ALL INDIA MOCK TEST

Sample Paper - 10

DURATION : 180 Minutes **MARKS : 720**

Topic Covered

Physics	**: FULL SYLLABUS : 45 Questions**
Chemistry	**: FULL SYLLABUS : 45 Questions**
Biology	**: FULL SYLLABUS : 90 Questions**

Please read the instructions carefully :

1. The test is of **3 hours** duration and Test Booklet contains **180** questions. 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**.
2. Use **Blue/Black Ball Point Pen** only for writing particulars on this page/marking responses.
3. Rough work is to be done on the space provided in the Test Booklet only.
4. **On completion of the test, the candidate must handover the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
5. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your roll no. anywhere else except in the specified space in the Test Booklet/Answer Sheet.
6. Before attempting the question paper ensure that it contains all the pages and no question is missing.
7. Each candidate must show on demand his/her Admission Card to the Invigilator.
8. If any student is found to have occupied the seat of another student, both the students shall be removed from the examination and shall have to accept any other penalty imposed upon them.
9. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
10. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice.
11. Use of Electronic/Manual Calculator is prohibited.
12. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
13. The candidates will write the Correct Test ID Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Name of the Student (In CAPITALS) : _____

Candidate ID : _____

Candidate Signature : _____ **Invigilator's Signature :** _____

PHYSICS

1. If C, R, L and I denote capacity, resistance, inductance and electric current respectively, the quantities having the same dimensions of time are: **[4]**

   i. CR

   ii. $\frac{L}{R}$

   iii. $\sqrt{LC}$

   iv. LI^2

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

2. The energy (E), angular momentum (L), and universal gravitational constant (G) are chosen as fundamental quantities. The dimensions of universal gravitational constant in the dimensional formula of Planck's constant (h) is: **[4]**

   a) 1
   b) 0
   c) -1
   d) $\frac{5}{3}$

3. The dimensions of self-inductance are: **[4]**

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

4. A body covered a distance of 5 m along a semicircular path. The ratio of distance to displacement is: **[4]**

a) 7 : 5 b) 12 : 5

c) 11 : 7 d) 8 : 3

5. A person walked up a stalled escalator in 90s. When standing on the same escalator, now moving, he is carried up in 60 s. How much time would it take him to walk up the moving escalator? **[4]**

a) 30 s b) 36 s

c) 60 s d) 26 s

6. A body is moving with constant speed, in a circle of radius 10 m. The body completes one revolution in 4 s. At the end of 3rd second, the displacement of body (in m) from its starting point is: **[4]**

a) 5π b) $10\sqrt{2}$

c) 15π d) 30

7. A river is flowing from west to east at a speed of 4 m/min. In what direction should a man on the south bank of the river, capable of swimming at 8 m/min in still water, swim to cross the river in the shortest time? **[4]**

a) East - North b) North - West

c) West - North d) South - West

8. A ball is thrown upwards and it returns to ground describing a parabolic path. Which of the following quantities remains constant throughout the motion? **[4]**

i. Kinetic energy of the ball

ii. Speed of the ball

iii. Horizontal component of velocity

iv. Vertical component of velocity

a) only iii b) i and ii

c) ii and iii

d) iv and i

9. Conservation of momentum in a collision between particles can be understood from **[4]**

a) Newton's second law only

b) both Newton's second and third law

c) Newton's first law only

d) conservation of energy

10. A simple pendulum is suspended from the ceiling of a stationary elevator and its period of oscillation is T. The elevator is then set into motion and the new time period is found to be longer. Then, the elevator is: **[4]**

a) accelerated downward

b) accelerated upward

c) moving upward with uniform speed

d) moving downward with uniform speed

11. A man in a lift throws up a ball, with velocity v m/s relative to the lift and catches it after t sec. The vertical acceleration of the lift is: **[4]**

a) 9.8 m/s^2 downwards

b) $(9.8 - \frac{v}{t})$ m/s^2 downwards

c) $(9.8 - \frac{2v}{t})$ m/s^2 downwards

d) $(9.8 - \frac{2v}{t})$ m/s^2 upwards

12. A body starts from rest and acquires a velocity V in time T. The work done on the instantaneous power delivered to the body in time t is proportional to: **[4]**

a) $\frac{V^2}{T}t^2$

b) $\frac{V^2}{T^2}t$

c) $\frac{V}{T}t$

d) $\frac{V^2}{T^2}t^2$

13. On a frictionless surface, a block of mass M moving at speed v collides elastically with another block of the same mass M which is initially at rest. After the collision, the first block moves at an angle θ to its initial direction and has a speed $\frac{v}{3}$. The second block's speed after the collision is **[4]**

a) $\frac{3}{4}$ v

b) $\frac{\sqrt{3}}{2}$ v

c) $\frac{2\sqrt{2}}{3}$ v

d) $\frac{3}{\sqrt{2}}$ v

14. Four bodies of masses 2 kg, 3 kg, 4 kg and 5 kg are placed at points A, B, C, and D respectively of a square ABCD of side 1 metre. The radius of gyration of the system about an axis passing through A and perpendicular to plane is **[4]**

a) $\sqrt{\frac{4}{3}}$ m

b) 4 m

c) $\sqrt{\frac{8}{7}}$ m

d) $2\sqrt{2}$ m

15. From a circular disc of radius R and mass 9M, a small disc of mass M and radius $\frac{R}{3}$ is removed concentrically. The moment of inertia of the remaining disc about an axis perpendicular to the plane of the disc and passing through its centre is: **[4]**

a) 4 MR^2

b) $\frac{40}{9}MR^2$

c) $\frac{4}{9}MR^2$

d) MR^2

16. A particle of mass 10 g is kept on the surface of a uniform sphere of mass 100 kg and radius 10 cm. Find the work to be done against the gravitational force between them to take the particle far away from the sphere. (You may take G = 6.67 × 10^{-11} n N-m^2/kg^2) **[4]**

a) 6.67 × 10^{-10} J

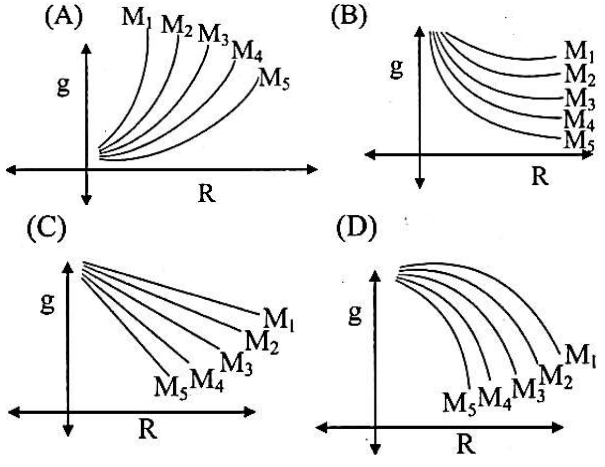
b) 13.34 × 10^{-10} J

c) 3.33 × 10^{-10} J

d) 6.67 × 10^{-9} J

17. If radius of 5 planets varies whose masses are M_1, M_2, M_3, M_4 and M_5, then which of the following graphs represents variation of acceleration due to gravity at the surface with radius, for these 5 planets? **[4]**

($M_1 > M_2 > M_3 > M_4 > M_5$)



a) Option (B)

b) Option (D)

c) Option (C)

d) Option (A)

18. If the earth suddenly shrinks to half of its present radius, the acceleration due to gravity will be: **[4]**

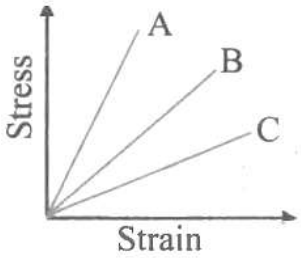
a) $\frac{g}{2}$

b) 4g

c) 2g

d) $\frac{g}{4}$

19. The stress-strain curves for brass, steel and rubber are shown in the figure. The lines A, B and C are for **[4]**



a) steel, brass and rubber respectively.

b) steel, rubber and brass respectively.

c) rubber, brass and steel respectively.

d) brass, steel and rubber respectively.

20. Two metal strips that constitute a thermostat must necessarily differ in their: **[4]**

a) resistivity

b) length

c) mass

d) coefficient of linear expansion

21. 10 gm of ice at -20°C is added to 10 gm of water at 50°C. Specific heat of water = 1 cal /gm-°C, specific heat of ice = 0.5 cal/gm-°C. Latent heat of ice = 80 cal/gm. Then, the amount of water at the resulting temperature is: **[4]**

a) 20 gm

b) 0 gm

c) 15 gm

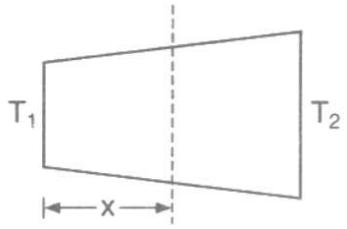
d) 10 gm

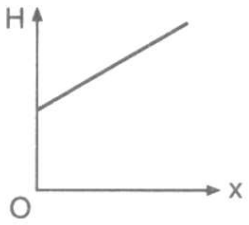
22. For an ideal monoatomic gas, the universal gas constant R is n times the molar heat capacity at constant pressure C_p. Here n is: **[4]**

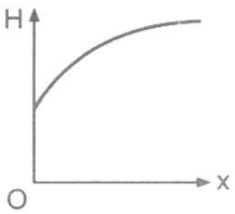
a) 0.4 b) 1.4

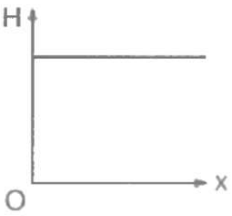
c) 0.67 d) 1.67

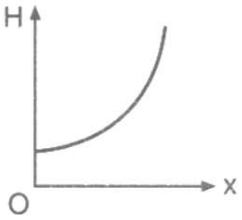
23. Radius of a conductor increases uniformly from the left to right end as shown in the figure. Material of the conductor is isotropic and its curved surface is thermally isolated from surroundings. Its ends are maintained at temperatures T_1 and $T_2(T_1 > T_2)$. If, in steady-state, heat flow rate is equal to H, then which of the following graphs is correct? **[4]**



a) 

b) 

c) 

d) 

24. Three samples of the same gas A, B and C($\gamma = \frac{3}{2}$)have initially equal volume. Now the volume of each sample is doubled. The process is adiabatic for A, isobaric for B and isothermal for C. If the final pressures are equal for all the three samples, the ratio of their initial pressures is: **[4]**

a) $\sqrt{2}$:1:2 b) 2:1:$\sqrt{2}$

c) $2\sqrt{2}$:2:1 d) $2\sqrt{2}$:1:2

25. Which of the following gases possesses maximum rms velocity, all being at the same temperature? **[4]**

a) Air
b) Hydrogen
c) Carbon dioxide
d) Oxygen

26. A spring (spring constant = k) is cut into 4 equal parts and two parts are connected in parallel. What is the effective spring constant? **[4]**

a) 4 k
b) 8 k
c) 6 k
d) 16 k

27. What effect occurs on the frequency of a pendulum, if it is taken from the earth's surface to deep into a mine? **[4]**

a) No effect
b) Increases
c) First increases then decreases
d) Decreases

28. An echo is heard when the minimum distance of the reflecting surface is: **[4]**

a) 10 cm
b) 340 m
c) 34 m
d) 17 m

29. Two solid bars are having Young's modulus Y_1 and Y_2 in the ratio $(Y_1/Y_2) = 4$. If the bars are made up of the material with the same density, then the ratio of the speed of longitudinal waves in the solid bars, i.e. (v_1/v_2) is: **[4]**

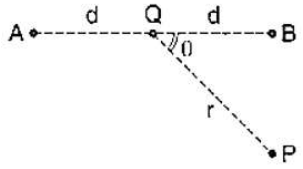
a) 3
b) 1
c) 2
d) 4

30. Two copper balls, each weighing 10 gm, are kept in air 10 cm apart. If one electron from every 10^6 atoms is transferred from one ball to the other, the coulomb force between them is: (atomic weight of copper is 63.5) **[4]**

a) 2.0×10^6 N
b) 2.0×10^{10} N

c) 2.0×10^4 N d) 2.0×10^8 N

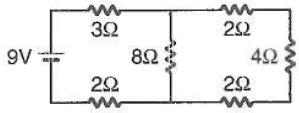
31. The work done in taking a unit positive charge from P to A is W_A and from P to B is W_B. Then: **[4]**



a) $W_A > W_B$ b) $W_A + W_B = 0$

c) $W_A = W_B$ d) $W_A < W_B$

32. In the electrical circuit shown in figure, the current through the 4 Ω resistor is: **[4]**



a) 0.1 A b) 0.5 A

c) 1 A d) 0.25 A

33. A circular coil of radius 4 cm has 50 turns. In this coil a current of 2 A is flowing. It is placed in a magnetic field of 0.1 weber/m. The amount of work done in rotating it through 1800 from its equilibrium position will be: **[4]**

a) 0.8 J b) 0.2 J

c) 0.1 J d) 0.4 J

34. The hysteresis cycle for the material of transformer core is: **[4]**

a) tall and wide b) tall and narrow

c) short and narrow d) short and wide

35. The Curie-Weiss law is obeyed by iron: **[4]**

a) above the Curie temperature b) at the Curie temperature only

c) at all temperatures d) below the Curie temperature

36. A galvanometer is connected to the secondary coil. The galvanometer shows an instantaneous deflection of 7 divisions when current is started in the primary coil of the solenoid. Now, if the primary coil is suddenly rotated through 180°, then the new instantaneous deflection will be: **[4]**

a) 7 unit
b) 14 unit
c) 21 unit
d) 0 unit

37. A boat is moving due east in a region where the earth's magnetic field is 5.0×10^{-5} N $A^{-1}m^{-1}$ due north and horizontal. The boat carries a vertical aerial 2 m long. If the speed of the boat is 1.50 m s^{-1}, the magnitude of the induced emf in the wire of aerial is: **[4]**

a) 0.15 mV
b) 1 mV
c) 0.75 mV
d) 0.50 mV

38. In an AC generator, a coil with N turns all of the same area A and total resistance R, rotates with frequency ω in a magnetic field B. The maximum value of emf generated in the coil will be: **[4]**

a) NABω
b) NAB
c) NABR
d) NABRω

39. Beyond which frequency, the ionosphere bends any incident electromagnetic radiation but do not reflect it back towards the earth? **[4]**

a) 30 MHz
b) 50 MHz
c) 20 MHz
d) 40 MHz

40. The f-number of a camera lens is 4.5. Which of the following statements is correct? **[4]**

a) The ratio of focal length to the aperture is 4.5.
b) The aperture of the lens is 4.5 cm.
c) The focal length of the lens is 4.5 cm.
d) It is the reciprocal of the focal length expressed in metre.

