particle moving with a velocity $\vec{v}$ in a magnetic field $\vec{B}$ is not

   (a) perpendicular to both $\vec{v}$ and $\vec{B}$ (b) maximum if $\vec{v}$ is perpendicular to $\vec{B}$

   (c) maximum if $\vec{v}$ is parallel to $\vec{B}$ (d) zero if $\vec{v}$ is parallel to $\vec{B}$

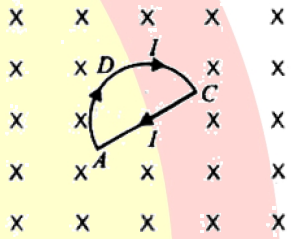
2. The magnetic force acting on a charged particle of charge $-2\mu C$ in a magnetic field of $2T$ acting in Y-direction, when the particle velocity is $\left(2\hat{i}+3\hat{j}\right)\times10^{6}$ ms^{-1} is

   (a) 4 N in z-direction (b) 8 N in y-direction (c) 8 N in z-direction (d) 8 N in $-z$ direction

3. A current of 10 ampere is flowing in a wire of length 1.5 metre. A force of 15 newtons acts on it when it is placed in a uniform magnetic field of 2 tesla. The angle between the magnetic field and the direction of the current is

   (a) 30° (b) 45° (c) 60° (d) 90°

4. Figure shows a conducting loop $ADCA$ carrying current I and placed in a region of uniform magnetic field induction B_0. The part ADC forms a semicircle of radius R. The force on the semicircle part of the loop ADC is equal to

   (a) zero

   (b) $\pi R I B_0$

   (c) $2\pi R I B_0$

   (d) $2RI B_0$

5. Which of the following particles will describe the smallest circle when projected with the same velocity perpendicular to the magnetic field?

   (a) Electron (b) Proton (c) α -particle (d) Deutron

6. A particle having positive charge is released from rest in an electric field acting horizontally and moves under the influence of both electric field and gravity. Which one of the following quantities connected with the charge particles continuously increase with time?

   (a) Electric potential energy (b) Gravitational potential energy

   (c) Electrical charge (d) Kinetic energy

7. If a charged particle enters perpendicular in the uniform magnetic field, then

   (a) energy and angular momentum both remain constant

   (b) energy remains constant but angular momentum changes

   (c) both energy and angular momentum change

   (d) energy changes but angular momentum remains constant

8. An electron and a proton enters a magnetic field perpendicularly. Both have same kinetic energy. Which of the following is true?

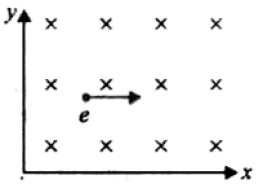
   (a) Trajectory of electron is less curved (b) Trajectory of proton is less curved

   (c) Both trajectories are equal (d) Both move in straight line path

9. The cyclotron frequency of an electron orbiting in a magnetic field of 1 T is approximately

   (a) 28 MHz (b) 280 M Hz (c) 2.8 G Hz (d) 28 G Hz

10. In the figure, the electron enters into the magnetic field. It deflects in ... direction



(a) +ve X-direction
(b) –ve X-direction
(c) +ve Y-direction
(d) –ve Y-direction

11. If the strength of the magnetic field produced 10 cm away from an infinitely long straight conductor is 10^{-5} weber/m^2, the value of the current flowing in the conductor will be

(a) 5 A (b) 10 A (c) 500 A (d) 1000 A

12. A wire in the form of a square of side a carries a current I. The magnetic field induction at the centre of the square wire is (Magnetic permeability of free space $= \mu_0$)

(a) $\frac{\mu_0 I}{2\pi a}$ (b) $\frac{\mu_0 I\sqrt{2}}{\pi a}$ (c) $\frac{2\sqrt{2}\mu_0 I}{\pi a}$ (d) $\frac{\mu_0 I}{\sqrt{2}\pi a}$

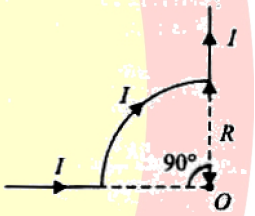
13. A wire of length L is bent into a semicircle. The magnetic field at the centre is

(a) $\frac{\mu_0 \pi I}{4L}$ (b) $\frac{\mu_0 I}{4\pi L}$ (c) $\frac{\mu_0 I}{\pi L}$ (d) $\frac{\mu_0 I}{4L}$

14. A circular coil of radius 10 cm and 100 turns carries a current 1 A. What is the magnetic moment of the coil?

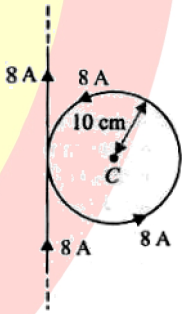
(a) 3.142 Am^2 (b) 3142×10^4 Am^2 (c) 3 Am^2 (d) 10^4 Am^2

15. A current carrying conductor is bent into a quarter of a circle of radius R as shown in figure. The magnetic field at the centre O is



(a) $\frac{\mu_0 I}{8R}$ inwards (b) $\frac{\mu_0 I}{8R}$ outwards
(c) $\frac{\mu_0 I}{4R}$ inwards (d) $\frac{\mu_0 I}{4R}$ outwards

16. A long, straight wire is turned into a loop of radius 10 cm figure. If a current of 8 A is passed through the loop, then the value of the magnetic field and its direction at the centre C of the loop shall be close to

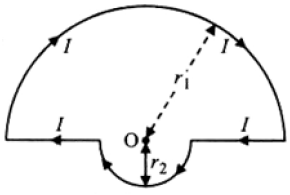


(a) 5.0×10^{-5} N A^{-1} m^{-1}, upward
(b) 3.4×10^{-5} N A^{-1} m^{-1}, upward
(c) 1.6×10^{-5} N A^{-1} m^{-1}, downward
(d) 1.6×10^{-5} N A^{-1} m^{-1}, upward

17. A thin ring of radius R metre has charge q coulomb uniformly spread on it. The ring rotates about its axis with a constant frequency of f revolutions/s. The value of magnetic induction in Wb/m^2 at the centre of the ring is

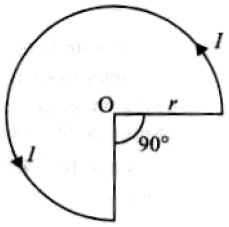
(a) $\frac{\mu_0 q f}{2\pi R}$ (b) $\frac{\mu_0 q}{2\pi f R}$ (c) $\frac{\mu_0 q}{2 f R}$ (d) $\frac{\mu_0 q f}{2R}$

18. In the figure shown, there are two semicircles of radii r_1 and r_2 in which a current I is flowing. The magnetic field induction at the centre O will be



(a) $\frac{\mu_0 I}{2}(r_1 + r_2)$ (b) $\frac{\mu_0 I}{4}(r_1 - r_2)$
(c) $\frac{\mu_0 I}{4}\left(\frac{r_1 + r_2}{r_1 r_2}\right)$ (d) $\frac{\mu_0 I}{4}\left(\frac{r_2 - r_1}{r_1 r_2}\right)$

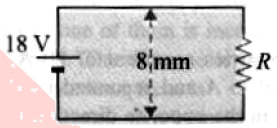
19. Refer to figure, the magnitude of magnetic field induction at point O due to current I in the arrangement is



(a) $\frac{\mu_0}{4\pi}\frac{I}{r}$ (b) $\frac{\mu_0}{8\pi}\frac{I}{r}$

(c) $\frac{\mu_0}{4\pi}\frac{I}{r}(1+\pi)$ (d) $\frac{3\mu_0 I}{8r}$

20. Force per unit length between long wires in the circuit is 3.6×10^{-3} Nm^{-1}. Resistance of the wire is



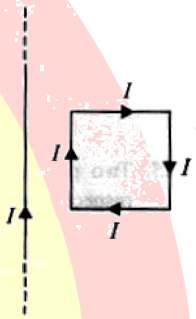
(a) 3 Ω

(b) 1.5 Ω

(c) 4.5 Ω

(d) 6 Ω

21. A rectangular loop carrying a current I is situated near a long wire such that the wire is parallel to the one of the sides of the loop and is in the plane of the loop. If a steady current I is established in wire as shown in figure, the loop will



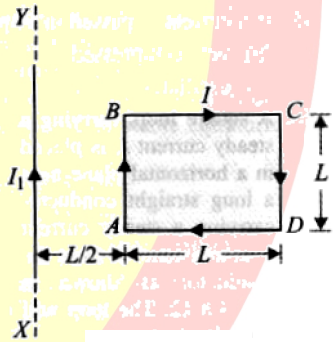
(a) rotate about an axis parallel to the wire

(b) move away from the wire or towards right

(c) move towards the wire

(d) remain stationary

22. A square loop $ABCD$ carrying a current I, is placed near and coplanar with a long straight conductor XY, carrying a current I_1, the net force on the loop will be



(a) $\frac{2\mu_0 I I_1}{3\pi}$

(b) $\frac{\mu_0 I I_1}{2\pi}$

(c) $\frac{2\mu_0 I I_1 L}{3\pi}$

(d) $\frac{\mu_0 I I_1 L}{2\pi}$

23. Two long parallel straight wires A and B carrying currents 8.0 A and 5.0 A in the same direction are separated by a distance of 4.0 cm. The force on a 10 cm section of wire A is

