ALL INDIA MOCK TEST

Sample Paper - 8

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. What are the units of $K = \frac{1}{4\pi\varepsilon_0}$? **[4]**

   a) Unitless
   b) $\mathrm{Nm^2C^{-2}}$
   c) $C^2N^{-1}m^{-2}$
   d) $\mathrm{Nm^2C^2}$

2. The equation $\left(P + \frac{a}{V^2}\right)(V - b)$ = constant. The units of a are: **[4]**

   a) dyne $\times$ cm^4
   b) dyne $\times$ cm^2
   c) dyne $\times$ cm^5
   d) dyne $\times$ cm^3

3. If ε_0, μ_0 and c represent the relative permittivity of free space, the magnetic permeability of free space, and the velocity of light respectively, which of the following combinations is correct? **[4]**

   a) $c = \frac{1}{\mu_0\varepsilon_0}$
   b) $c = \sqrt{\mu_0\varepsilon_0}$
   c) $c = \frac{1}{\sqrt{\mu_0\varepsilon_0}}$
   d) $c = \mu_0\varepsilon_0$

4. A metro train starts from rest and in five seconds achieves 108 km/h. After that it moves with constant velocity and comes to rest after travelling 45 m with uniform retardation. If total distance travelled is 395 m, then total time of travelling is: **[4]**

   a) 15.3 sec
   b) 12.2 sec
   c) 9.0 sec
   d) 17.2 sec

5. A train of 150 m length is going towards north direction at a speed of 10 ms^{-1}. A parrot flies at a speed of 5 ms^{-1} towards south direction parallel to the railway track. The time taken by the parrot to cross the train is equal to: **[4]**

a) 10 s
b) 8 s
c) 15 s
d) 12 s

6. Choose the wrong statement. **[4]**

a) Zero velocity of a particle does not necessarily mean that its acceleration is zero.
b) If speed of a particle is constant, its acceleration must be zero.
c) If speed of a particle is increases, its acceleration must be zero.
d) Zero acceleration of a particle does not necessarily mean that its velocity is zero.

7. The ceiling of a hall is 40 m high. For maximum horizontal distance, the angle at which the ball may be thrown with a speed of 56 ms^{-1} without hitting the ceiling of the hall is: **[4]**

a) 60°
b) 45°
c) 30°
d) 25°

8. If $\vec{A} + \vec{B} = \vec{C}$ and A = B = C, then what should be the angle between $\vec{A}$ and $\vec{B}$? **[4]**

a) 0
b) $\frac{\pi}{3}$
c) $\frac{2\pi}{3}$
d) π

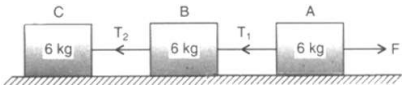
9. A mass attached to one end of a string crosses the top-most point on a vertical circle with critical speed. Its centripetal acceleration when string becomes horizontal will be (g = gravitational acceleration) **[4]**

a) g
b) 6g

c) 3g

d) 4g

10. A force of FN is applied as shown in the figure. Find the tensions in the string between BC, if the friction force is negligible: **[4]**



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

b) F

c) $\frac{F}{2}$

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

11. If mass of an atom is M moving with speed v, what will be its speed after the emission of an a-particle if speed of a-particle is zero? **[4]**

a) $\frac{Mv}{M-4}$

b) $\frac{Mv}{M+4}$

c) $\frac{M-4}{Mv}$

d) $\frac{Mv}{M+2}$

12. A bullet of mass 4 g is fired horizontally with a speed of 300 m/s into 0.8 kg block of wood at rest on a table. If the coefficient of friction between the block and the table is 0.3, how far will the block slide approximately? **[4]**

a) 0.19 m

b) 0.379 m

c) 0.758 m

d) 0.569 m

13. The potential energy between two atoms, in a molecule is given by U(x) = $\frac{a}{x^{10}} - \frac{b}{x^5}$ where a and b are positive constants and x is the distance between the atoms. The atom is in stable equilibrium, when **[4]**

a) x = 0

b) x = $\left(\frac{2a}{b}\right)^{\frac{1}{5}}$

c) x = $\left(\frac{11a}{5b}\right)^{1/5}$

d) x = $\left(\frac{a}{2b}\right)^{1/5}$

14. From a solid sphere o f mass M and radius R, a cube of maximum possible volume is cut. Moment of inertia of cube about an axis passing through its centre and perpendicular to one of its faces is **[4]**

