OUAT 2019

QUESTION PAPER

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MENTAL APTITUDE
Questions : 50

Direction for questions 1 - 3 :

In each of the following questions, four groups of letters are given; three of them are alike in a certain way while one is different. Choose the ODD one.

Questions :

1. (A) EBD (B) IFH (C) QNO (D) YVX
2. (A) ABDG (B) IJLO (C) MNPS (D) RSUY
3. (A) WRONG (B) PRONE (C) WHITE (D) RIGHT

4. If 1st February 1996 is Wednesday, what day is 3rd March 1996 ?
   (A) Monday (B) Sunday (C) Saturday (D) Friday

Direction for questions 5 - 8 :

In each of the following questions, a pair of words is given. You are to study the relation existing between them and then find out from the given alternatives, the pair of words that bears the same relation between them and indicate that on the answer sheet.

Questions :

5. Heart : Cardiology
   (A) Brain : Psychology (B) History : Histology
   (C) Civics : Polity (D) Fossils : Paleontology

6. Horse : Mare
   (A) Duck : Geese (B) Dog : Puppy
   (C) Donkey : Pony (D) Fox : Vixen

7. Flag : Nation
   (A) Emblem : Prosperity (B) Insignia : Rank
   (C) Wealth : Prestige (D) Honour : Status

8. Ornaments : Body
   (A) Murals : Walls (B) Painting : Canvas
   (C) Light : Road (D) Cleanliness : Hospital

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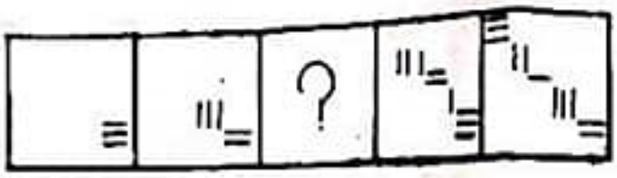
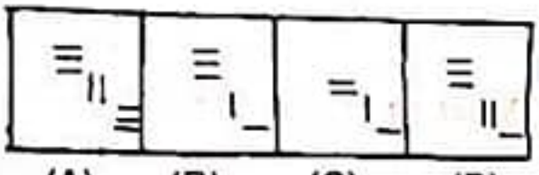
9. If + stands for ÷, × stands for +, – stands for ×, and ÷ stands for –, then which of the following equations is correct?

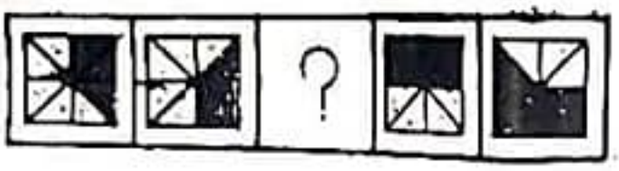
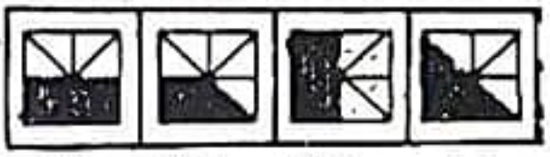
(A) $36 \times 6 + 7 \div 2 - 6 = 20$
(B) $36 \div 6 + 3 \times 5 - 3 = 45$
(C) $36 + 6 - 3 \times 5 \div 3 = 24$
(D) $36 - 6 + 3 \times 5 \div 3 = 74$

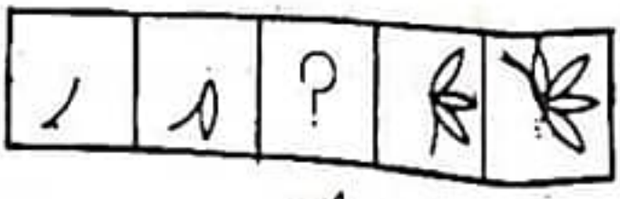
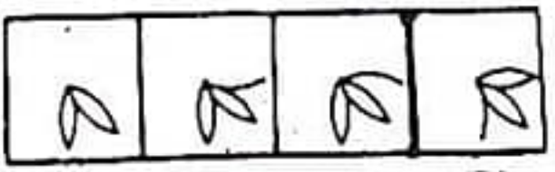
Direction for questions 10- 19 :

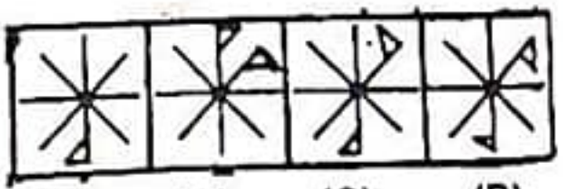
In each of these questions, there are two separate figures. The figures on the left are Problem Figures (four figures and one question-marked space) and those on the right are Answer Figures indicated by letters A, B, C and D. A series is established if one of the four Answer Figures is placed at the "question-marked space". Figures form a series if they change from left to right according to same rule. The letter of the Answer Figure which should be placed in the question-marked space is the answer. All the five figures, i.e., four Problem Figures and one Answer Figure placed in the question-marked space should be considered as forming the series.

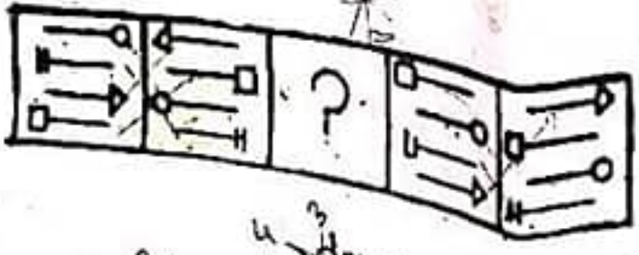
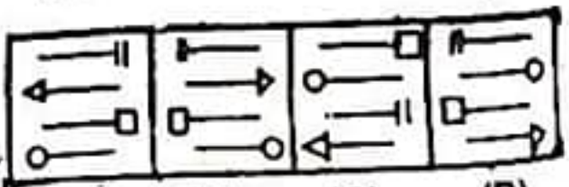
Problem Figures ***Answer Figures***

10. 

(A) (B) (C) (D)

11. 

(A) (B) (C) (D)

12. 

(A) (B) (C) (D)

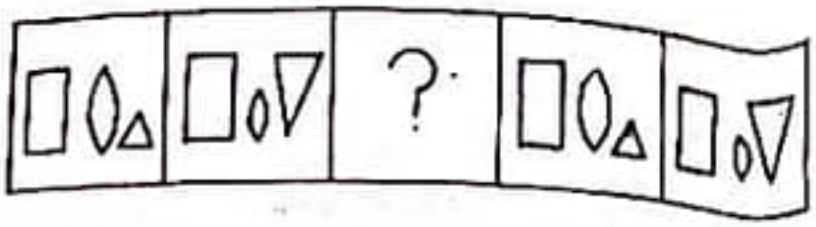
13. 

(A) (B) (C) (D)

14. 

(A) (B) (C) (D)

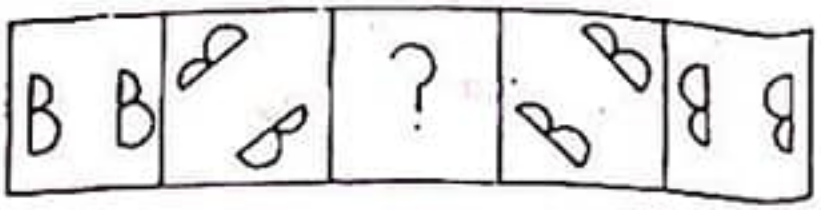
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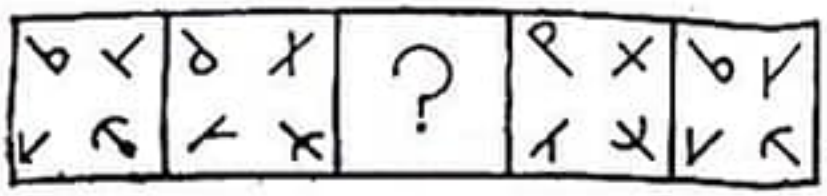
Problem Figures **Answer Figures**

15. 

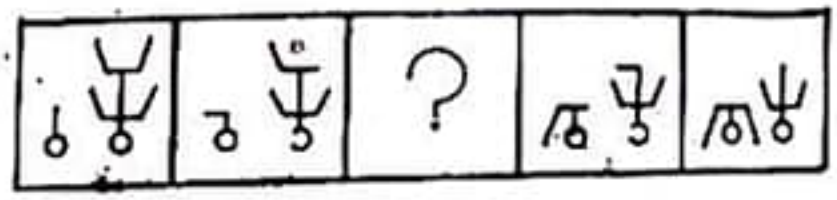
(A) (B) (C) (D)

16. 

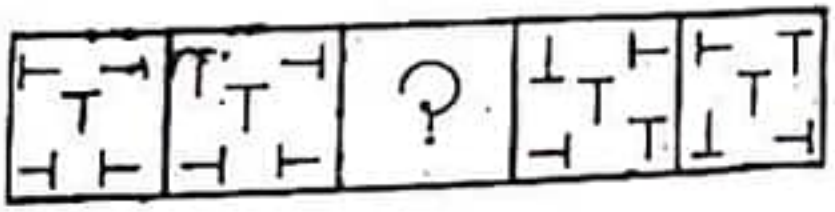
(A) (B) (C) (D)

17. 

(A) (B) (C) (D)

18. 

(A) (B) (C) (D)

19. 

(A) (B) (C) (D)

20. Vivek starts from his home and goes 2 km straight. Then, he turned right and goes 1 km. Again he turns right and covers 1 km. If he is north-west from his house, then in which direction did he go in the beginning ?

