ALL INDIA MOCK TEST

Sample Paper - 9

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. The SI unit of gravitational potential is: **[4]**

   a) J
   b) $J\text{-}kg^{-2}$
   c) $J\text{-}kg^{-1}$
   d) J-kg

2. In the relation: **[4]**

   $y = a \sin(\omega t - Kx)$,

   the dimensional formula for K is:

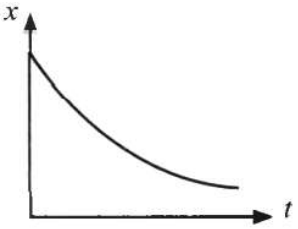
   a) $[M^0L^{-1}T^{-1}]$
   b) $[M^0LT]$
   c) $[M^0L^{-1}T^0]$
   d) $[M^0LT^{-1}]$

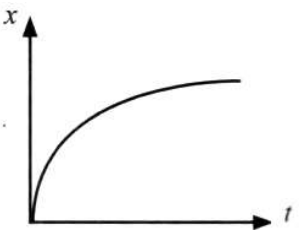
3. In the relation: **[4]**

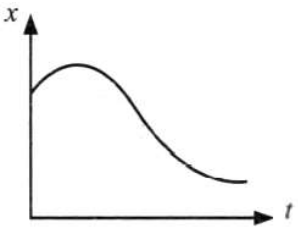
   $y = a \cos(\omega t + Kx)$, the dimensional formula for Kx is the same as that of:

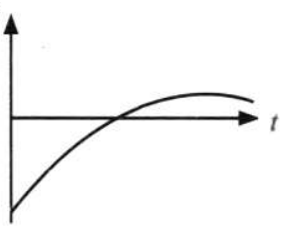
   a) $\frac{ya}{\omega t}$
   b) $\frac{a}{\omega}$
   c) $\frac{\omega t}{a}$
   d) $\frac{a}{y}$

4. Among the four graphs, there is only one graph for which average velocity over the time interval (0, T) can vanish for a suitably chosen T. Which one is it? **[4]**

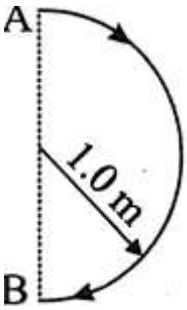
a) 

b) 

c) 

d) 

5. In 1.0 s, a particle goes from point A to B, moving in a semi-circle of radius 1.0 m (as shown in the figure). The magnitude of the average velocity of the particle is: **[4]**



a) Zero
b) 2.0 m/s
c) 1.0 m/s
d) 3.14 m/s

6. Which of the following changes, when a particle is moving with uniform velocity? **[4]**

a) acceleration
b) speed
c) position vector
d) velocity

7. A body is whirled in a horizontal circle of radius 20 cm. It has an angular velocity of 10 rad/s. What is its linear velocity at any point on the circular path? **[4]**

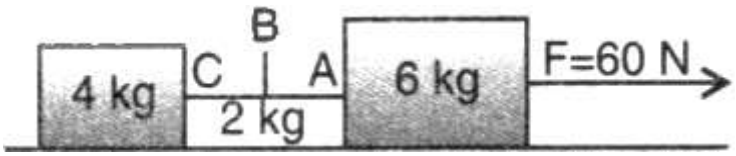
a) 20 ms^{-1}
b) $\sqrt{2}$ ms^{-1}
c) 10 ms^{-1}
d) 2 ms^{-1}

8. The point from where a ball is projected is taken as the origin of the co-ordinate axes. The x and y components of its displacement are given by $x = 6t$ and $y = 8t - 5t^2$. What is the velocity of projection? **[4]**

a) $6\ ms^{-1}$ b) $10\ ms^{-1}$

c) $14\ ms^{-1}$ d) $8\ ms^{-1}$

9. Two blocks of masses 6 kg and 4 kg connected by a rope of mass 2 kg are resting on a frictionless floor as shown in the following figure. **[4]**

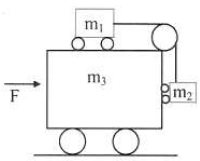


If a constant force of 60 N is applied to 6 kg block, tension in the rope at points A, B and C are respectively given by:

a) 30 N, 25 N, 20 N b) 60 N, 60 N, 60 N

c) 20 N, 25 N, 30 N d) 20 N, 20 N, 20 N

10. A frictionless cart carries two other frictionless carts as shown in the figure. Connected by a string over a pulley. The horizontal force F that must be applied so that m_1 and m_2 do not move relative to m_3 is: **[4]**



a) $(m_1 + m_2 + m_3)\frac{m_2 g}{m_1}$ b) $(m_1 + m_2)\frac{m_2 g}{m_1}$

c) $(m_1 + m_3)\frac{m_1 g}{m_2}$ d) $(m_2 + m_3)\frac{m_1 g}{m_2}$

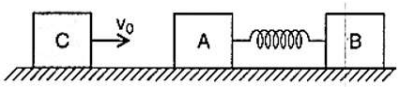
11. A particle moving along the circular path with a speed v and its speed increases by g in one second. If the radius of the circular path be r, then the net acceleration of the particle is: **[4]**

a) $\left[\frac{v^4}{r^2} + g^2\right]^{\frac{1}{2}}$ b) $\frac{v^2}{r^2} + g^2$

c) $\left[\frac{v^2}{r} + g\right]^{1/2}$ d) $\frac{v^2}{r} + g$

12. A block C of mass m is moving with velocity v_0 and collides elastically with block A of mass m and connected to another block B of mass 2m through a spring of spring constant k. What is k if x_0 is the compression of spring when velocity of A and B is **[4]**

same?



a) $\frac{3}{2}\frac{mv_0^2}{x_0^2}$

b) $\frac{mv_0^2}{2x_0^2}$

c) $\frac{2}{3}\frac{mv_0^2}{x_0^2}$

d) $\frac{mv_0^2}{x_0^2}$

13. A big particle of mass (3 + m)kg blasts into 3 pieces, such that a particle of mass 1 kg moves along the x-axis, with velocity 2m/s and a particle of mass 2 kg moves with velocity 1 m/s perpendicular to the direction of 1 kg particle. If the third particle moves with velocity $\sqrt{2}$ m/s, then m is: **[4]**

a) $3\sqrt{2}$ kg

b) 2 kg

c) $2\sqrt{2}$ kg

d) 1 kg

14. The correct relation between moment of inertia I, radius of gyration K and mass M of the body is: **[4]**

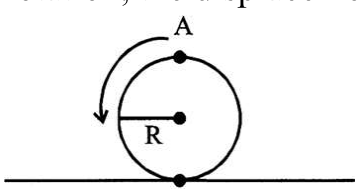
a) $K = \sqrt{\frac{M}{I}}$

b) $K = \sqrt{\frac{I}{M}}$

c) $K = I^2M$

d) $K = IM^2$

15. A disc is rolling without slipping on a surface. The radius of the disc is R. At t = 0, the top most point on the disc is A as shown in figure. When the disc completes half of its rotation, the displacement of point A from its initial position is **[4]**



a) $R\sqrt{(\pi^2+1)}$

b) $R\sqrt{(\pi^2+4)}$

c) $2R\sqrt{(1+4\pi^2)}$

d) 2R

16. The total energy and kinetic energy of an Earth's satellite are respectively: **[4]**

a) negative and negative

b) positive and positive

c) negative and positive

d) positive and negative

17. Two point masses, each equal to 4 kg, attract one another with a force of 10^{-9} kg-wt. The distance between the point masses is ($G = 6.6 \times 10^{-11}$ MKS units) **[4]**

a) 37.1 cm

b) 32.8 cm

c) 24.6 cm

d) 18.3 cm

18. According to Kepler's law, the period of revolution of a planet (T) and its mean distance from the sun (R) are related by the equation: **[4]**

a) T^3R^3 = constant

b) T^2R = constant

c) TR^3 = constant

d) T^2R^{-3} = constant

19. A copper wire of cross-sectional area 0.01 cm^2 is under a tension of 22 N. Find the percentage change in the cross-sectional area. (Young's modulus of copper = 1.1×10^{11} N/m^2 and Poisson ratio = 0.32) **[4]**

a) 12.8×10^{-3}

b) 8.6×10^{-3}

c) 6.4×10^{-3}

d) 2.8×10^{-3}

20. Two rods of equal length and area of cross-section are kept parallel and lagged between temperatures 20^oC and 80^oC. The ratio of the effective thermal conductivity to that of the first rod is: [the ratio $(K_1/K_2) = 3:4$] **[4]**

a) 7 : 4

b) 7 : 8

c) 7 : 6

d) 4 : 7

21. The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5\ r_2$) through 1 K are in the ratio: **[4]**

a) $\frac{9}{4}$

b) $\frac{27}{8}$

c) $\frac{5}{3}$

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

22. The temperatures inside and outside of a refrigerator are 273 K and 303 K respectively. Assuming that the refrigerator cycle is reversible, for every joule of work **[4]**

done, the heat delivered to the surroundings will be near:

a) 20 J
b) 10 J
c) 30 J
d) 50 J

23. Heat is given to an ideal gas in an isothermal process. **[4]**

A. Internal energy of the gas will decrease.

B. Internal energy of the gas will increase.

C. Internal energy of the gas will not change.

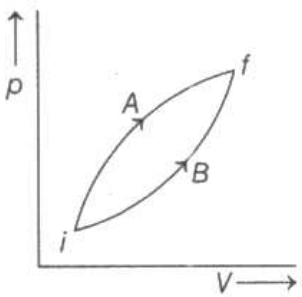
D. The gas will do positive work.

E. The gas will do negative work.

Choose the correct answer from the options given below:

a) C and D only
b) B and D only
c) A and E only
d) C and E only

24. Following figure shows two processes A and B for a gas. If ΔQ_A and ΔQ_B are the amount of heat absorbed by the system in two cases, and ΔU_A and ΔU_B are changes in internal energies respectively, then **[4]**



a) $\Delta Q_A = \Delta Q_B$; $\Delta U_A = \Delta U_B$
b) $\Delta Q_A > \Delta Q_B$, $\Delta U_A > \Delta U_B$
c) $\Delta Q_A > \Delta Q_B$, $\Delta U_A = \Delta U_B$
d) $\Delta Q_A < \Delta Q_B$, $\Delta U_A < \Delta U_B$

25. At which of the following temperatures would the molecules of a gas have twice the average kinetic energy they have at 27°C? **[4]**

a) 373° C
b) 393° C
c) 313° C
d) 586° C

26. The pendulum bob has a speed of 3 ms^{-1} at its lowest position. The pendulum is 0.5 m long. The speed of the bob, when the length makes an angle of 60° to the vertical, will be ($g = 10ms^{-2}$): **[4]**

a) 3 ms^{-1} b) $\frac{1}{2}$ ms^{-1}

c) 2 ms^{-1} d) $\frac{1}{3}$ ms^{-1}

27. The displacement of a particle executing SHM is given by: **[4]**
$y = 5\sin\left(4t + \frac{\pi}{3}\right)$
If T is the time period and the mass of the particle is 2 g, the kinetic energy of the particle when $t = \frac{T}{4}$ is given by:

a) 0.4 J b) 0.5 J

c) 3 J d) 0.3 J

28. A glass tube is open at both the ends. A tuning fork of frequency f resonates with the air column inside the tube. Now the tube is placed vertically inside water so that half the length of the tube is filled with water. Now the air column inside the tube is in unison with another fork of frequency f'. Then: **[4]**

a) f' = 4f b) f' = f/2

c) f' = f d) f' = 2f

29. The ratio of intensities between two coherent sound sources is 4 : 1. The difference of loudness (in decibels) between maximum and minimum intensities when they interfere in space is: **[4]**

a) 10 log (3) b) 20 log (3)

c) 20 log (2) d) 10 log (2)

30. A charge + q is at a distance $\frac{L}{2}$ above a square of side L. Then, what is the flux linked with the surface? **[4]**

a) $\frac{2q}{3\varepsilon_0}$ b) $\frac{6q}{\varepsilon_0}$

c) $\frac{q}{6\varepsilon_0}$ d) $\frac{q}{4\varepsilon_0}$

31. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 V. The potential at the centre of the sphere is **[4]**

a) same as at a point 25 cm away from the surface

b) same as at a point 5 cm away from the surface

c) zero

d) 10 V

32. In metals the time of relaxation of electrons: **[4]**

a) decreases with increasing temperature.

b) changes suddenly at 400 K.

c) increases with increasing temperature.

d) does not depend on temperature.