(a) 2×10^{-4} N attractive force normal to A towards B

(b) 2×10^{-5} N attractive force normal to A towards B

(c) 2×10^{-4} N repulsive force normal to A away from B

(d) 2×10^{-5} N repulsive force normal to A away from B

24. Two identical spheres carrying charges $-9\mu C$ and $-5\mu C$ respectively are kept in contact and then separated from each other. Point out true statement from the following. In each sphere

(a) 1.25×10^{13} electrons are in deficit (b) 1.25×10^{13} electrons are in excess

(c) 2.15×10^{13} electrons are in excess (d) 2.15×10^{13} electrons are in deficit

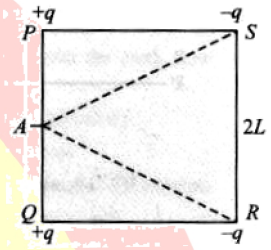
25. Two point charges placed at a certain distance r in air exert a force F on each other. Then the distance r' at which these charges will exert the same force in a medium of dielectric constant k is given by

(a) r (b) r/k (c) $r/\sqrt{k}$ (d) $r\sqrt{k}$

26. The electric potential V at any point (x, y, z) (all in metre) in space is given by $V = 4x^2$ volt. The electric field at the point (1, 0, 2) in V/m is

(a) 16 along + x-axis (b) 8 along neg. x-axis (c) 8 along + x-axis (d) 16 along neg. x-axis

27. Four electric charges $+q$, $+q$, $-q$ and $-q$ are placed at the corners of a square of side 2 L as shown in figure. The electric potential at point A midway between the two charges $+q$ and $+q$ is



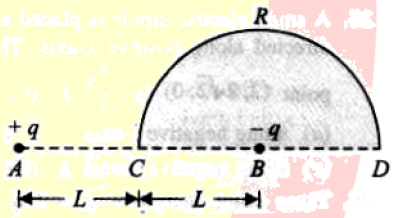
(a) $\frac{1}{4\pi\epsilon_0}\frac{2q}{L}\left(1-\frac{1}{\sqrt{5}}\right)$ (b) Zero

(c) $\frac{1}{4\pi\epsilon_0}\frac{2q}{L}\left(1+\frac{1}{\sqrt{5}}\right)$ (d) $\frac{1}{4\pi\epsilon_0}\frac{2q}{L}\left(1+\sqrt{5}\right)$

28. A bullet of mass 2 g is having a charge of $2\mu C$. Through what potential diff. must it be accelerated, starting from rest to acquire a speed of 10 m/s ?

(a) 50 kV (b) 5 V (c) 50 V (d) 5 kV

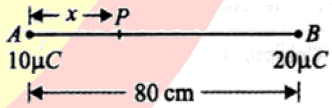
29. Charges $+q$ and $-q$ are placed at points A and B respectively, which are at a distance 2 L apart. C is mid point of A and B. Work done in moving a charge $+Q$ along the semicircle CRD, figure, is



(a) $\frac{qQ}{2\pi\epsilon_0 L}$ (b) $\frac{qQ}{6\pi\epsilon_0 L}$

(c) $-\frac{qQ}{6\pi\epsilon_0 L}$ (d) $\frac{qQ}{4\pi\epsilon_0 L}$

30. In figure, distance of the point from A, where the electric field is zero is



(a) 20 cm

(b) 10 cm

(c) 33 cm

(d) none of these

31. The dimensional formula of electric potential is

(a) $[MLT^{-2}A^{-1}]$ (b) $[ML^2T^{-2}A^{-1}]$ (c) $[ML^2T^{-3}A^{-1}]$ (d) $[ML^2T^{-3}A^{-2}]$

32. There is an electric field in x-direction. If work done on moving a charge 0.2 C through a distance of 2 m along a like making an angle of 60° with x-axis is 4.0 J. What is the value of E?

(a) $\sqrt{3}\,N/C$ (b) $4\,N/C$ (c) $5\,N/C$ (d) None of these

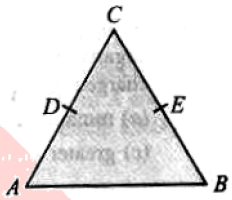
33. Kinetic energy of an electron accelerated in a potential difference of 100 V is

(a) 1.6×10^{-17} J (b) 1.6×10^{21} J (c) 1.6×10^{-29} J (d) 1.6×10^{-34} J

34. Two point charges $-q$ and $+q$ are located at points $(0, 0 - a)$ and $(0, 0, a)$, respectively. The potential at a point $P\ (0, 0, z)$ where $z > a$ is

(a) $\frac{qa}{4\pi\varepsilon_0 z^2}$ (b) $\frac{q}{4\pi\varepsilon_0 a}$ (c) $\frac{2qa}{4\pi\varepsilon_0\left(z^2-a^2\right)}$ (d) $\frac{2qa}{4\pi\varepsilon_0\left(z^2+a^2\right)}$

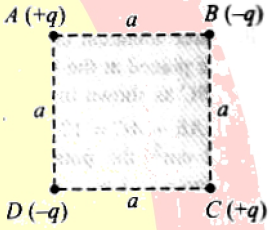
35. Three charges, each $+q$, are placed at the corners of an isosceles triangle ABC of sides BC and $AC = 2\ a$. D and E are the mid points of BC and CA. The work done in taking a charge Q from D to E is



(a) zero (b) $\frac{3qQ}{4\pi \in_0 a}$

(c) $\frac{3qQ}{8\pi \in_0 a}$ (d) $\frac{qQ}{4\pi \in_0 a}$

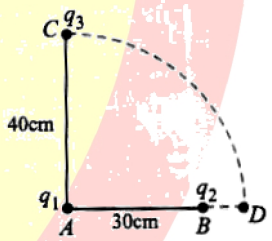
36. There are four point charges $+q$, $-q$, $+q$ and $-q$ placed at the corners A, B, C and D respectively of a square of side a. The potential energy of the system is $\frac{1}{4\pi\varepsilon_0}$ times.



(a) $\frac{q^2}{a}\left(-4+\sqrt{2}\right)$ (b) $\frac{q^2}{2a}\left(-4+\sqrt{2}\right)$

(c) $\frac{4q^2}{a}$ (d) $\frac{-4\sqrt{2}q^2}{a}$

37. Two charges q_1 and q_2 are placed 30 cm apart, as shown in figure. A third charge q_3 is moved along the arc of a circle of radius 40 cm from C to D. The change in the potential energy of the system is $\frac{q_3}{4\pi \in_0}k$, where k is



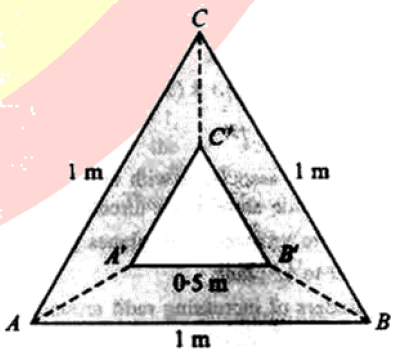
(a) 8 q_2

(b) 6 q_2

(c) 8 q_1

(d) 6 q_1

38. Three point charges of 1C, 2 C and 3 C are placed at corners of an equilateral triangle of side 1 m. Work required to move these charges to the corners of a smaller equilateral triangle of side 0.5 will be



(a) 9.9×10^{10} J

(b) 9.9×10^{9} J

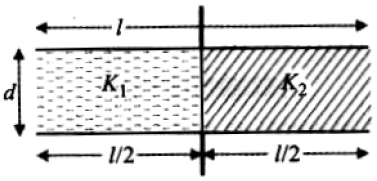
(c) 9.9×10^{8} J

(d) 9.9×10^{11} J

39. When a dielectric material is introduced between the plates of a charged condenser, then electric field between the plates

(a) decreases (b) increases (c) remains constant (d) first (b) then (a)

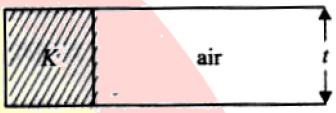
40. A parallel plate capacitor is filled with two dielectrics as shown in figure. Its capacity has ratio with capacity without dielectric as



(a) $(K_1 + K_1)$ (b) $\left(\frac{K_1 + K_2}{2}\right)$

(c) $\left(\frac{K_1 K_2}{K_1 + K_2}\right)$ (d) $2(K_1 + K_2)$

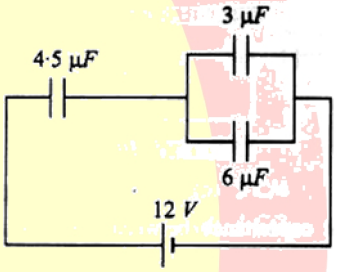
41. A parallel plate capacitor with air as the dielectric has capacitance C. A slab of dielectric constant K and having the same thickness as the separation between the plates is introduced so as to fill one-fourth of the capacitor as shown in figure. The new capacitance will be