(A) North (B) South (C) East (D) West

Direction for questions 21 - 23 :

In each of the following letter series, some of the letters are missing which are given in that order as one of the alternatives below it. Choose the correct alternative.

Questions :

21. _ a b b _ _ b b _ a _ b b a b _ b a

(A) bababa (B) bbabbb (C) ababaa (D) aaaabb

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22. b a c c c c b a b a c
(A) ababa (B) bbaac (C) abbbc (D) aabba

23. c c d b d b c b c d a b a c d b a
(A) adabcd (B) cdbbca (C) daabbc (D) bdbcba

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24. If *Bangle* is called *Cassette*, *Cassette* is called *Table*, *Table* is called *Game*, *Game* is called *Cupboard* and *Cupboard* is called *Bangle*, then which is played in the tape recorder ?
(A) Table (B) Bangle (C) Cupboard (D) Cassette

Direction for questions 25 – 29:

Each question is followed by two statements (1) and (2).

Indicate

(A) if Statement (1) ALONE is sufficient, but Statement (2) alone is not sufficient

(B) if Statement (2) ALONE is sufficient, but Statement (1) alone is not sufficient

(C) if EACH statement ALONE is sufficient

(D) if Statements (1) and (2) TOGETHER are NOT sufficient

Questions:

25. Is $x > y$?

(1) $x = y + 2$

(2) $\frac{x}{2} = y - 1$

26. Last year the average (arithmetic mean) salary of the 10 employees of Company X was Rs. 42800/-. What is the average salary of the same 10 employees this year ?

(1) For 8 of the 10 employees, this year's salary is 15 percent greater than last year's salary.

(2) For 2 of the 10 employees, this year's salary is the same as last year's salary.

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27. In a certain classroom, there are 80 books, of which 24 are fiction and 23 are written in English. How many of the fiction books are written in English ?

(1) Of the fiction books, there are 6 more that are not written in English than are written in English.

(2) Of the books written in English, there are 5 more nonfiction books than fiction books.

28. If n is an integer, is n + 1 odd ?

(1) n + 2 is an even integer.

(2) n – 1 is an odd integer.

29. The hypotenuse of a right triangle is 10 cm. What is the perimeter, in centimeters, of the triangle ?

(1) The area of the triangle is 25 sq.cm.

(2) The 2 legs of the triangle are of equal length.

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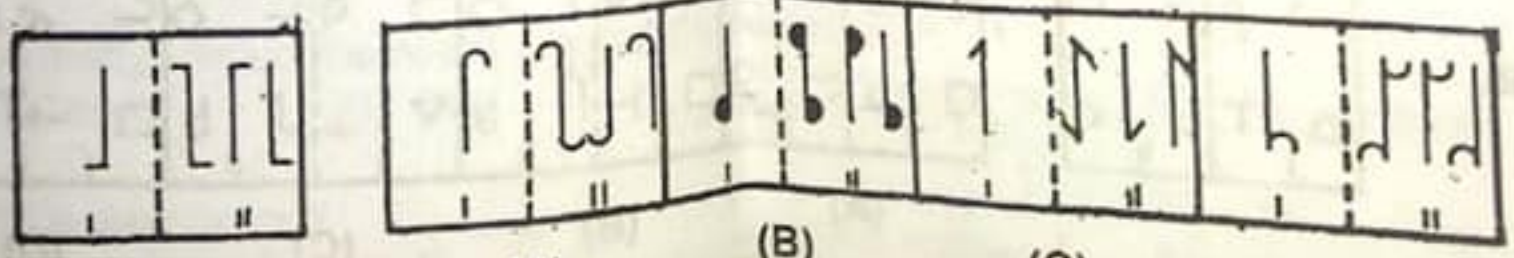
30. In a certain code ALMIRAH is written as BNPMWGO, which word would be written as DNRWLUA?

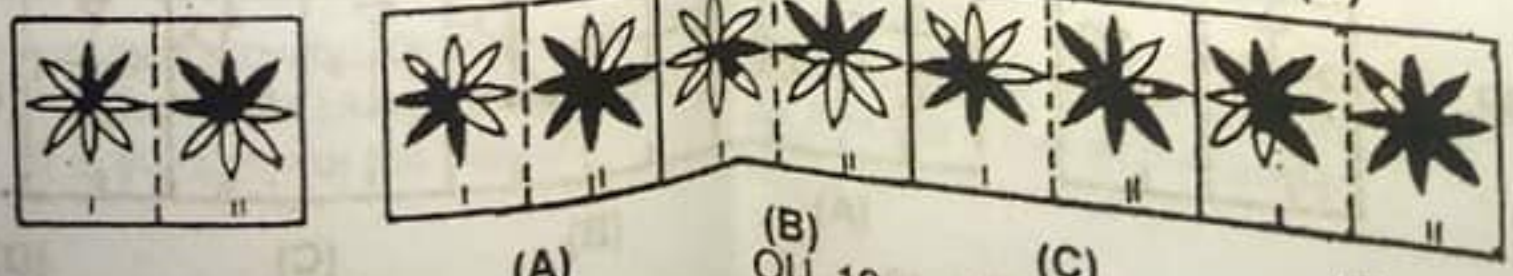
(A) COSGOLT (B) TOGSOLC (C) TOGCLOS (D) CLOSGOT

Direction for questions 31- 40 :

In each of these questions, a related pair of figures (unnumbered) is followed by four numbered pairs of figures. Out of these four, three have relationship similar to that in the original pair. Only one pair of figures does not have similar relationship. Select that pair of figures which does *NOT* have a similar relationship to that in the unnumbered pair. Letter of that figure is your answer.

Problem Figures ***Answer Figures***

31. 

32. 

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Problem Figures **Answer Figures**

33.



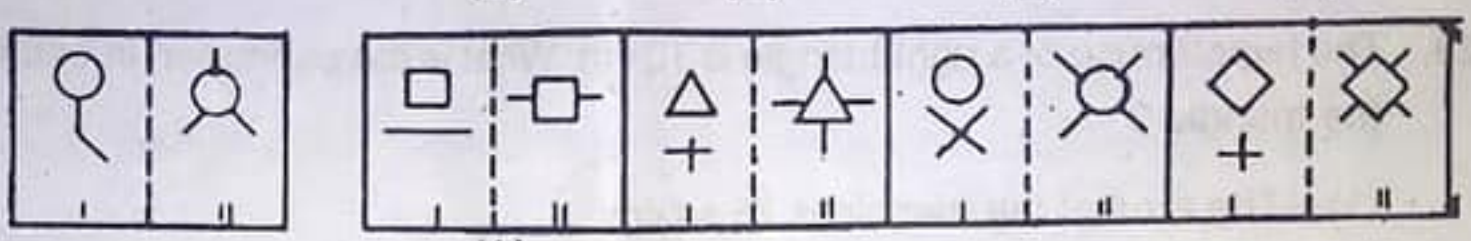
(A) (B) (C) (D)

34.



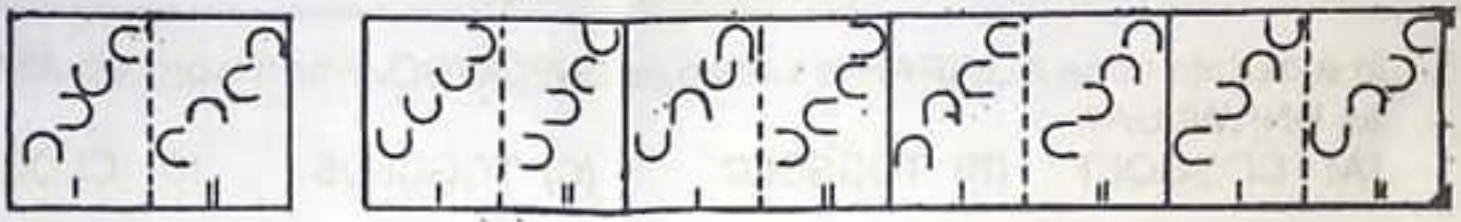
(A) (B) (C) (D)

35.



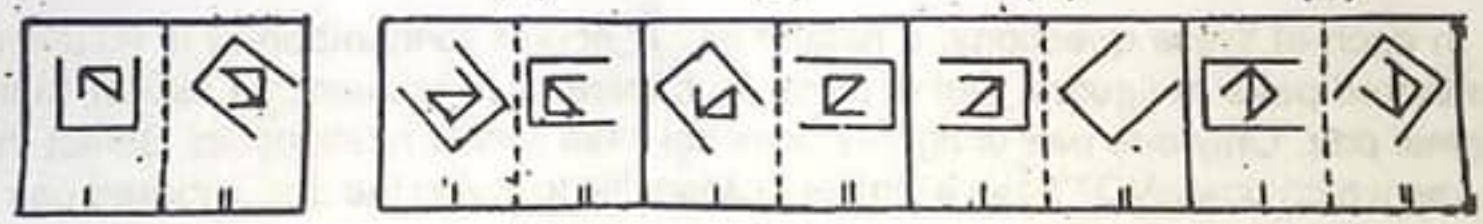
(A) (B) (C) (D)

36.