33. A galvanometer of resistance G is converted into a voltmeter of range 0 - 1 V by connecting a resistance R_1 in series with it. The additional resistance R_1 in series with it. The additional resistance that should be connected in series with R_1 to increase the range of the voltmeter to 0 - 2V will be: **[4]**

a) R_1 - G

b) R_1 + G

c) G

d) R_1

34. The susceptibility of a paramagnetic material at 300 K is 1.4×10^{-5}. The material is cooled and at a particular temperature, its susceptibility increased to 2.1×10^{-5}. What is the change in temperature of the material? **[4]**

a) 200 K

b) 100 K

c) 300 K

d) 400 K

35. The force experienced by a pole of strength 100 Am at a distance of 0.2 m from a short magnet of length 5 cm and pole strength of 200 Am on its axial line will be: **[4]**

a) 2.5×10^{-3} N

b) 2.5×10^{-2} N

c) 5.0×10^{-3} N

d) 5.0×10^{-2} N

36. A uniform magnetic field B exists in a direction perpendicular to the plane of a square loop made of a metal wire. The wire has a diameter of 4 mm and a total length of 30 cm. The magnetic field changes with time at a steady rate $\frac{dB}{dt} = 0.032\ Ts^{-1}$. The induced current in the loop is close to (Resistivity of the metal wire is $1.23 \times 10^{-8}\ \Omega$ m) **[4]**

a) 0.53 A
b) 0.61 A
c) 0.34 A
d) 0.43 A

37. In an inductor of self-inductance L = 2 mH, current changes with time according to the relation: $I = t^2 e^{-t}$. At what time emf is zero? **[4]**

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

38. If wattless current flows in the AC circuit, then the circuit is **[4]**

a) Purely Resistive circuit
b) Purely Inductive circuit
c) RC series circuit only
d) LCR series circuit

39. A beam of light of intensity 20 W cm^{-2} falls on a nonreflecting surface at normal incidence. If the area of the surface is 15 cm^2, the average force exerted on the surface during 30-minute time span is: **[4]**

a) 4×10^{-6} N
b) 3×10^{-6} N
c) 1×10^{-6} N
d) 2×10^{-6} N

40. A small telescope has an objective lens of focal length 140 cm and an eyepiece of focal length 5.0 cm. The magnifying power of the telescope for viewing distant objects when the final image is formed at the least distance of distinct vision (= 25 cm) is: **[4]**

a) 11.6
b) 33.6
c) 22.6
d) 66.12

41. A polariser is used to : **[4]**

a) increase intensity of light
b) reduce intensity of light
c) produce polarised light
d) produce unpolarised light

42. A metallic surface ejects electrons when exposed to green light of intensity I but no photoelectrons are emitted when exposed to the yellow light of intensity I. Is it possible to eject electrons from the same surface by: **[4]**

a) red light of any intensity
b) yellow light of intensity which is less than I
c) green light of any intensity
d) yellow light of intensity which is more than I

43. Einstein's work on the photoelectric effect provided support for the equation: **[4]**

a) $E = -\frac{Rhc}{n^2}$
b) $E = hv$
c) $E = mc^2$
d) $KE = \frac{1}{2}\ mv^2$

44. The energy of a hydrogen atom in the ground state is - 13.6eV. The energy of a He^+ ion in the first excited state will be: **[4]**

a) -13.6 eV
b) -54.4 eV
c) -27.2 eV
d) -6.8 eV

45. You are given that mass of $^7_3$ L = 7.0160 u, **[4]**
Mass of $^4_2$He = 4.0026 u
and Mass of $^1_1$H = 1.0079 u
When 20 g of $^7_3$Li is converted into $^4_2$He by proton capture, the energy liberated, (in kWh), is:
[Mass of nucleon = 1 GeV/c^2]

a) 4.5×10^5
b) 8×10^6
c) 1.33×10^6
d) 6.82×10^5

CHEMISTRY

46. A gaseous mixture contains oxygen and nitrogen in the ratio of 1 : 4 by weight. Therefore, the ratio of their number of molecules is **[4]**

a) 7 : 32
b) 1 : 8
c) 3 : 16
d) 1 : 4

47. One mole of any substance contains 6.022×10^{23} atoms/molecules. The number of molecules of H_2SO_4 present in 100 mL of 0.02 M H_2SO_4 solution is: **[4]**

a) 12.044×10^{20} molecules
b) 1×10^{23} molecules
c) 12.044×10^{23} molecules
d) 6.022×10^{23} molecules

48. For which of the following, the radius will be same as for hydrogen atom having n =1? **[4]**

a) Li^{2+}, n = 2
b) Li^{2+}, n = 3
c) Be^{3+}, n = 2
d) He^{+}, n = 2

49. If S_1 be the specific charge ($\frac{e}{m}$) of cathode rays and S_2 be that of positive rays then which is true? **[4]**

a) $S_1 < S_2$
b) $S_1 > S_2$
c) $S_1 \neq S_2$
d) $S_1 = S_2$

50. The angular momentum of electron in nth orbit is given by: **[4]**

a) $\frac{n^2h}{2\pi}$
b) nh
c) $\frac{h}{2\pi n}$
d) $\frac{nh}{2\pi}$

51. Which of the following generally decreases in going down the halogen group? **[4]**

a) Ionisation potential
b) Boiling point
c) Ionic radius
d) Atomic radius

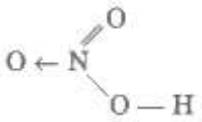
52. In the complex, BH_3PF_3, what is the type of back bond from B to P? **[4]**

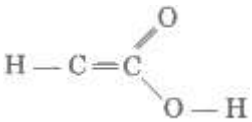
a) $\sigma \rightarrow d$
b) $\pi \rightarrow \pi^*$

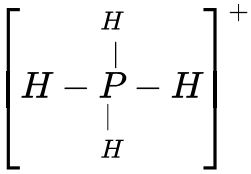
c) $\pi^* \rightarrow d$ d) $\sigma \rightarrow \pi$

53. Which one of the following formulae does not correctly represent the bonding capacities of the atoms involved? **[4]**

a) 

b) 

c) 

d) 

54. Stability of the species Li_2, Li_2^- and Li_2^+ increases in the order of **[4]**

a) $Li_2 < Li_2^- < Li_2^+$ b) $Li_2^- < Li_2 < Li_2^+$

c) $Li_2 < Li_2^+ < Li_2^-$ d) $Li_2^- < Li_2^+ < Li_2$

55. Standard state Gibbs energy changes for the isomerization reaction, cis-2-pentene $\rightarrow$ trans-2-pentene is -3.67 kJ/mol at 400 K. If more trans-2-pentene is added to the reaction vessel, then: **[4]**

a) more cis-2-pentene is formed

b) additional trans-2-psntene is formed

c) equilibrium is shifted in forward direction

d) equilibrium remains unaffected

56. One mole of ice is converted into the water at 273 K. The entropies of $H_2O(s)$ and $H_2O(l)$ are 38.20 and 60.01 J mol^{-1} K^{-1} respectively. The enthalpy change for the conversion is: **[4]**

a) 59.54 J mol^{-1} b) 5954 J mol^{-1}

c) 595.4 J mol^{-1} d) 320.6 J mol^{-1}

57. What is the pH of the resulting solution when equal volumes of 0.1 M NaOH and 0.01 M HCl are mixed? **[4]**

a) 2.0

b) 7.0

c) 1.04

d) 12.65

58. Which substance serves as a reducing agent in the following reaction, **[4]**
$14H^{+} + Cr_2O_4^{2-} + 3Ni \longrightarrow 2Cr^{3+} + 7H_2O + 3Ni^{2+}$?

a) Ni

b) $Cr_2O_7^{2-}$

c) H_2O

d) H^{+}

59. Experimentally it was found that a metal oxide has formula $M_{0.98}O$. Metal M is present as M^{2+} and M^{3+} in its oxide. Fraction of the metal which exists as M^{3+} would be: **[4]**

a) 6.05%

b) 5.08%

c) 7.01%

d) 4.08%

60. Hydrogen peroxide in aqueous solution decomposes on warming to give oxygen according to the equation $2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$ under conditions where one mole of gas occupies 24 dm^3, 100 cm^3 of XM solution of H_2O_2 produces 3 dm^3 of O_2. Thus X is: **[4]**

a) 0.25

b) 2.5

c) 0.5

d) 1

61. The stability of +1 oxidation state among Al, Ga, In and Tl increases in the sequence: **[4]**

a) Al < Ga < In < Tl

b) TI < In < Ga < Al

c) Ga < In < Al < Tl

d) In < TI < Ga < Al

62. In which of the following processes hybridization is not affected? **[4]**

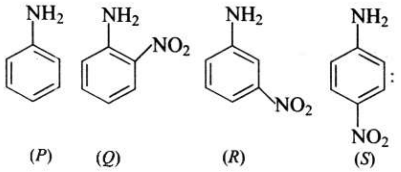
a) $BeF_2\,(g) \xrightarrow{\text{Hoar frosting}} BeF_2\,(s)$

b) $LiH + AlH_3 \longrightarrow LiAlH_4$

c) $PCl_5(s) \xrightarrow{melt} PCl_4^{+} + PCl_6^{-}$

d) $NH_3 + H_2O \longrightarrow NH_2OH$

63. The decreasing order of basicity of following aniline derivatives is **[4]**



a) R > Q > P > S

b) P > Q > R > S

c) P > R > S > Q

d) S > R > Q > P

64. $CH_3 - CH = CH_2 \xrightarrow[H_2O_2/OH^-]{BD_3} product\ X, X$ is : **[4]**

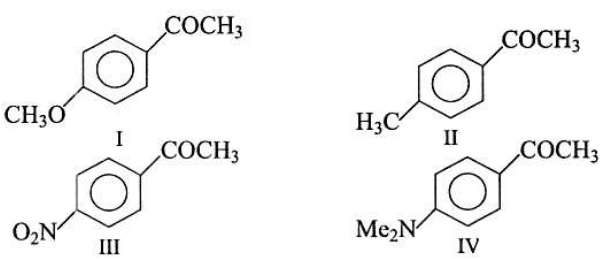
a) $CH_2 - \underset{OH}{\underset{|}{CH}} - CH_4D$

b) $CH_3 - \underset{D}{\underset{|}{CH}} - CH_2D$

c) $CH_3 - \underset{OD}{\underset{|}{CH}} - CH_2D$

d) $CH_3 - \underset{OH}{\underset{|}{CH}} - CH_2D$

65. **[4]**



Friedel-Crafts acylation reaction can be used to obtained the compounds:

a) I, II and IV

b) II, III and IV

c) II and III

d) I and II

66. Pure water boils at -99.725°C at Shimla. If K_b for water is 0.51 K mol^{-1} kg, the boiling point of 0.69 molal urea solution will be: **[4]**

a) 100.35

b) 96.37

c) 99.37

d) 100.08

67. 15 g of a solute in 100 g of water makes a solution to freeze at -1 °C. 30 g of a solute in 100g of water will give a depression in f.pt. equal to: **[4]**

a) 0.5°C

b) 2°C

c) -2°C

d) 1°C

68. The vapour pressure of two liquids P and Q are 80 torr and 60 torr respectively. The total vapour pressure obtained by mixing 3 mole of P and 2 mole of Q would be: **[4]**

a) 20 torr

b) 68 torr

c) 72 torr

d) 140 torr

69. The solubility of NaCl is 36 g/100 g water at 20°C. If three systems A, B and C contain 40 g, 36 g and 20 g of NaCl in 100 g water respectively, the correct decreasing order of vapour pressure of systems will be: **[4]**

a) C > A = B

b) A > B > C

c) C = B = A

d) A = B > C

70. In which of the following half cells, electrochemical reaction is pH dependent? **[4]**

a) $Ag \mid AgCl \mid Cl^-$

b) $Pt \mid Fe^{3+}, Fe^{2+}$

c) $\frac{1}{2} F_2 \mid F^-$

d) $MnO_4^- \mid Mn^{2+}$

71. Which one of the following pairs of substances on reaction will not evolve H_2 gas? **[4]**

a) Iron and steam

b) Sodium and ethyl alcohol

c) Copper and $HCl_{(aq)}$

d) Iron and $H_2SO_{4(aq)}$

72. The conductivity of pure water at 25°C is 5.55×10^{-8} ohm^{-1} cm^{-1}. $\Lambda^\circ_{H^+} = 350$ ohm^{-1} cm^2 mol^{-1} and $\Lambda^\circ_{OH^-} = 200$ ohm^{-1} cm^2 mol^{-1}. Determine dissociation constant of water. **[4]**

a) 10^{-14}

b) 1.8×10^{-16}

c) 1.8×10^{-12}

d) 1.018×10^{-14}

73. Which of the following statements is incorrect for the collision theory of chemical reaction? **[4]**

a) Colliding species must be properly oriented with sufficient

threshold energy for effective collision.

b) A number of effective collisions determine the rate of reaction.

c) It considers reacting species to be hard spheres and ignores their structural aspects.

d) Collision of species possessing sufficient threshold energy results in product formation.

74. In the presence of a catalyst, the heat evolved or absorbed during the reaction: **[4]**

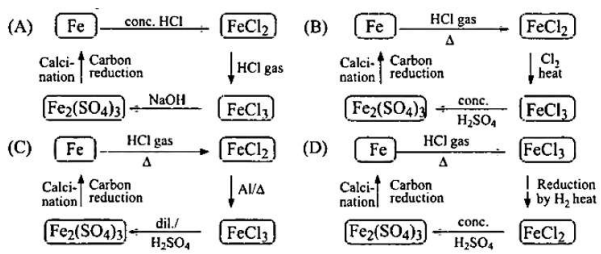
a) increase

b) remains unchanged

c) decreases

d) may increase or decrease

75. Which systematic diagram represents the CORRECT chemical relations between iron and its compounds? **[4]**



a) Only (D)

b) Only (C)

c) Only (B)

d) Only (A)

76. Among the following compounds the one that is polar and has the central atom with sp^2-hybridization is: **[4]**

a) BF_3

b) SiF_4

c) H_2CO_3

d) $HClO_2$

77. Select complex in which metal have primary valency = 2, secondary valency = 4 and shows stereoisomerism: **[4]**

a) $PtCl_4 \cdot 2NH_3$

b) $PtCl_2 \cdot 3NH_3$

c) $PtCl_2 \cdot 2NH_3$

d) $PtCl_2 \cdot 4NH_3$

78. Aqueous solution of nickel sulphate on treating with pyridine and then adding a solution of sodium nitrite gives dark blue crystals of: **[4]**

a) $Ni(py)_3(NO_2)]_2SO_4$

b) $Ni(py)_2(NO_2)_2]$

c) $[Ni(py)_4]SO_4$

d) $[Ni(py)_4](NO_2)_2$

79. Removal of an electron from an antibonding molecular orbital **[4]**

a) destabilizes the system

b) increases the bond order

c) decreases the bond order

d) increases the intemuclear distance

80. An alkyl halide may be converted into an alcohol by: **[4]**

a) substitution

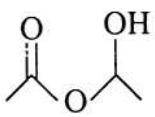
b) dehydrohalogenation

c) elimination

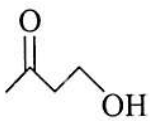
d) addition

81. The alcohol which is most readily dehydrated is: **[4]**

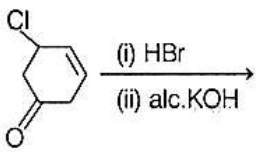
a) 2 -butanol

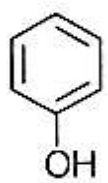
b) 