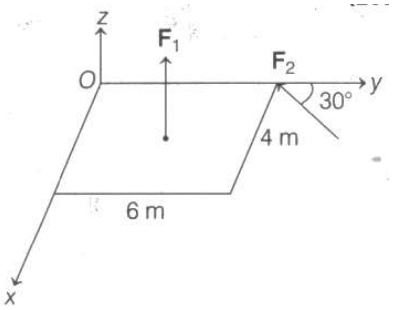
a) $\frac{4MR^2}{9\sqrt{3}\pi}$

b) $\frac{MR^2}{16\sqrt{2}\pi}$

c) $\frac{MR^2}{32\sqrt{2}\pi}$

d) $\frac{4MR^2}{3\sqrt{3}\pi}$

15. A slab is subjected to two forces $\vec{F}_1$ and $\vec{F}_2$ of same magnitude F as shown in the figure. Force $\vec{F}_2$ is in xy-plane while force $\vec{F}_1$ acts along Z-axis at the point $(2\hat{\mathbf{i}} + 3\hat{\mathbf{j}})$. The moment of these forces about point O will be **[4]**



a) $(3\hat{\mathbf{i}} + 2\hat{\mathbf{j}} + 3\hat{\mathbf{k}})F$

b) $(3\hat{\mathbf{i}} - 2\hat{\mathbf{j}} + 3\hat{\mathbf{k}})F$

c) $(3\hat{\mathbf{i}} - 2\hat{\mathbf{j}} - 3\hat{\mathbf{k}})F$

d) $(3\hat{\mathbf{i}} + 2\hat{\mathbf{j}} - 3\hat{\mathbf{k}})F$

16. If the polar ice caps of the earth melt, how will it affect the length of the day? **[4]**

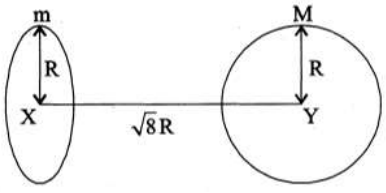
a) Length of day would fall

b) Length of day would increase

c) Length of day would remain unchange

d) Length of day would decrease

17. Find the gravitational force of attraction between the ring and sphere as shown in the diagram, where the plane of the ring is perpendicular to the line joining the centres. If $\sqrt{8}R$ is the distance between the centres of a ring (of mass 'm ') and a sphere (mass 'M') where both have equal radius 'R' **[4]**



a) $\frac{1}{3\sqrt{8}} \cdot \frac{GMm}{R^2}$

b) $\frac{2\sqrt{2}}{3} \cdot \frac{GMm}{R^2}$

c) $\frac{\sqrt{8}}{9} \cdot \frac{GmM}{R}$

d) $\frac{\sqrt{8}}{27} \cdot \frac{GmM}{R^2}$

18. A mass M is split into two parts, m and (M - m), which are then separated by a certain distance. What ratio of m/M maximizes the gravitational force between the two parts? **[4]**

a) 1/5 b) 1/4

c) 1/2 d) 1/3

19. A heavy uniform rod is suspended vertically from some rigid support. If it is stretched due to its own weight, then diameter of the rod is: **[4]**

a) the smallest at the top and gradually increases down the rod b) uniform everywhere

c) the largest at the top and gradually decreases down the rod d) maximum in the middle

20. A rectangular block is heated from $0^{o}C$ to $100^{o}C$. The percentage increase in its length is 0.10%. What will be the percentage increase in its volume? **[4]**

a) 0.03% b) 0.10%

c) 0.30% d) 0.50%

21. Which of the following statements is correct? **[4]**

i. A gas has two specific heats only.

ii. A gas has an infinite number of specific heats.

iii. A material will have only one specific heat always.

iv. None of these

a) option (iv) b) option (iii)

c) option (ii) d) option (i)

22. 1 kg of water is heated from $30^{o}C$ to $60^{o}C$, if its volume remains constant, then the change in internal energy is: (specific heat of water = 4148 $Jkg^{-1}K^{-1}$) **[4]**

a) 1.24×10^{5} J b) 1×10^{5} J

c) 2.48×10^{5} J d) 2×10^{5} J

23. One mole of an ideal monoatomic gas is heated at a constant pressure of one atmosphere from 0°C to 100°C. Then, the change in internal energy is: **[4]**

a) 12.48×10^2 joule

b) 6.56 joule

c) 8.32×10^2 joule

d) 20.80×10^2 joule

24. During an adiabatic process, the pressure of a gas is proportional to the cube of its absolute temperature. The value of $\frac{C_p}{C_v}$ for the gas is: **[4]**

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

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

c) $\frac{4}{3}$

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

25. Which one of the following is not an assumption of kinetic theory of gases? **[4]**

a) The collision between the molecules is elastic.

b) All molecules have the same speed.

c) The volume occupied by the molecules of the gas is negligible.

d) The force of attraction between the molecules is negligible.