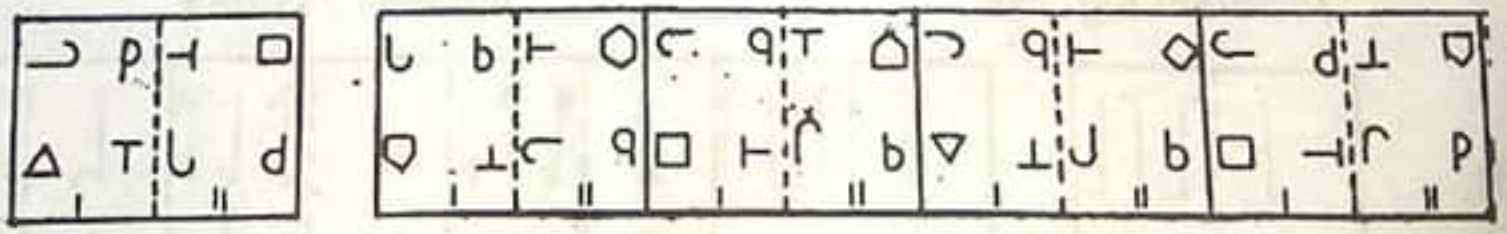
(A) (B) (C) (D)

37.



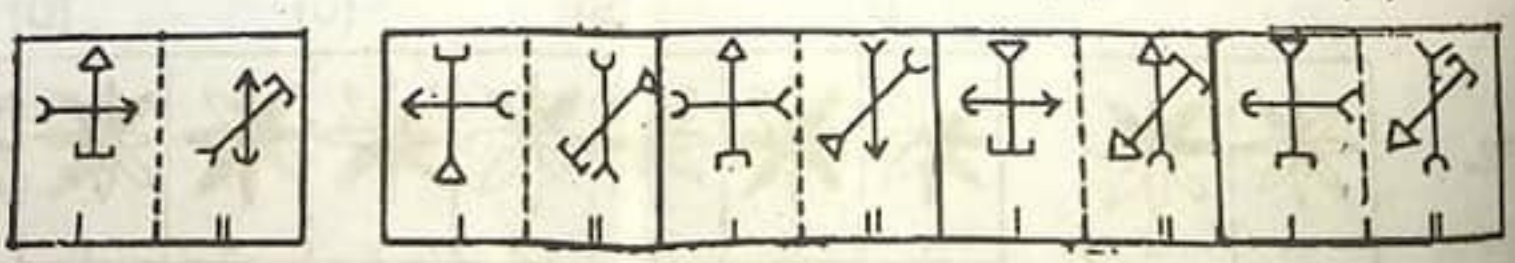
(A) (B) (C) (D)

38.



(A) (B) (C) (D)

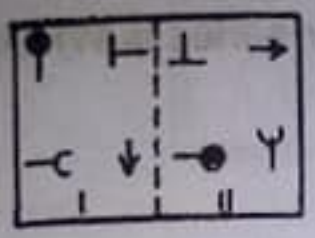
39.



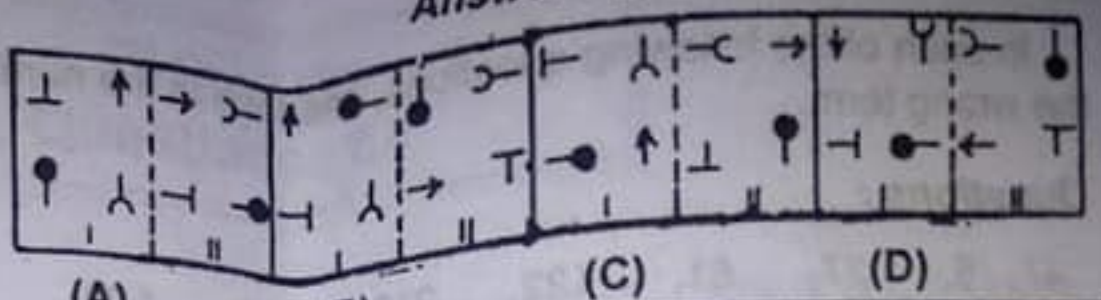
(A) (B) (C) (D)

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40. Problem Figures



Answer Figures



(A) (B) (C) (D)

41. Pointing to a person a man said to a woman, "His mother is the only daughter of your father". How was the woman related to the person ?
(A) Aunt (B) Mother (C) Wife (D) Daughter

Direction for questions 42 - 46 :

Read the following information to answer the given questions.

i) A, B, C, D, E and F are six family members.
ii) There is one doctor, one lawyer, one engineer, two students and one housewife.
iii) There are two married couples in the family.
iv) F, who is a doctor, is father of E.
v) A is a student, and her husband is not a lawyer.
vi) B is the grandmother of D and is a housewife.
vii) C is the father-in-law of A and is an engineer.
viii) D is the sister of E.

Questions :

42. How is E related to B ?
(A) Grand-daughter or grand-son (B) Daughter or son
(C) Daughter-in-law or son-in-law (D) Sister or brother

43. Which of the followings is one of the pairs of married couples ?
(A) FB (B) FA (C) CF (D) FD

44. How many female members are there in the family ?
(A) Three (B) Two (C) Three or four (D) Two or three

45. Who is the doctor ?
(A) D (B) E (C) A's husband (D) C's wife

46. Which of the following statements is definitely TRUE ?
(A) C is the father of the student. (B) B is the mother of the student.
(C) D is the sister of the lawyer. (D) F is the father of the lawyer.

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Direction for questions 47 - 50 :

In each of the following questions, one term in the number series is WRONG. Find out the wrong term.

Questions :

47. 5, 27, 61, 122, 213, 340, 509
(A) 27 (B) 61 (C) 122 (D) 509

48. 46080, 3840, 384, 48, 24, 2, 1
(A) 384 (B) 48 (C) 24 (D) 2

49. 15, 16, 22, 29, 45, 70
(A) 16 (B) 22 (C) 45 (D) 70

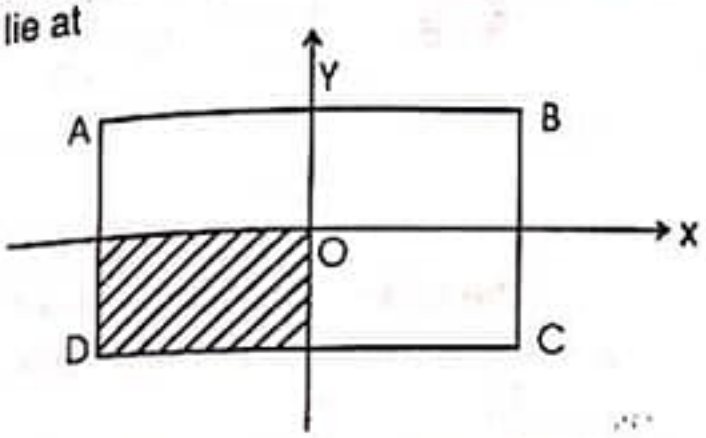
50. 0, 2, 3, 5, 8, 10, 15, 18, 24, 26, 35
(A) 18 (B) 24 (C) 26 (D) 10

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PHYSICS
Questions : 50

51. Figure shows a thin rectangular copper plate with the centre of mass at origin O and side AB = 2BC = 2m. If a quarter part of the plate (shown as shaded) is removed, the centre of mass of the remaining plate would lie at



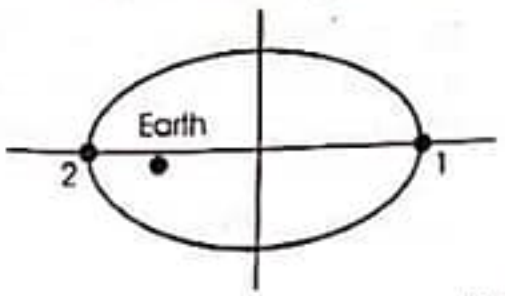
(A) $\frac{1}{12}m, \frac{1}{6}m$ (B) $\frac{1}{6}m, \frac{1}{12}m$

(C) $\frac{1}{3}m, \frac{1}{6}m$ (D) $\frac{1}{3}m, \frac{1}{2}m$

52. Two solid spheres of the same metal but of mass M and 8M fall simultaneously in a viscous fluid. If their terminal velocities are v and nv, then the value of n will be

(A) 16 (B) 8 (C) 4 (D) 2

53. A small satellite is in elliptical orbit around the earth as shown in the figure. L denotes the magnitude of its angular momentum and K denotes its kinetic energy. If 1 and 2 denotes two positions of the satellite, then



(A) $L_2 = L_1, K_2 = K_1$ (B) $L_2 = L_1, K_2 > K_1$

(C) $L_2 > L_1, K_2 < K_1$ (D) $L_2 = L_1, K_2 < K_1$

54. The force F is given in terms of time t and displacement x by the equation F = A cos Bx + C sin Dt. The dimensional formula of D/B is

(A) $[M^0L^0T^0]$ (B) $[M^0L^0T^{-1}]$ (C) $[M^0L^{-1}T^0]$ (D) $[M^0L^1T^{-1}]$

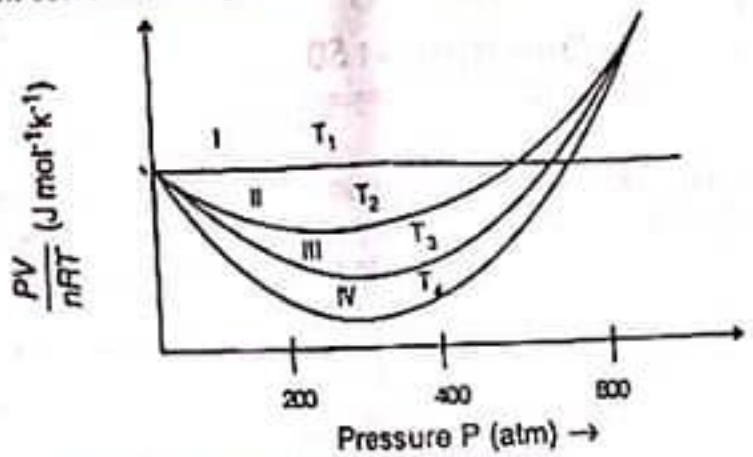
55. Springs of spring constant K, 3K, 9K, $27K,...\infty$ are connected in series. Equivalent spring constant of the combination is

(A) $\frac{3K}{2}$ (B) $\frac{K}{2}$ (C) $\frac{2K}{3}$ (D) ∞

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56. Different curves in the figure show the behaviour of gases.