(a) $(K+3)\frac{C}{4}$ (b) $(K+2)\frac{C}{4}$

(c) $(K+1)\frac{C}{4}$ (d) $\frac{KC}{4}$

42. In the circuit shown in figure, the potential difference across the $4.5\,\mu F$ capacitor is



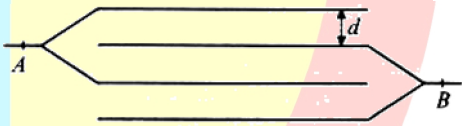
(a) $\frac{8}{3}$ V

(b) 4 V

(c) 6 V

(d) 8 V

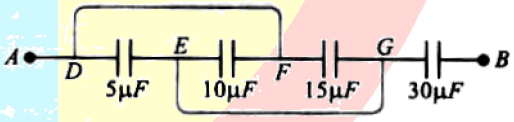
43. The capacitance of arrangement of 4 plates of area A at distance d as shown in figure is



(a) $\in_0 A/d$ (b) $2 \in_0 A/d$

(c) $3 \in_0 A/d$ (d) $4 \in_0 A/d$

44. The resultant capacitance between the points A and B in figure is



(a) $15\,\mu F$ (b) $30\,\mu F$

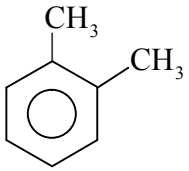
(c) $60\,\mu F$ (d) $45\,\mu F$

45. Large number of capacitors of rating $10\mu F / 200$ V are available. The minimum number of capacitors required to design a $10\mu F / 700$ V capacitor is

(a) 16 (b) 4 (c) 8 (d) 7

46. $CH_3-CH_2-CH_2-Cl$ and $CH_3-\underset{\underset{Cl}{|}}{CH}-CH_3$ shows which type isomerism

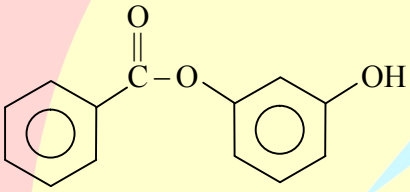
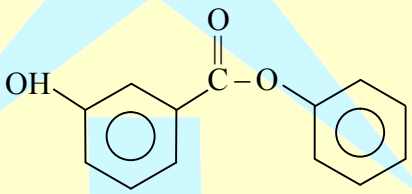
(a) Chain isomer (b) Position isomers (c) Functional isomers (d) Metamers

47.  and  shows which type of isomerism

(a) Position isomers (b) Chain isomers (c) Functional isomers (d) Metamers

48. CH_3-CH_2-COOH and $CH_3-\overset{\overset{O}{\|}}{C}-O-CH_3$ express which of isomerism

(a) Position isomers (b) Chain isomers (c) Metamers (d) Functional isomerism

49.  and  express which type of isomers

(a) Metamers (b) Tautomers (c) Functional isomers (d) Chain isomers

50. The molecules which not exhibit metamerism are

(a) $C_4H_{10}O$(ethers) (b) C_4H_8(Alkene) (c) $C_5H_{10}O$(ketone) (d) $C_4H_{11}N$(Amine)

51. Which molecule has higher enol contents

(a) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ (b) $H-\overset{\overset{O}{\|}}{C}-CH_2-\overset{\overset{O}{\|}}{C}-H$

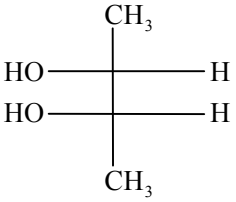
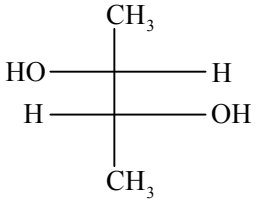
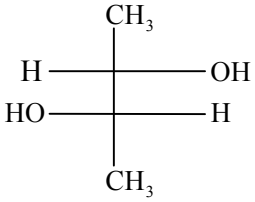
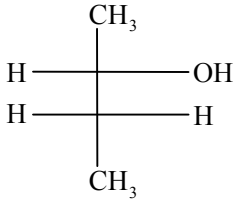
(c) $CH_3-\overset{\overset{O}{\|}}{C}-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$ (d) $CH_3-O-\overset{\overset{O}{\|}}{C}-CH_2-\overset{\overset{O}{\|}}{C}-O-CH_3$

52. Give the E-Z designation of the following compound –

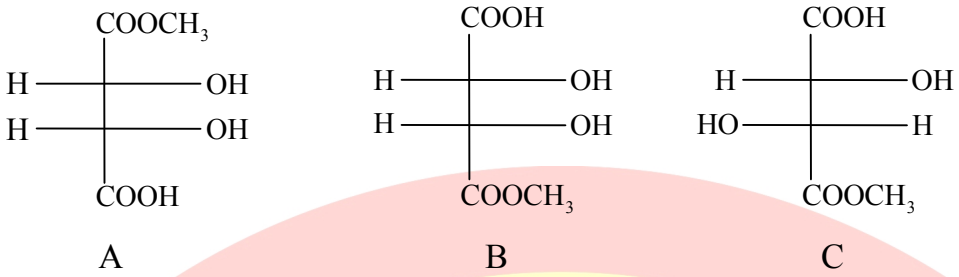
$$CH_3-NH \diagdown \quad C_6H_5 \diagdown \quad C=C \quad \diagup I \quad \diagup Br$$

(a) Z (b) E (c) E-Z (d) E-E

53. A Fischer projection of (2R, 3S) -2,3-butanediol is

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

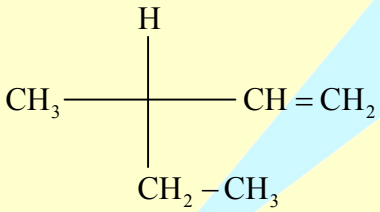
54. The correct statement about the compound A, B and C



(a) A & B are diasteromers (b) A & B are Identical

(c) A & C are enantiomers (d) None of these

55. The following hydrocarbon can exhibit



(a) Optical isomerism (b) Geometrical isomerism

(c) Both (a) & (b) (d) Metamerism

56. Which of the following compounds exhibits geometrical isomers –

(a) C_2H_5Br (b) $(CH_2)(COOH)_2$ (c) CH_3CHO (d) None of these

57. The no. of geometrical isomers of $CH_3-CH=CH-CH=CH-CH=CHCl$

(a) 2 (b) 8 (c) 4 (d) 6

58. Maleic and Fumaric acids are –

(a) Tautomers (b) Geometrical isomer

(c) Optical isomers (d) Metamers

59. Which of the following can exhibit cis-trans isomers –

(a) $H_2C=CH_2$ (b) $ClCH=CHCl$ (c) $CH_3\cdot CHCl\cdot COOH$ (d) $ClCH_2-CH_2Cl$

60. Geometrical isomers is possible in case of –

(a) Pent-1-ene (b) But-2-ene (c) Butane (d) Ethene

61. The density of a pure substance '*A*' whose atoms pack in cubic close pack arrangement is 1 g/cc. If *B* atoms can occupy tetrahedral void and if all the tetrahedral voids are occupied by '*B*' atom. What is the density of resulting solid in g/cc. [Atomic mass (A) = 30 g/mol and atomic mass (B) = 50 g/mol]

(a) 3.33 (b) 4.33 (c) 2.33 (d) 5.33

62. How many unit cells are present in 5.0 gm of crystal AB (formula mass of $AB = 40$) having rock salt type structure? (N_A = Avogadro's no.)

(a) N_A (b) $\frac{N_A}{10}$ (c) $4N_A$ (d) none of these

63. The density of CaF_2 (fluorite structure) is 3.18 g/cm^3. The length of the side of the unit cell is :

(a) 253 pm (b) 344 pm (c) 546 pm (d) 273 pm

64. First three nearest neighbour distances for body centered cubic lattice are respectively :

(a) $\sqrt{2}a, a, \sqrt{3}a$ (b) $\frac{a}{\sqrt{2}}, a, \sqrt{3}a$ (c) $\frac{\sqrt{3}a}{2}, a, \sqrt{2}a$ (d) $\frac{\sqrt{3}a}{2}, a, \sqrt{3}a$

65. When heated above 916°C, iron changes its bcc crystalline form to fcc without the change in the radius of atom. The ratio of density of the crystal before heating and after heating is:

(a) 1.069 (b) 0.918 (c) 0.725 (d) 1.231

66. A solution of urea (mol. mass 60 g mol^{-1}) boils at 100.18°C at the atmospheric pressure. If K_f and K_b for water are 1.86 and 0.512 K kg mol^{-1} respectively, the above solution will freeze at :

(a) 0.654°C (b) –0.654°C (c) 6.54°C (d) –6.54°C

67. 18 g glucose ($C_6H_{12}O_6$) is added to 178.2 g of water. The vapour pressure of water for this aqueous solution at 100°C is:

(a) 759 torr (b) 7.60 torr (c) 76 torr (d) 752.4 torr

68. Relationship between osmotic pressure at 273 K when 1% glucose (π_1), 1% urea (π_2), 81% sucrose (π_3), are dissolved in 1 litre of water :

(a) $\pi_1 > \pi_2 > \pi_3$ (b) $\pi_2 > \pi_1 > \pi_3$ (c) $\pi_3 > \pi_1 > \pi_2$ (d) $\pi_1 = \pi_2 = \pi_3$

69. A 0.004 M solution of Na_2SO_4 is isotonic with a 0.010 M solution of glucose at same temperature. The apparent degree of dissociation of Na_2SO_4 is :

(a) 25% (b) 50% (c) 75% (d) 85%

70. The amount of ice that will separate out on cooling a solution containing 50 g of ethylene glycol in 200 g water to –9.3°C is :

$\left(K_f' = 1.86 \text{ K molality}^{-1}\right)$

(a) 38.71 g (b) 38.71 mg (c) 42 g (d) 42 mg

71. Rate of reaction $A + B \longrightarrow C$ is given below as function of different initial concentrations of A and B.