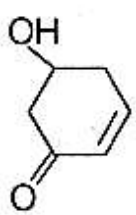
c) 1-phenyl -1-propanol

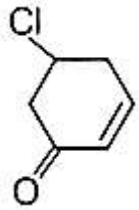
d) 

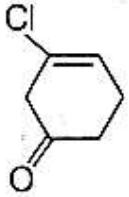
82. The major product of the following reaction is the **[4]**



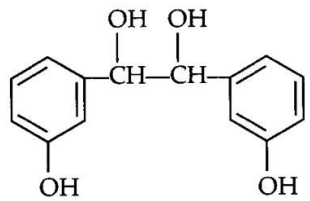
a) 

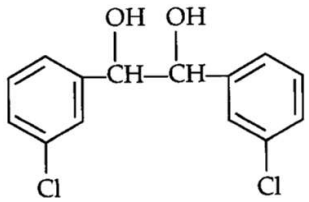
b) 

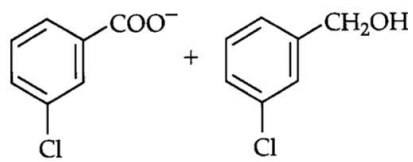
c) 

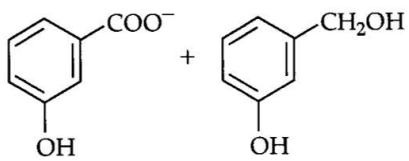
d) 

83. When m-chlorobenzaldehyde is treated with 50% KOH solution, the product(s) obtained is (are): **[4]**

a) 

b) 

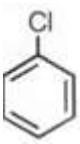
c) 

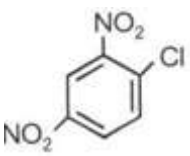
d) 

84. Which compound undergoes nitration readily? **[4]**

a) 

b) 

c) 

d) 

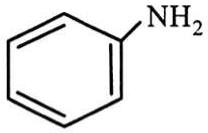
85. Which of the following monosaccharides is a pentose? **[4]**

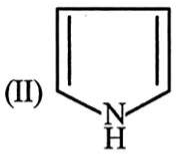
a) Fructose
b) Galactose
c) Ribose
d) Glucose

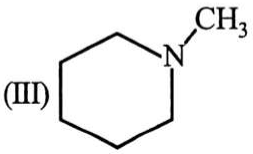
86. Which one is the complimentary base of adenine in one strand to that in the other strand of DNA? **[4]**

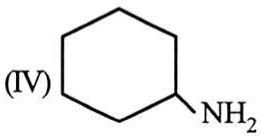
a) Guanine
b) Uracil
c) Thymine
d) Cytosine

87. Among the following compounds, the increasing order of their basic strength is: **[4]**

(I) 

(II) 

(III) 

(IV) 

a) (I) < (II) < (IV) < (III)

b) (I) < (II) < (III) < (IV)

c) (II) < (I) < (IV) < (III)

d) (II) < (I) < (III) < (IV)

88. Aqueous solution of which of the following compounds is the best conductor of electric current? **[4]**

a) Acetic acid, $C_2H_4O_2$

b) Hydrochloric acid, HCl

c) Ammonia, NH_3

d) Fructose, $C_6H_{12}O_6$

89. A liquid compound (x) can be purified by steam distillation only if it is _____. **[4]**

a) steam volatile, miscible with water

b) not steam volatile, immiscible with water

c) not steam volatile, miscible with water

d) steam volatile, immiscible with water

90. $[X] + H_2SO_4 \rightarrow [Y]$ a colourless gas with irritating smell **[4]**
$[Y] + K_2Cr_2O_7 + H_2SO_4 \rightarrow$ green solution [X] and [Y] is

a) Cl^-, HCI

b) S^-_2, H_2S

c) CO_{32-}, CO_2

d) SO_3^{2-}, SO_2

BOTANY

91. Which of the following genera placed in the family Solanaceae? **[4]**

a) Petunia

b) All of these

c) Datura

d) Solanum

92. Match the entities in Column I with their mode of reproduction in Column II. **[4]**

Column I	Column II
(A) Planaria	(i) Binary fission
(B) Fungi	(ii) Asexual spores
(C) Yeast	(iii) Budding
(D) Amoeba	(iv) True regeneration

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

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

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

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

93. In taxonomic hierarchy family comes between **[4]**

a) class and order.

b) division and class.

c) genus and species.

d) order and genus.

94. Which statement is correct for bacterial transduction? **[4]**

a) Transfer of some genes from one bacteria to another bacteria through virus

b) Transfer of genes from one bacteria to another bacteria by conjugation

c) Bacteria obtained DNA from other external source

d) Bacteria obtained its DNA directly

95. Match the entities in column I with their character in column II : **[4]**

Column I	**Column II**
(a) Plante	(i) Reproduce only by asexual spores
(b) Deuteromycetes	(ii) Alternation of generation
(c) Basidiomycetes	(iii) Conidia
(d) Ascomycetes	(iv) Asexual spores are generally not found
(e) Phycomycetes	(v) Aseptate and coenocytic

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

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

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

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

96. Ruminate endosperm is present in: **[4]**

a) Coconut

b) Myristica (jaiphel)

c) Tradescantia

d) Walnut

97. Match the structures given in column I with their ploidy levels given in column II and select the correct option. **[4]**

Column I (Structures)	**Column II (Ploidy)**
(A) Megaspore	(i) 2n
(B) Microspore mother cell	(ii) (n + n)
(C) Central cell	(iii) n
(D) Antipodal cell	

a) A-(i), B-(i), C-(ii), D-(iii)

b) A-(i), B-(i), C-(ii), D-(iii)

c) A-(iii), B-(i), C-(ii), D-(iii)

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

98. The type of pollination which brings genetically different pollen grains to the stigma is **[4]**

a) xenogamy

b) Both geitonogamy and autogamy

c) autogamy

d) geitonogamy

99. Leaves bear sporangia called: **[4]**

a) Macrophylls

b) All of these

c) Microphylls

d) Sporophylls

100. The plant body of moss (Funaria) is **[4]**

a) Predominantly sporophyte with gametophyte
b) Completely sporophyte
c) Completely gametophyte
d) Predominantly gametophyte with sporophyte

101. Which of the following statements is incorrect? **[4]**

i. Genes expressed as RNA
ii. Polypeptide expression
iii. DNA polymorphism
iv. Novel DNA sequences

a) Option (iii)
b) Option (ii)
c) Option (i)
d) Option (iv)

102. I_2 is obtained from: **[4]**

a) Brown algae
b) Red algae
c) green algae
d) Blue-green algae

103. Progeny produced as a result of cross-pollination: **[4]**

a) Genetically inferior
b) Is homozygous with phenotypic uniformity
c) Shows a high degree of variability and is evolutionary important
d) Genetically abnormal

104. Select the structure which exhibits a fascinating array of patterns and designs. **[4]**

a) Anther wall
b) Exine of pollen grain
c) Intine of pollen grain
d) Synergids of embryo sac

105. Whorled type phyllotaxy found in: **[4]**

a) Alstonia
b) Mustard

c) Calotropis
d) China rose

106. Which structure becomes green flashy and photosynthetic in Australian Acacia? **[4]**

a) Rachis
b) Petiole
c) All of these
d) Lamina

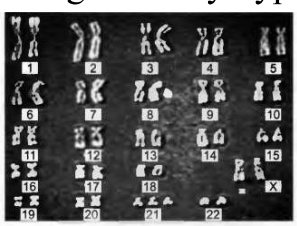
107. In Barley stem, vascular bundles are: **[4]**

a) Closed and radial
b) Open and scattered
c) Open and in a ring
d) Closed and scattered

108. Anatomically old dicotyledonous root is distinguished from the dicotyledonous stem by: **[4]**

a) Presence of cortex
b) Absence of secondary phloem
c) Absence of secondary xylem
d) Position of protoxylem

109. The given karyotype represents: **[4]**



a) Down's syndrome
b) Klinefelter's syndrome
c) Turner's syndrome
d) Normal man

110. Colour blindnesses due to: **[4]**

a) Dominant male chromosome
b) Recessive male chromosome
c) Recessive female chromosome
d) Dominant female chromosome

111. Genetic code is called degenerative: **[4]**

a) One type of mRNA synthesizes many types of enzymes
b) Amino acid can be coded by more than one codon

c) One tRNA recognizes one amino acid

d) Amino acid codes for different codons

112. Which of the following is not produced by E.coli in the lactose? **[4]**

a) Transacetylase

b) Lactose permease

c) Lactose dehydrogenase

d) Beta-galactosidase

113. Select the mismatch: **[4]**

a. Gas vacuoles - Green bacteria

b. Large central vacuoles - Animal cells

c. Protists - Eukaryotes

d. Methanogens - Prokaryotes

a) Option (d) is mismatch

b) Option (a) is mismatch

c) Option (b) is mismatch

d) Option (c) is mismatch

114. A scientist wanted to genetically engineer a new type of corn plant that could withstand cold temperatures. He decided to try to change the composition of the plant's membrane to lower the temperature of phase transition. Which of the following membrane changes might be expected to improve the cold tolerance of the plants? **[4]**

a) Increasing the length of the fatty acyl chains.

b) Decreasing the frequency of unsaturated fatty acyl chains.

c) Eliminating all the steroids.

d) Increasing the frequency of unsaturated fatty acyl chains.

115. Identify the condition, related to cell which is very active in the synthesis and secretion of proteins. **[4]**

a) Equal amount of RER and SER

b) More SER than RER

c) More RER than SER

d) More Golgi bodies and no ER

116. Antibodies fight against: **[4]**

a) Stress

b) Thirst

c) Starvation

d) Infection

117. Salmonella typhi causes: **[4]**

a) All of these

b) Enlargement of spleen and pain in stomach

c) An acute infection of intestine that causes high fever and weakness

d) Rose coloured rashes on the body

118. A person smokes many cigarettes daily. It may lead into: **[4]**

a) Throat cancer, oral cancer, syphilis, dysentery

b) Bronchitis, oral cancer, CAD, anaemia, increased O_2 level in blood

c) Throat cancer, urinary bladder cancer, hepatitis, gastric ulcer

d) Throat cancer, lung cancer, high b.p., emphysema, gastric ulcer

119. Which form of tumour remains confined to their original location and do not spread to other parts of the body? **[4]**

a) Benign tumour

b) Both Malignant tumour and Benign tumour

c) Malignant tumour

d) Leukaemia

120. Which of the following statements are true? **[4]**

i. Some cells in the adult animals do not appear to exhibit division.

ii. Many cells of animals divide only occasionally.

iii. These cells that do not divide further exit G_1 - phase to enter an inactive stage called G_0.

iv. Cells in quiescent stage remain metabolically active but no longer proliferate unless called on to do so.

v. In animals, mitotic cell division is only seen in the haploid somatic cells.

vi. Plants can show mitotic divisions in both haploid and diploid cells.

a) (i), (ii), (iv) and (v)

b) (i), (ii), (iii), (v) and (vi)

c) (i), (ii) and (iii)

d) All except (v)

121. In a growing population of country: **[4]**

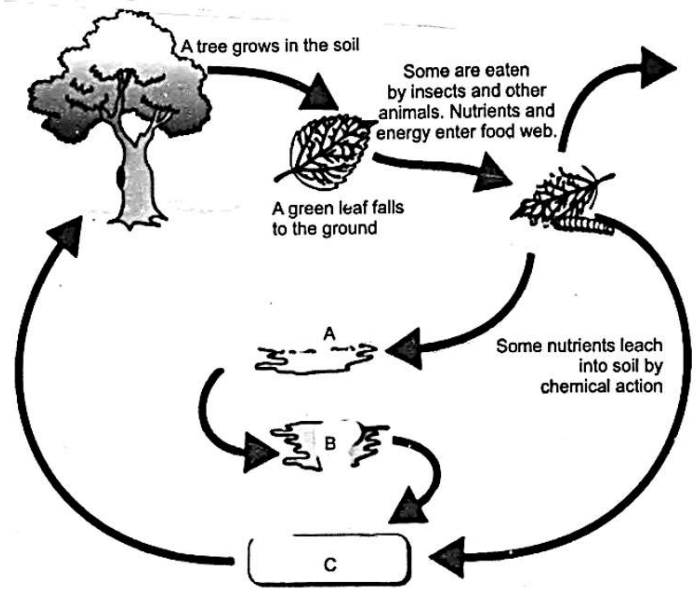
a) Pre-reproductive individuals are less than the reproductive individuals.

b) Reproductive and pre-reproductive individuals are equal in number.

c) Reproductive individuals are less than the post-reproductive individuals.

d) Pre-reproductive individuals are more then the reproductive individuals.

122. Given figure is a diagrammatic representation of decomposition cycle in a terrestrial ecosystem, which of the following option is correct about A, B, and C? **[4]**



a) A-decomposition by fungus and bacteria; B-organic rich soil; C-decomposition by fungus and earthworm.

b) A-decomposition by earthworm; B-decomposition by fungus and bacteria; C-organic rich soil.

c) A-organic rich soil; B-decomposition by fungus and

d) A-decomposition by fungus and bacteria; B-decomposition by

earthworm; C-decomposition by fungus and bacteria.

fungus and earthworm; C-organic rich soil.