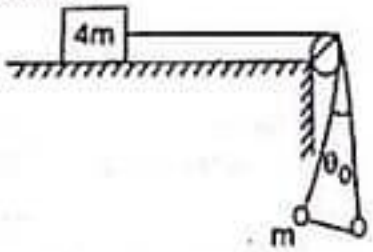


1. The curve I represents ideal gas behaviour.
2. Curves II, III and IV also represent ideal gas behaviour at different temperatures T_2, T_3 and T_4.
3. Curves II, III and IV represent behaviour of a real gas at different temperatures T_2, T_3 and T_4.
4. $T_2 > T_3 > T_4$

The correct statements are

(A) 1, 2, 4 (B) 2, 3, 4 (C) 1, 3, 4 (D) 1, 2, 3

57. Two bodies of masses m and 4m are attached with a string as shown in the figure below. The body of mass m ranging from a string of length l is executing oscillation of angular amplitude θ_0 while the other body is at rest. The minimum coefficient of friction between the mass 4m and the horizontal surface should be



(A) $\left(\frac{2-\cos\theta_0}{3}\right)$ (B) $2\cos^2\left(\frac{\theta_0}{2}\right)$

(C) $\left(\frac{1-\cos\theta_0}{2}\right)$ (D) $\left(\frac{3-2\cos\theta_0}{4}\right)$

58. A rocket is moving at a speed of 200 ms^{-1} towards a stationary target. While moving it emits a wave of frequency 1000 Hz. Some of the sound reaching the target gets reflected back to the rocket as an echo. The frequency of the echo as detected by the rocket is (velocity of sound = 330 ms^{-1})

(A) 1000 Hz (B) 1580 Hz (C) 2504 Hz (D) 4080 Hz

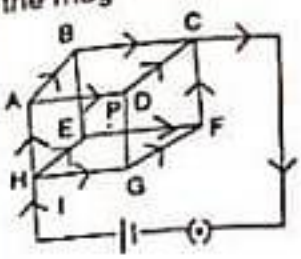
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59. A convex lens has a focal length f. It is cut into two parts along the dotted line as shown in the figure. The focal length of each part will be

(A) f/2 (B) f (C) 3f/2 (D) 2f



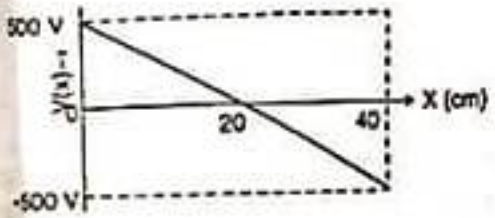
60. A steady current is set up in a cubic network composed of wires of equal resistance and length d as shown in the figure. What is the magnetic field at the centre P due to the cubic network?



(A) $\frac{\mu_0}{4\pi}\frac{2I}{d}$ (B) $\frac{\mu_0}{4\pi}\frac{3I}{\sqrt{2}d}$

(C) 0 (D) $\frac{\mu_0}{4\pi}\frac{8\pi I}{d}$

61. An electron is placed on X-axis where the electric potential depends on x as shown in the figure (the potential does not depend on y and z). What is the electric force on the electron?



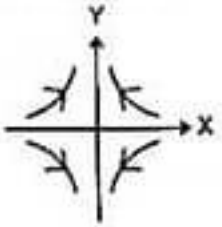
(A) 4.0×10^{-18} N

(B) 8.0×10^{-18} N

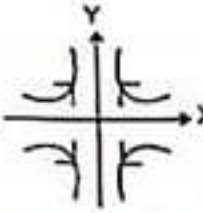
(C) 3.2×10^{-16} N

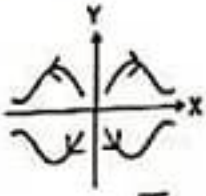
(D) 4.0×10^{-16} N

62. The potential field depends on x and y-coordinates as $V = x^2 - y^2$. Corresponding electric field lines in X-Y plane are as

(A) 

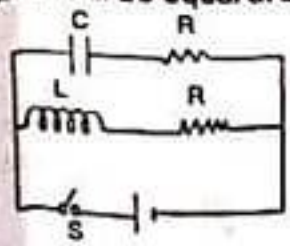
(B) 

(C) 

(D) 

63. In the circuit shown in the figure, the switch S is closed at time t = 0 (Given, $R = \sqrt{\frac{L}{C}}$).

The current through the capacitor and inductor will be equal at a time t equals to



(A) RC (B) RC ln 2

(C) $\frac{1}{RC \ln 2}$ (D) LR

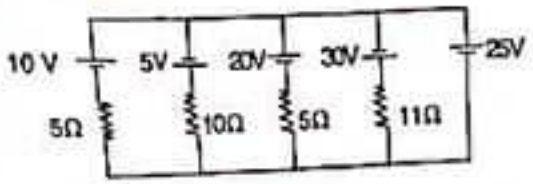
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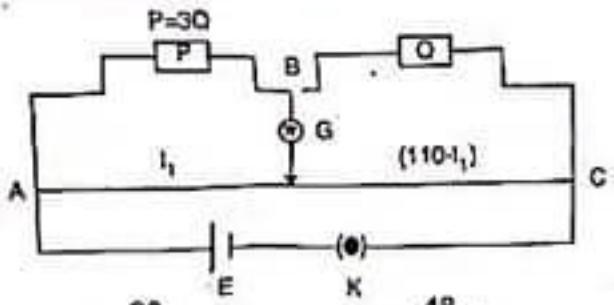
64. In the circuit shown, current through 25V cell is

(A) 7.2 A (B) 10 A

(C) 12 A (D) 14.2 A



65. In a meter bridge experiment resistances are connected as shown in the figure. The balancing length is 55 cm. Now an unknown resistance x is connected in series with P and the new balancing length is found to be 75 cm. The value of x is



(A) $\frac{54}{12}\Omega$ (B) $\frac{20}{11}\Omega$ (C) $\frac{48}{11}\Omega$ (D) $\frac{11}{48}\Omega$

66. Four persons are initially at the four corners of a square whose side is equal to d. Each person now moves with a uniform speed V in such a way that the first move directly towards the second, the second directly towards the third, the third directly towards the fourth and the fourth directly towards the first. The four persons meet after a time equals to

(A) $\frac{d}{V}$ (B) $\frac{2d}{3V}$ (C) $\frac{2d}{\sqrt{3}V}$ (D) $\frac{d}{\sqrt{3}V}$

67. In a stack of three polarizing sheets, the first and the third are crossed while the middle one has its axis at 45^0 to the axes of the other two. The fraction of intensity of an incident unpolarized beam of light that is transmitted by the stack is

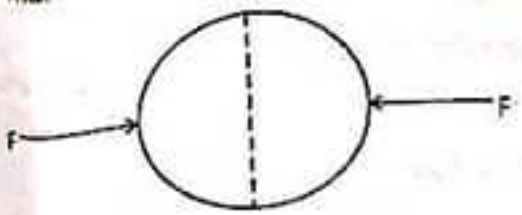
(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) $\frac{1}{8}$

68. When a beam of 10.6 eV photons of intensity 2.0 W/m^2 falls on a metalic surface of area 1×10^{-4} m^2 and work function 5.6 eV, 0.53% of incident photons eject photoelectrons. The number of photoelectrons emitted per second is

(A) 1.18×10^{16} (B) 6.25×10^{11} (C) 6.25×10^{13} (D) 6.25×10^{15}

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69. A uniformly charged thin spherical shell of radius R carries uniform surface charge density of σ. It is made of two hemispherical shells, held together by pressing them with force F (see figure). F is proportional to



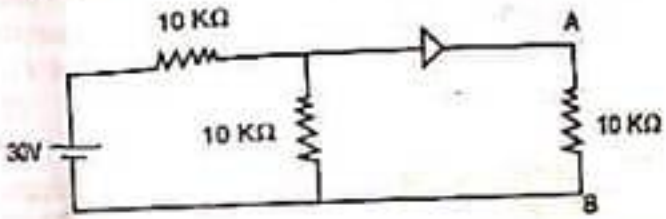
(A) $\frac{1}{\epsilon_0}\sigma^2R^2$ (B) $\frac{1}{\epsilon_0}\sigma^2R$