	[A] mol L^{-1}	**[B] mol L^{-1}**	**Initial rate**
1.	0.01	0.01	0.005
2.	0.02	0.01	0.010
3.	0.01	0.02	0.005

Determine the order with respect to A and B.

(a) 1, 0 (b) 0, 1 (c) 1, 1 (d) 2, 1

72. The rate of reaction between A and B increases by a factor of 1000 when concentration of A is changed from 0.5 mol L^{-1} to 5 mol L^{-1}. The order of reaction with respect to A is

(a) 0 (b) 1 (c) 2 (d) 3

73. For reaction $A \to B$, the rate constant $k_1 = A_{1e^{-E_{a1}/RT}}$ and for the reaction $P \to Q$, the rate constant $k_2 = A_{2e^{-E_{a2}/RT}}$ If $A_1 = 10^8, A_2 = 10^{10}$ and $E_{a_1} = 600, E_{a_2} = 1200,$ then the temperature at which $k_1 = k_2$ is

(a) $\frac{600}{R}$ (b) $300 \times 4.606R$ (c) $\frac{600}{4.606R}$ (d) $\frac{4.606}{600R}$

74. There are two reactions $X \longrightarrow$ Products and $Y \longrightarrow$ Products have rate constants k_1 and k_2 at temperature T and activation energies E_1 and E_2 respectively.

If $k_1 > k_2$ and $E_1 < E_2$. Assuming that the Arrhenius factor is same for both the temperatures, then

(a) On increasing the temperature, the increases in k_2 will be greater than increase in k_1

(b) On increasing the temperature, the increases in k_1 will be greater than increase in k_2

(c) At lower temperature, k_1 will be closer to k_2

(d) At lower temperature, $k_1 < k_2$

75. For an endothermic process, where ΔH represents the enthalpy of reaction in kJ/mol, the minimum value for the energy activation will be

(a) Less than ΔH (b) Zero (c) More than ΔH (d) Equal to ΔH

76. Three faradays of electricity are passed through molten Al_2O_3, aqueous solution of $CuSO_4$ and molten NaCl in three different electrolytic cells. The amount of Al, Cu, Na deposited at the cathodes will be in mole ratio of

(a) 1:2:3 (b) 1:1:5:3 (c) 3:2:1 (d) 1:5:2:3

77. Given : $Hg_2^{2+} + 2e^- \rightleftharpoons 2Hg \quad E° = 0.789\,V$

$Hg^{+2} + 2e^- \rightleftharpoons Hg \quad E° = 0.854\,V$

Calculate the equilibrium constant for $Hg_2^{+2} \rightleftharpoons Hg + Hg^{+2}$

(a) 3.13×10^{-3} (b) 3.13×10^{-4} (c) 6.26×10^{-3} (d) 6.26×10^{-4}

78. The saturated reduction potential for Cu^{+2}/Cu is +0.34 Volt. Calculate reduction potential at pH = 14 for the above couple K_{SP} of $Cu(OH)_2$ is 1×10^{-19}

(a) 0.2214 V (b) –0.2214 V (c) 2.214 V (d) 0.1107 V

79. Reduction potential diagram for Cu in acid solution is

$$Cu^{+2} \xrightarrow{0.15\ volt} Cu^{+} \xrightarrow{0.50\ volt} Cu$$
$$\uparrow \quad E° = x\ volt \quad \uparrow$$

Calculate x.

(a) –0.325 V (b) 3.25 V (c) 0.032 V (d) 0.325 V

80. For $I_2 + 2e^- \longrightarrow 2I^-$, standard reduction potential $= 0.54$ volt

For $2Br^- \longrightarrow Br_2 + 2e^-$ standard oxidation potential $= -1.08$ volt

For $Fe^{2+} + 2e^- \longrightarrow Fe$ standard reduction potential $= -0.44$ volt

Which of the following reactions is non–spontaneous?

(a) $Br_2 + 2I^- \longrightarrow 2Br^- + I_2$ (b) $Fe + Br_2 \longrightarrow Fe^{2+} + 2Br^-$

(c) $Fe + I_2 \longrightarrow Fe^{2+} + 2I^-$ (d) $I_2 + 2Br^- \longrightarrow 2I^- + Br_2$

81. In an atomic bcc, what fraction of edge is not covered by atoms?

(a) 0.32 (b) 0.16 (c) 0.134 (d) 0.268

82. The density of solid argon $(Ar = 40\,g/mol)$ is 1.68 g/mL at 40 K. If the argon atom is assumed to be a sphere of radius 1.50×10^{-8} cm, what % of solid Ar is apparently empty space? (use $N_A = 6 \times 20^{23}$)

(a) 35.64 (b) 64.36 (c) 74% (d) none of these

83. The van't Hoff factor for $BaCl_2$ at 0.01 M concentration is 1.98. The percentage dissociation of $BaCl_2$ at this concentration is :

(a) 49 (b) 69 (c) 89 (d) 98

84. Which of the following is not correct for an ideal solution?

(a) Raoult's law is obeyed for entrie concentration range and temperatures

(b) $\Delta H_{mix} = 0$

(c) $\Delta V_{mix} = 0$

(d) $\Delta S_{mix} = 0$

85. The depressions in freezing point for 1M urea, 1M glucose and 1M NaCl are in the ratio:

(a) 1 : 2 : 3 (b) 3 : 2 : 2 (c) 1 : 1 : 2 (d) none of these

86. In the first order reaction, the concentration of reactant decreases from 800 mol L^{-1} to 50 mol L^{-1} in $2 \times 10^4 s$. The rate constant in s^{-1} is

(a) 1.386×10^{-4} (b) 1386 (c) 138.6 (d) 13.86

87. For the reaction $2O_3 \longrightarrow 3O_2$, the following mechanism is suggested

$O_3 \longleftrightarrows O_2 + [O]$ $(fast)$ $O_3 + [O] \longrightarrow 2O_2$ $(slow)$

the rate law expression will be

(a) $r = k[O]\ [O_3]$ (b) $r = k[O_3]^2$ (c) $r = k[O_3]^2[O_2]^{-1}$ (d) $r = k[O_3]^3[O_2]^1$

88. The emf of a Daniell cell $Zn(s)\left|Zn^{+2}(aq)\right|\left|Cu^{+2}(aq)\right|Cu(s)$ can be increased by

(a) Increasing area of the electrodes

(b) Increasing the concentration of aqueous copper (II) sulphate

(c) Increasing the concentration of aqueous $ZnSO_4$

(d) Replacing the aqueous $CuSO_4$ with dilute sulphuric acid

89. $Cu^{+} + e \longrightarrow Cu,\ E° = x_1$ $\quad Cu^{2+} + 2e^{-} \longrightarrow Cu,\ E° = x_2$

For $Cu^{2+} + e \longrightarrow Cu^{+}$ $E°$ will be:

(a) $x - 2x_2$ (b) $x + 2x_2$ (c) $x_1 - x_2$ (d) $2x_2 - x_1$

90. For the electrolytic production of $NaClO_4$ from $NaClO_3$ are per reaction:

$$ClO_3^{-} + H_2O \rightarrow ClO_4^{-} + 2H^{+} + 2e$$

What volume of H_2 at STP will be liberated at the cathode in the time taken to form 12.25 g of $NaClO_4$?

(a) 1345 mL (b) 1456 mL (c) 2490 mL (d) none

91. Match the column:

	Column – I		Column – II
A.	$\phi \times 174 DNA$	(ii)	3.3×10^9 bp
B.	λ – phage DNA	(ii)	4.6×10^6 *bp*
C.	E.coli DNA	(iii)	48502 bP
D.	Haploid content of human DNA	(iv)	5386 bases

(a) A = (iv), B = (iii), C = (ii), D = (i)
(b) A = (i), B = (ii), C = (iii), D = (iv)
(c) A = (ii), B = (iii), C = (iv), D = (i)
(d) A = (i), B = (iv), C = (ii), D = (iii)

92. Which of the following is found in a DNA?

(a) dATP
(b) GMP
(c) dUMP
(d) Deoxyribonucleoside monophosphates

93. Which of the following is not found in a deoxyribonucleotide?

(a) Phosphodiester bond
(b) Phosphoester bond
(c) Glycosidic bond
(d) Covalent bond

94. Read the following statements:

(i) A purine is heterocyclic, 9-membered double ring structure with nitrogen at 1, 3, 7 and 9 positions

(ii) A pyrimidine is heterocyclic, 6-membered single ring structure with nitrogen at 1 and 3 positions

(iii) Purine nucleosides have l'-9 glycosidic linkage whereas pyrimidine nucleosides have l'-l glycosidic linkage

(iv) Two nucleotides are linked by 3' - 5' phosphodiester linkage to form a dinucleotide

(v) Ribose sugar can be represented as $C_5H_{10}O_4$ whereas deoxyribose sugar can be represented as $C_5H_{10}O_5$

Which of the above statements are correct?