26. The mass and the diameter of a planet are three times the respective values for the earth. The period of oscillation of a simple pendulum on the earth is 2 s. The period of oscillation of the same pendulum on the planet would be **[4]**

a) $\frac{\sqrt{3}}{2}$s

b) $2\sqrt{3}$s

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

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

27. A simple pendulum of length l is moved aside till the string makes an angle θ_1, with the vertical. If the acceleration due to gravity is g, the kinetic energy of the bob when the string is inclined at θ_2 to the vertical is: **[4]**

a) mgl(cos θ_2 - cos θ_1)

b) mgl sin (θ_1 - θ_2)

c) mgl(cos θ_1 - cos θ_2)

d) mgl cos (θ_1 - θ_2)

28. If the tension in the string of a sonometer changes by a small amount from T to T + Δ T, the fundamental frequency of vibration changes from n to n + Δn, then: **[4]**

a) $\frac{\Delta n}{n} = - \left(\frac{1}{2}\right) \frac{\Delta T}{T}$

b) $\frac{\Delta n}{n} = \frac{\Delta T}{T}$

c) $\frac{\Delta n}{n} = \left(\frac{1}{2}\right) \frac{\Delta T}{T}$

d) $\frac{\Delta n}{n} = 2 \left(\frac{\Delta T}{T}\right)$

29. The amplitude of sound is tripled and the frequency is reduced to one-third. The intensity of sound at the same point will: **[4]**

a) be decreased to one third

b) be decreased to half

c) remain same

d) be increased to three times

30. In finding the electric field using Gauss law the formula $|\vec{E}| = \frac{q_{enc}}{\varepsilon_0 |A|}$ is applicable. In the formula ε_0 is permittivity of free space, A is the area of Gaussian surface and q_{enc} is charge enclosed by the Gaussian surface. This equation can be used in which of the following situation? **[4]**

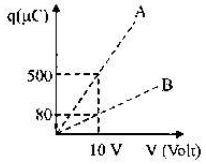
a) Only when the Gaussian surface is an equipotential surface and $|\vec{E}|$ is constant on the surface

b) For any choice of Gaussian surface

c) Only when the Gaussian surface is an equipotential surface

d) Only when $|\vec{E}|$ = constant on the surface

31. Figure shows charge (q) versus voltage (V) graph for series and parallel combination of two given capacitors. The capacitances are: **[4]**



a) 60 μF and 40 μF

b) 40 μF and 10 μF

c) 50 μF and 30 μF

d) 20 μF and 30 μF

32. Silver and copper voltmeters are connected in parallel with a battery of emf 12 V. In 30 min 1 g of silver and 1.8 g of copper are liberated. The energy supplied by the battery is **[4]**

a) 720 J

b) 24.12 J

c) 2.41 J

d) 4.34×10^4 J

33. A galvanometer has a resistance of 3663 ohm. A shunt S is connected across it such that (1/34) of the total current passes through the galvanometer. the multiplying power of the shunt is: **[4]**

a) 34

b) 33

c) 35

d) 1

34. A magnet is parallel to a uniform magnetic field. If it is rotated by 60^o the work done is 0.8 J. How much work is done in moving it 30^o further? **[4]**

a) 8 J

b) 0.8 erg

c) 0.4 J

d) 0.8×10^7 erg

35. In an experiment with vibration magnetometer the value of $\frac{4\pi^2 I}{T^2}$ for a short bar magnet is observed as 36×10^{-4}. In the experiment with deflection magnetometer with the same magnet the value of $\left(\frac{4\pi d^3}{2\mu_0}\right)$ is observed as $\frac{10^8}{36}$. The magnetic moment of the magnet used, is: **[4]**