123. Which of the following organism derives energy for N_2 fixation by performing photosynthesis? **[4]**

a) Rhizobium

b) Anabaena

c) Bacillus

d) Azotobacter

124. Which of the following statements regarding antibiotics is not correct? **[4]**

i. Antibiotics are the attenuated microorganisms which in small concentration can kill or retard the growth of other harmful microorganisms.

ii. Penicillin was the first antibiotic discovered by Alexander Fleming (1928) while working on bacterium Staphylococcus aureus.

iii. The full potential of penicillin as an effective antibiotic was established by Ernest Chain and Howard Florey.

iv. Fleming, Chain and Florey were awarded the Nobel Prize in 1945.

a) (iii) only

b) (i), (iii) and (iv)

c) (ii) and (iv)

d) (i) only

125. Match the column and select correct option for sacred groves and area where it find? **[4]**

Column I (sacred groves)	**Column II (State)**
(A) Khasi and Jaintia Hills	(i) Meghalaya
(B) Aravalli Hills	(ii) Madhya Pradesh
(C) Western Ghat regions	(iii) Karnataka and Maharashtra
(D) Sarguja, Chanda and Bastar areas	(iv) Rajasthan

a) (A)-(i); (B)-(iv); (C)-(iii); (D)-(ii)

b) (A)-(iii); (B)-(ii); (C)-(i); (D)-(iv)

c) (A)-(i); (B)-(ii); (C)-(iii); (D)-(iv)

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

126. Which one of the following statement is correct for botanical garden? **[4]**

a) They allow ex-situ conservation of germ plasm.

b) They provide a beautiful area for recreation.

c) One can observe tropical plants there.

d) They provide the natural habitat for wildlife.

127. Animals and plants are best protected in **[4]**

a) zoos

b) national parks

c) sanctuaries

d) botanical gardens

128. To observe chiasmata, the most appropriate stage of meiosis would be: **[4]**

a) Diplotene

b) Diakinesis

c) Metaphase - II

d) Pachytene

129. Which of the following stages of meiosis involves division of centromere? **[4]**

a) Anaphase II

b) Metaphase II

c) Metaphase I

d) Telophase II

130. First stable product of Calvin cycle has: **[4]**

a) 3 carbon atoms

b) 6 carbon atoms

c) 2 carbon atoms

d) 4 carbon atoms

131. Photorespiration involves **[4]**

a) mitochondria and peroxisome

b) chloroplasts, peroxisome and mitochondria

c) chloroplasts, cytoplasm, and mitochondria

d) chloroplast and mitochondria

132. CO_2 acceptor in C_3 plants is: **[4]**

a) 3-phosphoglyceric acid
b) Xylulose-5-phosphate
c) Ribulose-1, 5-diphosphate
d) Phosphoenol pyruvic acid

133. Granal chloroplasts are found in **[4]**

a) bundle sheath cells of C4 plants
b) mesophyll cells of C4 plants.
c) bundle sheath cells of C3 plants
d) both bundle sheath and mesophyll cells of C4 plants.

134. Cellular respiration **[4]**

a) converts kinetic energy to potential energy
b) converts energy stored in the chemical bonds of glucose to an energy that the cell can use
c) converts energy stored in the chemical bonds of proteins to an energy that the cell can use.
d) converts potential energy to kinetic energy.

135. Identify the correct and incorrect statements from the following. **[4]**

i. 17,500 new cells are produced per hour by a single maize root apical meristem.
ii. With the help of length, growth of pollen tube is measured.
iii. The growth of the leaf is measured in term of volume.
iv. Cells in a watermelon may increase in size by up to 3,50,000 times.

a) (i), (ii), (iii) are correct and (iv) is incorrect.
b) (ii), (iii) are correct and (i), (iv) are incorrect.
c) (i), (ii), (iv) are correct and (iii) is incorrect.
d) (i), (iv) are correct and (ii), (iii) are incorrect.

ZOOLOGY

136. Osphradium of Pila acts as **[4]**

a) chemoreceptor
b) Segmentation
c) tangoreceptor
d) thermoreceptor

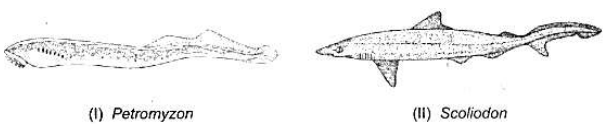
137. In which of the following animal/s scales are absent? **[4]**

a) All of these
b) Rana
c) Myxin
d) Petromyzon

138. Umbrella-shaped and free-swimming form in Cnidarians is known as? **[4]**

a) Hypostome
b) All of these
c) Polyp
d) Medusa

139. Which of the following option is correct for given diagram regarding their class and character? **[4]**



(I) *Petromyzon* (II) *Scoliodon*

a) I- Cyclostomata-with jaws , II- Chondrichthyes - without jaws
b) I- Chondrichthyes- with jaw, II- Osteichthyes- with jaw
c) I- Cyclostomata- without jaws, II- Chondrichthyes-with jaw
d) I- Chondrichthyes-with jaw, II- Cyclostomata- without jaws

140. Sailent feature/s of Balanoglossus is/are: **[4]**

a) Tomaria
b) All of these
c) Regeneration
d) Buccal diverticulum

141. The guts of cow and buffalo possess: **[4]**

a) Methanogens
b) Fucus spp
c) Cyanobacteria
d) Chlorella spp

142. During an injury nasal septum gets damaged and for its recovery which cartilage is preferred? **[4]**

a) Calcified cartilage
b) Fibrous cartilage
c) Elastic cartilage
d) Hyaline cartilage

143. Which of the following is not applicable in cockroach? **[4]**

a) Blood from sinuses enter the heart through ostia.

b) The haemolymph is composed of coloured plasma and haemocynine.

c) Blood flow in the haemocoel.

d) Blood is known as haemolymph.

144. 6000 to 8000 ml of air is the: **[4]**

a) Vital capacity of lungs

b) Inspiratory capacity of lung

c) Sum of VC + RV

d) Volume of normal expiration per minute

145. Which one of the following is an environment related disorder with the correct main cause? **[4]**

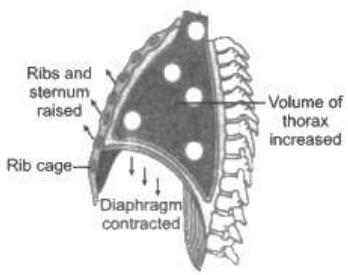
a) Skin cancer mainly in people exposed to benzene and methane

b) Non-hodgkin's lymphoma found mainly in workers involved in manufacture of neem based pesticides

c) Black lung disease (pneumoconiosis) found mainly in workers in stone quarries and crushers

d) Blue baby disease (methaemoglobinaemia) due to heavy use of nitrogenous fertilizers in the area

146. The given figure illustrates the changes in lung volume during the process of breathing, it represents: **[4]**



a) Expiration

b) Inspiration and expiration

c) Inspiration

d) demise

147. Type of cartilage seen in tracheal wall is: **[4]**

a) Inelastic cartilage
b) Elastic cartilage
c) Fibro cartilage
d) Hyaline cartilage

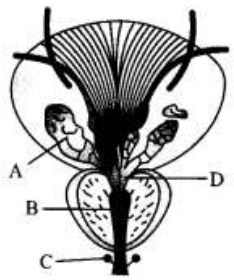
148. Under which condition, dissociation of oxygen from oxyhaemoglobin in tissues occurs? **[4]**

a) High pCO_2
b) Low pO_2
c) All of these
d) high H^+

149. CO_2 dissociates from carbaminohaemoglobin when: **[4]**

a) pCO_2 and pO_2 are equal
b) pCO_2 is low & pO_2 is low
c) pCO_2 is high & pO_2 is low
d) pO_2 is high and pCO_2 is low

150. In the image given below, identify the structure of male reproductive system whose removal will cause the sperm to be reacted with acidic urine in the urethra. **[4]**



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

151. After ovulation, Graafian follicles turns into **[4]**

a) corpus atresia
b) corpus albicans
c) corpus callosum
d) corpus luteum

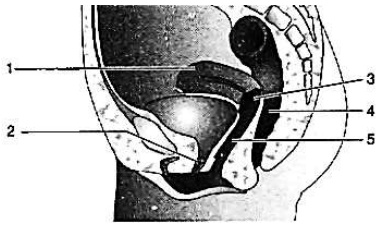
152. Which set of enzymes is found in the acrosome of mammalian spermatozoa? **[4]**

a) Hyaluronidase only
b) Hyaluronidase, Corone Penetrating Enzyme (CPE) only

c) Hyaluronidase, CPE, Peptidase

d) Hyaluronidase, CPE, Zona lysine

153. Given diagram represent sectional view of pelvis of female, identify given number and choose correct option. **[4]**



a) Cervix, Rectum, Vagina, Uterus, Urethra

b) Vagina, Uterus, Rectum, Cervix, Urethra

c) Urethra, Uterus, Vagina, Cervix, Rectum

d) Uterus, Urethra, Cervix, Rectum, Vagina

154. Which of the following contraceptive methods do involve the role of hormone? **[4]**

a) CuT, Pills, Emergency contraceptives

b) Pills, Emergency contraceptives, Barrier methods

c) Barrier method, Lactational amenorrhea, Pills

d) Lactational amenorrhea, Pills, Emergency contraceptives

155. By the amniocentesis, one of the following group can be possible to: **[4]**

a) Nature of embryo

b) Cytoplasmic behaviour

c) Cellular organelles

d) Abnormal behaviour of chromosomes and physiological activities

156. Cu ions released from copper releasing intra uterine devices (IUDs) : **[4]**

a) Increase phagocytosis of sperms

b) Suppress sperm motility

c) Prevent ovulation

d) Make uterus unsuitable for implantation

157. The writer of the book **Philosophic zoologique** was: **[4]**

a) Mendel
b) Darwin
c) de Vries
d) Lamarck

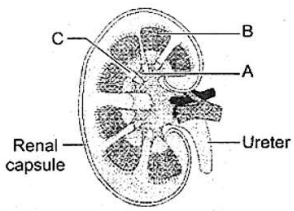
158. The early stage of human embryo distinctly possesses. **[4]**

a) Eye brows
b) External ear (pinna)
c) Gills
d) Gill slits

159. What is the cause that right kidney is at slightly lower level than the left kidney in human being? **[4]**

a) Due to improper ascentment of kidney during embryonic life.
b) Presence of colon in right side during I.U.L.
c) Presence of liver in right side therefore kidney does not ascends properly in I.U.L.
d) None of the these

160. In given diagram of kidney A, B and C represents: **[4]**



a) A-Calyx, B-Medullary pyramid, C-Renal column
b) All are incorrect
c) A-Renal pelvis, B-Renal pyramid, C-Renal column
d) A-Calyx, B-Renal column, C-Cortex

161. Ascending limb of loop of Henle is permeable for: **[4]**

a) Na^+
b) Glucose
c) Water
d) NH_3

162. A substance not secreted by renal tubule is: **[4]**

a) Potassium ions
b) Glucose
c) All of these
d) Ammonia

163. How many metacarpals are present in the palm? **[4]**

a) 4
b) 6
c) 3
d) 5

164. What is not true for smooth muscle fibres? **[4]**

a) Syncytial
b) Uninucleated
c) Spindle-shaped
d) Under ANS

165. Forearm is rotated to turn palm downward or backwards by muscle: **[4]**

a) Abductor
b) Extensor
c) Adductor
d) Pronator

166. Stimulation of a muscle fibre by a motor neuron occurs at: **[4]**

a) The sarcoplasmic reticulum
b) The neuromuscular junction
c) The transverse tubules
d) The myofibril

167. Receptor sites for neurotransmitters are present on: **[4]**

a) Pre-synaptic membrane
b) Post-synaptic membrane
c) Tips of axon
d) Membrane of synaptic vesicles

168. During the transmission of nerve impulse through a nerve fibre, the potential on the inner side of the plasma membrane has which type of electric charge? **[4]**

a) First negative, then positive and again back to negative
b) First positive, then negative and again back to positive
c) First negative, then positive and continue to be positive
d) First positive, then negative and continue to be negative

169. The shape of eye lens is changed by **[4]**

a) iris
b) optic nerve
c) ciliary muscle
d) pupil

170. Resorption of water and electrolytes by distal tubules of kidney and thereby diuresis reducing the loss of water through urine (diuresis) is done by **[4]**

a) FSH
b) vasopressin.
c) oxytocin
d) LH

171. Choose the wrong statement: **[4]**

A. Glucocorticoids produce anti-inflammatory reactions and suppress the immune response.

B. PTH also stimulates reabsorption of Ca^{2+} by the renal tubules and increases Ca^{2+} absorption from the digested food.

C. Vasopressin increases the loss of water through urine called antidiuretic hormone.

D. Pitocin is known as childbirth as well as milk ejection hormone.

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

172. Epinephrine and norepinephrine together known as: **[4]**

a) Catecholamines
b) All of these
c) Steroids
d) Pheromones

173. Which one of the following plasma proteins is involved in the coagulation of blood? **[4]**

a) Fibrinogen
b) Globulin
c) Serum amylase
d) Albumin

174. The blood vascular system of mammals is known as double vascular system because: **[4]**

a) All of these
b) A group of arteries carries oxygenated and the groups of

veins conduct deoxygenated blood

c) The two different systems never meet

d) Oxygenated blood runs from heart to different organs by one set of arteries while deoxygenated blood runs from heart to lung by pulmonary artery

175. Match the Column-I with Column-II: **[4]**

Column-I	**Column-II**
(a) P-wave	(i) Depolarisation of ventricles
(b) QRS complex	(ii) Repolarisation of ventricles
(c) T-wave	(iii) Coronary ischemia
(d) Reduction in the size of T-wave	(iv) Depolarisation of atria
	(v) Repolarisation of atria

a) (a) - (ii), (b) - (iii), (c) - (v), (d) - (iv)

b) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)

c) (a) - (iv), (b) - (i), (c) - (ii), (d) - (v)

d) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)

176. The term **recombinant DNA** refers to DNA **[4]**

a) with more than one recognition sites.

b) of the host cell.

c) with a piece of foreign DNA.

d) with selectable marker.

177. A bacterial cell was transformed with a recombinant DNA that was generated using a human gene. However, the transformed cells did not produce the desired protein. Reasons could be: **[4]**

a) Human protein is formed but degraded by bacteria

b) A human gene may have intron which bacteria cannot possess

c) Amino acid codons for humans and bacteria are different

d) All of these

178. Genetic engineering is: **[4]**

a) Study of extra nuclear gene

b) Manipulation of enzymes

c) Manipulation of RNA

d) Manipulation of genes by artificial method

179. Transgenic animals can be used to: **[4]**

a) study vaccine safety.

b) to produce biological products.

c) All of these

d) study normal physiology.