(a) (i) only
(b) (i), (ii), (iii) and (iv)
(c) (iii), (iv) and (v)
(d) (iv) and (v) only

95. Which of the following dsDNA samples will have highest melting temperate? That with:

(a) 90% GC
(b) 2% A
(c) 20% T
(d) 20% A

96. The percentage of adenine in DNA isolated from human liver is observed to be 30.7%. What is the expected percentage of thymine, guanine and cytosine?

(a) T = 19.3%, G = 19.3%, C = 30.7%
(b) T = 19.3%, G = 30.7%, C = 19.3%
(c) T = 30.7%, G = 19.3%, C = 30.7%
(d) T = 30.7%, G = 19.3%, C = 19.3%

97. If in one of the strands of a ds DNA $\frac{A+G}{T+C}=\frac{3}{5}$ then, what will be the ratio of $\frac{A+G}{T+C}$ in the other strand?

(a) $\frac{5}{3}$ (b) $\frac{2}{3}$ (c) $\frac{3}{2}$ (d) $\frac{1}{5}$

98. If a hybrid DNA molecule labelled with N^{15} is allowed to replicate twice in a normal culture medium then the percentage of hybrid DNA will be:

(a) 50% (b) 12.5% (c) 25% (d) 75%

99. Suppose 75 heavy dsDNA molecules replicate twice in a medium containing N^{14}.Which of the following is true?

(a) 150 hybrid and 150 normal dsDNA are produced

(b) 75 hybrid and 75 normal dsDNA are produced

(c) 150 hybrid and 75 normal dsDNA are produced

(d) 75 hybrid and 150 normal dsDNA are produced

100. Identify W, X, Y and M in the table provided below:

Types of DNA	Rotation	Helical diameter	Vertical rise per base pair	Base pair per turn
A	Right handed	23 Å	**Y**	11
B	Right handed	20 Å	3.4 Å	**M**
C	Right handed	**X**	3.3 Å	9.33
Z	**W**	18.4 Å	3.8 Å	12

	W	**X**	**Y**	**M**
(a)	Right handed	19.4 Å	2.56 Å	10
(b)	Right handed	19.4 Å	2.56 Å	11
(c)	Left handed	19 Å	2.56 Å	10
(d)	Right handed	23 Å	3.4 Å	12

101. What will bi: the number of N-glycosidic bonds (NGB) and phosphodiester bonds (PDB) in the nucleoid of *E.coli* made of 4.6×10^6 bp

(a) NGB = 9.2×10^6, PDB = 9.2×10^3 (b) NGB = 4.6×10^6, PDB = 4.6×10^3

(c) NGB = 4.6×10^6, PDB = 4.6×10^6 (d) NGB = 9.2×10^6, PDB = 9.2×10^6

102. Watson and Crick gave the famous double helix DNA model based on _____ produced by _____:

(a) Density gradient centrifugation; Meselson and Stahl

(b) Density gradient centrifugation; Maurice Wilkins and Rosalind Franklin

(c) X-ray diffraction; Meselson and Stahl

(d) X-diffraction; Maurice Wilkins and Rosalind Franklin

103. One of the hallmarks of Watson and Crick proposition for DNA structure was:

(a) Base pairing between the two strands of polynucleotide chains

(b) The discovery of nitrogenous bases

(c) The presence of ribonucleotides

(d) All of the above

104. Which of the following is correct for a dsDNA molecule?

(a) The two chains have antiparallel polarity which means one chain has the polarity $5' \rightarrow 3'$ and other also has $5' \rightarrow 3'$ polarity

(b) It is a polymer of deoxyribonucleoside triphosphates

(c) The pitch of helix is 3.4 A

(d) The backbone is constituted by sugar-phosphate and bases project inside

105. The length of dsDNA double helix in a human somatic cell is approximately:

(a) 3.3×10^9 bp (b) 6.6×10^9 bp (c) 3.3×10^6 bp (d) 6.6×10^6 bp

106. The prokaryotic DNA is nucleoid which is organised in large loops held by:

(a) Positively charged polyamines (positively charged proteins)

(b) Negatively charged proteins

(c) Neutral amino acids

(d) RNA only

107. How many nucleosomes (beeded structure) are approximately present in a human somatic cell made of 6.6×10^9 bp?

(a) 3.3×10^9 (b) 6.6×10^9 (c) 6.6×10^9 (d) 3.3×10^7

108. In a nucleosome, the histone core is made of:

(a) 2(H2A + H2B + H3 + H4) (b) 2(H1 + H2 + H3 + H4)

(c) 4(H2A + H2B + H3 + H4) (d) 8(H2A + H2B + H3 + H4)

109. A typical nucleosome contains _____of DNA helix:

(a) 400 bp (b) 600 bp (c) 200 bp (d) 500 bp

110. Which of the following is not incorrect?

(a) Nucleosomes constitute the repeating unit of a structure in nucleus called chromatin

(b) Histones are rich acidic amino acids like lysines and arginines

(c) The nucleoid of E.coli is made of 4.6×10^3 bp

(d) After the formation of chromatin further packaging does not occur

111. Non-histone chromosomal proteins (NHC):

(a) Are required to package chromatin for chromosome formation

(b) Include DNA and RNA polymerases

(c) Includes high mobility group (HMG) proteins that control gene expression

(d) Are involved in all of the above

112. In the transformation experiment, what did Griffith observe?

(a) Mixing heat-killed non-pathogenic strain of bacteria with living pathogenic strain makes the pathogenic strain non-pathogenic

(b) Mixing heat-killed pathogenic strain of bacteria with living non-pathogenic strain can convert all the living cells the pathogenic form.

(c) Mixing heat-killed pathogenic strain of bacteria with living non-pathogenic strain can convert some of the living cells into the pathogenic form

(d) Infecting mice with non-pathogenic strain of bacteria makes them resistant to pathogenic strains

113. The experimental bacteria in Griffith's experiment was:

(a) Streptococcus pneumoniae (b) Bacillus

(c) Escherichia (d) Pseudomonas pneumoniae

114. The biochemical characterisation of 'transforming substance' in Griffith's experiment was done by:

(a) Avery, Leod and Carty, who proved the transforming substance is DNA

(b) Hershey and Chase, who proved the transforming substance is DNA

(c) Chargaff, who proved the transforming substance is DNA

(d) Avery, Leod and Carty, who proved the transforming substance is protein

115. Which of the following can be determined directly from X-ray diffraction photographs of crystallized DNA?

(a) The rate of replication (b) The diameter of the helix

(c) The sequence of nucleotides (d) The frequency of adenine versus thymine

116. In trying to determine whether DNA or protein is the genetic material of phages, Hershey and Chase made use of which of the following facts?

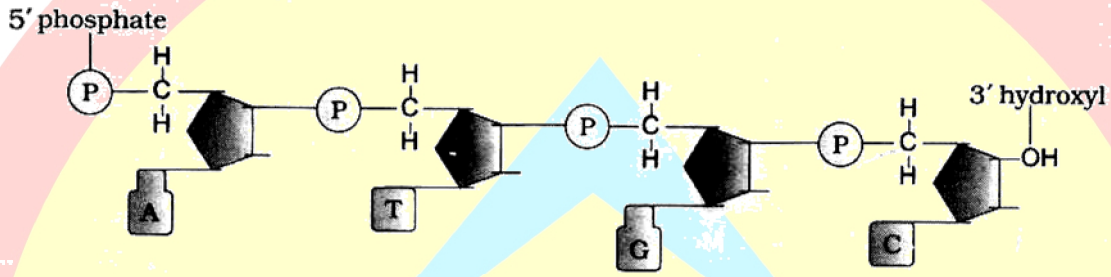
(a) DNA contains nitrogen, whereas protein does not

(b) DNA includes deoxyribose sugars but protein does not

(c) DNA contains phosphorus, whereas protein does not

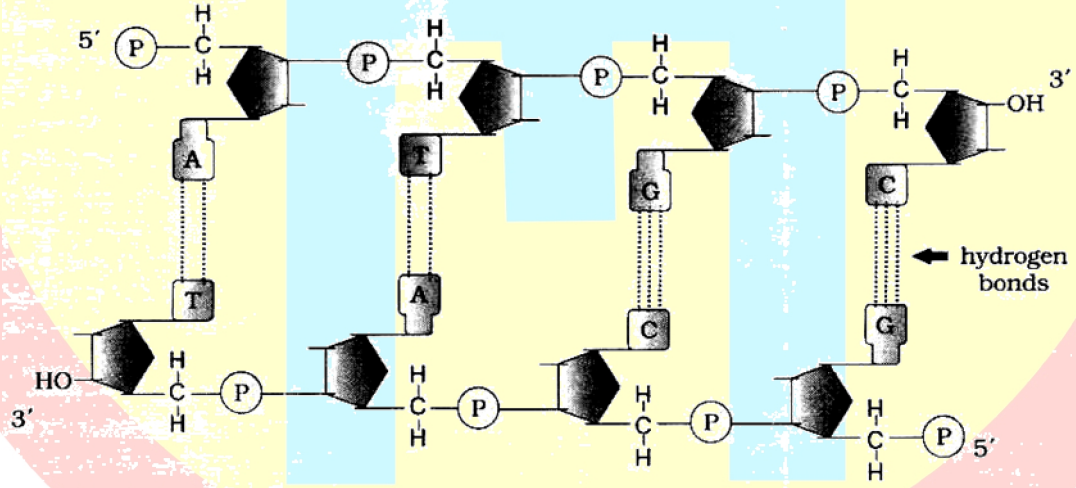
(d) DNA contains sulphur, whereas protein does not