41. Consider the diffraction pattern obtained from the sunlight incident on a pinhole of diameter 0.1 μm. If the diameter of the pinhole is slightly increased, it will affect the diffraction pattern such that **[4]**

a) Its size increases, but intensity decreases

b) Its size increases, and intensity increases

c) Its size decreases, but intensity increase

d) Its size decreases, and intensity decreases

42. An α-particle and a deuteron are moving with velocities v and 2 v respectively. What will be the ratio of their de Broglie wavelengths? **[4]**

a) $\sqrt{2} : 1$

b) $1 : \sqrt{2}$

c) $2 : 1$

d) $1 : 1$

43. The radiation corresponding to $3 \rightarrow 2$ transition of hydrogen atom falls on a metal surface to produce photoelectrons. These electrons are made to enter a magnetic field of 3×10^{-4} T. If the radius of the largest circular path followed by these electrons is 10.0 mm, the work function of the metal is close to **[4]**

a) 0.8 eV

b) 1.1 eV

c) 1.8 eV

d) 1.6 eV

44. An α-particle of energy 5 MeV is scattered through 180° by a fixed uranium nucleus. The distance of the closest approach is of the order of: **[4]**

a) 10^{-15} cm

b) 1 $\mathring{A}$

c) 10^{-12} cm

d) 10^{-10} cm

45. A star initially has 10^{40} deuterons. It produces energy via the processes, and ${}_1H^2 + {}_1H^3 \rightarrow {}_1H^3 + p$. If the average power radiated by the star is 10^{16} W, the deuteron supply of the star is exhausted in a time of the order of:- **[4]**

The masses of the nuclei are as follows:

$M(H^2) = 2.014$ amu;

$M(H^2) = 1.007$ amu; $M(n) = 1.008$ amu; $M(He^4) = 4.001$amu.

a) 10^{16} s

b) 10^{6} s

c) 10^{8} s

d) 10^{12} s

CHEMISTRY

46. Using the given data, calculate the average atomic mass of argon. **[4]**

Isotope	**Atomic mass (amu)**	**Relative abundance (%)**
^{36}Ar	35.97	0.337
^{38}Ar	37.96	0.063
^{40}Ar	39.96	99.6

a) 39.94 amu

b) 38.00 amu

c) 38.50 amu

d) 40 amu

47. For the redox reaction, **[4]**

$MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow Mn^{2+} + CO_2 + H_2O$

The correct coefficients of the reactants for the balanced reaction are

a) $MnO_4^- = 5, C_2O_4^{2-} = 16, H^+ = 2$

b) $MnO_4^- = 16, C_2O_4^{2-} = 5, H^+ = 2$

c) $MnO_4^- = 2, C_2O_4^{2-} = 5, H^+ = 16$

d) $MnO_4^- = 2, C_2O_4^{2-} = 16, H^+ = 5$

48. The uncertainty in the momentum of an electron is 10^{-5} kg ms^{-1}.The uncertainty in its position will be: **[4]**

a) 1.05×10^{-26} m

b) 5.25×10^{-28} m

c) 1.05×10^{-28} m

d) 5.27×10^{-30} m

49. A certain orbital has no angular nodes and two radial nodes. The orbital is **[4]**

a) 3p

b) 3s

c) 2p

d) 2s

50. If the wave number of light is 5×10^6 m^{-1}, then the frequency associated with this light is _____. **[4]**

a) 1.6×10^{-2} sec
b) 1.5×10^{15} sec^{-1}
c) 1.5×10^{15} sec
d) 1.6×10^{-2} sec^{-1}

51. Which of following is **not** correctly matched? **[4]**

A. d-block element: electronic configuration is ns^{0-2} $(n - 1)d^{1-10}$
B. p-block element: electronic configuration is ns^{1-2} np^{1-6}
C. s-block elemen: electronic configuration is ns^{1-2}
D. Ce: f-block's first member.

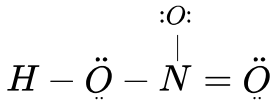
a) D
b) B
c) A
d) C

52. Which of the following compounds readily decomposes on heating to give ionic compound with higher value of lattice energy as compare to corresponding reactant? **[4]**

i. Li_2CO_3
ii. $LiBF_4$
iii. $BeSO_4$
iv. Na_2O_2
v. $BeCO_3$

a) All of these
b) i, iii, iv, v
c) i, iv, v
d) i, v

53. What is the formal charge on the nitrogen atom in HNO_3? **[4]**



a) 0
b) +1
c) +3
d) +5

54. The bond order in NO^+ molecule is _____. **[4]**

a) 4 b) 1

c) 3 d) 2

55. A mixture contains n_1 moles of monoatomic gas and n_2 moles of diatomic gas. If γ = 1.50 for mixture, the ratio of $n_1 : n_2$ is: **[4]**

a) 2 : 1 b) 1 : 1

c) 1 : 2 d) 2 : 3

56. For the reaction $H_2(g) + I_2(g) \rightarrow 2HI(g)$ the change in enthalpy (ΔH) will be **[4]**

a) 0 b) $= \Delta E$

c) $> \Delta E$ d) $< \Delta E$

57. The total number of different kind of buffers obtained during the titration of H_3PO_4 with NaOH are: **[4]**

a) 2 b) 1

c) zero d) 3

58. Which of the following is not an example of redox reaction? **[4]**

i. $CuO + H_2 \rightarrow Cu + H_2O$

ii. $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

iii. $2K + F_2 \rightarrow 2KF$

iv. $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCI$

a) ii and iii b) iv and i

c) i and ii d) iii and iv

59. The mass of phosphoric acid (H_3PO_4) required to prepare 550 mL of 0.40 N solution **[4]**

i. assuming complete neutralisation of acid

ii. assuming reduction to HPO_3^{2-} are respectively:

a) 10.8 g, 10.8 g

b) 7.19 g, 7.19 g

c) 10.8 g, 7.19 g

d) 7.19 g, 10.8 g

60. Which of the following reactions is an example of a redox reaction? **[4]**

i. $XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$

ii. $XeF_2 + PF_5 \rightarrow [XeF]^+ PF_6^-$

iii. $XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$

iv. $XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

a) iii and iv

b) ii and iii

c) only i

d) iv and i

61. Bucky ball or Buckminster fullerene is: **[4]**

a) it has sp^2-hybridised nature and resembles with a soccer ball

b) an allotrope of carbon

c) it is referred as C-60

d) All of these

62. Graphite $\xrightarrow[(oxidation)]{Strong\ oxdising,agent} X(acid) \xrightarrow[Dehydration]{\Delta} Y$, Y is: **[4]**

a) C_3O_2

b) CO_2

c) CO

d) $C_{12}O_9$

63. Which of the following ion is most stable? **[4]**

a) $CH_3CH_2\overset{+}{C}H_2$

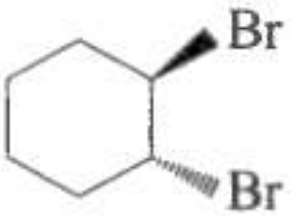
b) $CH_3 - \overset{CH_3}{\underset{CH_3}{\overset{|}{\underset{|}{C}}}} - \overset{+}{C}H_2$

c) $CH_3\overset{+}{C}HCH_2CH_3$

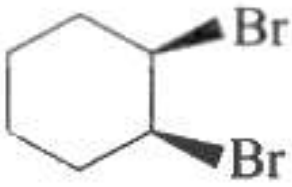
d) $CH_3 - \overset{+}{\underset{CH_3}{\overset{|}{C}}} - CH_3$

64.  **[4]**

A will have configuration:

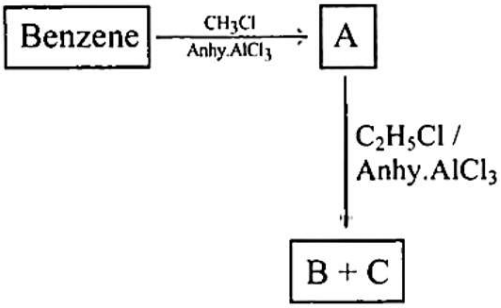
a) 

b) none of these

c) 

d) both true

65. Consider the following reactions: **[4]**



Calculate the ratio of number of sp^2 hybridized C-atoms to the number of sp^3 hybridized C-atoms in products B and C.

a) Product B - Ratio 2:3, Product C - Ratio 3:2

b) Product B - Ratio 1:2, Product C - Ratio 1:2

c) Product B - Ratio 2:1, Product C - Ratio 2:3

d) Product B - Ratio 2:1, Product C - Ratio 2:1

66. An aqueous solution of a non-volatile solute show vapour pressure of 90.9 mm. If vapour pressure of pure water is 100 mm at the same temperature and K_f for water is 1.86 K molality^{-1}, what will be depression in f.pt. of solution? **[4]**

a) 0.1034

b) 10.34

c) 1.034

d) 0.206

67. An unripe mango placed in a concentrated salt solution to prepare pickle, shrivels because: **[4]**

a) it gains water due to endo osmosis

b) it gains water due to reverse osmosis

c) it loses water due to exo osmosis

d) it loses water due to reverse osmosis

68. An unknown substance **X** contains 66.66 % carbon, 3.73 % hydrogen and 29.62 % oxygen. Molar mass of **X** is the same as its empirical molar mass. If 3.15 grams of the unknown substance is dissolved in 25 grams of benzene, what is the freezing point of the resulting solution? **[4]**

Normal freezing point of benzene is $5.50^{o}C$ and the molal freezing-point depression constant, K_f, for benzene is 5.12 K kg mol^{-1}.

a) $-8.2^{o}C$

b) $-11.9^{o}C$

c) $-2.9^{o}C$

d) $-6.5^{o}C$

69. The freezing point of a 0.05 molal solution of a non-electrolyte in water is: (K_f = 1.86 K $molality^{-1}$) **[4]**

a) -0.093°C

b) -1.86°C

c) -0.93°C

d) 0.093°C

70. At pH = 1.2 and 1 bar pressure, potential of hydrogen electrode at 298 K is _____. **[4]**

[Given : log 1.2 = 0.079]

a) 0.00 V

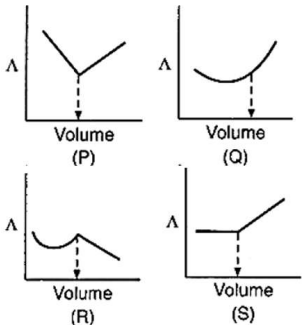
b) -0.295 V

c) -0.0708 V

d) -0.059 V

71. $AgNO_3$(aq.) was added to an aqueous KCl solution gradually and the conductivity of the solution was measured. The plot of conductance (Λ) versus the volume of $AgNO_3$ **[4]**

is:



a) (P)
b) (R)
c) (Q)
d) (S)

72. Which of the following statements is incorrect for salt bridge? **[4]**

a) It maintains electrical neutrality of two half-cell solution.
b) It prevents mixing of the electrolytic solutions.
c) It completes the electrical circuit.
d) It prevents the flow of current between the two half-cells.

73. For a first order reaction A $\longrightarrow$ Product, the initial concentration of A is 0.1 M and after 40 minute it becomes 0.025 M. Calculate the rate of reaction at reactant concentration of 0.01M. **[4]**

a) 3.47×10^{-5} M min^{-1}
b) 1.735×10^{-6} M min^{-1}
c) 3.47×10^{-4} M min^{-1}
d) 1.735×10^{-4} M min^{-1}

74. For a first order reaction, A $\rightarrow$ P, $t_{\frac{1}{2}}$ (half-life) is 10 days. The time required for $\frac{1}{4}^{th}$ conversion of A(in days) is: (In 2 = 0.693, In 3 = 1.1). **[4]**

a) 3.2
b) 2.5
c) 5
d) 4.1

75. If outermost E.C. of Ce is $4f^1\ 5d^1\ 6s^2$, then select the **incorrectly** matched outermost E.C. of its various ions in ground state: **[4]**

a) $Ce^{2+} \longrightarrow 4f^1\ 5d^1$
b) $Ce^{3+} \longrightarrow 4f^1$

c) $Ce^{4+} \longrightarrow 4f^0$

d) $Ce^{2+} \longrightarrow 4f^2$

76. When conc. H_2SO_4 was treated with $K_4[Fe(CN)_6]$, CO gas was evolved. By mistake, somebody used dilute H_2SO_4 instead of conc. H_2SO_4 then the gas evolved was: **[4]**

a) HCN

b) CO_2

c) N_2

d) CO

77. When neutral or faintly alkaline $KMnO_4$ is treated with potassium iodide, iodide ion is converted into **X.X** is_____. **[4]**

a) IO_3^-

b) IO^-

c) I_2

d) IO_4^-

78. In the coordination compound $K_4[Ni(CN)_4]$, the oxidation state of nickel is: **[4]**

a) -1

b) 0

c) +2

d) +1

79. The following statements are TRUE about crystal field theory except: **[4]**

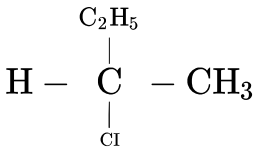
a) It does not explain π bonding in complexes.

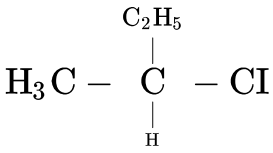
b) The satisfactory explanation is not provided for the fact that water is a stronger ligand than OH^-.

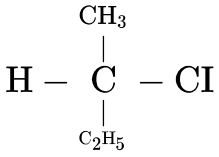
c) Partial covalent nature of metal ligand bond is not explained.

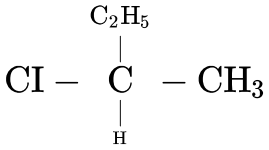
d) It considers s, p and d orbitals of the central metal.