a) 1000 A-m

b) 50 A-m

c) 200 A-m

d) 100 A-m

36. A circular disc of radius 0.2 meter is placed in a uniform magnetic field of induction $\frac{1}{\pi}\left(\frac{wb}{m^2}\right)$ in such a way that its axis makes an angle of 60° with B. The magnetic flux linked with the disc is: **[4]**

a) 0.01 wb

b) 0.08 wb

c) 0.02 wb

d) 0.06 wb

37. The magnetic flux through a coil is inversely proportional to: **[4]**

a) number of turns

b) area

c) none of these

d) magnetic field

38. A 5 cm long solenoid having 10 ohm resistance and 5 mH inductance is joined to a 10 V battery. At steady state, the current through the solenoid (in ampere) will be: **[4]**

a) 1

b) 2

c) zero

d) 5

39. If $\vec{E}$ and $\vec{B}$ are the electric and magnetic field vectors of electromagnetic waves, then the direction of propagation of the electromagnetic wave is along the direction of: **[4]**

a) $\vec{E}$

b) $\vec{E} \times \vec{B}$

c) $\vec{E} + \vec{B}$

d) $\vec{B}$

40. A person who can see things most clearly at a distance of 10 cm, requires spectacles to enable to see clearly things at a distance of 30 cm. What should be the focal length of the spectacles? **[4]**

a) 0

b) 10 cm

c) 15 cm (convex)

d) 15 cm (concave)

41. Two coherent monochromatic light sources are located at two vertices of an equilateral triangle. If the intensity due to each of the sources independently is 1 Wm^{-2} at the third vertex, the resultant intensity due to both the sources at that point (i.e., at the third vertex) is: (in Wm^{-2}) **[4]**

a) 4

b) $\sqrt{2}$

c) 2

d) 0

42. The velocity of the photoelectron emitted in the photoelectric effect depends only on: **[4]**

a) the frequency of incident light

b) the frequency and intensity of incident light

c) the frequency and intensity of incident light and the frequency of incident light

d) the wavelength of the incident light

43. The work function of a substance is 4.0 eV. The longest wavelength of light that can cause photoelectron emission from this substance is approximately: **[4]**

a) 400 nm
b) 220 nm
c) 540 nm
d) 310 nm

44. An electron from various excited states of hydrogen atom emits radiation to come to the ground state. Let λ_n, λ_g be the de Broglie wavelength of the electron in the n^{th} state and the ground state respectively. Let Λ_n be the wavelength of the emitted photon in the transition from the n^{th} state to the ground state. For large n, (A, B are constants) **[4]**

a) $\Lambda_n \approx A + B\lambda_n$
b) $\Lambda_n^2 \approx A + B\lambda_n^2$
c) $\Lambda_n \approx A + \frac{B}{\lambda_n^2}$
d) $\Lambda_n^2 \approx \lambda$

45. A chain reaction is continuous due to: **[4]**

a) production of more neutrons during fission
b) large energy
c) large mass defect
d) daughter nuclei formed

CHEMISTRY

46. How many moles of electrons weigh one kilogram? **[4]**

a) $\frac{1}{2.108} \times 10^{31}$
b) 6.023×10^{23}
c) $\frac{6.023}{9.108} \times 10^{54}$
d) $\frac{1}{9.108 \times 6.023} \times 10^{8}$

47. The normality of 10% (mass/volume) acetic acid is: **[4]**

a) 0.83 N
b) 10 N
c) 1.7 N
d) 1 N

48. An ion which has 18 electrons in the outermost shell is: **[4]**

a) K^+
b) Cs^+

c) Th^{4+} d) Cu^{+}

49. Number of unpaired electrons in Ni^{2+} is/are: **[4]**

a) 3 b) 0

c) 1 d) 2

50. The wave number of the first emission line in the Balmer series of H-Spectrum is: (R = Rydberg constant) **[4]**

a) $\frac{9}{400}R$ b) $\frac{7}{6}R$

c) $\frac{3}{4}R$ d) $\frac{5}{36}R$

51. Lanthanide contraction means: **[4]**

a) Contraction of atoms of elements after lanthanum due to poor shielding of the f-subshell electron.

b) Contraction of atoms of elements before lanthanum due to poor shielding of the f-subshell electron.

c) Contraction of an atom of lanthanum element due to poor shielding d-subshell electron.

d) Contraction of an atom of lanthanum element due to high shielding of the d-subshell electron.