(C) $\frac{\sigma^2}{\epsilon_0 R}$ (D) $\frac{\sigma^2}{\epsilon_0 R^2}$

70. In a mean life of a radioactive sample about _____ of the substance disintegrates.

(A) 2/3 (B) 1/3 (C) 90% (D) 50%

71. Refer to the figure, Potential difference between A and B is



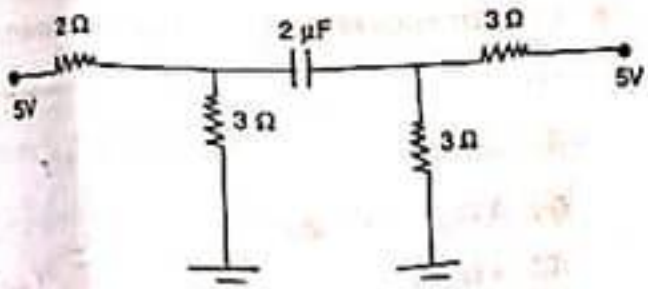
(A) zero (B) 5 V

(C) 10 V (D) 15 V

72. A conducting circular loop is placed in a uniform magnetic field, B = 0.025 T with its plane perpendicular to the loop. The radius of the loop is made to shrink at a constant rate of 1 mm S^{-1}. The induced emf when the radius is 2 cm, is

(A) $2\pi\,\mu V$ (B) $\pi\,\mu V$ (C) $\frac{\pi}{2}\,\mu V$ (D) $2\,\mu V$

73. The charge on the capacitor in steady state in the circuit shown is



(A) 0.5 μC (B) 1 μC

(C) 2 μC (D) 4 μC

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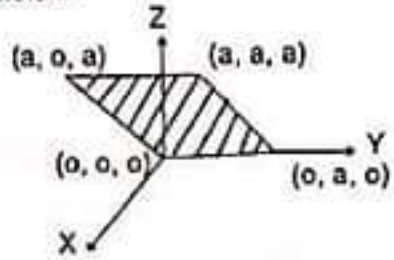
74. The relation between time t and distance x for a moving particle is $t = \alpha x^2 + \beta x$, where α and β are constants. If V is the velocity at distance x, then the retardation of the particle is

(A) $2\alpha V^3$ (B) $2\beta V^3$ (C) $2\alpha\beta V^3$ (D) $2\beta^2 V^2$

75. Consider an electric field $\vec{E} = E_0\hat{x}$, where E_0 is a constant. The flux through the shaded area (as shown in figure) due to this field is

(A) $2E_0a^2$ (B) $\sqrt{2}E_0a^2$

(C) E_0a^2 (D) $\frac{E_0a^2}{\sqrt{2}}$



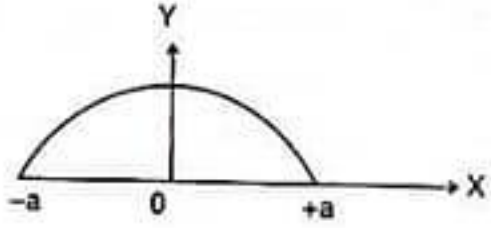
76. An Alpha particle accelerated through V volts is fired towards a nucleus. Its distance of closest approach is r. If a proton accelerated through the same potential is fired towards the same nucleus, its distance of closest approach will be

(A) r (B) 2r (C) r/2 (D) r/4

77. Determine the r.m.s value of a semicircular current wave which has a maximum value of a.

(A) $\left(\frac{1}{\sqrt{2}}\right)a$ (B) $\sqrt{\frac{3}{2}}a$

(C) $\sqrt{\frac{2}{3}}a$ (D) $\left(\frac{1}{\sqrt{3}}\right)a$



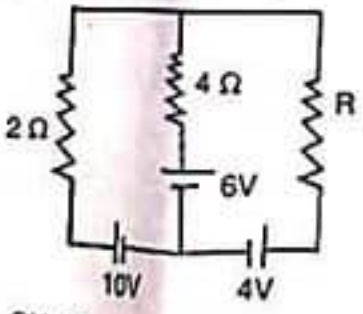
78. For what value of R in the circuit as shown, current through 4 Ω will be zero?

(A) 1 Ω

(B) 2 Ω

(C) 3 Ω

(D) 4 Ω

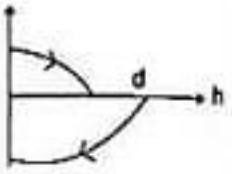


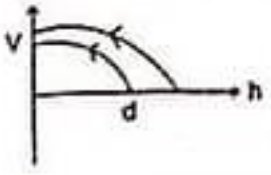
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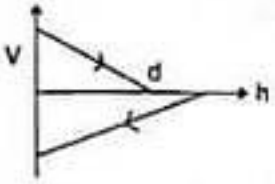
79. A uniform chain of length L meters is lying over a table. If the coefficient of friction be μ, then the maximum length of the part of this chain which can be over hung the edge without sliding is

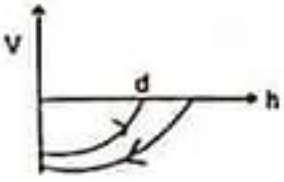
(A) $\frac{\mu L}{\mu+1}$ (B) $\frac{(\mu+1)}{\mu L}$ (C) $\frac{\mu L}{\mu-1}$ (D) $\frac{(\mu-1)L}{\mu}$

80. A ball is dropped vertically from a height d above the ground. It hits the ground and bounces up vertically to a height d/2. Neglecting subsequent motion and air resistance, its velocity V varies with height h above the ground, as

(A) 

(B) 

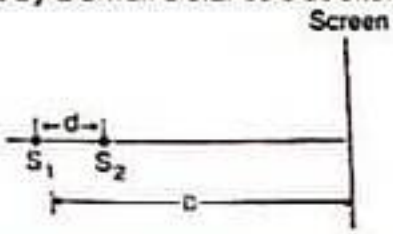
(C) 

(D) 

81. Two coherent sources S_1 and S_2 are separated by a small distance d as shown. The fringes obtained on the screen will be

(A) points (B) straight lines

(C) semi-circle (D) concentric circles



82. When only carrier is transmitted, antenna current observed is 8A. When it is modulated with 500 Hz sine wave antenna current becomes 9.6 A. The modulation is

(A) 80% (B) 20% (C) 94.26% (D) 83.76%

83. An ideal gas is kept in a closed vessel having capacity 0.0083 m^3 at a temperature of 300 K and a pressure of 1.6×10^5 $N.m^{-2}$. The specific heat of an ideal gas at constant pressure is $C_p = \frac{5R}{2}$. If 2.49×10^4 J amount of heat energy is supplied to the gas, then final pressure of the gas will be

(A) 1.6×10^6 $N.m^{-2}$ (B) 2×10^6 $N.m^{-2}$

(C) 2.5×10^6 $N.m^{-2}$ (D) 3.6×10^6 $N.m^{-2}$

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84. A composite slab is made up of two different materials having thickness 2x and 8x, thermal conductivity 2K and 4K respectively and temperatures T_2 and T_1 ($T_2 > T_1$). The rate of heat transfer through the slab, in a steady state is $\left[\frac{A(T_2 - T_1)K}{x}\right] f$ with f equals to

(A) 1 (B) 1/2 (C) 2/3 (D) 1/3

85. A neutron inelastically collide with a single ionised helium atom at rest with kinetic energy = 65 eV, making a scattering angle 90^0 with respect to the original direction. The allowed values of the energy of the neutron after the collision are

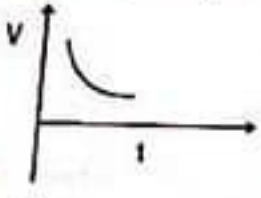
(A) 6.36 eV and 0.312 eV (B) 17.84 eV and 16.32 eV
(C) 1.8 eV and 15.8 eV (D) 16.328 eV and 6.36 eV

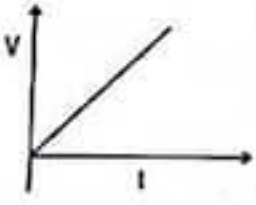
86. A ray of light is incident on a surface of glass slab at an angle 45^0. If the lateral shift produced per unit thickness is $\frac{1}{\sqrt{3}}$ m, the angle of refraction produced is

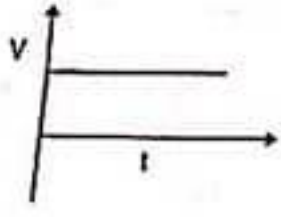
(A) $\tan^{-1}\left(\sqrt{\frac{2}{\sqrt{3}-1}}\right)$ (B) $\sin^{-1}\left(1-\sqrt{\frac{2}{3}}\right)$

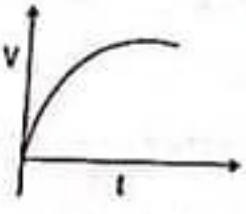
(C) $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$ (D) $\tan^{-1}\left(1-\sqrt{\frac{2}{3}}\right)$

87. During charging a capacitor, the variation of potential V of the capacitor with time t is

(A) 

(B) 

(C) 

(D) 

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88. A girl uses a simple pendulum of 1 m length to calculate the acceleration due to gravity g. She uses a stop watch with the least count of 1 sec for this and records 60 sec for 30 oscillations. For this observation, which of the following statements is TRUE?

(A) Percentage error in g is 2.5%.
(B) Percentage error in g is 3%.
(C) Percentage error in g is 3.3%.
(D) Percentage error in g is 2%.