80. CH_3-CHCl-CH_2-CH_3 has a chiral centre which one of the following represents its R-configuration? **[4]**

a) 

b) 

c) 

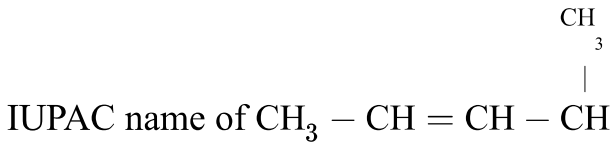
d) 

81. Propene on hydroboration oxidation produces: **[4]**

a) $CH_3CH_2CH_2O$ b) CH_3CH_2CHO

c) $CH_3CHOHCH_2OH$ d) $CH_3CHOHCH_3$

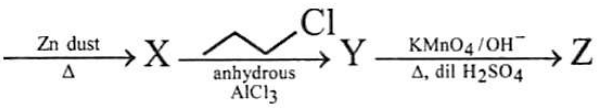
[4]

82. The correct IUPAC name of  is _____.

a) 2-methylbut-1-en-1-ol b) pent-3-en-2-ol

c) pent-4-en-2-ol d) pent-2-en-4-ol

[4]

83. Phenol  **[4]**

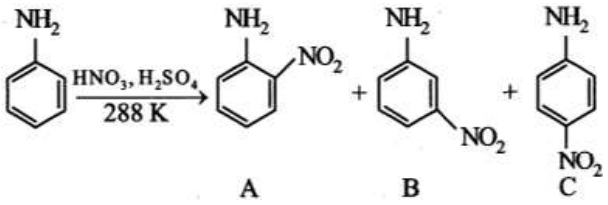
Predict Y and Z.

a) Y = n-Propylbenzene
Z = 2-Propylbenzaldehyde

b) Y = Isopropylbenzene
Z = Benzoic acid

c) Y = Isopropylbenzene
Z = Phenol

d) Y = Propylphenol,
Z = Benzophenone

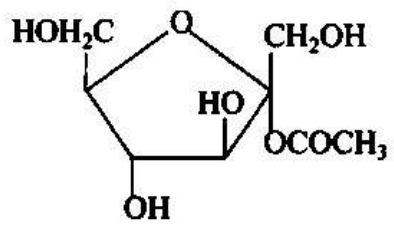
84.  **[4]**

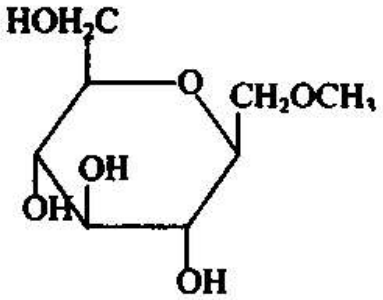
Consider the given reaction, percentage yield of:

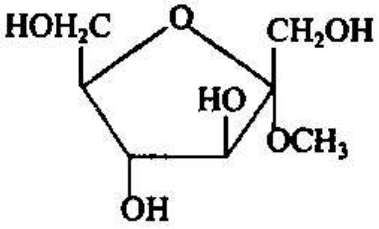
a) A > C > B b) C > A > B

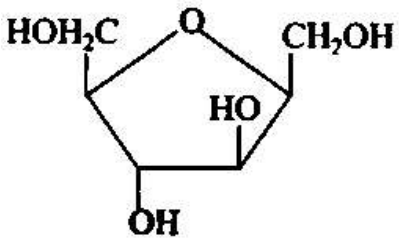
c) C > B > A d) B > C > A

85. Which of the following compounds will behave as a reducing sugar in an aqueous KOH solution? **[4]**

a) 

b) 

c) 

d) 

86. RNA and DNA are chiral molecules, their chirality is due to: **[4]**

a) chiral bases

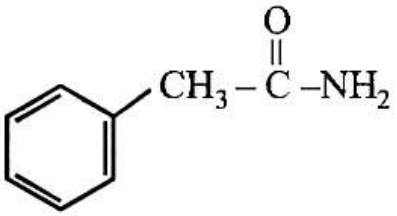
b) chiral phosphate ester units

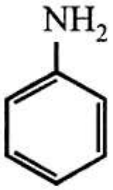
c) D-sugar component

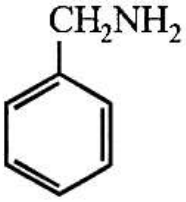
d) L-sugar component

87. Which of the following compounds can be prepared in good yield by Gabriel phthalimide synthesis? **[4]**

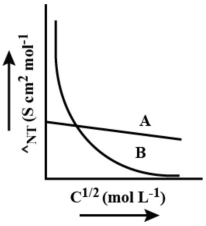
a) $CH_3 - CH_2 - NHCH_3$

b) 

c) 

d) 

88. Mark the correct choice of electrolytes represented in the graph. **[4]**



a) A $\longrightarrow$ CH_3COOH, B $\longrightarrow$ CH_3COONa

b) A $\longrightarrow$ NH_4OH, B $\longrightarrow$ NH_4Cl

c) A $\longrightarrow$ NH_4OH, B $\longrightarrow$ NaCl

d) A $\longrightarrow$ KCl, B $\longrightarrow$ NH_4OH

89. Which techniques is based on the difference in the solubilities of the compound and the impurities in a suitable solvent? **[4]**

a) Crystallisation

b) Sublimation

c) Condensation

d) Distillation

90. When iodine reacts with sodium thiosulphate, the oxidation state of sulphur changes from +4 to _____. **[4]**

a) -2

b) +2

c) $+\frac{3}{2}$

d) $+\frac{5}{2}$

BOTANY

91. The practical purpose of classification of living organisms is to **[4]**

a) facilitate identification of unknown organisms.

b) explain the origin of living organisms.

c) name the living organisms.

d) trace the evolution of living organisms.

92. Taxonomic keys are one of the Taxonomic tools in the identification and classification of plants and animals . it is used in the preparation of: **[4]**

a) Fauna

b) Both Monographs and Flora

c) Monographs

d) Flora

93. Which of the following specie/s is/are included in genus Panthera? **[4]**

a) pardus

b) leo

c) All of these

d) tigris

94. Nitrifying bacteria, Nitrosomonas and Nitrobacter : **[4]**

a) Convert (oxidise) ammonia or ammonium compounds into nitrates.
b) Convert carbon dioxides into carbohydrates.
c) Convert nitrogen into nitrates.
d) Convert nitrate into nitrogen.

95. The germ theory of disease was put forward by : **[4]**

a) Pasteur
b) Koch
c) Devaine
d) Rayer

96. Mature Polygonum type embryo sac has got: **[4]**

a) Eight cells and eight nuclei
b) Seven nuclei and eight cells
c) Seven cells and seven nuclei
d) Seven cells and eight nuclei

97. Which plant will lose its economic value, if its fruits are produced by induced parthenocarpy? **[4]**

a) Banana
b) Orange
c) Grape
d) Pomegranate

98. Select the event that is unique to flowering plants. **[4]**

a) Occurrence of pollination
b) Development of endosperm
c) Double fertilisation
d) Formation of pollen grains

99. How many statements for artificial systems of classification are correct from given statements? **[4]**

i. The classification used only gross superficial morphological characters.
ii. They were based mainly on vegetative characters or on the androecium structure.
iii. Not give equal weightage to vegetative and sexual characteristics.
iv. They separated the closely related species since they were based on a few characteristics.

v. They were based on habit, colour, number and shape of leaves etc.

a) Three
b) One
c) Five
d) Four

100. Which of the following is called red alga? **[4]**

a) Rhodophyceae
b) Phaeophyceae
c) Chlorophyceae
d) All of these

101. The plant body of a liverwort is: **[4]**

a) Thalloid
b) Leaf-like
c) Flower-like
d) Both thalloid and leaf-like

102. Roots in some genera of gymnosperm have fungal association in the form of mycorrhiza found in: **[4]**

a) Sequoia
b) Cycas
c) Cedrus
d) Pinus

103. Select the incorrect statement about sporopollenin. **[4]**

a. Exine is made up of sporopollenin.
b. It can withstand high temperatures and strong acids and alkali.
c. It can be degraded by enzymes.
d. Both (a) and (b)

a) Statement (d) is incorrect.
b) Statement (c) is incorrect.
c) Statement (a) is incorrect.
d) Statement (b) is incorrect.

104. Crassinucellate ovule shows: **[4]**

a) Well developed nucellus
b) Partially developed nucellus
c) Absence of nucellus
d) Poorly developed nucellus

105. Choose the correct statement for the leaf: **[4]**

i. In simple leaf, the lamina is not incised or incisions do not touch the midrib.

ii. In compound leaf, the lamina is divided into a number of leaflets.

iii. A bud is present in the axil of leaflets of the compound leaf, but not in the axil of both simple and compound leaves.

iv. In pinnately compound leaf, leaflets are present on a common axis, the rachis and it found in neem.

v. Palmately compound leaves, the leaflets are attached at a common point, i. e., at the tip of petiole, as in silk cotton.

a) All except (v)
b) All of these
c) (iii), (iv) and (v)
d) All except (iii)

106. When gynoecium is present in the topmost position of the thalamus, the ovary is known as **[4]**

a) Superior
b) Inferior
c) Half superior
d) Half inferior

107. Cambium is most active in: **[4]**

a) Summer
b) Snow areas
c) Winter
d) All seasons

108. Some vascular bundles are described as open because these: **[4]**

a) Are surrounded by pericycle but no endodermis
b) Are not surrounded by pericycle
c) Possess conjunctive tissue between xylem and phloem
d) Are capable of producing secondary xylem and phloem

109.  in pedigree represents: **[4]**

a) Dizygotic twins
b) Sibling brothers
c) Monozygotic twins
d) Either of two

110. Which one of the following character in man is controlled by recessive gene? **[4]**

a) Curly hairs
b) Brachy dactyly
c) Colour blindness
d) Woolly hair

111. The number of base pairs in one pitch in E-DNA is: **[4]**

a) 11
b) 6.66
c) 9.33
d) 7.5

112. Which of the following statements is not true for cancer cells in relation to mutations? **[4]**

a) Mutations inhibit the production of telomerase.
b) Mutations destroy telomerase inhibitors.
c) Mutations inactive the cell control.
d) Mutations in proto-oncogenes accelerate the cell cycle.

113. Which of the following groups is present in leucoplast? **[4]**

a) Chloroplast, mitochondria, and aleuroplasts
b) Chromoplast, elaioplast, and aleuroplasts
c) Amyloplast, elaioplast, and aleuroplasts
d) Amyloplast, chloroplast, and aleuroplasts

114. Ribosomes are found not only in the cytoplasm but also within the two organelles likes: **[4]**

a) Both Chloroplasts and Mitochondria
b) RER
c) Mitochondria
d) Chloroplasts

115. Some proteins are found in the plasma membrane. What part of the protein is within the membrane itself? **[4]**

a) Hydrophobic region
b) Hydrocoel region
c) Hydrophilic region
d) Hydroponic region

116. Physical carcinogen, e.g. UV-ray, X-ray and y-rays causes **[4]**

a) DNA damage
b) Both DNA damage and RNA damage
c) RNA damage
d) protein damage

117. The cell-mediated immunity inside the human body is carried out by: **[4]**

a) B-lymphocytes
b) T-lymphocytes
c) Erythrocytes
d) Thrombocytes

118. Which of the following sets of diseases is caused by bacteria? **[4]**

a) Typhoid and smallpox
b) Cholera and tetanus
c) Herpes and influenza
d) Tetanus and mumps

119. The infectious stage of Plasmodium that enters the human body is **[4]**

a) sporozoites
b) trophozoites
c) male gametocytes
d) female gametocytes

120. G_0 - phase is: **[4]**

a) Phase after M - phase in which daughter cells enter new cell cycle
b) Phase of G_2
c) All of these
d) Arrest of cell cycle and onset of differentiation

121. A population of lotus plants in a pond is 450 in the starting of January 2014. It has a birth rate of 0.2/lotus plant/month. The number of plants after 2 months will be : **[4]**

a) 630
b) 540
c) 648
d) 610

122. If the carbon atoms fixed by producers already have passed through three species, the trophic level of the last species would be: **[4]**

a) Secondary consumer
b) Tertiary producer
c) Tertiary consumer
d) Scavenger

123. Why are flocs important in biological treatment of waste water? **[4]**

a) Microbes present in flocs consume the major part of the organic matter in the effluent
b) Form components of activated sludge
c) Significantly reduces the BOD (Biochemical Oxygen Demand) of the effluent
d) All of these

124. Which of the following in sewage treatment remove suspended solids? **[4]**

a) Sludge treatment
b) Secondary treatment
c) Tertiary treatment
d) Primary treatment

125. The species confined to a particular region and not found elsewhere is termed as **[4]**

a) alien
b) endemic
c) keystone
d) rare

126. Modem ex-situ conservation includes **[4]**

i. cryopreservation techniques
ii. in vitro-fertilization
iii. propagation of plants by using tissue culture methods

a) (ii) and (iii)
b) All of these
c) Only (iii)
d) Only (i)

127. Match the animals given in column I with their location in column II: **[4]**

Column I	**Column II**
(i) Dodo	(A) Africa
(ii) Quagga	(B) Russia
(iii) Thylacine	(C) Mauritius
(iv) Stellar's sea cow	(D) Australia

Choose the correct match from the following:

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

128. Anaphase promoting complex (APC) is a protein degradation machinery necessary for proper mitosis of animal cells. If APC is defective in a human cell, which of the following is expected to occur? **[4]**

a) Chromosomes will not segregate
b) Chromosomes will be fragmented
c) Chromosomes will not condense
d) Recombination of chromosome arms will occur

129. For study of meiosis which is the most suitable material? **[4]**

a) Root tips/shoot tips
b) Young floral buds
c) Mature anthers
d) Young anthers/Testes of grasshopper

130. The main difference between the molecules of chlorophyll a and b is **[4]**

a) chlorophyll a has an aldehyde group while chlorophyll b has a methyl group.

b) chlorophyll a has a methyl group while chlorophyll b has an aldehyde group.

c) the phytol tail is absent in chlorophyll b and is present in chlorophyll a.

d) the porphyrin group in chlorophyll b has manganese atom but chlorophyll a has magnesium atom.