52. The geometry of $XeOF_4$ by VSEPR theory is: **[4]**

a) Square pyramidal b) Pentagonal planar

c) Trigonal bipyramidal d) Octahedral

53. Find the ions which do not have X-O-X type of linkage: **[4]**

a) $H_2P_2O_5^{2-}$ b) $Si_2O_7^{6-}$

c) $(P_3O_9)^{3-}$ d) $S_2O_3^{2-}$

54. In which of the following reactions the hybridisation state of underlined atom is same in reactants and products? **[4]**

a) $\underline{N}H_3 + H^+ \rightarrow NH_4^+$

b) $\underline{Al}Cl_3 + Cl^- \rightarrow AlCl_4^-$

c) $\underline{N}O_3^- + Zn + OH^- \rightarrow NH_3 + ZnO_2^{2-}$

d) $\underline{B}F_3 + F^- \rightarrow BF_4^-$

55. For the chemical reaction, X $\rightleftharpoons$ Y, the standard reaction Gibbs energy depends on temperature T (in K) as **[4]**

$\Delta_r G^o$ (in kJ mol^{-1}) = 120 - $\frac{3}{8}$T

The major component of the reaction mixture at T is

a) Y if T = 280 K

b) X if T = 315 K

c) Y if T = 300 K

d) X if T = 350 K

56. The covalent bond energy of A - Z, B - Z, C - Z and D - Z and 240, 382, 276, 486 respectively. The shortest bond length exist for: **[4]**

a) A - Z

b) B - Z

c) D - Z

d) C - Z

57. The conjugate base of $H_2PO_4^-$ is: **[4]**

a) P_2O_5

b) HPO_4^{2-}

c) PO_4^{3-}

d) H_3PO_4

58. The equivalent conductance of NaCl at concentration C and at infinite dilution are λ_c and λ_∞ relationship. The correct relationship between λ_c and λ_∞ is given as (where, the constant B is positive) **[4]**

a) $\lambda_c = \lambda_\infty$ + (B) C

b) $\lambda_c = \lambda_\infty + (B)\sqrt{C}$

c) $\lambda_c = \lambda_\infty - (B)\sqrt{C}$

d) $\lambda_c = \lambda_\infty$ - (B) C

59. Identify disproportionation reaction. **[4]**

i. $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

ii. $CH_4 + 4Cl_2 \longrightarrow CCl_4 + 4HCl$

iii. $2F_2 + 2OH^- \longrightarrow 2F + OF_2 + H_2O$

iv. $2NO_2 + 2OH^- \longrightarrow NO_2^- + NO_3^- + H_2O$

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

60. The reaction between cadmium oxide and carbon monoxide produces cadmium and carbon dioxide. Which element displays the highest oxidation number in this reaction? **[4]**

a) C
b) O
c) Both Cd and C
d) Cd

61. A compound **X** upon reaction with H_2O produces a colourless gas **Y** with rotten fish smell. Gas **Y** is absorbed in a solution of $CuSO_4$ to give Cu_3P_2 as one of the products. Predict the compound **X**. **[4]**

a) $Ca(PO_4)_2$
b) NH_4Cl
c) As_2O_3
d) Ca_3P_2

62. Which of the following is incorrect statement? **[4]**

a) PbF_4 is covalent in nature
b) GeX_4 (X = F, Cl, Br, I) is more stable than GeX_2
c) SnF_4 is ionic nature
d) $SiCl_4$ is easily hydrolysed

63. Pick the CORRECT match for the molecule in column A with the number of C - Cσ, C-Hσ and C-Cπ bonds in column B. **[4]**

Column A	Column B
i. $HC \equiv C - CH = CH - CH_3$	a. 2, 3 and 0
ii. $CH_2 = C = CH - CH_3$	b. 4, 6 and 2
iii. $CH_2 - CH - C \equiv N$	c. 4, 6 and 3

iv. $CH_3 - CH = CH - \overset{O}{\overset{\|}{C}} - H$	d. 3, 6 and 1
	e. 3, 6 and 2