117. Find out the number of phosphodiester bonds (PDB) and N-glycosidic bonds (NGB) in the polynucleotide provided below:



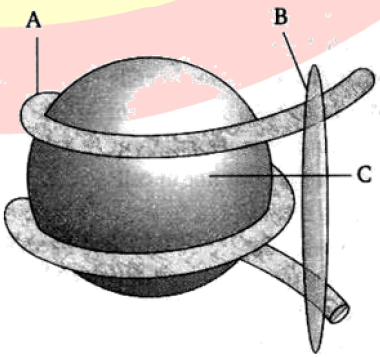
(a) PDB = 4, NGB = 4 (b) PDB = 3, NGB = 3 (c) PDB = 4, NGB = 3 (d) PDB = 3, NGB = 4

118. How many phosphodiester bonds (PDB) and N-glycosidic bonds (NGB) are present in a stretch of dsDNA given below?



(a) PDB = 8, NGB = 6 (b) PDB = 3, NGB = 11 (c) PDB = 6, NGB = 8 (d) PDB = 8, NGB = 8

119. Identify, A, B and C of nucleosome:



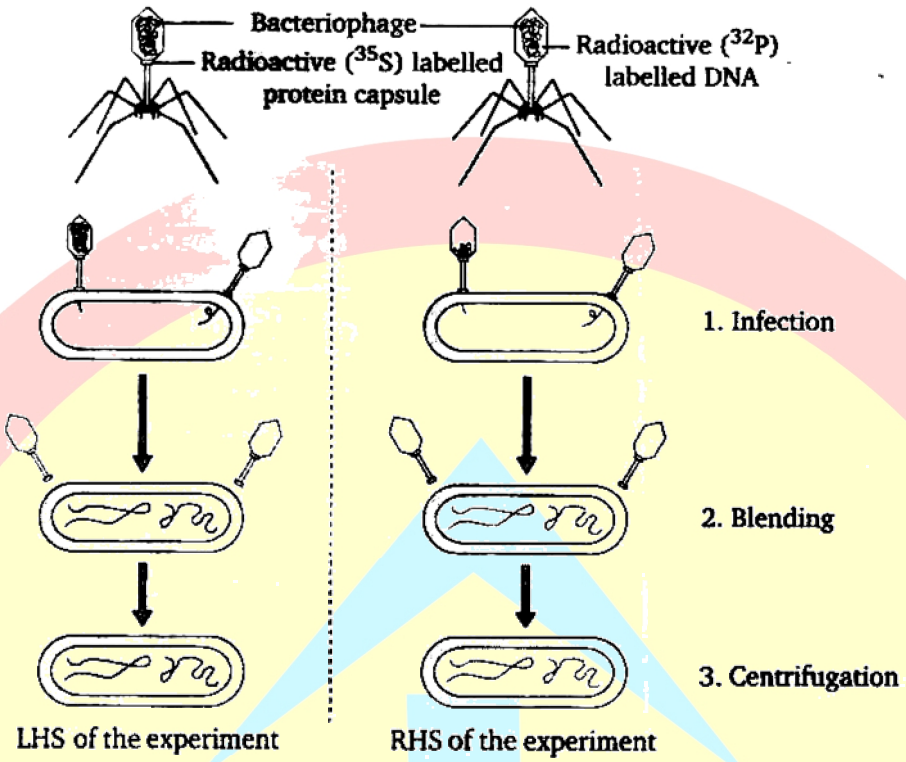
(a) A = Histone core, B = DNA, C = H1

(b) A = DNA, B = Histone octamer, C = H1

(c) A = DNA, B = HI, C = Nu-body

(d) A = DNA, B = Histone core, C = HI

120. What is true regarding the left hand side (LHS) and right hand side (RHS) of the Hershey and Chase's experiment after centrifugation step is complete?



(a) LHS = Radioactivity detected in supernatant but not in cells
RHS = Radioactivity detected in supernatant but not in cells

(b) LHS = Radioactivity detected in cells but not in supernatant
RHS = Radioactivity detected in cells but not in supernatant

(c) LHS = Radioactivity detected in supernatant but not in cells
RHS = Radioactivity detected in cells but not in supernatant

(d) LHS = Radioactivity detected in cells but not in supernatant
RHS = Radioactivity detected in supernatant but not in cells

121. RNA is the genetic material in:

(a) TMV
(b) QB bacteriophage
(c) Ebola virus and SARS virus
(d) All of the above

122. Which of the following is not a criteria for a molecule to act as genetic material?

(a) It should be able to generate its replica
(b) It should be able to pass itself to the next generation
(c) It should provide the scope for fast change (fast mutation)
(d) It should be structurally stable

123. Proteins cannot act as genetic material because:

(a) It is not a macromolecule
(b) It is chemically highly unstable
(c) It cannot generate its own replica
(d) None of these

124. RNA was not selected as genetic material in most organisms because:

(a) It is chemically unstable
(b) The 2' OH group present at every nucleotide in RNA is a reactive group
(c) Some RNAs are catalytic
(d) All of the above

125. Read the following statements:

(i) RNA is chemically more stable than DNA
(ii) The presence of thymine at the place of uracil destabilizes DNA
(iii) RNA being stable mutates faster
(iv) DNA is preferred storage genetic material and for transmission of genetic information, RNA is better
(v) RNA was the first genetic material to evolve

Which of the above statements are correct?

(a) (i), (ii) and (iii)
(b) (iii) only
(c) (iv) only
(d) (iv) and (v)

126. It became apparent to Watson and Crick after completion of their model that the DNA molecule could carry a vast amount of heredity information in which of the following?

(a) Phosphate-sugar backbone
(b) Sequence of bases
(c) Complementary pairing of bases
(d) Different five carbon sugars

127. In an analysis of nucleotide composition of DNA, which of the following would be found?

(a) A = G and T = C
(b) A + C = G + T
(c) A = C
(d) G + C = T + A

128. Which of the following is not incorrect?

(a) DNA evolved from RNA
(b) RNA is never catalytic
(c) Both (a) and (b)
(d) RNA lacks phosphodiester bonds

129. Read the following statements:

(i) Some essential life processes like metaboism, translation and splicing evolved around RNA

(ii) During early evolution RNA used to act as genetic material as well as catalyst

(iii) DNA being double stranded and having complementary strand resist changes by evolving a process of repair

(iv) DNA replication is semi-discontinuous and conservative

(v) Both DNA and RNA have the ability to direct their duplication/replication

Which of the above statements are correct?

(a) (i), (iv) and (v) (b) (iv) only (c) (v) only (d) (i), (ii), (iii) and (v)

130. The model for semi-conservative DNA replication was initially put forward by:

(a) Meselson and Stahl (b) Watson and Crick

(c) Wilkins and Franklin (d) Nirenberg and Matthaei

131. The experimental proof of semiconservative DNA replication was given by:

(a) Meselson and Stahl in E.coli (b) Watson and Crick in E.coli

(c) Wilkins and Franklin in Salmonella (d) Nirenberg and Matthaei in Salmonella

132. Which of the following is not affected by DNase treatment?

(a) Transformatior (b) Transduction (c) Conjugation (d) Both (b) and (c)

133. DNA replication occurs at which phase of cell cycle:

(a) S-phase of a somatic cell (b) S-phase of a meiocyte

(c) G_2-phase of a cell (d) More than one option is correct

134. The semi-conservative DNA replication in chromosomes was experimentally proven in eukaryotes *(Vicia faba)* by:

(a) Taylor using H^3 (b) Taylor using N^{15}

(c) Meselson and Stahl using H^3 (d) Meselson and Stahl using C^{14}

135. Messelson and Stahl proved the semi-conservative DNA replication by using:

(a) Radioactive nitrogen (b) Heavy isotope of nitrogen

(c) Radioactive carbon (d) Heavy isotope of carbon

136. Meselson and Stahl while experimentally proving semi-conservation DNA replication, separated light, heavy and hybrid DNA molecules with the help of:

(a) Sucrose density gradient centrifugation (b) NaCl density gradient centrifugation

(c) $MgCl_2$ density gradient centrifugation (d) CsCl density gradient centrifugation

137. Suppose you are provided with an actively dividing culture of E.coli to which radioactive thymine are added. What would happen if a cell replicates once in the presence of this radioactive base?