131. Discovery of Emerson effect has already shown the existence of: **[4]**

a) Light and dark reactions of photosynthesis

b) Photorespiration

c) Two distinct photosystems

d) Photophosphorylation

132. During non-cyclic photophosphorylation, electrons lost from the reaction centre of PS II are replaced by the electrons of: **[4]**

a) H_2O

b) O_2

c) CO_2

d) PS I

133. If the total incident solar radiation the proportion of PAR is: **[4]**

a) About 70%

b) Less than 50%

c) About 60%

d) More than 80%

134. A single turn of Krebs' cycle yields: **[4]**

a) 1$FADH_2$, 1 NADH and 1 ATP

b) 1 $FADH_2$, 3NADH and 1 ATP

c) 1 $FADH_2$, 2NADH and 1 ATP

d) 2 $FADH_2$, 2 NADH and 2 ATP

135. The problem of necrosis and gradual senescence, while performing tissue culture can be overcome by **[4]**

a) spraying auxins

b) spraying cytokinins

c) subculture

d) suspension culture

ZOOLOGY

136. Which is free swimming stage in the life history of Fasciola? **[4]**

a) Miracidium
b) Both (Redia) and (Sporozoite)
c) Redia
d) Sporozoite

137. Match the name of the animal (Column I) with one characteristic (Column II) and the phylum/class (Column III) to which it belongs. **[4]**

Column I	**Column II**	**Column III**
(a) Ichthyophis	Terrestrial	Reptile
(b) Limulus	Body covered by chitinous exoskeleton	Pisces
(c) Adamsia	Radially symmetrical	Porifera
(d) Petromyzon	Ectoparasite	Cyclostomata

a) **Coloumn I -** Limulus, **Coloumn II -** Body covered by chitinous exoskeleton, **Coloumn III -** Pisces
b) **Coloumn I -** Adamsia, **Coloumn II -** Radially symmetrical, **Coloumn III -** Porifera
c) **Coloumn I -** Petromyzon, **Coloumn II -** Ectoparasite, **Coloumn III -** Cyclostomata
d) **Coloumn I -** Ichthyophis, **Coloumn II -** Terrestrial, **Coloumn III -** Reptile

138. Which one of the following is a matching set of a phylum with its three examples? **[4]**

a) Porifera : Spongilla, Euplectella, Pennatula
b) Platyhelminthes : Planaria, Schistosoma, Enterobius
c) Mollusca : Loligo, Teredo, Octopus
d) Cnidaria : Bonellia, Physalia, Aurelia

139. Which one of the following is a distinctive character of Class Bivalvia of the phylum Mollusca? **[4]**

a) Presence of a coiled shell
b) Presence of arms or tentacles around the mouth
c) Absence of gills
d) Absence of a head

140. Which of the following group of animals are the members of Class Aves? **[4]**

a) Clarias, Betta, Pterophyllum
b) Neophron, Hemidactylus, Naja
c) Pteropus, Camelus, Macaca
d) Struthio, Pavo, Aptenodytes, Neophron

141. Which of the following statement(s) is/are correct about nervous system of cockroach? **[4]**

i. It consists of a series of fused segmentally arranged ganglia joined by paired longitudinal connectives on the ventral side.
ii. There are six ganglia which lie in the thorax, and three in the abdomen.
iii. The sense organs are antennae, eyes, maxillary pulps, labial pulps, and anal cerci etc.
iv. Each eye consists of about 5000 hexagonal ommatidia.

a) Only (iii)
b) Both (i) and (iii)
c) Only (ii)
d) Both (i) and (iv)

142. The dorsal surface of the body is marked by a dark median mid-dorsal line along the longitudinal axis of the body represents: **[4]**

a) Ventral blood vessel
b) Heart
c) All of these
d) Dorsal blood vessel

143. Desmosomes are associated with: **[4]**

a) Cell division
b) Cytolysis
c) Cell excretion
d) Attachment of cells

144. Select the correct events that occur during inspiration. **[4]**

i. Contraction of diaphragm

ii. Contraction of external intercostal muscles

iii. Pulmonary volume decreases

iv. Intra pulmonary pressure increases

a) Option (i)

b) Option (iii) and (iv)

c) Option (i), (ii) and (iv)

d) Option (i) and (ii)

145. Oxyhemoglobin dissociates into oxygen and deoxyhemoglobin at **[4]**

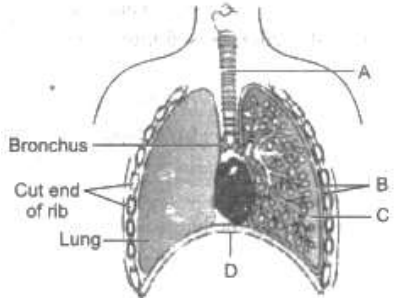
a) low O_2 pressure in tissue.

b) all times irrespective of O_2 pressure.

c) high O_2 pressure in tissue.

d) equal O_2 pressure inside and outside tissue.

146. The figure shows a diagrammatic view of the human respiratory system with labels A, B, C, and D. Select the option which gives correct identification and main function and/or characteristic. **[4]**



a) B-pleural membrane - surround ribs on both sides to provide cushion against rubbing

b) D-Lower end of lungs - diaphragm pulls it down during inspiration

c) A-trachea - long tube supported by complete cartilaginous rings for conducting inspired air

d) C-Alveoli - thin walled vascular bag like structures for exchange of gases

147. Bulk of oxygen diffuses from the plasma into the red blood corpuscles where it joins loosely with Fe^{2+} ions of hemoglobin (Hb) to form bright red oxyhemoglobin (HbO_2). The process is called **[4]**

a) dehydrogenation
b) oxidation
c) oxygenation
d) hydration

148. When temperature decreases, oxy-Hb curve becomes **[4]**

a) more steep
b) steeper
c) parabola
d) straight

149. Which of the following organ receives electrical messages from the brain for breathing in and out? **[4]**

a) Trachea
b) Diaphragm
c) Bronchioles
d) Alveoli

150. Liver and pancreas are derived from: **[4]**

a) Mesentery
b) Endoderm
c) Both Ectoderm and Mesentery
d) Ectoderm

151. Choose the incorrect pair. **[4]**

a. Antrum - Fluid-filled cavity in secondary follicle
b. Tertiary follicle - Primary oocyte completes its first meiotic division inside it
c. Secondary oocyte - Haploid cell formed after first meiotic division
d. Graafian follicle - Mature secondary follicle which ruptures during ovulation

a) Option (c) is incorrect pair.
b) Option (a) is incorrect pair.
c) Option (d) is incorrect pair.
d) Option (b) is incorrect pair.

152. How many statements are correct for fertilization? **[4]**

i. The motile sperms swim rapidly enter into the uterus after insemination and finally reach fallopian tube.
ii. Fertilisation only occurs at the ampullary- isthmic junction.
iii. During fertilisation, a sperm comes in contact with the zona pellucida layer of the ovum and induces changes in the membrane that block the entry of additional

sperms.

iv. The secretions of the acrosome help the sperm enter into the cytoplasm of the ovum and induce the completion of the meiotic division of the secondary oocyte.

v. Scientifically it is correct to say that the sex of the body is determined by the father and not by the mother.

a) Four
b) Two
c) Five
d) One

153. First menstrual cycle is known as: **[4]**

a) Menopause
b) Amenorrhoea
c) Menarche
d) Metastasis

154. In a test-tube baby programme which of the following is not occurring? **[4]**

a) IVF followed by IUT
b) In Vitro Fertilization (IVF) and Embryo Transfer (ET)
c) In Vivo Fertilization-Embryo Recovery-Embryo Transfer
d) In Vitro Fertilization (IVF) and ZIFT or IUT

155. According to the 2001 census report, the population growth rate was still around 1.7 percent, our population could double in 33 years. How the government check this population growth rate? **[4]**

a) Motivate smaller families by using various contraceptive methods
b) Incentives given to couples with small families
c) All of these
d) Statutory raising of marriageable age

156. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive? **[4]**

a) GIFT and ICSI
b) ZIFT and IUT

c) GIFT and ZIFT
d) ICSI and ZIFT

157. The golden age of reptiles was **[4]**

a) Coenozoic era
b) Palaeozoic era
c) Proterozoic era
d) Mesozoic era

158. Which of the following fossil men had religious feelings of worship and used burial customs? **[4]**

a) African ape men
b) Neanderthal men
c) Peking men
d) Java men

159. Duct of Bellini opens on: **[4]**

a) Renal papilla
b) Ureter
c) Duodenum
d) DCT

160. Given below are few layers between the glomerular and Bowman's capsule through which the filtration takes place. **[4]**

i. Endothelium of the glomerular blood vessel.
ii. Middle lamella.
iii. Basement membrane between the endothelium of glomerular blood vessels and epithelium of the Bowman's capsule.
iv. Epithelium of the Bowman's capsule.

Identify the correct layers.

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

161. A person who is not taking food or beverages will have in urine: **[4]**

a) Excess urea
b) Little fat
c) Less urea
d) Little glucose

162. Waste product of adenine and guanine metabolism are excreted by man as **[4]**

a) Urea
b) Allantoin
c) Ammonia
d) Uric acid

163. The cervical vertebrae are characterized by the presence of: **[4]**

a) Odontoid process
b) Transverse process
c) Vertebra-arterial canals
d) Amphiplateus centrum

164. Isotonic contraction takes places during: **[4]**

a) Exercise
b) Load on head
c) All of these
d) Walking

165. In skeletal muscle Z-line is connected to: **[4]**

a) Myosin
b) Actin
c) Henson's line
d) Tropomyosin

166. Blind spot is called so because of: **[4]**

a) the presence of photoreceptor cells.
b) the absence of optic nerves.
c) the absence of photoreceptor cells.
d) the presence of optic nerves.

167. Which of the following statements is correct regarding the organ of sight-eye? **[4]**

a) The space between cornea and lens is filled with transparent gel.
b) When all cones are stimulated equally, a sensation of no light (dark) is produced.
c) The anterior transparent portion of choroid is called cornea.
d) Rhodopsin is purplish red protein, hence called visual purple.

168. Which cranial nerve has the highest number of branches? **[4]**

a) Trigeminal nerve
b) Facial nerve
c) Vagus nerve
d) Optic nerve

169. Alzheimer's disease in humans is associated with the deficiency of **[4]**

a) acetylcholine
b) glutamic acid
c) gamma-aminobutyric acid (GABA).
d) dopamine

170. Which endocrine gland not becomes inactive in old age? **[4]**

a) Pituitary
b) hypophysis
c) Thymus
d) Adrenal

171. Given below is an incomplete table on hormones, their source glands and one major effect of each human body. Identify the option representing correct grouping of hormone its gland and effect. **[4]**

Gland	Secretion	Effect on body
A	Oestrogen	Maintenance of secondary sexual characters
Alpha cells of Islets of Langerhans	B	Raises blood sugar level
Anterior pituitary	C	Over secretion leads to gigantism

a) (A) - Ovary, (B) - Insulin, (C) - Calcitonin
b) (A) - Placenta, (B) - Insulin, (C) - Vasoperssin
c) (A) - Ovary, (B) - Glucagon, (C) - Growth hormone
d) (A) - Placenta, (B) - Glucagon, (C) - Calcitonin

172. State whether true or false: **[4]**

A. Gastrointestinal tract, kidney and heart also produce hormones.

B. Pars distalis produces six trophic hormones.

C. B-lymphocytes provide cell-mediated immunity.

D. Insulin resistance results in a disease called diabetes mellitus.

a) (A)-T, (B)-T, (C)-F, (D)-T

b) (A)-F, (B)-F, (C)-T, (D)-T

c) (A)-T, (B)-T, (C)-F, (D)-F

d) (A)-T, (B)-F, (C)-T, (D)-T

173. Which of the following is the correct statement about the circulatory system of cockroach? **[4]**

a) It has a closed type of circulatory system.

b) It has a complicated type of circulatory system.

c) It has 13 chambered heart and in each segment one pair of ostia are present.

d) It takes place without the participation of tissue.

174. The haemoglobin content per 100 ml of blood of a normal healthy human adult is: **[4]**

a) 12-16 mg

b) 25-30 mg

c) 5-11 mg

d) 17-20 mg

175. Which of the following sequences is truly a systemic circulation pathway? **[4]**

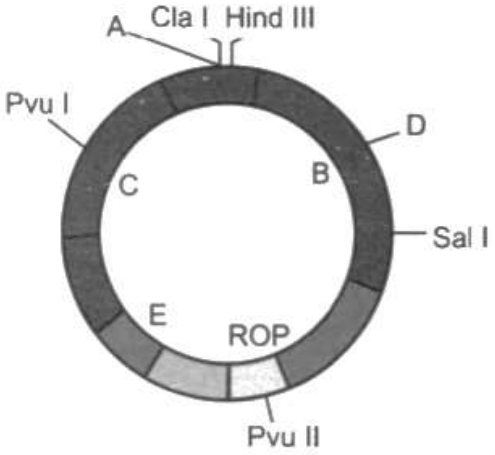
a) Left auricle → Left ventricle → Pulmonary aorta → Tissues → Right auricle

b) Left auricle → Left ventricle → Aorta → Arteries → Tissues → Veins → Right atrium

c) Right ventricle → Pulmonary aorta → Tissues → Pulmonary veins → Left auricle

d) Right auricle → Left ventricle → Aorta → Tissues → Veins → Right auricle

176. Identify A, B, C, D, E in the given diagram of E. coli cloning vector pBR 322 and select the correct option. **[4]**



A	B	C	D	E
(a) Bam HI	tet^R	amp^R	EcoRI	Hind I
(b) EcoRI	tet^R	amp^R	BamHI	Ori
(c) Ori	EcoRI	amp^R	BamHI	tet^R
(d) EcoRI	amp^R	tet^R	BamHI	Ori

a) Only b
b) Only a
c) Only c
d) Only d

177. Enzyme Taq polymerase used in PCR, has been isolated from bacterium, **[4]**

a) Escherichia coli
b) Agrobacterium tumefaciens
c) Streptomyces albus
d) Thermus aquaticus

178. The significance of heat shock method in bacterial transformation is to facilitate: **[4]**

a) Uptake of DNA through membrane transport proteins
b) Binding of DNA to the cell wail
c) Expression of antibiotic resistance gene
d) Uptake of DNA through transient pores in the bacterial cell wall

179. Vaccine for small pox was developed by: **[4]**

a) Louis Pasteur
b) Salman Waksman

c) Cesor Milstein

d) Edward Jenner

180. Bioprospecting includes: **[4]**

a) Preserving knowledge of indigenous forms by activists.

b) Exploitative appreciation of indigenous forms of knowledge by commercial actors.

c) Exploitative appreciation of indigenous forms of knowledge by naturalists.

d) Exploitative appreciation of foreign knowledge by commercial actors.

S O L U T I O N

PHYSICS

1.