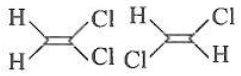
a) i - b, ii - d, iii - c, iv - e

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

c) i - b, ii - e, iii - d, iv - c

d) i - c, ii - b, iii - e, iv - b

64. The following compounds differ in: **[4]**



a) configuration

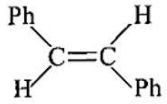
b) chirality

c) conformation

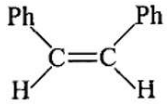
d) structure

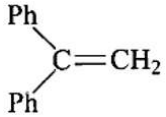
65. Ph - CH = CH - Ph $\xrightarrow[CCl_4]{Cl_2} X \xrightarrow{2NaNH_2} Y \xrightarrow{H_2,\ Pd-CaCO_3} Z$ **[4]**

Identify product (Z) of the reaction.

a) 

b) Ph - C ≡ C - Ph

c) 

d) 

66. A solution at 20 °C is composed of 1.5 mol of benzene and 3.5 mol of toluene. If the vapour pressure of pure benzene and pure toluene at this temperature are 74.7 torr and 22.3 torr, respectively, then the total vapour pressure of the solution and the benzene mole fraction in equilibrium with it will be, respectively: **[4]**

a) 35.8 torr and 0.280

b) 38.0 torr and 0.589

c) 30.5 torr and 0.389

d) 30.5 torr and 0.480

67. The observed depression in freezing point of a solution will be _____ times if the weight of the solute dissolved is four times higher, and the weight of solvent taken is halved. **[4]**

a) eight

b) four

c) two

d) one-half

68. Which of the following colligative property can provide molar mass of proteins (or polymers or colloids) with greatest precision? **[4]**

a) Osmotic pressure

b) Depression in freezing point

c) Relative lowering of vapour pressure

d) Elevation in boiling point

69. Isotonic solutions are those which have the: **[4]**

a) same density

b) same normality

c) same molarity

d) same osmotic pressure

70. Kohlrausch's law states that at: **[4]**

a) infinite dilution, each ion makes definite contribution to conductance of an electrolyte whatever be the nature of the other ion of the electroly.

b) infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte, whatever be the nature of the other ion of the electrolyte.

c) infinite dilution each ion makes definite contribution to equivalent conductance of an electrolyte depending on the nature of the other ion of the electrolyte.

d) finite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte, whatever be the nature of the other ion of the electrolyte.

71. If $E^{\circ}_{Fe^{2+}/Fe}$ = -0.441 V and $E^{\circ}_{Fe^{3+}/Fe^{2+}}$ = 0.771 V, the standard e.m.f. of the reaction, $Fe + 2Fe^{3+} \rightarrow 3Fe^{2+}$ will be: **[4]**

a) 0.111 V

b) 1.212 V

c) 0.330 V

d) 1.653 V

72. In an electrolytic cell of Ag |$AgNO_3$| Ag, when current is passed the concentration of $AgNO_3$: **[4]**

a) increases
b) Rises
c) decrease
d) remains same

73. If for a certain chemical reaction, A + B $\longrightarrow$ C + D, the unit of its rate constant is M^{-2} s^{-1}, which of the following could be a possible rate law for the reaction? **[4]**

a) Rate = $k[A][B]^2$
b) Rate = k[A][B]
c) Rate = $k[A][B]^3$
d) Rate = $k[A]^2[B]^2$

74. For the reaction, $H_2(g) + Br_2(g) = 2HBr(g)$, the reaction rate = $K [H_2] [Br_2]^{1/2}$. Which statement is true about this reaction? **[4]**

a) The unit of K is sec^{-1}
b) Molecularity of the reaction is 2
c) Molecularity of the reaction is $\frac{3}{2}$
d) The reaction is of second order

75. Name the gas that can readily decolourise acidified $KMnO_4$ solution: **[4]**

a) P_2O_5
b) SO_2
c) NO_2
d) CO_2

76. The correct statement among the following is **[4]**

a) $(SiH_3)_3$ N is planar and less basic than $(CH_3)_3$ N
b) $(SiH_3)_3$ N is pyramidal and less basic than $(CH_3)_3$ N
c) $(SiH_3)_3$ N is pyramidal and more basic than $(CH_3)_3$ N
d) $(SiH_3)_3$ N is planar and more basic than $(CH_3)_3$ N

77. Gadolinium belongs to 4f series, Its atomic number is 64. Which of the following is the correct electronic configuration of gadolinium? **[4]**

a) [Xe] $4f^8$ $6d^2$
b) [Xe] $4f^7 5d^1 6s^2$
c) [Xe]$4f^6 5d^2 6s^2$
d) [Xe]$4f^9$ $5s^1$