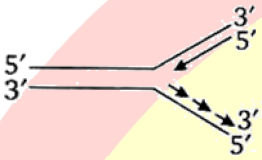
(a) Neither of the two daughter cells will be radioactive

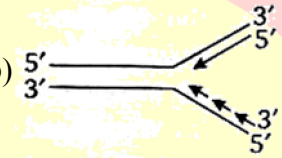
(b) One of the daughter cells, but not the other, would have radioactive DNA

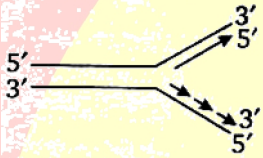
(c) All four bases of the DNA will become radioactive

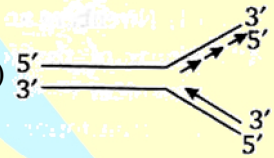
(d) DNA in both the daughter cells would be radioactive

138. Which of the following correctly represents DNA replication?

(a) 

(b) 

(c) 

(d) 

139 Replication in prokaryotes differ from replication in eukaryotes for which of the following reasons?

(a) Prokaryotes have telomeres but eukaryotes do not

(b) Prokaryotes produces Okazaki fragments but eukaryotes do not

(c) The rate of elongation during DNA replication is slower in prokaryotes than in eukaryotes

(d) Prokaryotes have single origin of replication (*ori-site*) whereas eukaryotes have many *ori*-sites

140 What is meant by the description 'antiparallel' regarding strands that make up DNA?

(a) The twisting nature of DNA creates non-parallel strands

(b) The 5' to 3' direction of one strand runs counter to the 5' to 3' direction of the other strand

(c) Base pairing creates unequal spacing between the two strands

(d) One strand is positively charged and the other negatively charged

141. The distance between the two strands of a dsDNA is approximately uniform because of the following reason(s)?

(a) Purine always comes opposite to pyrimidine in a dsDNA

(b) Presence of phosphodiester bonds

(c) Presence of N-glycosidic linkage

(d) More than one option is correct

142. Which of the following possess both $5' \rightarrow 3'$ polymerase activity as well as $3' \rightarrow 5'$ exonuclease activity?

(a) DNA polymerase-I

(b) DNA polymerase-II

(c) DNA polymerase-III

(d) All of the above

143. The average rate of DNA polymerisation in prokaryotes *(E.coli)* is:

(a) 10,000 bp/sec (b) 4.000 bp/sec

(c) 200 bp/sec (d) 2,000 bp/sec

144. During DNA replication deoxyribonucleoside triphosphates serve the dual purpose of:

(a) Acting as substrate and has enzymatic activity

(b) Acting as transducer and has enzymatic activity

(c) Acting as substrate and provides energy for polymerisation

(d) Acting as enzyme and provides energy for polymerisation

145. Match the column:

Column – I	Column – II
A. DNA polymerase	(i) DNA dependent RNA polymerase
B. RNA polymerase	(ii) 23 SrRNA
C. Reverse transcriptase	(iii) RNA dependent DNA polymerase
D. Peptidyl transferase	(iv) DNA dependent DNA polymerase

(a) A = (i), B = (iv), C = (iii), D = (ii) (b) A = (iv), B = (i), C = (ii), D = (iii)

(c) A = (iii), B = (ii), C = (i), D = (iv) (d) A = (iv), B = (i), C = (iii), D = (ii)

146. The DNA dependent DNA polymerase polymerise DNA in _____ direction.

(a) $3' \rightarrow 5'$ (b) $5' \rightarrow 3'$

(c) Both $5' \rightarrow 3$ and $3' \rightarrow 5'$ (d) $3' \rightarrow 4'$

147. For long DNA molecules, since the two strands of DNA cannot be separated in its entire length due to very high energy requirement, so the replication occur within a small opening of the DNA helix called as:

(a) Transcription bubble (b) Transcription unit

(c) Replication fork (d) Replication terminator

148. Why Okazaki fragments are formed during DSA replication?

(a) Antiparallel nature of DNA

(b) DNA polymerase is designed to synthesize DNA from $5' \rightarrow 3'$ only

(c) The parent dsDNA helix opens gradually

(d) More than one option is correct

149. Read the following steps of DNA replication and arrange them in sequence:

I. Continuous strand and discontinuous strand synthesis

II. DNA polymerase action

III. Primers bind against the 3' ends of each stand of separated dsDNA

IV. Action of single stranded binding (SSB) protein

V. Action of helicase (unwindase) and gyrase

(a) $I \rightarrow II \rightarrow IV \rightarrow III \rightarrow V$ (b) $V \rightarrow III \rightarrow IV \rightarrow I \rightarrow II$

(c) $V \rightarrow IV \rightarrow III \rightarrow II \rightarrow I$ (d) $I \rightarrow V \rightarrow IV \rightarrow III \rightarrow II$

150. The number of ori-site(s) in viruses is:

(a) One (b) Two (c) Three (d) Numerous

151. The main polymerising enzyme in DNA replication is:

(a) DNA polymerase-I (b) DNA polymerase-II

(c) DNA polymerase-III (d) Helicase

152. What is the function of DNA polymerase-III?

(a) Unwinds the DNA helix during replication

(b) Adds nucleotides to the 3'-end of a growing DNA strand

(c) Join Okazaki fragments

(d) Degrades damaged DNA

153. Individuals with Xeroderma pigmentosum are hypersensitive to sunlight. This occurs because their cells are impaired in what way?

(a) They cannot replicate DNA (b) They cannot undergo mitosis

(c) Recombination is absent (d) They cannot repair thymine dimers

154. Which enzyme removes the RNA nucleotides from primer and adds equivalent DNA nucleotides?

(a) Ligase (b) DNA polymerase-I

(c) Primase (d) DNA polymerase-II

155. Which of the following enzymes covalently connects segments of DNA?

(a) Helicase (b) Ligase

(c) DNA polymerase-II (d) DNA polymerase-I

156. Which of the following enzymes synthesize short segments of RNA?

(a) Primase (b) Ligase (c) DNA polymerase-I (d) DNA polymerase-III

157. Which of the following sets of materials are required by both eukaryotic and prokaryotic DNA replication?

(a) Topoisomerases, polymerases, telomerases

(b) G-C rich regions, polymerases, four NTPs

(c) Ligase, primers, nucleases and telomerases

(d) A dsDNA, four types of dNTPs, primers and on-site

158. Once the pattern found after one round of DNA replication was observed, Meselson and Stahl could be confident of which of the following conclusions?

(a) Replication is not dispersive

(b) Replication is not semi-conservative

(c) Replication is neither dispersive nor conservative

(d) Replication is not conservative

159. E.coli cells grown on N^{15} medium are transferred to N^{14} medium and allowed to grow for two more generations (two cycles of DNA replication). DNA extracted from these cells is centrifuged. What density distribution of DNA would you expect in this experiment?

(a) One low-density band and one intermediate density band

(b) One high-density and one low density band

(c) Only one intermediate-density band

(d) Only one low density band

160. The DNA replication is summarised below. Identify X and Y.

$$n(dNTP) \xrightarrow[\text{DNA polymerase-III}]{\text{DNA template}} \text{Y+n(PPi)}$$

(a) $X = Ca^{2+}, Y = (dnMP)_n$

(b) $X = Mg^{2+}, Y = (NMP)_n$

(c) $X = Ca^{2+}, Y = (NMP)_n$

(d) $X = Mg^{2+}, Y = (dNMP)_n$

161. How replication is different from transcription?

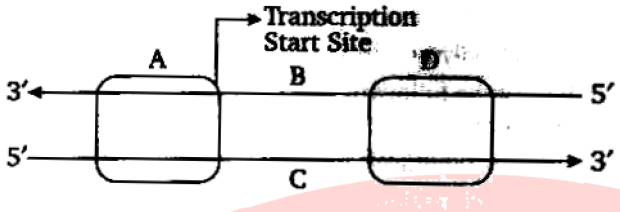
(a) Replication once set, the total DNA gets duplicated whereas in transcription only a segment of DNA gets transcribed

(b) Both the strands of DNA act as template in replication but only one strand of DNA act as template during transcription

(c) Replication requires deoxyribonucleotides whereas transcription requires ribonucleotides

(d) All of the above

162. Identify A, B, C, D in the transcription unit mentioned below:



	A	B	C	D
(a)	Promoter	Template strand	Non-coding strand	Terminator
(b)	Terminator	Template strand	Coding strand	Promoter
(c)	Terminator	Coding strand	Template strand	Promoter
(d)	Promoter	Antisense strand	Non-template strand	Terminator

163. A transcription unit in DNA is basically composed of:

(a) A promoter
(b) The structural gene
(c) A terminator
(d) All of these

164. Why both the strands of a dsDNA do not act as template during transcription?

(a) One DNA segment would be coding for two different proteins which would complicate the genetic information transfer machinery

(b) Two RNA molecules if produced would form dsRNA which would not undergo translation