180. Which of the following Bt crops is being grown in India by the farmers? **[4]**

a) Maize

b) Brinjal

c) Cotton

d) Soyabean

S O L U T I O N

PHYSICS

1.

(c) J-kg^{-1}

Explanation:

The gravitational potential at a point is always negative, V is maximum at infinity. The SI unit of gravitational potential is **J/Kg**.

2.

(c) [$M^0L^{-1}T^0$]

Explanation:

Here, Kx is dimensionless. Hence,

[K] = $\left[\frac{1}{x}\right]$ = [$M^0L^{-1}T^0$]

3.

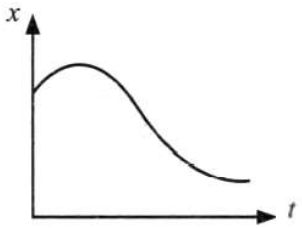
(d) $\frac{a}{y}$

Explanation:

Here, [a] = [y]. So, $\frac{a}{y}$ is dimensionless. Same is the case with Kx.

4.

(c)



Explanation:

In the graph, for one value of displacement, there are two timings. As a result of it, for one time, the average velocity is positive and for another time is equal but negative. Due to it, the average velocity for timings (equal to time-period) can vanish.

5.

(b) 2.0 m/s

Explanation:

$|\text{Avera} \geq \text{velocity}| = \frac{|\text{displacement}|}{\text{time}}$

$= \frac{2r}{t} = 2 \times \frac{1}{1} = 2$ m/s

6.

(c) position vector

Explanation:

position vector

7.

(d) 2 ms^{-1}

Explanation:

Radius of circle r = 20 cm = 0.2 m and angular velocity (ω) = 10 rad/s

linear velocity (v) = rω = 0.2 $\times$ 10 = 2 m/s

8.

(b) 10 ms^{-1}

Explanation:

$v_x = \frac{dx}{dt} = 6$ and $v_y = \frac{dy}{dt} = 8 - 10t = 8 - 10 \times 0 = 8$

$\therefore v = \sqrt{v_x^2 + v_y^2} = \sqrt{6^2 + 8^2} = 10 ms^{-1}$.

9. **(a)** 30 N, 25 N, 20 N

Explanation:

At point A, because tension is pulling the rope and block of mass 4 kg, hence $T_A = (2 + 4) \times 5 = 30N$

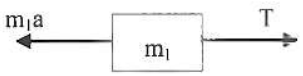
Similarly, at points B and C

$T_B = (1 + 4) \times 5 = 25N$

and $T_C = (0 + 4) \times 5 = 20N$

10. **(a)** $(m_1 + m_2 + m_3)\frac{m_2 g}{m_1}$

Explanation:



$a = \frac{F}{m_1 + m_2 + m_3}$

$T = m_1 a$; $T = m_2 g$

$\therefore m_1 a = m_2 a$ or $a = \frac{m_2}{m_1} g$

$\therefore F = \frac{m_2}{m_1} g (m_1 + m_2 + m_3)$

$\therefore F = (m_1 + m_2 + m_3)\frac{m_2 g}{m_1}$

11. **(a)** $\left[\frac{v^4}{r^2}+g^2\right]^{\frac{1}{2}}$

Explanation:

Centripetal acceleration = $\frac{v^2}{r}$. It is perpendicular to the rate of increase in speed, i.e., acceleration, which is equal to g according to the question. It is tangential to the circular path.

Hence, the net acceleration of the particle = $\left[\left(\frac{v^2}{r}\right)^2+g^2\right]^{\frac{1}{2}}$.

12.

(c) $\frac{2}{3}\frac{mv_0^2}{x_0^2}$

Explanation:

$\frac{2}{3}\frac{mv_0^2}{x_0^2}$

13.

(b) 2 kg

Explanation:

Resultant momentum = $\sqrt{(2)^2+(2)^2}=2\sqrt{2}$

Mass = $\frac{\text{Momentum}}{\text{Velocity}}=\frac{2\sqrt{2}}{\sqrt{2}}=2$ kg

14.

(b) K = $\sqrt{\frac{I}{M}}$

Explanation:

The correct relation between moment of inertia I, radius of gyration K and mass M of the body is

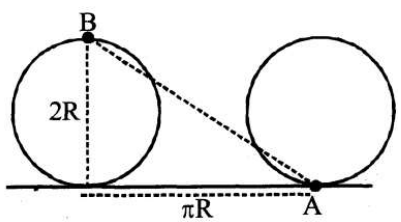
K = $\sqrt{\frac{I}{M}}$

15.

(b) $R\sqrt{(\pi^2+4)}$

Explanation:

From figure,



Displacement, BA = = $\sqrt{(2R)^2+(\pi R)^2}=R\sqrt{4+\pi^2}$

16.

(c) negative and positive

Explanation:

Total energy of Earth's satellite

T.E. = K + U

$= \left(\frac{GMm}{2r}\right) + \left(-\frac{GMm}{r}\right)$

$= -\frac{GMm}{2r}$

Hence, total energy is negative and kinetic energy is positive, i.e., correct answer.

17.

(b) 32.8 cm

Explanation:

$F = 10^{-9}$kg wt $= 10^{-9} \times 9.8$ N

$F = \frac{GM_1M_2}{R^2}$

$\therefore R^2 = \frac{GM_1M_2}{F} = \frac{6.6\times10^{-11}\times4\times4}{10^{-9}\times9.8} = 0.108\ m^2$

$\therefore R \approx 0.328$ m = 32.8 cm

18.

(d) T^2R^{-3} = constant

Explanation:

According to Kepler, $T^2 \propto r^3$

$\frac{T^2}{r^3}$ = constant

T^2R^{-3} = constant

19. **(a)** 12.8×10^{-3}

Explanation:

$Y = \frac{F}{A} \times \frac{L}{l}$

$\therefore \frac{L}{l} \times \frac{F}{AY}$

Poisson's ratio,

$\sigma = \frac{\frac{dr}{r}}{\frac{l}{L}} = \frac{\frac{dr}{r}}{F} \times AY$

$\therefore \frac{dr}{r} = \frac{\sigma F}{AY}$

$= \frac{0.32\times22}{0.01\times10^{-4}\times1.1\times10^{11}}$

$= 64 \times 10^{-6}$

Area of cross section of wire,

$A = \pi r^2$

$\therefore \frac{dA}{A} = 2\frac{dr}{r}$

$\therefore \%\frac{dA}{A} = 2 \times 64 \times 10^{-6} \times 100 = 12.8 \times 10^{-3}$

20.

(c) 7 : 6

Explanation:

For parallel combination of two rods of equal length and equal area of cross-section:

$K = \frac{K_1+K_2}{2} = \frac{K_1+\frac{4K_1}{3}}{2} = \frac{7K_1}{6}$

Hence, $\frac{K}{K_1} = \frac{7}{6}$

21.

(b) $\frac{27}{8}$

Explanation:

Heat suppled $\Delta Q = M_S \Delta T$

For same meterial 's' same

$\Delta Q \propto M$ and $M = \frac{4}{3}\pi r^3 \rho$

$\Delta Q \propto r^3$

$\frac{\Delta Q_1}{\Delta Q_2} = \left(\frac{r_1}{r_2}\right)^3 = \left(\frac{1.5}{1}\right)^3 = \frac{27}{8}$

22.

(b) 10 J

Explanation:

$\beta = \frac{Q_2}{W} = \frac{T_L}{T_H - T_L}$

$T_L = 273$ K, $T_H = 303$ K and W = 1 J

$\therefore \quad Q_2 = \frac{273}{303-273} \times 1 = \frac{273}{30} \cong 9J$

Hence, heat delivered to surroundings,

$Q_1 = Q_2 + W = 9 + 1 = 10$ J

23. **(a)** C and D only

Explanation:

From first law of thermodynamics

$dQ = dU + dW \Rightarrow dU = nC_V dT$

dU = 0 (for isothermal, dT = 0)

$\therefore$ U = constant

Hence, internal energy of the gas will not change.

Also dQ > 0 (Supplied)

Hence, dW > 0

24.

(c) $\Delta Q_A > \Delta Q_B$, $\Delta U_A = \Delta U_B$

Explanation:

According to the first law of t hermodynamics,

Heat supplied (ΔQ) = Work done (W) + Change in

internal energy of the system (ΔU)

$\Delta Q_A = \Delta U_A + W_A$

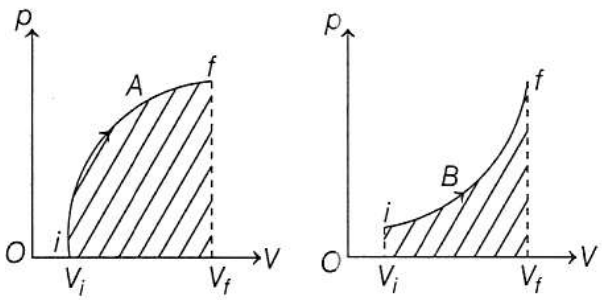
Similarly, for process B,

$\Delta Q_B = \Delta U_B + W_B$

Now, we know that,

work done for a process = area under it's p -V curve

Here,



Thus, it is clear from the above graphs,

$W_A > W_B$ ...(i)

Also, since the initial and final state are same in both process, so

$\Delta U_A = \Delta U_B$ ...(ii)

So, from Eqs. (i) and (ii), we can conclude that

$\Delta Q_A > \Delta Q_B$

25.

(c) 313° C

Explanation:

313° C

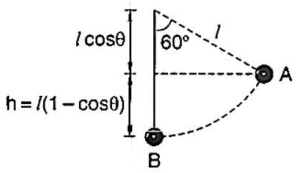
26.

(c) 2 ms^{-1}

Explanation:

K.E. at the lowest position, $E_B = \frac{1}{2}mv^2 = \frac{1}{2}m(3)^2 = \frac{9}{2}m$

When the length makes an angle $\theta(= 60°)$ to the vertical, the bob of the pendulum will have both KE and PE. If v is the velocity of bob at this position and h is the height of the bob w.r.t. B, then total energy of the bob at the position A.



$E_A = \frac{1}{2}mv^2 + mgh$

But $h = l(1 - \cos\theta) = 0.5\,[1 - \cos 60^\circ]$

$= \frac{1}{2}\left[1 - \frac{1}{2}\right] = \frac{1}{4}$

$\therefore E_A = \frac{1}{2}mv^2 + m \times 10 \times \frac{1}{4}$

$= \frac{1}{2}mv^2 + \frac{5m}{2}$

According to the law of conservation of energy,

$\frac{1}{2}mv^2 + \frac{5m}{2} = \frac{9m}{2}$

or $\frac{1}{2}mv^2 = \frac{9m}{2} - \frac{5m}{2} = 2m$

$\therefore v = 2\ ms^{-1}$

27.

(d) 0.3 J

Explanation:

The displacement of particle, executing SHM,

$y = 5\sin\left(4t + \frac{\pi}{3}\right)$ ...(i)

Velocity of particle,

$\left(\frac{dy}{dt}\right) = \frac{5d}{dt}\sin\left(4t + \frac{\pi}{3}\right) = 5\cos\left(4t + \frac{\pi}{3}\right) \cdot 4$

$= 20\cos\left(4t + \frac{\pi}{3}\right)$

Velocity at $t = \left(\frac{T}{4}\right)$

$\left(\frac{dy}{dt}\right)_{t=\frac{T}{4}} = 20\cos\left(4 \times \frac{T}{4} + \frac{\pi}{3}\right)$

or $u = 20\cos\left(T + \frac{\pi}{3}\right)$ ...(ii)

Comparing the given equation with standard equation of SHM

$y = a\sin(\omega t + \phi)$

We get; $\omega = 4$

As, $\omega = \frac{2\pi}{T}$ or $T = \frac{2\pi}{\omega}$

$T = \frac{2\pi}{4}$ or $T = \left(\frac{\pi}{2}\right)$

Now, putting value of T in eqn. (ii), we get;

$u = 20\cos\left(\frac{\pi}{2} + \frac{\pi}{3}\right) = -20\sin\frac{\pi}{3}$

$= -20 \times \frac{\sqrt{3}}{2} = -10 \times \sqrt{3}$

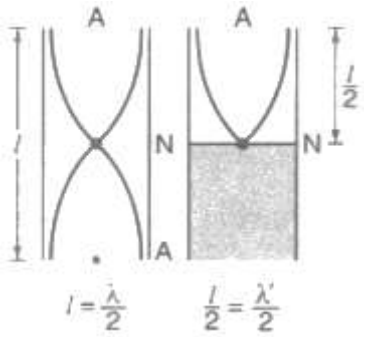
The kinetic energy of particle,

$KE = \frac{1}{2}mu^2 = \frac{1}{2} \times 2 \times 10^{-3} \times (-10\sqrt{3})^2 = 0.3J$

28.

(c) f' = f

Explanation:



In the first case,

$l = \frac{\lambda}{2}$

or $\lambda = 2l$

$\therefore f = \frac{v}{\lambda} = \frac{v}{2l}$ ...(i)

In second case,

$\frac{l}{2} = \frac{\lambda'}{4}$

or $\lambda' = 2l$

$f' = \frac{v}{\lambda'} = \frac{v}{2l}$ ...(ii)

From eqn. (i) and (ii),

$f' = f$

29.

(b) 20 log (3)

Explanation:

$\frac{I_1}{I_2} = \frac{4}{1}$ or $\sqrt{\frac{I_1}{I_2}} = \frac{2}{1}$

$\therefore \frac{I_{max}}{I_{min}} = \left[\frac{\sqrt{I_1/I_2}+1}{\sqrt{I_1/I_2}-1}\right]^2 = \left[\frac{2+1}{2-1}\right]^2 = 9$

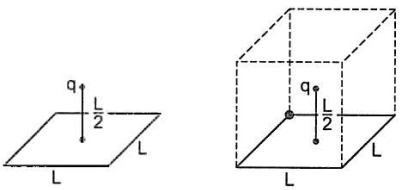
$\therefore L_1 - L_2 = 10 \log \frac{I_{max}}{I_0} - 10 \log \frac{I_{min}}{I_0}$

$= 10 \log \frac{I_{max}}{I_{min}} = 10 \log (9) = 20 \log (3)$

30.