89. The amplitude of a wave represented by displacement equation $y = \frac{1}{\sqrt{a}} \sin \omega t \pm \frac{1}{\sqrt{b}} \cos \omega t$ will be

(A) $\frac{a+b}{ab}$ (B) $\frac{\sqrt{a}+\sqrt{b}}{ab}$ (C) $\frac{\sqrt{a}-\sqrt{b}}{ab}$ (D) $\sqrt{\frac{a+b}{ab}}$

90. The wavelength of the first spectral line of the Balmer series of hydrogen atom is 5461 $\mathring{A}$. The wavelength of the second spectral line in the Balmer series of singly ionised helium atom is

(A) 1215 $\mathring{A}$ (B) 1640 $\mathring{A}$ (C) 2430 $\mathring{A}$ (D) 1011.3 $\mathring{A}$

91. In electromagnetic waves travelling in vacuum ⇒

(1) the electric field $\vec{E}$ is always perpendicular to the magnetic field $\vec{B}$
(2) $\vec{E} \times \vec{B}$ always gives the direction in which the waves travel
(3) the fields $\vec{E}$ and $\vec{B}$ vary sinusoidally
(4) There is a phase difference between $\vec{E}$ and $\vec{B}$ is $\pi/2$

The correct statement(s) is (are)

(A) 1, 3 (B) 1, 3, 4 (C) 1, 2, 3, 4 (D) 1, 2, 3

92. A potentiometer wire of length 100 cm has a resistance of 10 Ω. It is connected in series with a resistance and a cell of emf 2 V and of negligible internal resistance. A source of emf 10 mV is balanced against a length of 40 cm of the potentiometer wire. The value of the external resistance is

(A) 790 Ω (B) 890 Ω (C) 990 Ω (D) 1090 Ω

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CHEMISTRY
Questions : 50

101. Dissolving 120 g of urea (mol. wt. = 60) in 1000 g of water gave a solution of density 1.15 g/mL. The molarity of the solution is

(A) 1.78 M (B) 2.00 M (C) 2.05 M (D) 2.22 M

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

(A) C_2H_4 (B) C_3H_4 (C) C_6H_5 (D) C_7H_8

103. In the ground state of Cu^+, the number of shells occupied, subshells occupied, filled orbitals and unpaired electrons respectively are

(A) 4, 8, 15, 0 (B) 3, 6, 15, 1 (C) 3, 6, 14, 0 (D) 4, 7, 14, 2

104. The energy absorbed by each molecule (A_2) of a substance is 4.4×10^{-19} J and bond energy per molecule is 4.0×10^{-19} J. The kinetic energy of the molecule per atom will be

(A) 2.0×10^{-20} J (B) 2.2×10^{-19} J (C) 2.0×10^{-19} J (D) 4.0×10^{-19} J

105. Which one of the following orders represents the correct sequence of the increasing basic nature of the given oxides ?

(A) $Al_2O < MgO < Na_2O < K_2O$ (B) $MgO < K_2O < Al_2O_3 < Na_2O$
(C) $Na_2O < K_2O < MgO < Al_2O_3$ (D) $K_2O < Na_2O < Al_2O_3 < MgO$

106. Among the followings, the number of elements showing only one non-zero oxidation state is O, Cl, F, N, P, Sn, Tl, Na, Ti -

(A) 1 (B) 2 (C) 3 (D) 4

107. The rool mean square speed of the molecules of diatomic gas is u. When the temperature is doubled, the molecules dissociate into two atoms. The new rms speed of the atom is

(A) $\sqrt{2}\,u$ (B) u (C) 2 u (D) 4 u

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108. Standard enthalpy of vaporisation $\Delta_{vap}H^{\circ}$ for water at 100°C is 40.66 kJ mol^{-1}. The internal energy of vaporisation of water at 100°C (in kJ mol^{-1}) is (assume water vapour to behave like an ideal gas)

(A) +37.56 (B) −43.76 (C) +43.76 (D) +40.66

109. For a reaction, $\Delta H = +29$ kJ mol^{-1}, $\Delta S = -35$ kJ mol^{-1}. At what temperature the reaction will be spontaneous?

(A) 828.7 °C (B) 828.7 K

(C) Spontaneous at all temperature (D) Not possible

110. For the gas phase reaction, $C_2H_4 + H_2 \rightleftharpoons C_2H_6$; ($\Delta H = -32.7$ Kcal) carried out in a vessel, the equilibrium concentration of C_2H_4 can be increased by

(A) decreasing the pressure (B) increasing the temperature

(C) removing some C_2H_6 (D) adding some H_2

111. In which of the following equilibrium systems, is the rate of the backward reaction favoured by increase of pressure?

(A) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ (B) $2SO_2 + O_2 \rightleftharpoons 2SO_3$

(C) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (D) $N_2 + O_2 \rightleftharpoons 2NO$

112. At 25°C, the dissociation constants of CH_3COOH and NH_4OH in aqueous solution are almost the same, i.e, 10^{-5}. If pH of some acetic acid solution is 3, the pH of NH_4OH solution of same concentration at the same temperature would be

(A) 3.0 (B) 4.0 (C) 10.0 (D) 11.0

113. The coefficients of I^-, IO_3^- and H^+ in the redox reaction, $I^- + IO_3^- + H^+ \rightarrow I_2 + H_2O$ in the balanced form respectively are

(A) 5, 1,6 (B) 1, 5, 6 (C) 6, 1,5 (D) 5, 6, 1

114. The solubility of alkali metal hydroxide is

(A) LiOH < KOH < NaOH < RbOH < CsOH

(B) LiOH < NaOH < KOH < RbOH < CsOH

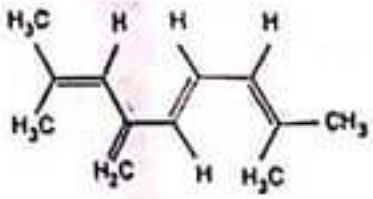
(C) CsOH < RbOH < KOH < NaOH < LiOH (D) None of these

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115. The main reason that $SiCl_4$ is easily hydrolysed as compared to CCl_4 is that
(A) Si - Si bond is weaker (B) $SiCl_4$ can form hydrogen bonds
(C) $SiCl_4$ is covalent (D) Si can extend its coordination number beyond four

116. The total number of π - bond electrons in the following structure is



(A) 4 (B) 8 (C) 12 (D) 16

117. Acid catalysed hydration of alkene is an example for
(A) free radical substitution (B) nucleophilic substitution
(C) nucleophilic addition (D) electrophilic addition

118. Assertion (A): CH_4 does not react with Cl_2 in dark.
Reason (R): Chlorination of CH_4 takes place in sunlight.
(A) Both A and R are correct and R is correct explanation of A.
(B) Both A and R are correct but R is not correct explanation of A.
(C) A is correct but R is incorrect. (D) Both A and R are incorrect.

119. Copper crystallises in FCC lattice with a unit cell edge of 361 pm. The radius of copper atom is
(A) 181 pm (B) 108 pm (C) 128 pm (D) 157 pm

120. Which of the followings has the highest value of energy gap ?
(A) Aluminium (B) Silver (C) Germanium (D) Diamond

121. The molarity of H_2SO_4 solution, which has a density 1.84 g /cc at 35°C and contains 98% by weight is
(A) 1.84 M (B) 18.4 M (C) 20.6 M (D) 24.5 M

122. If the elevation in boiling point of a solution of non-volatile, non-electrolytic and non-associating solute in a solvent ($K_b = x$ K kg mol^{-1}) is y K, then the depression in freezing point of solution of same concentration would be (K_f of the solvent = z K kg mol^{-1})

(A) $\frac{2xz}{y}$ (B) $\frac{yz}{x}$ (C) $\frac{xz}{y}$ (D) $\frac{yz}{2x}$

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123. The equivalent conductance of an aqueous solution of 1.0283×10^{-3} g equivalent acetic acid per litre is 48.15 Ω^{-1} cm^2 equiv^{-1} at 25°C and at infinite dilution value is 390.7 Ω^{-1} cm^2 equiv^{-1}. Calculate the degree of ionisation and ionisation constant of acetic acid.

(A) 0.1232, 1.78×10^{-5}
(B) 0.223, 10.2×10^{-5}
(C) 0.229, 1.78×10^{-5}
(D) 0.531, 2.85×10^{-5}

124. At 25°C, the molar conductance of 0.007 M hydrofluoric acid is 150 mho cm^2 mol^{-1} and its $\Lambda^0 m$ = 500 mho cm^2 mol^{-1}. The value of the dissociation constant of the acid at the given concentration at 25°C is

(A) 7×10^{-4}
(B) 7×10^{-4}
(C) 9×10^{-3}
(D) 9×10^{-4}

125. In a galvanic cell, the salt bridge

(A) does not participate chemically in the cell reaction
(B) stops the diffusion of ions from one electrode to another
(C) is necessary for the occurrence of the cell reaction
(D) ensures mixing of the two electrolytic solutions

126. 1 M solution each of $Cu(NO_3)_2$, $AgNO_3$, $Hg_2(NO_3)_2$ and $Mg(NO_3)_2$ is electrolysed using Pt - electrodes. The values of standard electrode potentials in volts are - Ag^+/Ag = + 0.80 V, Cu^{2+}/Cu = + 0.34 V, Hg_2^{2+}/Hg = + 0.79 V, Mg^{2+}/Mg = - 2.37 V. The sequence of deposition of metals on the cathode will be

(A) Mg > Ag > Cu
(B) Mg > Cu > Ag
(C) Ag > Hg > Cu
(D) Cu > Hg > Ag

127. In the hydrolysis of an organic chloride in the presence of large excess of water,

$$RCl + H_2O \rightarrow ROH + HCl$$

(A) molecularity and order of reaction both are 2
(B) molecularity is 2 but order of reaction is 1
(C) molecularity is 1 but order of reaction is 2
(D) molecularity is 1 and order of reaction is also 1

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128. For the non-stoichiometric reaction, $2A + B \rightarrow C + D$ the following kinetic data were obtained in three separate experiments, all at 298 K.