(c) RNA polymerase move in one direction only along the dsDNA

(d) More than one option is correct

165. Which of the following is incorrect w.r.t. transcription unit?

(a) The terminator is located towards 3'-end (downstream) of the coding strand

(b) The promoter is located towards 5'-end (upstream) of the coding strand

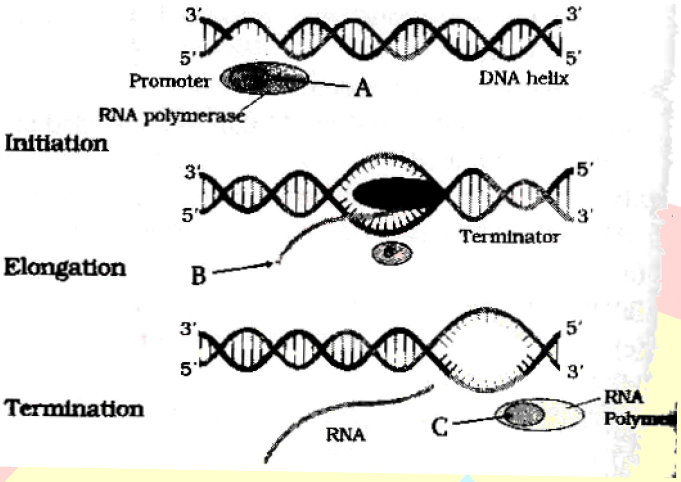
(c) Apart from promoter and terminator, additional regulatory sequences are absent upstream or downstream to the promoter

(d) A transcription unit is a length of dsDNA

166. The number of nucleotides present in the DNA wraped around a histone octamer in a nucleosome is:

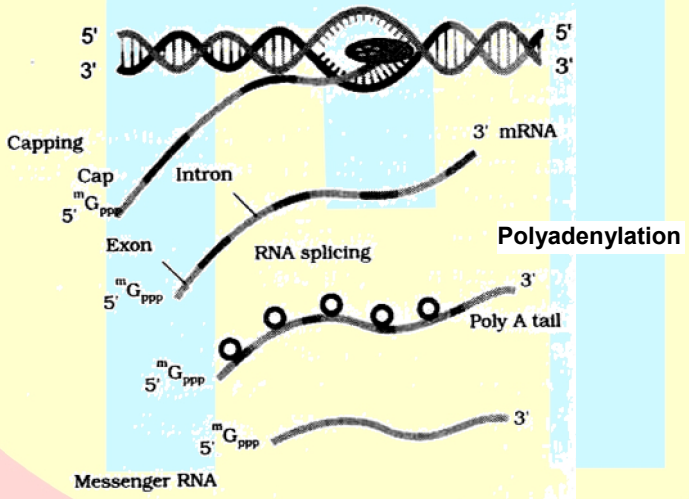
(a) 400 (b) 200 (c) 250 (d) 530

167. Identify A, B and C in the diagram depicting transcription below:



	A	B	C
(a)	Rho (ρ) protein	Nascent RNA	Sigma (σ) factor
(b)	Nascent RNA	Rho (ρ) factor	Sigma (σ) factor
(c)	Sigma (σ) factor	Rho (ρ) protein	Nascent RNA
(d)	Sigma (σ) factor	Nascent RNA	Rho (ρ) protein

168. What does the diagram given below depicts?



(a) Splicing in *E.coli*

(b) Transcription and post-transcription modification in Drosophila

(c) Splicing and translation in Drosophila

(d) Translation in *E.coli*

169. Splicing means:

(a) Removal of introns

(b) Removal of exons

(c) Joining of exons

(d) First (a) and then (c)

170. Read the following statements:

(i) Eukaryotic mRNA is polycistronic whereas prokaryotic mRNA is monocistronic

(ii)Prokaryotic mRNA is capless and tail-less whereas eukaryotic mRNA is with cap and tail

(iii) The precursor of prokaryotic mRNA is hnRNA

(iv) The initiation codon AUG in eukaryotes codes for formylated methionine

(v) In eukaryotes, transcription occurs in nucleus and translation in cytoplasm.

Which of the above statements are correct?

(a) (ii) and (v) (b) (iii), (iv) and (v) (c) (i), (ii) and (iii) (d) (iii) and (iv)

171. Methyl guanosine triphosphate is added to the 5' end of hnRNA in the process _____ of by the enzyme _____.

(a) Splicing, Guanyl transferase (b) Tailing, Guanyl transferase

(c) Capping, Guanyl transferase (d) Proofing, Guanyl transferase

172. Find out the incorrect match (for eukaryotic transcription):

(a) RNA polymerase-I → rRNA (b) RNA polymerase-II → hnRNA

(c) RNA polymerase-III →mRNA (d) RNA polymerase-III →tRNA

173. Match the column:

	Column – I		Column – II
A.	Exon	(i)	RNA of influenza virus
B.	Intron	(ii)	Functional DNA
C.	Genetic RNA	(iii)	RNA of eukaryotes
D.	Non-genetic RNA	(iv)	Junk DNA

(a) A = (ii), B = (iii), C = (i), D = (iv) (b) A = (ii), B = (iv), C m (i), D = (iii)

(c) A = (iv), B = (iii), C = (i), D = (ii) (d) A = (ii), B = (iii), C = (i), D = (iv)

174. Transcription as well as replication occurs in:

(a) 5'→3' direction (b) 3'→5' direction (c) 3'→2' direction (d) 2'→5'direction

175. Given below is a stretch of non-template strand of a dsDNA:

5' CCATACGCGCCTGTG 3'

What will be the base sequence of the primary transcript?

(a) 5'CCATACGCGCCTGTG 3' (b) 3' CCAUACGCGCCUGUG 5'

(c) 3' CCATACGCGCCTGTG 5' (d) 5' CCAUACGCGCCUGUG 3'

176. There is/are _____ DNA dependent RNA polymerase (s) which catalyses all types of RNA in bacteria:

(a) Three (b) Two (c) Five (d) Single

177. A particular triplet of bases in the template strand of DNA is 5' AGT 3'. The corresponding codon for the mRNA transcribed is:

(a) 3' UGA 5' (b) 3' UCA 5' (c) 5' TCA 3' (d) 5' ACU 5'

178. RNA polymerase binds to _____ to initiate transcription.

(a) Promoter (b) Silencer (c) Terminator (d) Structural gene

179. Transcription utilizes _____ as substrate and polymerises in a depended manner following the rule of complementarity.

(a) Ribonucleoside triphosphates, non-template

(b) Deoxyribonucleoside triphosphates, template

(c) Deoxyribonucleoside triphosphates, non-template

(d) Ribonucleoside triphosphates, template

180. The opening of double helix of a dsDNA during transcription is performed by which subunits (polypeptides) of the RNA polymerase of prokaryotes?

(a) α (b) β and β' (c) σ (d) ω

ANSWER

PHYSICS									
1	2	3	4	5	6	7	8	9	10
C	**D**	**A**	**D**	**A**	**D**	**C**	**B**	**D**	**D**
11	12	13	14	15	16	17	18	19	20
A	**C**	**A**	**A**	**A**	**B**	**D**	**C**	**D**	**B**
21	22	23	24	25	26	27	28	29	30
C	**A**	**B**	**B**	**C**	**B**	**A**	**A**	**C**	**C**
31	32	33	34	35	36	37	38	39	40
C	**D**	**A**	**C**	**A**	**A**	**A**	**A**	**A**	**B**
41	42	43	44	45					
A	**D**	**C**	**A**	**A**					
CHEMISTRY									
46	47	48	49	50	51	52	53	54	55
B	**A**	**D**	**A**	**B**	**B**	**B**	**A**	**D**	**A**
56	57	58	59	60	61	62	63	64	65
D	**B**	**B**	**B**	**B**	**B**	**D**	**C**	**C**	**B**
66	67	68	69	70	71	72	73	74	75
B	**D**	**B**	**C**	**A**	**A**	**D**	**C**	**A**	**C**
76	77	78	79	80	81	82	83	84	85
B	**C**	**B**	**D**	**D**	**C**	**B**	**A**	**D**	**C**
86	87	88	89	90					
A	**C**	**B**	**D**	**D**					
BIOLOGY									
91	92	93	94	95	96	97	98	99	100
A	**D**	**A**	**B**	**B**	**D**	**A**	**C**	**A**	**C**
101	102	103	104	105	106	107	108	109	110
D	**D**	**A**	**D**	**B**	**A**	**D**	**A**	**C**	**A**
111	112	113	114	115	116	117	118	119	120
D	**C**	**A**	**A**	**B**	**C**	**D**	**C**	**C**	**C**
121	122	123	124	125	126	127	128	129	130
D	**C**	**C**	**D**	**D**	**B**	**B**	**A**	**D**	**B**
131	132	133	134	135	136	137	138	139	140
A	**D**	**D**	**A**	**B**	**D**	**D**	**A**	**D**	**B**
141	142	143	144	145	146	147	148	149	150
A	**D**	**D**	**C**	**D**	**B**	**C**	**D**	**C**	**A**
151	152	153	154	155	156	157	158	159	160
C	**B**	**D**	**B**	**B**	**A**	**D**	**D**	**A**	**D**
161	162	163	164	165	166	167	168	169	170
D	**D**	**D**	**D**	**C**	**A**	**D**	**B**	**D**	**A**
171	172	173	174	175	176	177	178	179	180
C	**C**	**B**	**A**	**D**	**D**	**B**	**A**	**D**	**B**