(c) $\frac{q}{6\varepsilon_0}$

Explanation:



The given square of side L may be considered as one of the faces of a cube with edge L. Then given charge q will be considered to be placed at the centre of this cube. Then according to Gauss's theorem, the magnitude of the electric flux through the six faces of the cube is given by:

$\phi = \frac{q}{\varepsilon_0}$

Hence, electric flux through one face of the cube (or through the given square) will be,

$\phi' = \frac{\phi}{6} = \frac{q}{6\varepsilon_0}$

31.

(d) 10 V

Explanation:

Electric potential at any point inside a hollow metallic sphere is constant. Therefore, if potential at surface is 10 V, potential at centre will also be 10 V.

32. **(a)** decreases with increasing temperature.

Explanation:

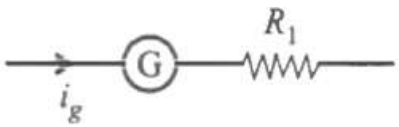
decreases with increasing temperature.

33.

(b) $R_1 + G$

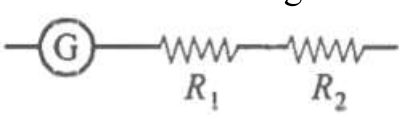
Explanation:

A galvanometer of resistance (G) converted into a voltmeter of range 0-1 V



$V = 1 = i_g (G + R_1)$ ...(i)

To increase the range of voltmeter 0-2 V



$2 = ig(R_1 + R_2 + G)$ ...(ii)

Dividing eq. (i) by (ii),

$\Rightarrow \frac{1}{2} = \frac{G+R_1}{G+R_1+R_2}$

$\Rightarrow G + R_1 + R_2 - 2G + 2R_1$

$\therefore R_2 = G + R_1$

34.

(b) 100 K

Explanation:

As per Curie law,

$\chi \propto \frac{1}{T}$

$\therefore \frac{\chi_2}{\chi_1} = \frac{T_1}{T_2}$

$\therefore \frac{2.1\times10^{-5}}{1.4\times10^{-5}} = \frac{300}{T_2}$

$\frac{3}{2} = \frac{300}{T_2}$

$\therefore T_2 = \frac{600}{3}$

= 200 K

∴ Change in temperature

= T_1 - T_2

= 300 - 200

= 100 K

35.

(b) 2.5 × 10^{-2} N

Explanation:

We know that,

F = mB

$= \frac{\mu_0}{4\pi}\frac{2m'l}{x^3}m$

$= \frac{10^{-7}\times2\times200\times0.05\times100}{8\times10^{-3}}$

= 2.5 × 10^{-2} N

36.

(b) 0.61 A

Explanation:

Given,

Length of wire, l = 30 cm

Radius of wire, r = 2 mm = 2 × 10^{-3} m

Resistivity of metal wire, ρ = 1.23 × 10^{-8} Ωm

Emf generated, $|e| = \frac{d\phi}{dt} = \frac{dB}{dt}$(A) ($\because \phi$ = BA)

Current, i = $\frac{e}{R}$

But, resistance of wire, R = $\rho\frac{l}{A}$

$\therefore i = \left|\frac{dB}{dt}\right|\frac{(A)^2}{\rho l} = \frac{0.032\times\{\pi\times2\times10^{-3}\}^2}{1.23\times10^{-8}\times0.3} = 0.61$ A

37.

(c) 2 s

Explanation:

$I = t^2 e^{-t}$

$\therefore \quad \frac{dI}{dt} = 2te^{-t} - t^2e^{-t} = te^{-t}(2 - t)$

The induced emf is

$\varepsilon = -L\frac{dI}{dt}$

According to given problem, $\varepsilon = 0$

or $\frac{dI}{dt} = 0$ (since, $L \neq 0$)

or $e^{-t}t(2 - t) = 0$

either $t = 0$or $t = 2s$

$t = 2s$

38.

(b) Purely Inductive circuit

Explanation:

Wattless current flow in a circuit only when circuit is resistanceless i.e. circuit is purely capacitive or inductive.

39.

(c) 1×10^{-6} N

Explanation:

Given that $I = 20$ W cm^{-2}

$= 20 \times 10^4$ W m^2

$A = 15\ cm^2 = 15 \times 10^{-4}\ m^2$

$t = 30$ min,$= 30 \times 60$ s $= 1800$ s

Total energy falling on the surface

$U = IAt$

$= (20 \times 10^4)(15 \times 10^{-4})(1800)$

$= 5.4 \times 10^5$ J

Total momentum delivered to the surface

$P = \frac{U}{c} = \frac{5.4 \times 10^5}{3 \times 10^8} = 1.8 \times 10^{-3} kgms^{-1}$

$\therefore$ Average force,

$F = \frac{dp}{dt} = \frac{1.8 \times 10^{-3}}{1800} = 1 \times 10^{-6}$ N

40.

(b) 33.6

Explanation:

When the final image is formed atleast distance of distinct vision d, magnifying power of the telescope is:

$m = \frac{f_0}{f_e}\left(1 + \frac{f_e}{d}\right) = \frac{140}{5}\left(1 + \frac{5}{25}\right)$

$= 28\ [1 + 0.2] = 28 \times 1.2 = 33.6$

41.

(c) produce polarised light

Explanation:

Polariser is used in producing polarised light.

42.

(c) green light of any intensity

Explanation:

The ejection of photoelectron does not depends on Intensity but on Frequency. The frequency of yellow and red light is less than that of green light so they can't eject photoelectrons.

43.

(b) E = hv

Explanation:

Einstein's photoelectric effect & compton effect establish the particle nature of light. These effects can be explained only, when we assume that the light has particle nature (To explain, Interference & diffraction the light must have wave nature. It means that light has both particle and have nature, so it is called dual nature of light).

$KE_{max} = E_{photon} - W_0$

The above equation supports:

$E_{photon} = hv$

It proves that light is in the form of discrete packets of energy and not wave. Otherwise, the light with a lower frequency than the threshold could give enough energy(slowly accumulate) to the electrons to come out of the metal. Hence this theory supports the particle nature of light, as suggested by Einstein.

44. **(a)** -13.6 eV

Explanation:

Energy of a hydrogen atom-like He^+ in an nth orbit is given by

$E_n = -\frac{13.6Z^2}{n^2}$ eV

For hydrogen atom, Z = 1

$\therefore E_1 = -\frac{13.6}{1^2}$ eV = -13.6 eV

For He^+ ion, Z = 2

$E_n = -\frac{4(13.6)}{(n)^2}$ eV

For first excited state, n = 2

$\therefore E_2 = -\frac{4(13.6)}{(2)^2}$ eV = -13.6 eV

Hence, the energy in He^+ ion in first excited state is same that of energy of the hydrogen atom in ground state i.e., -13.6 eV.

45.

(c) 1.33×10^6

Explanation:

$^7_3Li + ^1_1H \longrightarrow 2\ (^4_2He)$

$\Delta m \rightarrow [m_{Li} + m_H]$ - $2[M_{He}]$

Energy released = Δmc^2

In use of 1 g Li energy released = $\frac{\Delta mc^2}{m_{Li}}$

In use of 20g energy released = $\frac{\Delta mc^2}{m_{Li}} \times 20$ g

$= \frac{[(7.016+1.0079)-2\times4.0026]u\times c^2}{7.016\times1.6\times10^{-24}} \times 20$ g

$= \left(\frac{0.0187\times1.6\times10^{-19}\times10^9}{7.016\times1.6\times10^{-24}} \times 20\right) = 480 \times 10^{10}$ J

$\because$ 1 J = 2.778×10^{-7} kWh

$\therefore$ Energy released = $480 \times 10^{10} \times 2.778 \times 10^{-7}$

= 1.33×10^6 kWh

CHEMISTRY

46. **(a)** 7 : 32

Explanation:

Let mass of oxygen = 1 g, Then mass of nitrogen = 4g

Mol. wt. of N^2 = 28g, Mol. wt. of O^2 = 32g

28 g of N^2 has = 6.02 x 10^{23} molecules of nitrogen

4 g of N^2 has = $\frac{6.02\times10^{23}}{28} \times 4$ molecules of nitrogen

$= \frac{6.02\times10^{23}}{7}$ molecules of nitrogen

32 g of O^2 has = 6.02×10^{23}

$\therefore$ 1 g of O^2 has = $\frac{6.02\times10^{23}}{32} \times 1$

$= \frac{6.02\times10^{23}}{32}$ molecules of oxygen

47. **(a)** 12.044×10^{20} molecules

Explanation:

Milli mole = $M \times V_{mL}$

$= 0.02 \times 100 = 2$

$\therefore$ molecules = $2N \times 10^{-3}$

$= 2 \times 6.02 \times 10^{23} \times 10^{-3} = 12.044 \times 10^{20}$

48.

(c) Be^{3+}, n = 2

Explanation:

$r_2 Be^{3+} = \frac{r_1 H}{4} \times 2^2$ ($\because r_2 H = r_{1H} \times 2^2$ and $r_n Be^{3+} = \frac{r_n H}{n}$)

49.

(b) $S_1 > S_2$

Explanation:

Mass of positively charged ions in positive rays is more than mass of electrons.

50.

(d) $\frac{nh}{2\pi}$

Explanation:

Angular momentum of electron in an orbit = $n\frac{h}{2\pi}$

51. **(a)** Ionisation potential

Explanation:

Ionic radii = Increases

Atomic radii = Increases

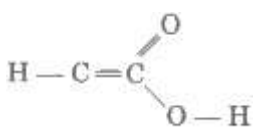
I.E. = Decreases

52. **(a)** $\sigma \rightarrow d$

Explanation:

$\sigma \rightarrow d$

53.

(c) 

Explanation:

$H - C = \overset{O}{\overset{\|}{C^*}} - O - H$

The asterick (*) marked carbon has a valency of 5 and hence this formula is not correct because carbon has a maximum valency of 4.

54.

(d) $Li_2^- < Li_2^+ < Li_2$

Explanation:

$Li_2 (3 + 3 = 6) = \sigma ls^2, \overset{*}{\sigma} ls^2, \sigma 2s^2$

Bond order $= \frac{N_b - N_a}{2} = \frac{4-2}{2} = 1$

$Li_2^+ (3 + 3 - 1 = 5) = \sigma ls^2, \overset{*}{\sigma} 1s^2, \sigma 2s^1$

Bond order $= \frac{3-2}{2} = \frac{1}{2} = 0.5$

$Li_2^- (3 + 3 + 1 = 7) = \sigma ls^2, \overset{*}{\sigma} 1s^2, \sigma 2s^2 \overset{*}{\sigma} 2s^1$

Bond order $= \frac{4-3}{2} = \frac{1}{2} = 0.5$

Stability order is $Li_2 < Li_2^+ < Li_2$ (because Li_2^- has more number of electrons in antibonding orbitals which destabilises the species).

55. **(a)** more cis-2-pentene is formed

Explanation:

more cis-2-pentene is formed

56.

(b) 5954 J mol^{-1}

Explanation:

$\Delta G = \Delta H - T\Delta S$; at equilibrium

$\Delta G = 0$

$\therefore \Delta H = T\Delta S$

or $\Delta H = 273 \times (60.01 - 38.20) = 5954.13$ J mol^{-1}

57.

(d) 12.65

Explanation:

meq. of HCl = $0.01 \times V$

meq. of NaOH = $0.1 \times V$

$\therefore$ meq. of NaOH left = 0.1 V - 0.01 V

$\therefore$ [NaOH] left $= \frac{0.09V}{2V} = 0.045$ M

$\therefore$ pOH = -log $[OH^-]$ = - log [0.045] = 1.35

$\therefore$ pH = 12.65

58. **(a)** Ni

Explanation:

Ni

59.

(d) 4.08%

Explanation:

Average oxidation no. of M = $+\frac{200}{98}$ (lies between 2 and 3)

Let % of M^{2+} be a and of M^{3+} be b

or $\frac{2 \times a + (100 - a) \times 3}{100} = 2.04$ ($\because$ a + b = 100)

$\therefore$ 2a + 300 - 3a = $\frac{200}{98}$

$\therefore$ +a = 300 - 2.04 $\times$ 100

= 300 - 204 = 96

Thus M^{2+} = 96%

M^{2+} = 4%

60.

(b) 2.5

Explanation:

Mole of O_2 formed = $\frac{3}{24} = \frac{1}{8}$

$\therefore$ Mole of $H_2O_2 = \frac{1}{8} \times 2 = \frac{1}{4}$

$\therefore$ 100 $\times$ X = $\frac{1}{4} \times 1000$ (m mole = m $\times$ V)

$\therefore$ X = 2.5

61. **(a)** Al < Ga < In < Tl

Explanation:

In group 13 elements, the stability of +3 oxidation state decreases down the group while that of +1 oxidation state increases due to the inert pair effect. Hence, stability of +1 oxidation state increases in the sequence: Al < Ga < In < Tl.

62.

(d) $NH_3 + H_2O \longrightarrow NH_2OH$

Explanation:

In $NH_3 + H_2O \longrightarrow NH_2OH$ Process hybridization is not affected. In this process both the nitrogen in the reactant and product are in sp^3 hybrid state.

i. $\underset{sp^3d}{PCl_5} \longrightarrow \underset{sp^3}{PCl_4^+} + \underset{sp^3d^2}{PCl_6^-}$

ii. $\underset{sp^2}{AlH_3} \longrightarrow \underset{sp^3}{AlH_4^-}$

iii. $\underset{sp}{BeF_2} \longrightarrow \underset{sp^3}{BeF_2(s)}$

iv. $\underset{sp^3}{NH_3} \longrightarrow \underset{sp^3}{NH_4^+}$

63.