(c) i, ii and iii

Explanation:

Capacitance, = $[M^{-1}L^{-2}T^{4}I^{2}]$

Resistance, R = $[ML^{2}T^{-3}r^{-2}]$

Inductance, L = $[ML^{2}T^{-2}r^{2}]$

Electric current, I = [I]

∴ Dimensional formulae of CR, $\frac{L}{R}$ and $\sqrt{LC}$ is same as that of time.

2.

(b) 0

Explanation:

$h \propto G^{x}L^{y}E^{z}$

$[M^{1}L^{2}T^{-1}] = [M^{-1}L^{3}T^{-2}]^{x}[M^{1}L^{2}T^{-1}]^{y}[M^{1}L^{2}T^{-2}]^{z}$

$[M^{1}L^{2}T^{-1}] = k[M^{-1}L^{3}T^{-2}]^{x}[M^{1}L^{2}T^{-1}]^{y}[M^{1}L^{2}T^{-2}]^{z}$

Comparing the powers, we get;

1 = - x + y + z ...(i)

2 = 3x + 2y + 2z ...(ii)

-1 = - 2x - y - 2z ...(iii)

On solving eqns. (i), (ii) and (iii), we get;

x = 0

3. **(a)** $[ML^{2}T^{-2}A^{-2}]$

Explanation:

Induced emf |e| = $L\frac{dI}{dt}$

$\therefore [L] = \frac{[e]}{[dI/dt]} = \frac{[W/q]}{[dI/dt]} = \frac{[ML^{2}T^{-2}/AT]}{[AT^{-1}]}$

= $[ML^{2}T^{-2}A^{-2}]$.

4.

(c) 11 : 7

Explanation:

$s = \frac{2\pi r}{2} = \pi r$

displacement = 2r

$\therefore \frac{s}{\text{displacement}} = \frac{\pi}{2} = \frac{11}{7}$

5.

(b) 36 s

Explanation:

Let distance be S

$V_{\text{man}} = \frac{s}{90}$

$V_{\text{escalator}} = \frac{s}{60}$

V_{man} on moving escalator w.r.t ground $V_{\text{man}} + V_{\text{escalator}} = s\left(\frac{1}{90} + \frac{1}{60}\right) = \frac{s}{36}$

Time $= \frac{s}{v} = \frac{s}{\frac{s}{36}} = 36$

6.

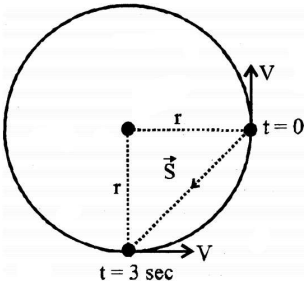
(b) $10\sqrt{2}$

Explanation:

$|\overrightarrow{S}| = \sqrt{r^2 + r^2}$

$= \sqrt{2}r = \sqrt{2} \times 10$

$= 10\sqrt{2}$ m



7.

(b) North - West

Explanation:

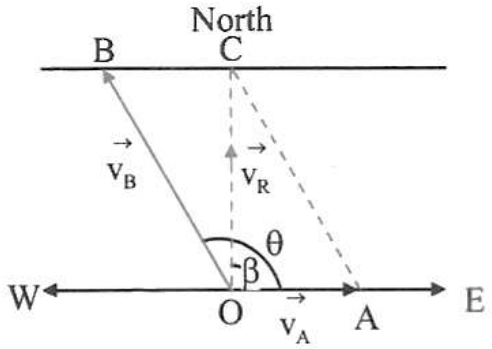
From the addition of two vectors, we know that

$C^2 = A^2 + B^2 + 2AB\cos\theta$

From this expression, it is clear that,

$C^2 < A^2 + B^2$ when $\theta > 90^o$

i.e., when $\theta > 90^o$, the man can cross the river in the shortest time.



From diagram, it is clear that man should swim in a northwest direction.

8. **(a)** only iii

   Explanation:

   The horizontal component of velocity remains constant throughout the motion, as it is not affected by the acceleration due to gravity which is directed vertically downwards.

9. **(b)** both Newton's second and third law

   Explanation:

   Conservation of momentum in a collision between particles can be understood from both Newton's second and third law.

10. **(a)** accelerated downward

    Explanation:

    accelerated downward

11. **(c)** $(9.8 - \frac{2v}{t})$ m/s^2 downwards

    Explanation:

    Variation of apparent weight of the body with acceleration of the lift:

    If lift is moving upward,

    $F = m(g + a)$

    Also, $v = u + \frac{1}{2}at$

    $\Rightarrow a = \frac{2v}{t}$

    $\therefore$ Acceleration of the lift $= g + \frac{2v}{t}$

    If lift is moving downward,

    $F = m(g - a)$

    $\therefore$ Acceleration of the lift $= g - \frac{2v}{t} = 9.8 - \frac{2v}{t}$ m/s^2

12. **(b)** $\frac{V^2}{T^2}t$

Explanation:

Power = $\frac{\text{work done}}{\text{time}} = \frac{V^2t^2}{T^2t}$

i.e., Power $\propto \frac{V^2t}{T^2}$

13.

(c) $\frac{2\sqrt{2}}{3}$v

Explanation:

In elastic collision

$(K.E.)_{\text{before collision}} = (K.E.)_{\text{After collision}}$

speed of second body after collision v_2 can be found as

$\frac{1}{2}mv^2 + 0 = \frac{1}{2}m\left(\frac{v}{3}\right)^2 + \frac{1}{2}m(v_2)^2$

$\therefore v^2 = \frac{v^2}{9} + v_2^2$

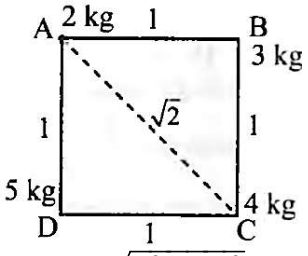
$\therefore \frac{8v^2}{9} = v_2^2$

$\therefore v_2 = \frac{2\sqrt{2}}{3}v$

14.

(c) $\sqrt{\frac{8}{7}}$ m

Explanation:



AC = $\sqrt{1^2 + 1^2} = \sqrt{2}$ m

$\therefore I_A = 3 \times 1^2 + 4 \times (\sqrt{2})^2 + 5 \times 1^2$

$= 3 + 8 + 5$

$= 16$ kg m^2

$\therefore MK^2 = 16$

$\therefore K^2 = \frac{16}{2+3+4+5}$

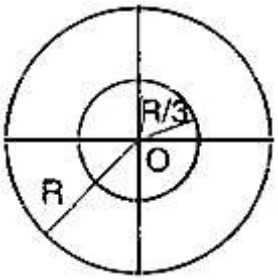
$= \frac{16}{14} = \frac{8}{7}$

or K = $\sqrt{\frac{8}{7}}$ m

15.

(b) $\frac{40}{9}MR^2$

Explanation:



Mass of the disc = 9M

Mass of removed portion of disc = M

The moment of inertia of the complete disc about an axis passing through its centre O and perpendicular to its plane is,

$I_1 = \frac{9}{2}MR^2$

Now, the moment of inertia of the disc with removed portion,

$I_2 = \frac{1}{2}M\left(\frac{R}{3}\right)^2 = \frac{1}{18}MR^2$

Therefore, moment of inertia of the remaining portion of disc about O is,

$I = I_1 - I_2$

$= 9\frac{MR^2}{2} - \frac{MR^2}{18} = \frac{40MR^2}{9}$

16. **(a)** 6.67×10^{-10} J

Explanation:

$W = \Delta U = 0 - \left(-\frac{GMm}{R}\right)$

$= \frac{6.67 \times 10^{-11} \times 100 \times 10 \times 10^{-3}}{10 \times 10^{-2}}$

$= 6.67 \times 10^{-10}$ J

17. **(a)** Option (B)

Explanation:

As, $g = \frac{GM}{R^2}$

For constant mass, $g \propto \frac{1}{R^2}$

∴ Graph g vs R is a parabola.

Now, for constant radius,

∴ $g \propto M$

As $M_1 > M_2 > M_3 > M_4 > M_5$

∴ $g_1 > g_2 > g_3 > g_4 > g_5$.

18.

(b) 4g

Explanation:

$g = \frac{GM}{R^2}$, If radius shrinks to half of its present value, then g will become four times.

19. **(a)** steel, brass and rubber respectively.

Explanation:

$Y = \tan\theta$

According to figure, $\theta_A > \theta_B > \theta_C$

i.e., $\tan\theta_A > \tan\theta_B > \tan\theta_C$

or $Y_A > Y_B > Y_C$

∴ A, B, and C graph are for steel, brass and rubber respectively.

20.

(d) coefficient of linear expansion

Explanation:

For metallic strip to bend on change in temperature the coefficient of linear expansion should be different.

21.

(c) 15 gm

Explanation:

15 gm

22. **(a)** 0.4

Explanation:

For ideal monoatomic gas

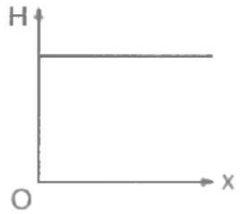
$C_p = \frac{5R}{2}$

or $R = \frac{2}{5} C_p = 0.4\ C_p$

∴ n = 0.4

23.

(c)



Explanation:

Since the curved surface of the conductor is thermally insulated, therefore, in steady-state, the rate of heat flow at every section will be the same. Hence, the curve between H and x will be

a straight line parallel to x-axis.

24.

(d) $2\sqrt{2}$:1:2

Explanation:

Let the initial pressure of the three samples P_A, P_B and P_C, then

$P_A(V)^{3/2} = (2V)^{3/2}P$ ($\because P_B = P$)

or $P_A = P(2)^{3/2}$

$P_C(V) = P(2V)$

or $P_C = 2P$

$\therefore P_A:P_B:P_C$

$= (2)^{3/2}:1:2 = 2\sqrt{2}:1:2$

25.

(b) Hydrogen

Explanation:

For all gases at the same temperature,

$v_{\text{rms}} \propto \frac{1}{\sqrt{M}}$

So, vrms is maximum for the lightest gas, i.e., hydrogen.

26.

(b) 8 k

Explanation:

If a spring constant k is divided into n equal parts, the spring constant of each part becomes nk. So, effective spring constant.

$k = k_1 + k_2$

$= 4k + 4k = 8k$

27.

(d) Decreases

Explanation:

Decreases

28.

(d) 17 m

Explanation:

The minimum distance for echo hearing is,

$\Delta x = \frac{1}{2}$ (v $\times$ Δt)

velocity of sound v = 340 m/sec, minimum time to return sound t = 0.1 sec

so required distance = $\frac{1}{2}$ (340 $\times \frac{1}{10}$) = 17 m

29.

(c) 2

Explanation:

v = $\sqrt{\frac{Y}{\rho}}$

where Y = Young's modulus

ρ = Mass density

Since solid bars are made up of the materials with same density,

hence $\rho_1 = \rho_2$ and $\frac{v_1}{v_2} = \sqrt{\frac{Y_1}{Y_2}} = \sqrt{4} = 2$

30.

(d) 2.0 $\times$ 10^8 N

Explanation:

2.0 $\times$ 10^8 N

31.

(c) $W_A = W_B$

Explanation:

As potential at A and B is the same $V_A = V_B = \frac{kQ}{d}$.

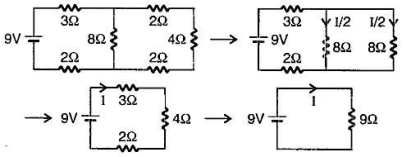
and W = qΔV

ΔV in both the cases is same. So work done in both the cause will be the same.

32.

(b) 0.5 A

Explanation:



$\therefore \quad I = \frac{E}{R_{\text{total}}} = \frac{9\text{V}}{9\Omega} = 1$ amP

Hence, it is clear from the figure that current through the 4 Ω

resistor = $\frac{1}{2} = \frac{1}{2}$ amP = 0.5 amp

33.

(c) 0.1 J

Explanation:

Work done in rotating a coil through angle θ from it's equilibrium position:

$W = MB(1 - \cos\theta)$, $\theta = 180^{o}$ and $M = NAi$

Now, $W = 2iNAB$

$= 2 \times 2 \times 50 \times \pi(4 \times 10^{-2})^2 \times 0.1$

$= 0.1$ J

34.

(b) tall and narrow

Explanation:

The transformer core is soft iron material which has small coercivity and large retentivity. Therefore its hysteresis loop is tall and narrow.

35. **(a)** above the Curie temperature

Explanation:

We know from the Curie-Weiss law that susceptibility of a ferromagnetic substance above its Curie temperature is inversely proportional to the excess of temperature above the Curie temperature. Since iron is a ferromagnetic substance, therefore Curie-Weiss law is obeyed by it at a temperature above the Curie temperature.

36.

(b) 14 unit

Explanation:

When current is started, change in current is from O to I. On suddenly rotating through 180°, change in current is from I to -I or change in current is 2I.

$\phi_s = M\Delta I$

As $I_S = \frac{E_s}{R} = \frac{1}{R}\frac{d\phi}{dt}$

is doubled, so deflection is doubled, i.e., it becomes equal to 14 units.

37. **(a)** 0.15 mV

Explanation:

Here, $Bh = 5.0 \times 10^{-5} NA^{-1}m^{-1}$,

$l = 2$ m and $v = 1.5$ m s^{-1}

Induced emf, $\varepsilon = B_H vl = 5 \times 10 \times 1.50 \times 2$

$= 15 \times 10^{-5} V = 0.15$ mV

38. **(a)** $NAB\omega$

Explanation:

In an AC generator, the emf generated is maximum when flux is maximum. It is possible if angle between area vector of the coil and magnetic field is 0^{o}. In such case the emf generated is e = NBAω cos ωt. On neglecting cos ωt, maximum value of emf generated in the coil is e = NBAω

39.

(d) 40 MHz

Explanation:

The ionosphere can reflect electromagnetic waves of frequency less than 40MHz but not of frequency more than 40MHz.

40. **(a)** The ratio of focal length to the aperture is 4.5.

Explanation:

The ratio of focal length to the aperture is 4.5.

41.

(c) Its size decreases, but intensity increase

Explanation:

$\because \sin\theta = \frac{1.22\lambda}{D}$, where D is opening diameter.

When opening size diameter of the pinhole is increased, the diffraction size decreases but intensity increases.

42.