78. Which of the following is a didentate ligand? **[4]**

a) en
b) $EDTA^{4-}$
c) dien
d) trien

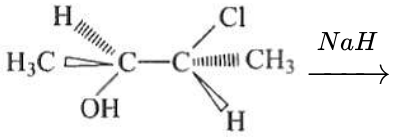
79. Which of the following is correct for the complex $[NiBr_2(PPh_3)_2]$? **[4]**

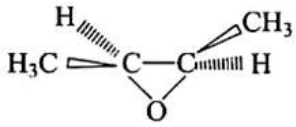
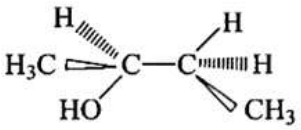
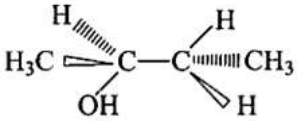
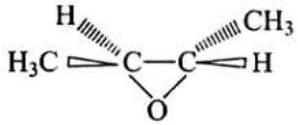
a) It is tetrahedral with two unpaired electrons.
b) It is tetrahedral with one unpaired electron.
c) It is square planar and diamagnetic.
d) It is square planar with one unpaired electron.

80. Which one is most reactive towards S_N1 reaction? **[4]**

a) $C_6H_5CH_2Br$
b) $C_6H_5CH(C_6H_5)Br$
c) $C_6H_5C(CH_3)(C_6H_5)Br$
d) $C_6H_5CH(CH_3)Br$

81. Find the product of following reaction with stereochemistry. **[4]**



a) 
b) 
c) 
d) 

82. $R - O^- + H - O - H \longrightarrow R - O - H + OH^-$ **[4]**

With respect to above reaction, choose an incorrect statement from the following:

a) The alkoxide ions act as a Bronsted base.
b) Alcohol is a better proton donor than the conjugate acid of hydroxide ions.
c) Water is a stronger acid as compared to alcohol.
d) The conjugate base of water is weaker than alkoxide ions.

83. Which one of the following compounds would form most stable hydrate? **[4]**

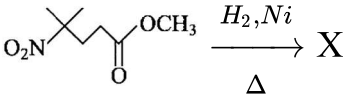
a) $Cl_3C-\overset{\overset{O}{\|}}{C}-H$

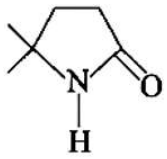
b) $H-\underset{\underset{O}{\|}}{C}-H$

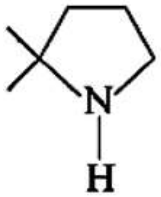
c) $F_3C-\overset{\overset{O}{\|}}{C}-CF_3$

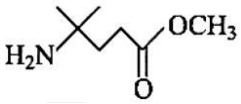
d) $H_3C-\overset{\overset{O}{\|}}{C}-H$

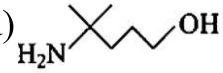
84. The major product (X) of the reaction is: **[4]**



a) 

b) 

c) 

d) 

85. Cobalt as a rare element is essential in the synthesis of this: **[4]**

a) Vitamin D

b) Vitamin B_1

c) Vitamin C

d) Vitamin B_{12}

86. Which of the following statement is not true about sucrose? **[4]**

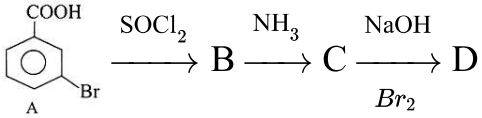
a) On hydrolysis, it produces glucose and fructose

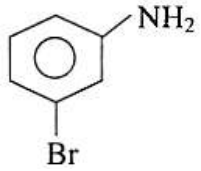
b) It is also named as invert sugar

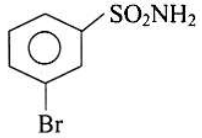
c) The glycosidic linkage is present between C_1 of α-glucose and C_1 of β-fructose

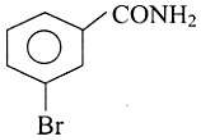
d) It is a non-reducing sugar

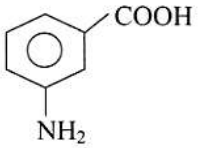
87. In a set of reactions, m-bromobenzoic acid gave product D. Identify product D. **[4]**



a) 

b) 

c) 

d) 