(c) P > R > S > Q

Explanation:

P > R > S > Q

64.

(b) $CH_3 - \underset{\underset{D}{|}}{CH} - CH_2D$

Explanation:

$CH_3 - \underset{\underset{D}{|}}{CH} - CH_2D$

65. **(a)** I, II and IV

Explanation:

-NO_2 is deactivating group, so it cannot give Friedel-Crafts reaction.

66.

(d) 100.08

Explanation:

$\Delta T_b = K \times$ molality $= 0.51 \times 0.69 = 0.352$;

$\therefore$ boiling point = 99.725 + 0.352 = 100.077°C

67.

(b) 2°C

Explanation:

$\Delta T \propto w$, if other factors are constant.

Thus $\frac{\Delta T}{1} = \frac{30}{15}$

$\therefore \Delta T = 2$

68.

(c) 72 torr

Explanation:

$P_M = 80 \times \frac{3}{5} + 60 \times \frac{2}{5}$

= 48 + 24 = 72 torr

69. **(a)** C > A = B

Explanation:

C > A = B

70.

(d) $MnO_4^- \mid Mn^{2+}$

Explanation:

Reduction of MnO_4^- is pH dependent.

In acidic medium

$MnO_4^- + 5e^- \longrightarrow Mn^{2+}$

In neutral medium

$MnO_4^- + 3e^- \longrightarrow Mn^{4+}$

In basic medium

$MnO_4^- + e^- \longrightarrow Mn^{6+}$

So, according to pH, the reaction and potential of cell changes.

71.

(c) Copper and $HCl_{(aq)}$

Explanation:

As copper is placed below hydrogen in the electrochemical series, thus copper does not give hydrogen with dilute acids. While all other will give hydrogen.

$Fe + \text{dilute } H_2SO_4 \rightarrow FeSO_4 + H_2\uparrow$

$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2\uparrow$

$2Na + C_2H_5OH \rightarrow 2C_2H_5ONa + H_2\uparrow$

$Cu + \text{dil. } HCl \rightarrow \text{No reaction}$

72.

(b) 1.8×10^{-16}

Explanation:

1.8×10^{-16}

73.

(d) Collision of species possessing sufficient threshold energy results in product formation.

Explanation:

According to collision theory, successful conversion of reactant(s) to product(s) takes place when,

i. reactant molecules possess sufficient threshold energy, and

ii. are properly oriented with respect to each other at the time of the collision.

74.

(b) remains unchanged

Explanation:

Catalyst does not change heat of reaction.

75.

(c) Only (B)

Explanation:

$Fe + 2HCl \longrightarrow FeCl_2 + H_2$

$Cl_2 + FeCl_2 \xrightarrow{\Delta} FeCl_3 \xrightarrow{H_2SO_4} Fe_2(SO_4)_3 \underset{carbon}{\overset{\Delta with}{\rightleftharpoons}} Fe$

76.

(c) H_2CO_3

Explanation:

Carbon in H_2CO_3 has sp^2 - hybridization and is polar as individual bond dipoles do not cancel each other.

BF_3 has sp^2 - hybridized but is non-polar. SiF_4 has sp^3 - hybridization. $HClO_2$ has sp^3 - hybridization.

77.

(c) $PtCl_2 \cdot 2NH_3$

Explanation:

$[Pt(NH_3)_2Cl_2]$

O.N. = +2, C.N. = 4, shows 2 G.I.

78.

(d) $[Ni(py)_4](NO_2)_2$

Explanation:

$[Ni(py)_4](NO_2)_2$

79.

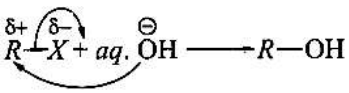
(b) increases the bond order

Explanation:

increases the bond order

80. **(a)** substitution

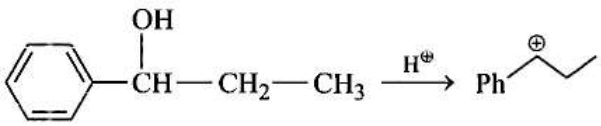
Explanation:



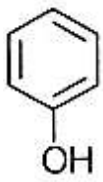
81.

(c) 1-phenyl -1-propanol

Explanation:

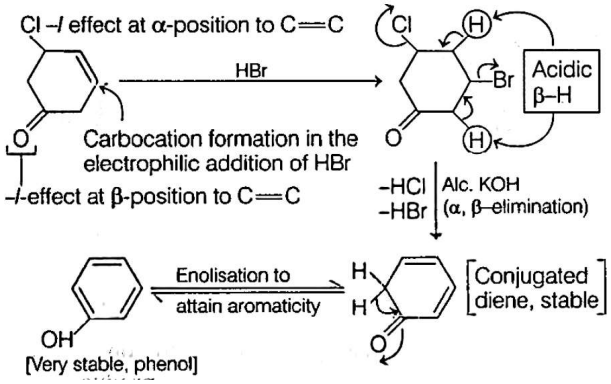


Highly stabilise cation

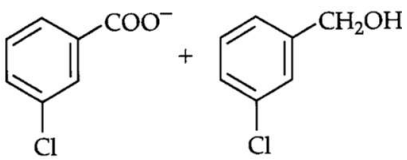
82. **(a)** 

Explanation:

In the presence of HBr, the reactant containing $>C=C<$ undergoes electrophilic addition reaction and gives substituted alkyl halide. On further reaction with ale. KOH, α, β-elimination takes place that give corresponding diene. The diene undergoes enolization to give a stable product (phenol).

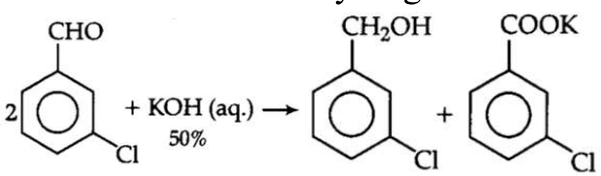


83.

(c) 

Explanation:

Due to absence of α-hydrogen m-chloro benzaldehyde gives cannizzaro reaction



84. **(a)** 

Explanation:

Acetophenone, benzonitrile, benzaldehyde, and benzoic acid all contain electron-withdrawing groups, therefore, in all these compounds the electron density over the phenyl ring is lower than in benzene. Thus, benzene undergoes electrophilic nitration most readily.

85.

(c) Ribose

Explanation:

Ribose

86.

(c) Thymine

Explanation:

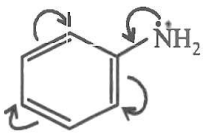
Thymine

87.

(c) (II) < (I) < (IV) < (III)

Explanation:

I.



+R effect

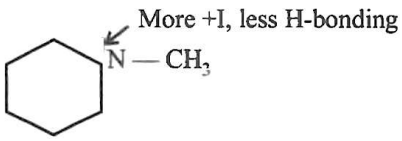
the lone pair of electrons is less easily available for protonation.

II.

+R effect

the lone pair of electrons is not available for proton.

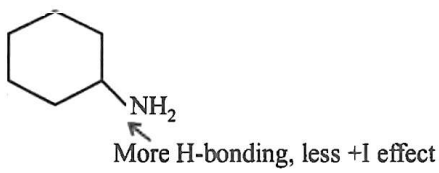
III.



+I, H-bonding

+I more preferred than H-bonding is due to steric hindrance to H-bonding in 1^{o} amine.

IV.



+I, H-bonding

Unstable Thus, the correct order is (I) < (II) < (IV) < (III)

88.

(b) Hydrochloric acid, HCl

Explanation:

Hydrochloric acid is a strong electrolyte that is almost completely ionized in its aqueous solution. Hence, among the given options, an aqueous solution of HCl is the best conductor of electric current.

89.

(d) steam volatile, immiscible with water

Explanation:

steam volatile, immiscible with water

90.

(d) SO_3^{2-}, SO_2

Explanation:

[X] and [Y] are SO_{32}^- and SO_2 respectively.

SO_{32}^- reacts with sulphuric acid to form sulphur dioxide which is a colourless gas with an irritating smell. $SO_{32}^- + H_2SO_4 \rightarrow SO_2$ (a colourless gas with irritating smell) + H_2O

Potassium dichromate oxidises sulphur dioxide to the green solution of chromium sulphate.

$SO_2 + K_2Cr_2O_7 + H_2SO_4 \rightarrow Cr_2(SO_4)_{3(greensolution)} + K_2SO_4 + H_2O$.

BOTANY

91.

(b) All of these

Explanation:

Solanum, Petunia and Datura are placed in the family Solanaceae which are based on both vegetative and reproductive features of plant species.

92.

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

Explanation:

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

93.

(d) order and genus.

Explanation:

Taxonomic hierarchy is the arrangement of various taxa. Carl Linnaeus developed a hierarchical system for organising living organisms in which highest rank was given to kingdom, followed subsequently by phylum, class, order, family, genus, and species. Species was Linnaeus's least inclusive level of classification and includes all organisms of similar morphologies that can interbreed and produce viable offspring. According to the given hierarchical system, family comes between order and genus.

94. **(a)** Transfer of some genes from one bacteria to another bacteria through virus

Explanation:

Transduction is the process by which foreign DNA is introduced into a cell by a virus or viral vector. When the DNA is transferred from one bacterium to another with the help of a virus or viral vector-like bacteriophage it is known as bacterial transduction.

95.

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

Explanation:

- Plants commonly show alteration of generation.
- In Deuteromycetes, only asexual or vegetative mode of reproduction is found that is why they are known as imperfect fungi.
- Basidiomycetes do not reproduce asexually however vegetative reproduction, commonly, occurs by fragmentation.
- Ascomycetes reproduce asexually by conidia formation.
- In Phycomycetes mycelium is aseptate and coenocytic.

96.

(b) Myristica (jaiphel)

Explanation:

Myristica (jaiphel)

97.

(c) A-(iii), B-(i), C-(ii), D-(iii)

Explanation:

Megaspore and antipodal are haploid cells, central cell has two haploid polar nuclei, and megaspore mother cell is diploid.

98. **(a)** xenogamy

Explanation:

Xenogamy is the transfer of pollen grains from anther to the stigma of a different plant. This is the only type of pollination which brings genetically different pollen grains to the stigma.

99.

(d) Sporophylls

Explanation:

The sporophytes bear sporangia that are subtended by leaf-like appendages called sporophylls. In some cases, sporophylls may form distinct compact structures called strobili or cones.

100.

(d) Predominantly gametophyte with sporophyte

Explanation:

Funaria is a bryophyte. In bryophyte, the main plant body is gametophytic in nature. Embryo formed by fertilization grows into a sporophyte. The sporophyte is dependent on gametophyte. It produces haploid meiospores which germinate to produce a gametophyte.

101.

(d) Option (iv)

Explanation:

Option (iv)

102. **(a)** Brown algae

Explanation:

Iodine is obtained from the members of Brown algae. Brown algae are also known as ribbon seaweeds. They accumulate iodine by obtaining iodide ions from the seawater.

103.

(c) Shows a high degree of variability and is evolutionary important

Explanation:

Cross-pollination is the transfer of pollen from the anthers of one flower to the stigma of another flower with the help of pollinating agents like wind, insects, etc. Cross-pollination leads to genetic variabilities because of the more chances of mixing of characters and thus, phenotypes and genotypes. Hence, it enriches the gene pool.

104.

(b) Exine of pollen grain

Explanation:

The exine exhibits a fascinating array of patterns and designs.

105. **(a)** Alstonia

Explanation:

Plants with whorled phyllotaxy have three or more leaves arising from the node. It is found in Alstonia.

106.

(b) Petiole

Explanation:

In some plants such as Australian acacia, the leaves are small and short-lived. The petioles in these plants expand, become green, and synthesise food.

107.

(d) Closed and scattered

Explanation:

The vascular bundles in Hordeum vulgare (barley) plant are scattered in ground tissues, many in number, and vary in size-smaller towards the periphery and bigger towards the centre of the ground tissue, oval or rounded in outline, conjoint, collateral, and closed.

108.

(d) Position of protoxylem

Explanation:

In dicot root the protoxylem is located near the periphery of the vascular cylinder, the metaxylem farther inward i.e., exarch or centripetal. In dicot stem the protoxylem is located near the centre of vascular bundle and metaxylem is located near the periphery i.e., endarch or centrifugal.

109. **(a)** Down's syndrome

Explanation:

Down's syndrome

110.

(c) Recessive female chromosome

Explanation:

Recessive female chromosome

111.

(b) Amino acid can be coded by more than one codon

Explanation:

Amino acid can be coded by more than one codon

112.

(c) Lactose dehydrogenase

Explanation:

Lactose dehydrogenase

113.

(c) Option (b) is mismatch

Explanation:

Large central vacuoles are characteristics of plant cells.

114.

(d) Increasing the frequency of unsaturated fatty acyl chains.

Explanation:

The temperature dependence of biological membrane is affected by the lipid composition of the membrane. Low temperatures can cause a membrane to enter a gel-like phase with very high membrane-lipid viscosity, whereas high temperatures can cause a membrane to become 'hyper fluid' with very little viscosity. The greater the proportion of unsaturated carbon - carbon bonds (double-bonds) in a lipid's fatty acid molecules, the easier solidification of it

occurs, in cold temperature and thus the lesser the changes in plants membrane at lower temperature.

115.

(c) More RER than SER

Explanation:

The RER offers extensive surface on which protein synthesis can be conveniently carried on by ribosomes. The proteins formed on ribosomes pass into the ER lumen where they are modified. Then the modified proteins move into the transitional area, where the ER buds off membranous sacs, the transport vesicles, carrying the proteins to the Golgi apparatus. Here, they are further processed and packaged into secretory vesicles for export by exocytosis at the plasma membrane.

116.