(d) 1 : 1

Explanation:

Given that; the velocity of α-particle [nucleus of $_2He^4$] = v

the velocity of the deuteron ($_1D^2$) = 2v

We know that, the de Broglie wavelength,

$\lambda = \frac{h}{mv}$ ...(i)

So, the de Broglie wavelength for α-particle,

$\lambda_\alpha = \frac{h}{4\times v}$ [m_α = 4] ...(ii)

and the de Broglie wavelength for deutron,

$\lambda_D = \frac{h}{2\times 2v}$ [m_D = 2] ...(iii)

On dividing eqn. (ii) by eqn. (iii)

$\frac{\lambda_\alpha}{\lambda_D} = \frac{h/4v}{h/4v} = \frac{1}{1}$

or $\lambda_\alpha : \lambda_D$ = 1 : 1

43.

(b) 1.1 eV

Explanation:

When an electron moves in a circular path, then

$r = \frac{mv}{eB} \quad \Rightarrow \quad \frac{r^2e^2B^2}{2} = \frac{m^2v^2}{2}$

$KE_{max} = \frac{(mv)^2}{2m} \Rightarrow \frac{r^2e^2B^2}{2m} = (KE)_{max}$

Work function of the metal (W), i.e. W = hv - KE_{max}

$1.89 - \phi = \frac{r^2e^2B^2}{2m}\frac{1}{2}eV = \frac{r^2eB^2}{2m}eV$[hv $\rightarrow$1.89 eV, for the transition on from third to second orbit of H-atom]

$= \frac{100\times10^{-6}\times1.6\times10^{-19}\times9\times10^{-8}}{2\times9.1\times10^{-31}}$

$\phi = 1.89 - \frac{16\times9}{2\times9.1}$ = 1.89 - 0.79 = 1.1 eV

44.

(c) 10^{-12} cm

Explanation:

At the distance of closest approach

$KE = \frac{1}{4\pi\varepsilon_0}\left(\frac{2Ze^2}{r}\right)$

i.e., $5 \times 10^6 \times 1.6 \times 10^{-19}$

$= \frac{9\times10^9\times\left(2\times1.6\times10^{-19}\right)\left(92\times1.6\times10^{-19}\right)}{r}$

$\therefore r = 5.2 \times 10^{-12}$ cm

45.

(d) 10^{12} s

Explanation:

$_1H^2 + {}_1H^2 \rightarrow {}_1H^3 + p$

$_1H^2 + {}_1H^3 \rightarrow {}_2He^4 + n$

By adding given two equation $3\,{}_1H^2 \rightarrow {}_2He^4 + p + n$

$\Delta m = 3(2.014) - [4.001 + 1.007 + 1.008] = 0.026$

3 deuterons release 3.87×10^{-12} J

$\therefore 10^{40}$ deuterons release = $\frac{3.87\times10^{-12}\times10^{40}}{3}$

$= 1.29 \times 10^{28}$ J

Power, $P = \frac{E}{t} \Rightarrow t = \frac{E}{P} = \frac{1.29\times10^{28}}{10^{16}} = 1.29 \times 10^{12}$

CHEMISTRY

46. **(a)** 39.94 amu

Explanation:

Average atomic mass = $\frac{\text{Sum of (Isotopic mass} \times \text{its \% abundance)}}{100}$

$= \frac{(35.97 \times 0.337) + (37.96 \times 0.063) + (39.96 \times 99.6)}{100}$

= 39.94 amu

47.

(c) $MnO_4^- = 2$, $C_2O_4^{2-} = 5$, $H^+ = 16$

Explanation:

The balanced redox reaction is

$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \longrightarrow 2Mn^{2+} + 10CO_2 + 16H_2O$

Hence, the coefficients of reactants in balanced reaction are 2, 5 and 16 respectively.

48.

(d) 5.27×10^{-30} m

Explanation:

Use $\Delta x \cdot \Delta p = \frac{h}{4\pi}$

49.

(b) 3s

Explanation:

Orbit	**Angular nodes** (ℓ)	**Radial nodes** **(n - ℓ - 1)**
2p	$\ell = 1$	2 - 1 - 1 = 0
3p	$\ell = 1$	3 - 1 - 1 = 1
3s	$\ell = 0$	3 - 0 - 1 = 2
2s	$\ell = 0$	2 - 0 - 1 = 1

3s orbital has no angular nodes and two radial nodes.

50.

(b) 1.5×10^{15} sec^{-1}

Explanation:

$v = c\bar{v}$

$= 3 \times 10^8$ $ms^{-1} \times 5 \times 10^6$ m^{-1}

$v = 1.5 \times 10^{15}$ sec^{-1}

51.

(b) B

Explanation:

p-block element: electronic configuration is ns^{1-2} np^{1-6}

52. **(a)** All of these

Explanation:

$Li_2CO_3 \xrightarrow{\Delta} Li_2O + CO_2$

$LiBF_4 \xrightarrow{\Delta} LiF + BF_3$

$BeSO_4 \xrightarrow{\Delta} BeO + SO_2 + \frac{1}{2}O_2$

$Na_2O_2 \xrightarrow{\Delta} Na_2O + \frac{1}{2}O_2$

$BeCO_3 \xrightarrow{\Delta} BeO + CO_2$

In all of the above reactions, the lattice energy of the product is higher as compared to the reactant.

53.

(b) +1

Explanation:

+1

54.

(c) 3

Explanation:

Electronic configuration of NO^+ molecule is

$NO^+ : KK(\sigma 2s)^2(\sigma^* 2s)^2(\sigma 2p_2)^2(\pi 2p_x)^2$

$\equiv (\pi 2p_\nu)^2(\pi^* 2p_x)^0$

KK represents closed K shell structure $(\sigma 1s)^2(\sigma^* 1s)^2$

Bond order of NO^+ molecule = $\frac{N_b - N_a}{2} = \frac{8-2}{2} = 3$

55.

(b) 1 : 1

Explanation:

1 : 1

56.

(b) $= \Delta E$

Explanation:

$H_{2(g)} + I_{2(g)} \rightarrow 2HI_{(2g)}$

$\Delta n = No.$

of gaseous product - no.of gaseous reactant

= 2 -(1+1) =0

$As \Delta H = \Delta E + \Delta nRT$

$\Rightarrow \Delta H = \Delta E + 0 \times RT$

$\Rightarrow \Delta H = \Delta E$

57.

(d) 3

Explanation:

$NaH_2PO_4 + H_3PO_4$; $NaH_2PO_4 + Na_2HPO_4$; $Na_2HPO_4 + Na_3PO_4$

58.

(b) iv and i

Explanation:

Neither there is an oxidant nor reductant or none of the species shows the change in oxidation no.

59.

(d) 7.19 g, 10.8 g

Explanation:

7.19 g, 10.8 g

60.

(c) only i

Explanation:

$XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$

$Xe^{4+} \rightarrow Xe^{6+} + 2e$

$2e + (O^{+1})_2 \rightarrow O_2^0$

61.

(d) All of these

Explanation:

All of these

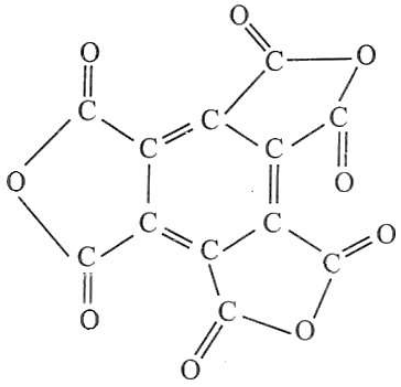
62.

(d) $C_{12}O_9$

Explanation:

Graphite produce mellitic acid $C_6(COOH)_6$ with oxidising agent and its anhydride is $C_{12}O_9$.

Structure of $C_{12}O_9$



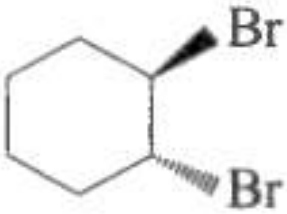
63.

(d) $CH_3 - \overset{+}{\underset{|}{C}}_{CH_3} - CH_3$

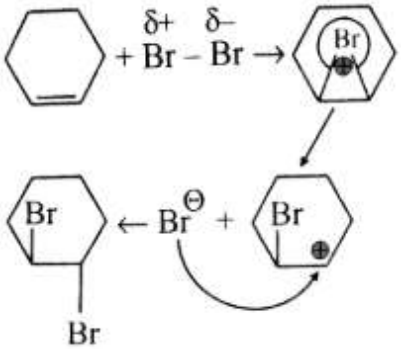
Explanation:

$CH_3 - \overset{+}{\underset{|}{C}}_{CH_3} - CH_3$

64. **(a)**



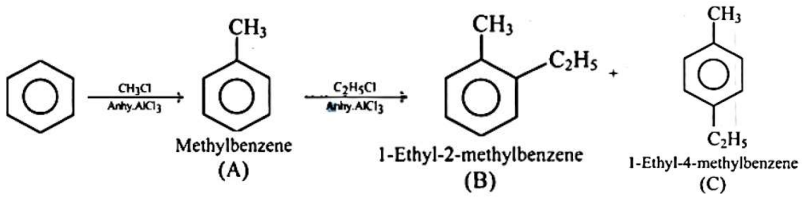
Explanation:



65.

(d) Product B - Ratio 2:1, Product C - Ratio 2:1

Explanation:

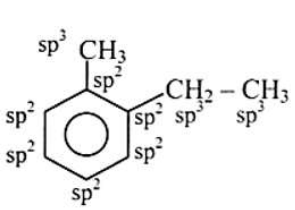


For both the products B and C:

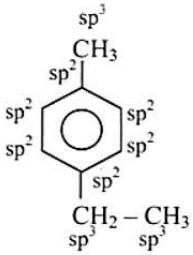
Number of C-atoms with sp^3 hybridization = 3

Number of C-atoms with sp^2 hybridization = 6

Ratio = $\frac{6}{3} = \frac{2}{1}$



Product (B)



Product (C)

66.

(b) 10.34

Explanation:

10.34

67.

(c) it loses water due to exo osmosis

Explanation:

When unripe mango is dipped in saturated solution then it loses water due to exosmosis.

68.

(d) -6.5^{o}C

Explanation:

Element	**% Composition**	**Moles**
C	66.66	$66.66\ g \times \frac{1\ mol}{12\ g} = 5.5\ mol$
H	3.73	$3.73\ g \times \frac{1\ mol}{1.008\ g} = 3.7\ mol$
O	29.62	$29.62\ g \times \frac{1\ mol}{16\ g} = 1.85\ mol$

$C_{\frac{5.5}{1.85}} H_{\frac{3.7}{1.85}} O_{\frac{1.85}{1.85}}$

$\therefore$ Empirical formula = C_3H_2O

Molar mass = 54 g/mol

Now, $T_{f(solution)} = T^0_{f(\ solvent\ )} - \Delta T_f$

$\Delta T_f = m \cdot K_f = \frac{3.15}{54 \times 0.025} \times 5.12$

$\Delta T_f = 11.95^{o}C$

$\therefore T_{f(solution)} = 5.5 - 11.95 = -6.45 \approx -6.5^{o}C$

69. **(a)** -0.093°C

Explanation:

$\Delta T_f = 1.86 \times 0.05 = 0.093$;

$\therefore T_f = 0 - 0.093 = -0.093°C$

70.

(c) -0.0708 V

Explanation:

For the given hydrogen electrode,

Pressure of H_2 = 1 bar and pH = 1.2

Pressure of H_2 is 1 bar (or 1 atm) and $[H^+] \neq 1$ M

$E_{\frac{H+}{H_2}} = \frac{0.059}{2}\log_{10}[H^+]^2$

$= 0.059 \times \log_{10}[H^+]$

$= 0.059 \times [-pH]$

$E_H = 0.059 \times (-pH) = 0.059 \times (-1.2) = -0.0708$ V

71.

(d) (S)

Explanation:

Initial conductance (Λ) of solution was due to $K^+_{(aq)}$ and $Cl^-_{(aq)}$ .On addition of $AgNO_3$, the reaction occurs as

$AgNO_3$ (aq) + KCl(aq) $\rightarrow$ AgCl $\downarrow$ + KNO_3

Showing $AgNO_3$ as limiting reagent upto complete precipitation. The conductance up to precipitation shows horizontal linearly due to $K^+_{(aq)}$ and (left Cl^- formed NO_3) anions as ionic mobility of NO_3 and CP are almost same. After complete precipitation, further addition of $AgNO_3$, the conductance is observed due to K^+, NO_3 ions and added Ag^+, NO_3 ions thus a sudden increase is noticed.

72.

(d) It prevents the flow of current between the two half-cells.

Explanation:

It prevents the flow of current between the two half-cells.

73.

(c) 3.47×10^{-4} M min^{-1}

Explanation:

$K = \frac{2.303}{40}\log\frac{0.1}{0.025}$

$\therefore K = 0.03466\ min^{-1}$

rate = $K \times 0.01 = 0.03466 \times 0.01 = 3.47 \times 10^{-4}$ M min^{-1}

74.

(d) 4.1

Explanation:

The half life $t_{\frac{1}{2}}$ = 10 days The decay constant,

$K = \frac{0.693}{t_{\frac{1}{2}}} = \frac{0.693}{10 \text{ days}} = 0.0693 \text{ days}^{-1}$

The time required for one fourth conversion

$t = \frac{2.303}{k}\log_{10}\frac{a}{a-x}$

$= \frac{2.303}{0.0693 \text{ day}^{-1}}\log_{10}\frac{1}{1-(\frac{1}{4})} = 4.1 \text{ days}$

75. **(a)** $Ce^{2+} \longrightarrow 4f^1\ 5d^1$

Explanation:

$Ce^{2+} \longrightarrow 4f^2$

76. **(a)** HCN

Explanation:

HCN

77. **(a)** IO_3^-

Explanation:

In neutral or faintly alkaline $KMnO_4$ solution, iodide ion is converted into iodate.

$2MnO_4^- + H_2O + I^- \rightarrow 2MnO_2 + 2OH^- + IO_3^-$

78.

(b) 0

Explanation:

$\overset{+4}{\underset{4}{K}}\left[\overset{0}{\underset{}{Ni}}\overset{-4}{\underset{}{(CN)_4}}\right]$

79.

(d) It considers s, p and d orbitals of the central metal.

Explanation:

In crystal field theory, only d orbitals of the central metal are considered. There is no explanation for s and p orbitals.

80.