Initial concentration [A]	Initial concentration [B]	Initial rate of formation of [C] (mol L^{-1} s^{-1})
0.1 M	0.1 M	1.2×10^{-3}
0.1 M	0.2 M	1.2×10^{-3}
0.2 M	0.1 M	2.4×10^{-3}

The rate law for the formation of C is

(A) $\frac{dc}{dt} = k[A][B]$ (B) $\frac{dc}{dt} = k[A]^2[B]$ (C) $\frac{dc}{dt} = k[A][B]^2$ (D) $\frac{dc}{dt} = k[A]$

129. Under the same reaction conditions, initial concentration of 1.386 mol dm^{-3} of a substance becomes half in 40 seconds and 20 seconds through 1st order and zero order kinetics, respectively. ratio (k_1/k_0) of the rate constants for first order (k_1) and zero order (k_0) of the reaction is

(A) 0.5 mol dm^{-3} (B) 1.0 mol dm^{-3} (C) 1.5 mol dm^{-3} (D) 2.0 mol dm^{-3}

130. Which one of the followings is an example of homogeneous catalysis?

(A) Manufacture of ammonia by Haber's process.
(B) Manufacture of sulphuric acid by contact process.
(C) Hydrogenation of oil.
(D) Hydrolysis of sucrose in presence of dilute hydrochloric acid.

131. The process of converting hydrated alumina into anhydrous alumina is called

(A) roasting (B) smelting (C) dressing (D) calcination

132. Carbon reduction is NOT used to obtain Cr and Mn because

(A) process is not thermodynamically feasible
(B) process is not economically feasible
(C) interstitial compounds are formed by Cr and Mn with carbon at high temperature
(D) Cr and Mn are high melting metals

133. A radioactive atom $^{x}_{y}M$ emits two α-particles and one β-particle successively. The number of neutrons in the nucleus of the product will be

(A) x - 4 - y (B) x - y - 5 (C) x - y - 3 (D) x - y - 6

134. Which among the following group 16 elements exists in more than two allotropic states ?

(A) Polonium (B) Tellurium (C) Selenium (D) Oxygen

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135. Which of the following statements is NOT true for hydrolysis of XeF_6?
(A) $XeOF_4$ is formed.
(B) XeO_2F_2 is formed.
(C) It is a redox reaction.
(D) XeO_3 is formed.

136. What are constituents of Misch metal?
(A) La, Fe (B) La, Cu (C) Fe, Ce (D) Ce, Cu

137. Which of the ions is colourless in spite of the presence of unpaired electrons?
(A) La^{3+} (B) Eu^{3+} (C) Gd^{3+} (D) Lu^{3+}

138. Among the following complexes, the one which shows zero crystal field stabilization energy (CFSE) is
(A) $[Mn(H_2O)_6]^{3+}$ (B) $[Fe(H_2O)_6]^{3+}$ (C) $[Co(H_2O)_6]^{2+}$ (D) $[Co(H_2O)_6]^{3+}$

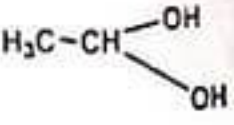
139. The ligand $N(CH_2CH_2NH_2)_3$ is
(A) tridentate (B) pentadentate (C) tetradentate (D) hexadentate

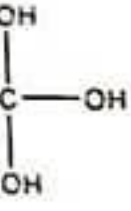
140. In the following reaction $RMgBr + CH(OEt)_3 \xrightarrow{ether} \xrightarrow{H_3O^+} P$; The product 'P' is
(A) RCHO (B) R_2CHOEt (C) R_3CH (D) $RCH(OEt)_2$

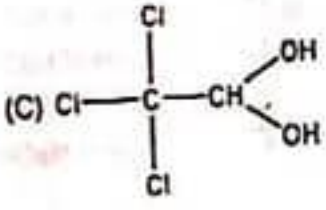
141. When alkyl halide is heated with Ag_2O, it produces
(A) ester (B) ether (C) ketone (D) alcohol

142. Iodoform can be prepared from all EXCEPT
(A) ethyl methyl ketone (B) isopropyl alcohol
(C) 3 - methyl - 2 - butanone (D) isobutyl alcohol

143. A compound containing two -OH groups attached with one carbon atom is unstable but which one of the followings is stable ?

(A) 

(B) 

(C) 

(D) None of these

144. When glycerol is heated with KHSO$_4$, it gives
(A) $CH_2 = CH - CH_3$ (B) $CH_2 = CH - CH_2OH$
(C) $CH_2 = CH - CHO$ (D) $CH_2 = C = CH_2$

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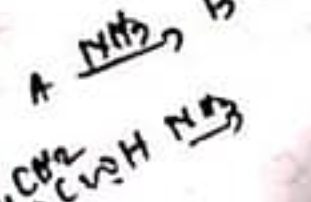
145. What are X and Y in the following reaction sequence, $C_2H_5OH \xrightarrow{Cl_2} X \xrightarrow{Cl_2} Y$

(A) C_2H_5Cl, CH_3CHO
(B) CH_3CHO, CH_3COOH
(C) CH_3CHO, CCl_3CHO
(D) C_2H_5Cl, CCl_3CHO

146. Two aromatic compounds having formula C_7H_8O which easily identifiable by $FeCl_3$ solution test (violet coloration) are

(A) o - cresol and benzyl alcohol
(B) m - cresol and p - cresol
(C) o - cresol and p - cresol
(D) methyl phenyl ether and benzyl alcohol

147. Positive Tollen's test is NOT observed for

(A)
(B)
(C) 
(D) 

148. An organic compound A upon reaction with NH_3 gives B. On heating, B gives C. C in presence of KOH reacts with Br_2 to give $CH_3CH_2NH_2$. A is

(A) $(CH_3)_2CH - COOH$
(B) CH_3CH_2COOH
(C) CH_3COOH
(D) $CH_3CH_2CH_2COOH$

149. The number of structural isomers possible from the molecular formula C_3H_9N is

(A) 4 (B) 5 (C) 2 (D) 3

150. In the Hoffmann bromide degradation reaction, the number of moles of NaOH and Br_2 used per mole of amine produced are

(A) four moles of NaOH and two moles of Br_2
(B) two moles of NaOH and two moles of Br_2
(C) four moles of NaOH and one mole of Br_2
(D) one mole of NaOH and one mole of Br_2

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BIOLOGY
Questions : 50

151. 'Muscular dystrophy' is caused by eating *Lathyrus sativus*. This is due to presence of
(A) Allyl sulphide
(B) Trans cinnamic acid
(C) β-oxalyl amino alanine
(D) Cucurbitacin

152. Photochemical smog is caused by light mediated reaction between
(A) NO_2 and O_3
(B) NO_2 and unsaturated hydrocarbon
(C) SO_3 and O_3
(D) SO_3 and unsaturated hydrocarbon

153. As it travels along the food-chain the concentration of DDT
(A) increases
(B) decreases
(C) stays constant
(D) fluctuates randomly

154. Match the following :
I-Helophytes, II-Psammophytes, III-Oxylophytes, IV-Chasmophytes
A – Saline soil, B – Sandy soil, C - Rock crevices, D - Acidic soil
(A) I – A, II – B, III – D, IV – C
(B) I – A, II – C, III – D, IV – C
(C) I – A, II – B, III – C, IV – D
(D) I – D, II – C, III – B, IV – A

155. Tobacco plants resistant to a nematode have seen developed by the introducing of DNA that produced (in host cells)
(A) both sense and antisense RNA
(B) a particular hormone
(C) an antifeedant
(D) a toxin protein

156. Consider the following four statements (1 – 4) and select the option which includes all the **correct** ones only.
(1) Single cell spirulina can produce large quantities of food rich in protein, minerals, vitamins etc.
(2) Body weight-wise the micro-organism *Methylophilus methylotrophus* may be able to produce several times more protein than the other organism.
(3) A rice variety has been developed which is very rich in calcium.
(4) Common button mushrooms are a very rich source of vitamin C.
(A) Statements (1) and (2)
(B) Statements (3) and (4)
(C) Statements (1), (3) and (4)
(D) Statements (2), (3) and (4)

157. A recombinant DNA molecule can be produced in the absence of the following.
(A) Restriction endonuclease
(B) DNA ligase
(C) DNA fragments
(D) E. Coli.

158. A technology which has found immense use in solving cases of disputed parentage, is
(A) Polymerase chain reaction
(B) DNA finger printing
(C) Monoclonal antibody production
(D) Recombinant DNA technology

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159. Antibiotics inhibit the growth of or destroy
(A) bacteria & fungi (B) bacteria & viruses
(C) bacteria, algae & viruses (D) bacteria, fungi & viruses

160. Uncontrolled plant introduction is responsible for introduction of which weed in India ?
(A) Agremone mexicana (B) Lantana camara
(C) Eichhornia crassipes (D) All of these

161. Porous wood is generally of
(A) Angiosperms (B) Gymnosperms (C) Both (A) & (B) (D) None of these

162. Non-alcoholic beverage contains stimulating property due to the presence of
(A) Caffeine (B) Atropine (C) Nimbin (D) Thymol

163. DNA synthesis can be specifically measured by estimating the incorporation by radia labelled
(A) Uracil (B) Adenine (C) Thymidine (D) Deoxyribose sugar

164. The enzyme reverse transcriptase is
(A) RNA dependent RNA polymerase (B) RNA dependent DNA polymarage
(C) DNA dependent DNA polymerase (D) DNA dependent RNA polymerase

165. Which of the following hydrolyses internal phosphodiester bonds in a polynucleotide chain ?
(A) Lipase (B) Ligase (C) Exonuclease (D) Endonuclease

166. Find the sequence of binding of the following amino acyl t-RNA complexes during translation to a m-RNA transcribed by a DNA segment having the base sequence '3TACATGGGT CCG5'. Choose the answer showing the **correct** order of numerals.
(i) AUG (ii) UAC (iii) CCG (iv) GGU
(A) (ii), (i), (iv), (iii) (B) (i), (ii), (iv), (iii)
(C) (ii), (i), (iii), (iv) (D) (i), (ii), (iii), (iv)

167. How many types of gametes wil be produced in the following allelic sequences—Aa BB CC Dd Ee ?
(A) 64 (B) 32 (C) 8 (D) 16

168. What will happen if the secretion of parietal cells of the gastric glands is blocked with an inhibitor ?
(A) Gastric juice will be deficient in pepsinogen.
(B) Gastric juice will be deficient in chymosin.
(C) In the absence of HCl secretion inactive pepsinogen is not converted into pepsin.
(D) Enterokinase will not be released.