(d) Infection

Explanation:

Infection

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

Explanation:

The primary lymphoid organs are bone marrow and thymus where immature lymphocytes differentiate into antigen-sensitive lymphocytes. After maturation, the lymphocytes migrate to secondary lymphoid organs like the spleen, lymph nodes, tonsils, Peyer's patches of the small intestine and appendix. The secondary lymphoid organs provide the sites for interaction of lymphocytes with the antigen, which then proliferate to become effector cells. There is lymphoid tissue also located within the lining of the major tracts (respiratory, digestive, and urogenital tracts) called mucosa-associated lymphoid tissue (MALT). It constitutes about 50 percent of the lymphoid tissue in the human body.

118.

(d) Throat cancer, lung cancer, high b.p., emphysema, gastric ulcer

Explanation:

Throat cancer, lung cancer, high b.p., emphysema, gastric ulcer

119. **(a)** Benign tumour

Explanation:

A benign tumour is a mass of cells (tumour) that lacks the ability to invade neighbouring tissue or metastasize. These do not spread into, or invade, nearby tissues; however, they can sometimes be quite large. Common examples of benign tumours include moles and uterine fibroids.

120.

(d) All except (v)

Explanation:

In animals, mitotic cell division is only seen in the diploid somatic cells whereas plant shows the mitotic division in both haploid and diploid cells.

121.

(d) Pre-reproductive individuals are more then the reproductive individuals.

Explanation:

In a growing population the younger population size is large than the reproductive group.

122.

(d) A-decomposition by fungus and bacteria; B-decomposition by fungus and earthworm; C-organic rich soil.

Explanation:

A-decomposition by fungus and bacteria; B-decomposition by fungus and earthworm; C-organic rich soil.

123.

(b) Anabaena

Explanation:

Anabaena

124.

(d) (i) only

Explanation:

Antibiotics are chemical substances secreted by certain microbes which inhibit the growth and development of other microbes. Most of them are produced by actinomycetes (specially the genus Streptomyces) and filamentous fungi. Some important antibiotics are: tetracycline, chloramphenicol, streptomycin, etc.

125. **(a)** (A)-(i); (B)-(iv); (C)-(iii); (D)-(ii)

Explanation:

(A)-(i); (B)-(iv); (C)-(iii); (D)-(ii)

126. **(a)** They allow ex-situ conservation of germ plasm.

Explanation:

A botanical garden is a place where plants are grown and revealed for the purposes of research and education and allows ex situ conservation for germ plasm. Botanical gardens distinguish them from other parks and gardens where plants, with beautiful flowers, are

grown for public convenience. Botanical gardens specialize in trees are referred to as arboreta.

127.

(b) national parks

Explanation:

National Park is a protected area, which is strictly reserved for the welfare of the wildlife and where activities like forestry, grazing and cultivation are not permitted. Their boundaries are well marked and circumscribed. In national parks, the emphasis is on the preservation of a single plant or animal species.

128. **(a)** Diplotene

Explanation:

Chiasmata is observed in meiosis during diplotene, sub-stage of Prophase-I of meiosis I. It is the result of crossing over. Each chiasma is the site of genetic crossing over between chromosomes that have paired up (i.e . between bivalents. It is produced by breakage and reunion between any two of the four strands present at each site.

129. **(a)** Anaphase II

Explanation:

Meiosis ensures the production of the haploid phase in the life cycle. It involves two sequential cycles of nuclear division called meiosis I and meiosis II.

In meiosis II, during anaphase II, sister chromatids are held together with centromere. During this phase, the splitting of the centromere of each chromosome takes place. It allows moving chromosomes towards the opposite poles.

130. **(a)** 3 carbon atoms

Explanation:

3 carbon atoms

131.

(b) chloroplasts, peroxisome and mitochondria

Explanation:

Photorespiration involves a series of reactions which occur in three organelles - chloroplast, peroxisome and mitochondrion.

132.

(c) Ribulose-1, 5-diphosphate

Explanation:

Ribulose-1, 5-diphosphate

133.

(b) mesophyll cells of C4 plants.

Explanation:

Chloroplasts in the mesophyll cells of C4 plants are granal and in bundle sheath cells are agranal. So, chloroplasts are dimorphic.

134.

(b) converts energy stored in the chemical bonds of glucose to an energy that the cell can use

Explanation:

The main purpose of cellular respiration is to get energy that is utilised for functioning various purposes. Energy from chemical bonds of glucose is transferred to ATP molecules.

135.

(c) (i), (ii), (iv) are correct and (iii) is incorrect.

Explanation:

The growth of the leaf is measured in term of surface area.

ZOOLOGY

136. **(a)** chemoreceptor

Explanation:

Osphradium is an olfactory organ in certain molluscs. It is linked with the respiration organ. The main function of this organ is to test incoming water for silt and possible food particles. The organ is present in all members of the genus Conus, the cone snails, a group of predatory sea snails.

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

Explanation:

Petromyzon (Lamprey) and Myxine (Hagfish) are Cyclostomes which lacks scales. Rana is a frog which belongs to Class Amphibia and does not have scales in its skin. Hence, all these animals do not have scales.

138.

(d) Medusa

Explanation:

Umbrella-shaped and free-swimming form in Cnidarians is known as medusa. Example - jelly fish.

139.

(c) I- Cyclostomata- without jaws, II- Chondrichthyes-with jaw

Explanation:

The image I, Petromyzon is a Cyclostomata which is jawless or without jaws and the image II, Scoliodon is a Chondrichthyes, with powerful jaws.

140.

(b) All of these

Explanation:

All of these

141. **(a)** Methanogens

Explanation:

Methanogens are found in the rumen of cows and buffalo which help in the breakdown of cellulose and thus play an important role in the nutrition of these animals.

142.

(d) Hyaline cartilage

Explanation:

Nasal septum consists of hyaline cartilage. It is bluish-green and translucent in appearance. It has fewer very fine white fibres in the matrix. This type of cartilage gives flexibility and support at the joints. Elastic calcified and fibrous cartilages occur in other parts of body.

143.

(b) The haemolymph is composed of coloured plasma and haemocynine.

Explanation:

Blood vascular system of cockroach is an open type. Blood vessels are poorly developed and open into space (haemocoel). Visceral organs located in the haemocoel are bathed in blood (haemolymph). The haemolymph is composed of colourless plasma and haemocytes. Blood from sinuses enter heart through ostia and is pumped anteriorly to sinuses again.

144.

(c) Sum of VC + RV

Explanation:

Sum of VC + RV

145.

(c) Black lung disease (pneumoconiosis) found mainly in workers in stone quarries and crushers

Explanation:

Coal workers' pneumoconiosis (CWP), also known as **black lung disease** or **black lung**, is caused by long-term exposure to coal dust.

146.

(c) Inspiration

Explanation:

Inspiration

147.

(d) Hyaline cartilage

Explanation:

Hyaline cartilage forms incomplete C shaped rings which surround the trachea. It is translucent cartilage. The rings lie posterior to the trachea. It supports the wall of the trachea and prevents its collapse during inspiration. The circoid, thyroid, and arytenoid rings are made of up hyaline cartilage. Elastic cartilage forms the epiglottis. It has great flexibility and allows repeated bending. Fibrocartilage is tough, very strong tissue found predominantly in the intervertebral disks.

148.

(c) All of these

Explanation:

In the tissues, there is low pO_2 high pCO_2, high H^+ and high temperature. All these conditions are favourable for the dissociation of oxygen from oxyhaemoglobin.

149.

(d) pO_2 is high and pCO_2 is low

Explanation:

High pO_2 and low pCO_2 in the lung alveoli causes dissociation of CO_2 from carbamino-haemoglobin.

150. **(a)** C

Explanation:

In the given figure, A is seminal vesicles; B is prostate, C is bulbourethral gland, and D is ejaculatory duct. The bulbourethral glands produce a droplet of alkaline fluid that neutralises residual urine in the urethra, protecting the sperm from its acidity.

151.

(d) corpus luteum

Explanation:

The ovulation is followed by the luteal phase during which the remaining parts of the Graafian follicles transform as the corpus luteum.

152.

(d) Hyaluronidase, CPE, Zona lysine

Explanation:

Hyaluronidase, CPE, Zona lysine

153.

(d) Uterus, Urethra, Cervix, Rectum, Vagina

Explanation:

Uterus, Urethra, Cervix, Rectum, Vagina

154.

(d) Lactational amenorrhea, Pills, Emergency contraceptives

Explanation:

- Lactational amenorrhea is one of the natural contraceptive methods. The ovulation and menstrual cycles do not occur during intense lactation after parturition. As long as breast feeding continued the chance of conception is almost nil.
- **Oral pills** contain hormones-eitber proge-stogens or progestogen-estrogen combinations used by the females.
- **An emergency contraceptive** is like the administration of progestogen-estrogen or the use of IUDs within 72 hours of coitus is effective in the prevention of conception.

155.

(d) Abnormal behaviour of chromosomes and physiological activities

Explanation:

Abnormal behaviour of chromosomes and physiological activities

156.

(b) Suppress sperm motility

Explanation:

IUDs increase phagocytosis of sperm within the uterus and the Cu ions released suppress sperm motility and the fertilizing capacity of sperms.

157.

(d) Lamarck

Explanation:

Lamarck

158.

(d) Gill slits

Explanation:

Early human embryo represented the fundamental chordate characters and possesses a dorsal hollow nerve cord, a well-developed notochord, and a series of gill slits.

159.

(c) Presence of liver in right side therefore kidney does not ascends properly in I.U.L.

Explanation:

Presence of liver in right side therefore kidney does not ascends properly in I.U.L.

160. **(a)** A-Calyx, B-Medullary pyramid, C-Renal column

Explanation:

A-Calyx, B-Medullary pyramid, C-Renal column

161. **(a)** Na^+

Explanation:

The ascending limb of the loop of Henle is a segment of the nephron in the kidney divided into a thin and thick ascending limb. The thin ascending limb is impermeable to water and ions, except sodium and chloride, which cross by diffusion. In the thick ascending limb, sodium (Na^+), potassium (K^+), and chloride (Cl^-) ions are reabsorbed by active transport.

162.

(b) Glucose

Explanation:

Glucose

163.

(d) 5

Explanation:

The palm has five bones known as metacarpal bones, one to each of the 5 digits. These metacarpals have a head, a shaft, and a base. Human hands contain fourteen digital bones, also called phalanges, or phalanx bones: two in the thumb (the thumb has no middle phalanx) and three in each of the four fingers.

164. **(a)** Syncytial

Explanation:

Syncytial

165.

(d) Pronator

Explanation:

Muscle is a bundle of fibrous tissue in a body that has the ability to contract, producing movement in or maintaining the position of parts of the body. The total number of muscles in the human body comes in the range of 640-850. The forearm is rotated to turn the palm downward or backward by muscle pronator. So, the correct answer is 'Pronator'.

166.

(b) The neuromuscular junction

Explanation:

Stimulation of a muscle fibre by a motor neuron occurs at the neuromuscular junction. The area of contact between a nerve and muscle fibre is called motor end plate. At neuromuscular junction a neuron activates the muscle to contract. Acety1 choline is a neurotransmitter that is involved in the transmission of impulse at the neuromuscular junction.

167.

(b) Post-synaptic membrane

Explanation:

Neuro transmitter is a chemical substance responsible for transmission of nerve impulse across synapse. It is released by synaptic vesicle into the synaptic cleft. Neuro transmitter binds with protein receptor molecule present on post synaptic membrane causing its depolarisation and generation of action potential.

168. **(a)** First negative, then positive and again back to negative

Explanation:

At resting potential (polarised phase), the inside of the plasma membrane is negatively charged (-70 mY). As the stimulus reaches, it becomes positively charged (-1-45 mY, depolarised phase). As impulse passes away, it regains its original ionic distribution and again becomes negatively charged.

169.

(c) ciliary muscle

Explanation:

Ciliary muscles are circular sheet of smooth muscle fibres present within the ciliary body. These muscles alter the shape of the lens during contraction.

170.

(b) vasopressin.

Explanation:

Vasopressin released by posterior lobe of pituitary acts mainly at the kidney and stimulates, reabsorption of water and electrolytes by the distal tubules and thereby reduces the loss of water through urine (diuresis). Hence, it is also called anti-diuretic hormone (ADH).

171.

(c) C

Explanation:

Vasopressin increases the loss of water through urine called antidiuretic hormone.

172. **(a)** Catecholamines

Explanation:

Catecholamines

173. **(a)** Fibrinogen

Explanation:

Fibrinogens are needed for clotting or coagulation of blood.

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

Explanation:

Double vascular systems in a four-chambered heart refer to two circulations namely, pulmonary and systemic are present. The pulmonary circulation starts with the pumping of deoxygenated blood by the right ventricle which is carried to the lungs where it is oxygenated and returned to the left atrium. The systemic circulation starts with the pumping of oxygenated blood by the left ventricle to the aorta which is carried to all the body tissues and the deoxygenated blood from there is collected by the veins and returned to the right atrium.

175.

(b) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)

Explanation:

(a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)

176.

(c) with a piece of foreign DNA.

Explanation:

After cutting the source DNA and the vector DNA with a specific restriction enzyme, the cut out 'gene of interest' from the source DNA and the cut vector with space are mixed and ligase enzyme is added. This results in the formation of rDNA or hybrid PNA or chimeric DNA.

177.

(b) A human gene may have intron which bacteria cannot possess

Explanation:

A human gene may have intron which bacteria cannot possess

178.

(d) Manipulation of genes by artificial method

Explanation:

Manipulation of genes by artificial method

179.

(c) All of these

Explanation:

Transgenic animals can be used to study normal physiology, vaccine safety and to produce biological products, etc.

180.

(c) Cotton

Explanation:

Bt toxin genes were isolated from Bacillus thuringiensis and incorporated into the several crop plants such as cotton. The choice of genes depends upon the crop and targeted pest, as most Bt toxins are insect-group specific. The toxin is coded by a gene named cry. These are numerous genes. Two cry genes I Ac and cry II Ab have been incorporated in cotton. The genetically modified crop is called Bt cotton as it contains Bt toxin genes against cotton bollworms.