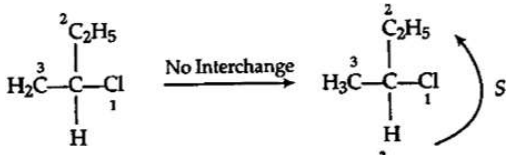
(d) $CI - \overset{\overset{C_2H_5}{|}}{\underset{\underset{H}{|}}{C}} - CH_3$

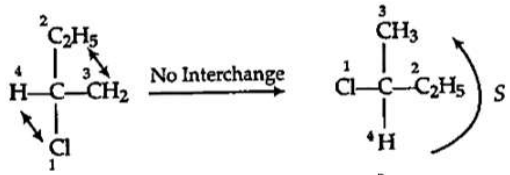
Explanation:

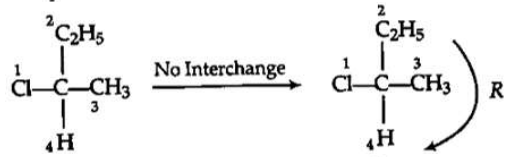
CH_3-CHCI-CH_2-CH_3

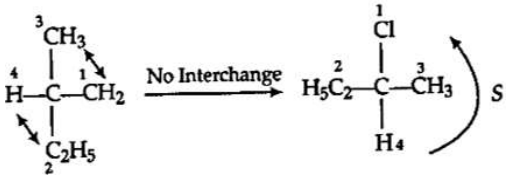
The priority order is -Cl > -C_2H_5 -CH_3 > -H

In option :

- 

- 

- 

- 

81. **(a)** $CH_3CH_2CH_2O$

Explanation:

Anti-Markovnikov addition of H_2O on alkene.

82.

(b) pent-3-en-2-ol

Explanation:

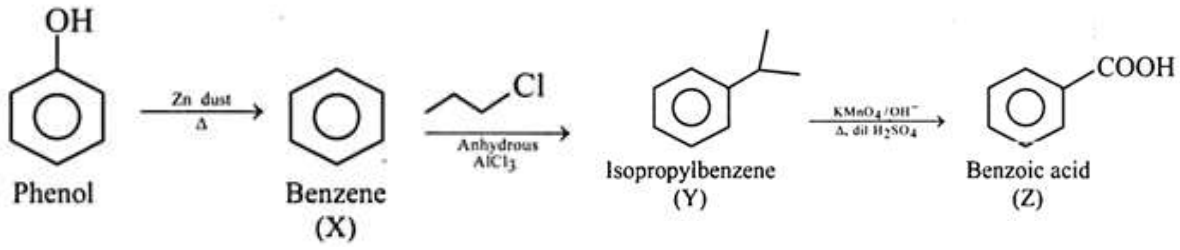
pent-3-en-2-ol

83.

(b) Y = Isopropylbenzene

Z = Benzoic acid

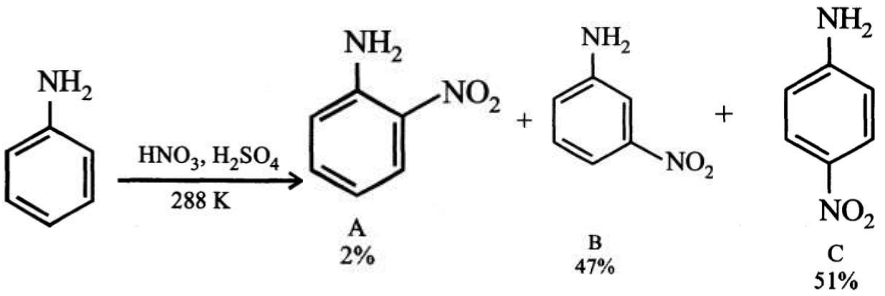
Explanation:



84.

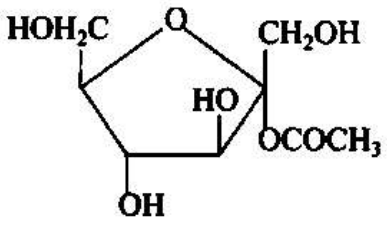
(c) C > B > A

Explanation:



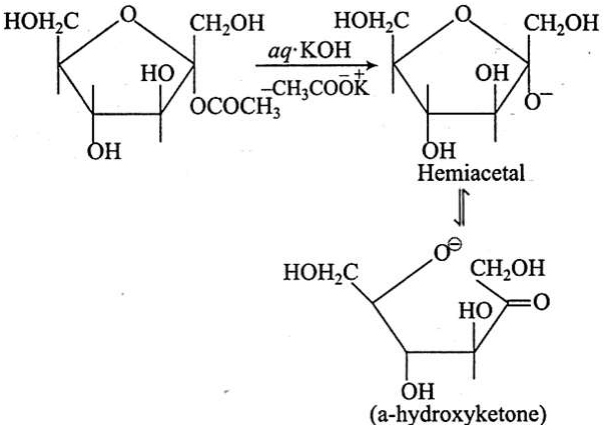
During nitration of aniline in strong acidic (HNO_3, H_2SO_4) medium, aniline changes to anilinium ion that can withdraws electron density. Its effect is felt maximum at ortho followed by meta and then para position. Consequently, very little of ortho nitrated product is formed.

85. **(a)**

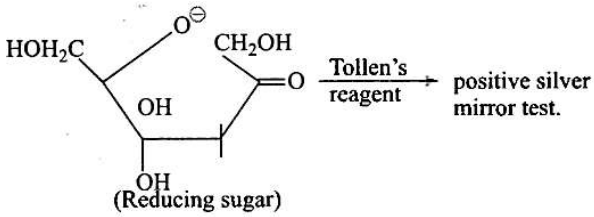


Explanation:

Sugars that have an aldehyde, a ketone, a hemiacetal or a hemiketal group is able to reduce an oxidising agent. These sugars are classified as reducing sugars.



Hemiacetal can be easily reduced by oxidising agent such as Tollen's reagent.

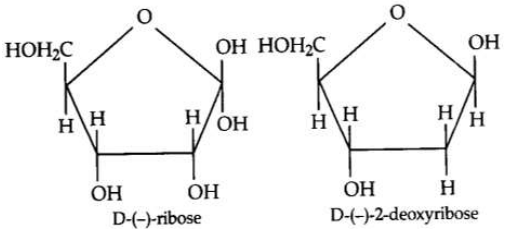


86.

(c) D-sugar component

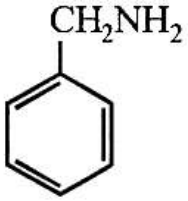
Explanation:

The sugar present in DNA is D-(-)-2 deoxyribose and sugar present in RNA is D-(-)-ribose. Due to these D-(-)-sugar component DNA and RNA molecules are chiral molecules.



87.

(d)



Explanation:

Gabriel phthalimide synthesis gives I^{o} amine in good yield.

88.

(d) A $\longrightarrow$ KCl, B $\longrightarrow$ NH_4OH

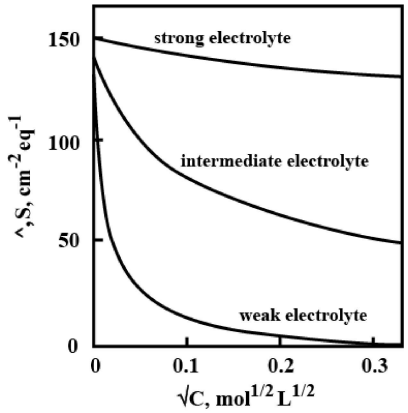
Explanation:

Electrolytes are chemicals that break into ions (ionize) when they are dissolved in water. The positively-charged ions are called cations, while the negatively charged ions are called anions. Substances can be categorized as strong electrolytes, weak electrolytes.

A strong electrolyte is a solution/solute that completely, or almost completely, ionizes or dissociates in a solution. These ions are good conductors of electric current in the solution.

Weak electrolytes only partially break into ions in water. Weak electrolytes include weak acids, weak bases, and a variety of other compounds.

KCl is a strong electrolyte and hence mains a linear relation. Whereas, NH_4OH is a weak electrolyte and hence has a curve nature.



89. **(a)** Crystallisation

Explanation:

Crystallisation process is based on the difference in the solubilities of the compound and the impurities in a suitable solvent.

The impure compound is dissolved in a solvent in which it is sparingly soluble at room temperature but appreciably soluble at higher temperature.

90.

(d) $+\frac{5}{2}$

Explanation:

$I_2 + 2\overset{+4}{S_2}O^{2-}_{3(aq)} \rightarrow \overset{+\frac{5}{2}}{S_4}O^{2-}_{6(aq)} + 2I^-_{(aq)}$

S has fractional oxidation state in the product.

BOTANY

91. **(a)** facilitate identification of unknown organisms.

Explanation:

Biological classification is the scientific arrangement of organisms in a hierarchical series of groups and sub groups on the basis of similarities and differences in their traits. It helps in building evolutionary pathways and in identifying new organisms.

92.

(b) Both Monographs and Flora

Explanation:

Flora contains the actual account of the habitat and distribution of plants in a given area. Monographs contain information on any one taxon. Hence, Both monographs and flora are used in the preparation of taxonomic tools which identifies and classifies plants and animals.

93.

(c) All of these

Explanation:

Lion (Panthera leo), leopard (P. pardus), jaguar (Panthera onca), snow leopard (Panthera uncia), and tiger (Panthera tigris) belong to genus Panthera.

94. **(a)** Convert (oxidise) ammonia or ammonium compounds into nitrates.

Explanation:

Nitrifying bacteria are chemolithotrophic organisms that include species of the genera Nitrosomonas, Nitrosococcus, Nitrobacter, and Nitrococcus. These bacteria get their energy through the oxidation of inorganic nitrogen compounds. Types include ammonia-oxidizing bacteria (AOB) and nitrite-oxidizing bacteria (NOB).

Many species of nitrifying bacteria have complex internal membrane systems that are the location for key enzymes in nitrification: ammonia monooxygenase (which oxidizes

ammonia to hydroxylamine), hydroxylamine-oxidoreductase (which oxidizes hydroxylamine to nitric oxide - which is oxidized to nitrite by a currently unidentified enzyme), and nitrite oxidoreductase (which oxidizes nitrite to nitrate).

95. **(a)** Pasteur

Explanation:

Pasteur was the first to propose that diseases were caused by microscopic organisms. The final proof of germ theory came when Pasteur was able to grow the anthrax bacillus in culture. Although anthrax had been isolated by Robert Koch, opponents believed that the spores he found could have been containments in his culture medium. Pasteur placed a drop of blood from a sheep dying of anthrax into a sterile culture and allowed the bacilli to grow. He repeated this process until none of the original cultures remained in the final dish. The final culture produced anthrax when injected into sheep, showing that the bacillus was responsible for the disease.

96.

(d) Seven cells and eight nuclei

Explanation:

Seven cells and eight nuclei

97.

(d) Pomegranate

Explanation:

Pomegranate

98.

(c) Double fertilisation

Explanation:

Double fertilisation involving two types of fusions, syngamy and triple fusion takes place in an embryo sac is an event unique to flowering plants.

99.

(c) Five

Explanation:

Artificial classification systems primarily relied on easily observable, superficial morphological features like leaf shape, color, and habit, often focusing heavily on vegetative characteristics or the structure of the androecium, without giving equal weightage to both vegetative and sexual features, which often led to closely related species being separated due to their reliance on a limited set of characteristics.

100. **(a)** Rhodophyceae

Explanation:

The members of Rhodophyceae are commonly called red algae because of the predominance of the red pigment, r-phycoerythrin in their bodies.

101. **(a)** Thalloid

Explanation:

The plant body of a liverwort is thalloid. The thallus is dorsiventral and closely appressed to the substrate. The leafy members have tiny leaf-like appendages in two rows on the stem-like structures.

102.

(d) Pinus

Explanation:

Roots in some genera have fungal associations in the form of mycorrhiza. Pinus is a gymnosperm bearing mycorrhiza for nitrogen fixation. In some others (Cycas) small specialised roots called coralloid roots are associated with N_2- fixing cyanobacteria.

103.

(b) Statement (c) is incorrect.

Explanation:

Sporopollenin is one of the most resistant organic material and cannot be degraded by any enzyme known so far.

104. **(a)** Well developed nucellus

Explanation:

Well developed nucellus

105.

(d) All except (iii)

Explanation:

All statements are true except (iii).

The correct statement is given below:

A bud is present in the axil of petiole in both simple and compound leaves, but not in the axil of leaflets of the compound leaf.

106. **(a)** Superior

Explanation:

Superior

107. **(a)** Summer

Explanation:

The activity of cambium is maximum during summer or spring, hence the wood elements are larger in size with a wide lumen.

108.

(d) Are capable of producing secondary xylem and phloem

Explanation:

The vascular bundle which has cambium are called open vascular bundles. They are found in dicot stem and root. Open vascular bundles contain an interfascicular cambium. Phloem and xylem are not in direct contact with each other in that case. Secondary growth occurs in the cambial tissues. So, open bundles produce secondary xylem and phloem in between the primary phloem and xylem. These are either collateral or bicollateral.

109. **(a)** Dizygotic twins

Explanation:

Dizygotic twins

110.

(c) Colour blindness

Explanation:

Colour blindness

111.

(d) 7.5

Explanation:

7.5

112. **(a)** Mutations inhibit the production of telomerase.

Explanation:

Mutations inhibit the production of telomerase.

113.

(c) Amyloplast, elaioplast, and aleuroplasts

Explanation:

Leucoplasts are colourless plastids found in endosperm, tubers, roots and other non-photosynthetic tissues of plants. They serve various functions, for example, storage of starch, lipids, or proteins. There are three types of special leucoplasts;

i. amyloplasts which are starch containing leucoplasts, e.g., potato tuber,
ii. elaioplasts which are colourless plastids and store lipids, e.g., tube rose,
iii. aleuroplasts which are protein storing plastids, e.g., aleurone cells of maize grain, endosperm cells of castor.

114. **(a)** Both Chloroplasts and Mitochondria

Explanation:

The organelle ribosomes are found in plastids (plastidoribosomes) and mitochondria (mitoribosomes)

115. **(a)** Hydrophobic region

Explanation:

Typically, a protein will span the plasma membrane a number of times, with hydrophobic (water-hating) regions in the membrane and hydrophilic (water loving) regions inside the cell or outside of the cell.

116. **(a)** DNA damage

Explanation:

Transformation of normal cells into cancerous neoplastic cells may be induced by physical, chemical or biological agents. These agents are called carcinogens. Ionising radiations like X-rays and gamma rays and non-ionizing radiations like UV rays causes DNA damage leading to neoplastic transformation.

117.