169. What is TRUE about haemoglobin ?
(A) It is a dipeptide and present in red blood corpuscles in blood worm.
(B) It is present in the dissolved state in blood plasma in earth worm.
(C) It is a dipeptide in mammals and localised in RBC.
(D) It is present in dissolved state in blood plasma in Scorpion.

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170. In which of the following organs will the rate of blood flow change the least during exercise ?
(A) Heart (B) Intestine (C) Brain (D) Skin

171. Find the INCORRECT statement regarding mechanism of urine formation in man.
(A) Tubular secretion takes place in the PCT.
(B) Aldosterone induces greater reabsorption of sodium.
(C) The counter current systems contribute in diluting the urine.
(D) The ultrafiltration is opposed by the colloidal osmotic pressure of plasma.

172. Identify the TRUE statement in the following.
(A) Each nucleosome consists of a core of five types of nine histone molecules.
(B) Oxidation of fatty acids and synthesis of phospholipids occur in peroxisomes.
(C) Telocentric chromosome contains two unequal arms.
(D) Smaller subunit of ribosome contains the enzyme peptidyl transferase.

173. Cellulose, the most important constitutent of plant cell wall is made of
(A) unbranched chain of glucose molecules linked by β-1, 4 - glycosidic bond
(B) branched chain of gluclose molecules linked by α-1, 6-glycosidic bond at the site of branching
(C) unbranched chain of glucose molecules linked by α-1, 4 - glycosidic bond
(D) branched chain of glucose molecules linked by β-1, 4 - glycosidic bond in straight chain & α-1, 6-glycosidic bond at the site of branching

174. Colchicine prevents the mitosis of cells at which of the following stages ?
(A) Anaphase (B) Metaphase (C) Prophase (D) Interphase

175. Which one of the followings is NOT associated with ascent of sap in tall trees ?
(A) Cohesion and adhesion of water molecules
(B) Continuity of water column
(C) Pressure in tracheary elements (D) Transpiration pull

176. Stomatal opening is affected by
(A) nitrogen, carbon-dioxide concentration and light
(B) carbon-dioxide concentration, temperature and light
(C) nitrogen concentration, temperature and light
(D) nitrogen, carbon-dioxide concentration and temperature

177. C_4 plants have higher net photosynthetic rate because
(A) they have no photorespiration
(B) they can photosynthesize in low light intensity
(C) they have PEP as CO_2 acceptor (D) they have Kranz type of anatomy

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178. Which statement is WRONG for Krebs' Cycles ?
(A) There is one point in the cycle where FAD⁺ is reduced to $FADH_2$.
(B) During conversion of succinyl Co-A to succinic acid a molecule of GTP is synthesized.
(C) The cycle starts with condensation of acetyl group (acetyl CoA) with pyruvic acid to yield citric acid.
(D) There are three points in the cycle where NAD^+ is reduced to $NADH^+ H^+$.

179. Match each disease with its correct type of vaccine.

Disease	Vaccine
(a) Tuberculosis	(i) Harmless virus
(b) Whooping cough	(ii) Killed bacteria
(c) Diphtheria	(iii) G_2-phase
(d) Polio	(iv) Harmless bacteria

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

180. Myelin sheath is produced by
(A) astrocytes and schwann cells (B) oligodendrocytes and osteoclasts
(C) osteoclasts and astrocytes (D) schwann cells and oligodendrocytes

181. Column – I is the part of human brain & Column – II is its function. Match the two columns.

Column – I	Column – II
(a) Cerebrum	(p) Controls the pituitary
(b) Cerebellum	(q) Controls vision and hearing
(c) Hypothalamus	(r) Controls the rate of heartbeat
(d) Midbrain	(s) Site of intelligence
	(t) Maintains body posture

(A) (a) – (s), (b) – t, (c) – (p), (d) – (q) (B) (a) – (t), (b) – (s), (c) – (q), (d) – (p)
(C) (a) – (s), (b) – t, (c) – (q), (d) – (p) (D) (a) – (t), (b) – (s), (c) – (p), (d) – (r)

182. Select the correct matched pair.
(A) Pineal gland — does not influence menstrual cycle
(B) Corpus luteum — secrets oxytocin
(C) Interstitial cells — erythropoietin
(D) Cholecystokinin — stimulates contraction of gall bladder

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183. How many ova and sperms will be produced from 100 secondary oocytes and 100 secondary spermatocytes during gametogenosis in man ?
(A) 50 ova, 100 sperms (B) 100 ova, 100 sperms
(C) 200 ova, 200 sperms (D) 100 ova, 200 sperms

184. 'Saheli' a new oral contraceptive for the female developed by Indian scientist is a
(A) steroidal preparation (B) hormonal preparation
(C) non-steroidal preparation (D) toxic preparation to kill sperms

185. Which of these is correct hierarchical order ?
(A) Division — Order — Family — Class (B) Class — Family — Order — Division
(C) Family — Order — Class — Division (D) Order — Class — Family — Division

186. Teichoic acid is present in the cell wall of
(A) Gram + ve bacteria (B) Gram – ve bacteria
(C) Cyanobacteria (D) Mycoplasma

187. A person suffering from a disease caused by plasmodium experiences recurring chill and fever at the time when
(A) the sporozoites released from RBCs are being rapidly killed and broken down inside spleen.
(B) the trophozoites reach maximum growth and give out certain toxins
(C) the parasite after its rapid multiplication inside RBCs ruptures them, releasing the stage to enter fresh RBCs
(D) the microgametocytes and megagametocytes are being destroyed by the WBCs

188. Edible part of Mushroom is
(A) Mycelium (B) Basidiocarp (C) Basidiospores (D) Fungal hyphae

189. Which one of the followings is NOT a characteristic features of Bryophytes ?
(A) Dominant gametophytic generation (B) Filamentous rhizoids
(C) Amphibious habitat (D) Vascular tissues

190. Coal is formed by
(A) Pteridophytes (B) Bryophytes (C) Fungi (D) Algae

191. Find out the WRONGLY matched pair.
(A) Tuber — Potato (B) Rhizome — Ginger
(C) Bulbil — Agave (D) Leaf buds — Banana

192. Starch is mainly manufactured by
(A) Palisade parenchyma (B) Spongy parenchyma
(C) Guard cells (D) Vascular bundle

193. In most simple type of canal system of porifera water flows through which one of the following ways ?
(A) Spongocoel → Ostia → Osculum → Exterior
(B) Ostia → Spongocoel → Osculum → Exterior
(C) Osculum → Spongocoel → Ostia → Exterior
(D) Osculum → Ostia → Spongocoel → Exterior

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194. Which of the followings is NOT correctly matched ?
(A) Ascaris — Flame cell
(B) Prawn — Haemocoel
(C) Sycon — Canal system
(D) Star fish — Radial symmetry

195. The correct sequence of arrangement of segments in the leg of cockroach is
(A) Coxa, Femur, Trochanter, Tibia, Tarsus
(B) Coxa, Trochanter, Femur, Tibia, Tarsus
(C) Trochanter, Coxa, Tibia, Femur, Tarsus
(D) Trochanter, Coxa, Femur, Tibia, Tarsus

196. All mammals without any exception are characteristed by
(A) viviparity and biconcave RBC
(B) heterodont teeth & 12 pairs of cranial nerves
(C) a muscular diaphragm and milk producing glands
(D) extra abdominal testes and a four-chambered heart

197. Which is the principal cation in the plasma of blood ?
(A) Calcium (B) Sodium (C) Potassium (D) Magnesium

198. Microfilaments are composed mainly of a protein called
(A) Actin (B) Myosin (C) Tubulin (D) Chitin

199. Match the following & choose the correct combination from the option given below.

Column – I	Column – II
(a) Sulphur	(1) Chlorophyll
(b) Zinc	(2) Nitrogen
(c) Magnesium	(3) Methionine
(d) Molybdenum	(4) Auxin

(A) (a) — (1), (b) — (2), (c) — (3), (d) — (4)
(B) (a) — (3), (b) — (4), (c) — (1), (d) — (2)
(C) (a) — (3), (b) — (1), (c) — (2), (d) — (4)
(D) (a) — (2), (b) — (4), (c) — (1), (d) — (3)

200. Miller synthesized simple amino acids from one of the following mixtures in an experiment.
(A) H_2, O_2, N_2 (1 : 2 :1) and water vapour
(B) H_2, O_2, N_2 (2 : 1 : 2) and water vapour
(C) CH_4, NH_3, H_2 (2 : 1 : 2) and water vapour
(D) CH_4, NH_3, H_2 (1 : 2 : 1) and water vapour

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