(b) T-lymphocytes

Explanation:

T-lymphocytes

118.

(b) Cholera and tetanus

Explanation:

Cholera and tetanus

119. **(a)** sporozoites

Explanation:

Female Anopheles mosquito injects sporozoites (sickle-shaped) into the human body.

120.

(d) Arrest of cell cycle and onset of differentiation

Explanation:

The **G0 phase** or resting **phase** is a period in the cell cycle in which cells exist in a quiescent state. Arrest of cell cycle and onset of differentiation.

121. **(a)** 630

Explanation:

630

122.

(c) Tertiary consumer

Explanation:

Tertiary consumer

123.

(d) All of these

Explanation:

All of these

124.

(d) Primary treatment

Explanation:

Primary or physical treatment is the process of removal of small and large, floating and suspended solids from sewage through two processes of filtration and sedimentation.

125.

(b) endemic

Explanation:

The species confined to a particular region and not found elsewhere is termed as endemic.

126.

(b) All of these

Explanation:

Ex situ conservation means off-site conservation. It protects an endangered species of plant or animal outside its natural habitat. While ex situ conservation comprises some of the oldest and best known conservation methods, it also involves newer methods also like cryopreservation etc.

127.

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

Explanation:

Dodo belongs to Mauritius. Quagga is an extinct subspecies of South Africa. Thylacine are a breed of wold which originally belong to Australia. Stellar is a sea cow variety which originally belonged to Europe.

128. **(a)** Chromosomes will not segregate

Explanation:

Anaphase promoting complex helps in the transition of the chromosome from metaphase to anaphase. The anaphase-promoting complex attaches to the chromosomes aligned at the equator during metaphase and allows the segregation of the chromatids.

129.

(d) Young anthers/Testes of grasshopper

Explanation:

Meiosis takes place in reproductive organs. It results in the formation of gametes with half the normal chromosome number. Young anthers/Testes of grasshopper are the best materials to study meiosis.

130.

(b) chlorophyll a has a methyl group while chlorophyll b has an aldehyde group.

Explanation:

Chlorophyll a and b differ in the composition of a side chain (chlorophyll a has $-CH_3$, while b has -CHO at carbon atom 3).

131.

(c) Two distinct photosystems

Explanation:

Emerson's effect was discovered by Robert Emerson in 1957. He observed that when 700 nm wavelength is used for photosynthesis then it proceeds very slowly, but when light of shorter wavelength (650 nm) is used then it proceeds very fast. It means when higher wavelength of light is simultaneously supplied with a shorter wavelengths, then rate of photosynthesis increased. So, the discovery of the Emerson effect showed the existence of two distinct reaction centres and photochemical reactions. It showed the existence of Photosystems I and II.

132. **(a)** H_2O

Explanation:

The excited electron from reaction centre of PS II is captured by a primary electron acceptor of the electron transport chain. The electron in the reaction centre needs to be replenished so as to repeat the cycle. This occurs by oxidation of water.

133.

(b) Less than 50%

Explanation:

If the total incident solar radiation, the proportion of PAR (photosynthetically active radiation) accounts to less than 50%. Photosynthetically active radiation designates the spectral range of solar radiation from 400 to 700 nanometers, that photosynthetic organisms are able to use in the process of photosynthesis.

134.

(b) 1 $FADH_2$, 3NADH and 1 ATP

Explanation:

1 $FADH_2$, 3NADH and 1 ATP

135.

(b) spraying cytokinins

Explanation:

Ageing/necrosis/senescence usually accompany with loss of chlorophyll and rapid breakdown of protein. Cytokinins increase the protein and chloroplast synthesis. Hence, ageing/necrosis/senescence problem in tissue culture is overcome by spraying cytokinin.

ZOOLOGY

136. **(a)** Miracidium

Explanation:

Miracidium is a free-swimming ciliated larval stage in which a parasitic fluke passes from the egg to its first host, typically a snail.

137.

(c) Coloumn I - Petromyzon, **Coloumn II -** Ectoparasite, **Coloumn III -** Cyclostomata

Explanation:

Petromyzon is an ectoparasite on some fishes. It belongs to Class Cyclostomata.

138.

(c) Mollusca : Loligo, Teredo, Octopus

Explanation:

Loligo, Teredo, and Octopus belong to phylum Mollusca which are bilaterally symmetrical, triploblastic and

coelomate animals.

139.

(d) Absence of a head

Explanation:

Bivalvia is a Class of Mollusca having a shell composed of the right and left halves. They lack a head. Hence, the absence of the head is a characteristic of Class Bivalvia.

140.

(d) Struthio, Pavo, Aptenodytes, Neophron

Explanation:

Struthio, Pavo, Aptenodytes, Neophron are the members of Class Aves.

141.

(b) Both (i) and (iii)

Explanation:

Statement (i) and (iii) are correct and statement (ii) and (iv) are incorrect. There are three ganglia lie in the thorax, and six in the abdomen. Each eye consists of about 2000 hexagonal ommatidia.

142.

(d) Dorsal blood vessel

Explanation:

The body of an earthworm is segmented and there are about 100 to 120 metameres or short segments. There is a dark median mid-dorsal blood vessel that is seen on the dorsal surface of the body. The ventral surface of the body has genital openings or pores. Hence, the dorsal surface of the body is marked by a dark median mid-dorsal line along the longitudinal axis of the body representing the dorsal blood vessel.

143.

(d) Attachment of cells

Explanation:

Desmosomes are intercellular junctions that provide strong adhesion between cells.

144.

(d) Option (i) and (ii)

Explanation:

During Inspiration: Contraction of diaphragm takes place. This downward movement of the diaphragm causes less intra-pulmonary pressure than the atmosphere.

Simultaneously, the external intercostal muscles also contract and cause the rib cage to be able to move outward. This further increases the pulmonary space and decreases the pulmonary pressure. Both of these movements cause inspiration.

145. **(a)** low O_2 pressure in tissue.

Explanation:

Oxyhemoglobin is the bright red hemoglobin which is formed by the combination of hemoglobin and oxygen from the lungs. Oxyhemoglobin transports oxygen to the cells of the body. It dissociates into oxygen and deoxyhemoglobin at low pressure in tissue.

146.

(d) C-Alveoli - thin walled vascular bag like structures for exchange of gases

Explanation:

In the given figure A, B, C and D are respectively trachea, pleural membranes, alveoli and diaphragm.

Trachea is supported by incomplete cartilaginous rings which prevent its collapse during inspiration and abdominal cavities. It is the principal muscle of respiration.

147.

(c) oxygenation

Explanation:

Bulk of oxygen diffuses from the plasma into the red blood corpuscles where it joins loosely with Fe^{2+} ions of hemoglobin (Hb) to form bright red oxyhemoglobin (HbO_2). The process is called oxygenation.

148.

(b) steeper

Explanation:

When temperature decreases, oxy-Hb curve will become steeper. The steep rise of the curve indicates high affinity of Hb for O_2.

149.

(b) Diaphragm

Explanation:

Diaphragm which receives electrical messages from the brain for breathing in and out, is a domeshaped muscular partition which separates thorax from the abdomen in mammals. It plays major role in breathing, as its contraction increases the volume of the thorax and so inflates the lung.

150.

(b) Endoderm

Explanation:

Endoderm

151.

(d) Option (b) is incorrect pair.

Explanation:

Option (b) is incorrect pair.

152. **(a)** Four

Explanation:

Four

153.

(c) Menarche

Explanation:

The first menstruation begins at puberty and is called menarche.

154.

(c) In Vivo Fertilization-Embryo Recovery-Embryo Transfer

Explanation:

In Vivo Fertilization-Embryo Recovery-Embryo Transfer

155.

(c) All of these

Explanation:

All of these

156.

(b) ZIFT and IUT

Explanation:

ZIFT- Zygote intrafallopian transfer, is an infertility treatment used when a blockage in the fallopian tubes prevents the normal binding of sperm to the egg. Egg cells are removed from a woman's ovaries, and in vitro fertilized. The resulting zygote is placed into the fallopian tube by the use of laparoscopy.

IUT- is the technique in which an embryo of more than 8 blastomeres is transferred into the uterus.

157.

(d) Mesozoic era

Explanation:

About 66 million years ago the Mesozoic era is known as the golden age of reptiles as reptiles became dominant during this period.

158.

(b) Neanderthal men

Explanation:

Neanderthal men

159. **(a)** Renal papilla

Explanation:

The distal convoluted tubules of a number of adjacent nephrons open into a common collecting duct or tubule. Collecting ducts (present in medullary pyramids) are long tubules, which traverse through the medulla in the pyramids and opens in the papilla of the medulla (in rabbit) or papilla of the individual medullary pyramid (in human). Several adjacent collecting ducts converge to open into a common short and thick duct of Bellini (present in papilla of medulla). All ducts of Bellini then open at the tip of the papillae into the pelvis.

160. **(a)** (i), (iii), and (iv)

Explanation:

Layers between the glomerular and Bowman's capsule through which the filtration takes place are as follows:

i. Endothelium of the glomerular blood vessel.
ii. Basement membrane between the endothelium of glomerular blood vessels and epithelium of the Bowman's capsule.
iii. Epithelium of the Bowman's capsule.

161.

(c) Less urea

Explanation:

Urea is a nitrogenous waste formed as a result of metabolism of various food/bevarages in the body and is excreted in the urine. So, if a person is not taking food/beverages he will have less urea in his urine.

162.

(d) Uric acid

Explanation:

Adenine and guanine are purines which are converted to xanthine and then enzyme xanthine oxidase converts xanthine to uric acid in liver and small intestine. Hence, the final waste product of adenine and guanine metabolism is uric acid.

163.

(c) Vertebra-arterial canals

Explanation:

There are 7 cervical vertebrae. All cervical vertebrae have apertures in their transverse processes, known as Foramina transversalis, which form vertebro-arterial-canals on either side for a vertebral artery to pass through to supply the brain and spinal cord.

164.

(c) All of these

Explanation:

All of these

165.

(b) Actin

Explanation:

Actin

166.

(c) the absence of photoreceptor cells.

Explanation:

The optic nerves leave the eye and the retinal blood vessels enter it at a point medial to and slightly above the posterior pole of the eyeball. Photoreceptor cells are not present in that region and hence it is called the blind spot. At the posterior pole of the eye, lateral to the blind spot there is a yellowish pigmented spot called macula lutea with a central pit called the fovea.

167.

(d) Rhodopsin is purplish red protein, hence called visual purple.

Explanation:

The space between the cornea and the lens is called the aqueous chamber and contains a thin watery fluid called the aqueous humour. When all the cones are stimulated equally, a sensation of white light is produced. The anterior transparent portion of sclera is called cornea.

168. **(a)** Trigeminal nerve

Explanation:

Trigeminal nerve is the largest 5th cranial nerve. It has three branches. Vagus nerve is the 10th cranial nerve and innervates larynx, trachea, oesophagus, stomach, lungs, heart and intestines.

Facial nerve is the 7th cranial nerve and innervates muscles of face and back, taste buds and salivary glands.

169. **(a)** acetylcholine

Explanation:

Alzheimer's disease is a neurological disease characterized by progressive loss of intellectual ability. The disease is associated with the following:

i. general shrinkage of the brain tissue, with deposits of β-amyloid protein and abnormal filaments composed of tau protein in the brain, and

ii. changes in the neurotransmitter systems within the brain that include a loss in the activity of cholinergic neurons (neurons releasing acetylcholine).

170.

(d) Adrenal

Explanation:

Adrenal

171.

(c) (A) - Ovary, (B) - Glucagon, (C) - Growth hormone

Explanation:

The correct option for the three blanks A, B, and C are ovary, glucagon and growth hormone respectively. Oestrogens are secreted by the Graafian follicle, which surrounds the mature ovum in the ovary. They stimulate the female reproductive tract to grow to full size and become functional. They also stimulate the differentiation of ova (oogenesis) in the ovary and stimulate the development of accessory sex characters such as enlargement of breasts, broadening of pelvis, growth of pubic and auxiliary hair, deposition of fat in the thigh; and onset of menstrual cycle. Glucagon is secreted by the alpha cells of the islets of Langerhans in response to a fall in the blood-glucose level. Somatotropic or growth hormone (STH or GH) or somatotropin hormone is secreted by the anterior lobe of pituitary. Growth hormone stimulates growth and development of all tissues by accelerating protein-synthesis and cell-division and by retaining calcium in the body. Over secretion of growth hormone leads to gigantism.

172. **(a)** (A)-T, (B)-T, (C)-F, (D)-T

Explanation:

(A)-T, (B)-T, (C)-F, (D)-T

173.

(c) It has 13 chambered heart and in each segment one pair of ostia are present.

Explanation:

The cockroach is an arthropod in which the circulatory system is open type where the blood pumped by the heart passes through large vessels into open spaces or body cavities called sinuses.

174. **(a)** 12-16 mg

Explanation:

The haemoglobin content per 100mL of blood of a normal healthy human adult is 12-16 mg.

175.

(b) Left auricle → Left ventricle → Aorta → Arteries → Tissues → Veins → Right atrium

Explanation:

Systemic circulation is the movement of the blood between heart and rest of the body (tissues) and the back to the heart. The oxygenated blood moves from the left auricle into the left ventricle. From here the blood moves into the aorta which ultimately divides into arteries that carry oxygenated blood to various tissues in the body. From the tissues deoxygenated

blood is carried by the veins into the right atrium via superior vena cava and inferior vena cava.

176. **(a)** Only b

Explanation:

A - EcoRI, B - tet^R, C - amp^R, D - BamHI, E - Ori

177.

(d) Thermus aquaticus

Explanation:

Taq DNA polymerase is isolated from a thermophilic bacterium, Thermus aquaticus.

178.

(d) Uptake of DNA through transient pores in the bacterial cell wall

Explanation:

Uptake of DNA through transient pores in the bacterial cell wall

179.

(d) Edward Jenner

Explanation:

Edward Jenner

180.

(b) Exploitative appreciation of indigenous forms of knowledge by commercial actors.

Explanation:

Bioprospecting is the process of discovery and commercialization of new products based on biological resources. Despite indigenous knowledge being intuitively helpful, bioprospecting has only recently begun to incorporate such knowledge in focusing screening efforts for bioactive compounds.

Bioprospecting may involve biopiracy, the exploitative appropriation of indigenous forms of knowledge by commercial actors, and also includes the search for previously unknown compounds in organisms that have never been used in traditional medicine before.