88. Consider $Cu^{2+}|Cu$ electrode. What is the electrode potential if 0.01M Cu^{2+} solution is used? **[4]**

(T = 298 K, $E^{o}_{\frac{Cu^{2+}}{Cu}}$ = 0.34 V)

a) 0.399 V

b) 0.281 V

c) 0.591 V

d) 0.222 V

89. During the fusion of an organic compound with sodium metal, nitrogen of the organic compound is converted into **[4]**

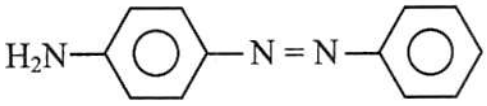
a) NaCN

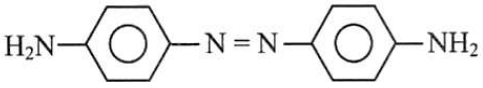
b) $NaNH_2$

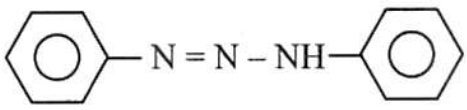
c) $NaNO_2$

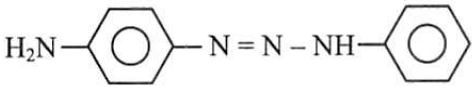
d) NaNC

90. Identify the structure of aniline yellow. **[4]**

a) 

b) 

c) 

d) 

BOTANY

91. Mango is grouped in which Order? **[4]**

a) Indica

b) Mangifera

c) Anacardiaceae

d) Sapindales

92. Circulation of blood was discovered by : **[4]**

a) William Harvey
b) Bose
c) Karl Landsteiner
d) Watson and Crick

93. Which of the following is correct for Mangifera indica Linn? **[4]**

a) This species was first described by Linnaeus
b) Name of mango was not changed by Linnaeus
c) Name of mango was changed by Linnaeus
d) This species was not first described by Linnaeus

94. Bacteria reproduce mainly by: **[4]**

a) Spores
b) Recombination
c) Conjugation
d) Fission

95. Aristotle classified plants into: **[4]**

a) Trees, shrubs, and herbs
b) Shrubs only
c) Trees only
d) herbs only

96. In angiosperm, archesporium gives rise to: **[4]**

a) Wall of anther
b) Wall of sporangium
c) Both wall of sporangium and sporogenous cells
d) Tapetum and sporogenous cells

97. The cell which develops into endosperm, results from the fusion of **[4]**

a) two male gametes and the egg.
b) two male gametes and two polar nuclei.
c) one male gamete and two polar nuclei.
d) a male gamete and the egg.

98. Pollination in lotus is carried out by: **[4]**

a) Both Water and Insects
b) Insects

c) Wind
d) Water

99. Select one of the following of important features distinguising Gnetum from Cycas and Pinus and showing: **[4]**

a) Absence of resin duct and leaf venation
b) Presence of vessel elements and absence of archegonia
c) Perianth and two integuments
d) Embryo development and apical meristem

100. Which one of the following pairs is wrongly matched? **[4]**

a) Virioids-RNA
b) Mustard-Synergids
c) Ginkgo-Archegonia
d) Salvinia-Prothallus

101. Protonema stage develops from: **[4]**

a) Sporophytes
b) Secondary protonema
c) Directly from a spore
d) Lateral bud

102. Flagellated cells are absent in: **[4]**

a) Red algae
b) Blue-green algae
c) All of these
d) Higher seed plants

103. Mature male gametophyte is made up of: **[4]**

a) One cell
b) Four cell
c) Three cell
d) Two cell

104. 8-nucleate embryo sac is: **[4]**

a) Tetrasporic
b) Bisporic
c) Monosporic
d) All of these

105. Which of the following symbols denotes presence of tepals and epitepalous stamens in a flower? **[4]**

a) $\widehat{G\ A}$

b) $\widehat{C\ A}$

c) $\widehat{P\ A}$

d) $\widehat{K\ A}$

106. Select the wrong statement for placentation. **[4]**

i. In Mustard and Argemone, the ovary is one-chambered but it becomes two-chambered due to the formation of the false septum.

ii. In Dianthus and Primrose, the placentation is called free central.

iii. In basal placentation, the placenta develops at the base of the ovary and many ovules are attached.

iv. In sunflower and marigold, basal placentation present.

v. In mustard and Argemone, free central placentation present.

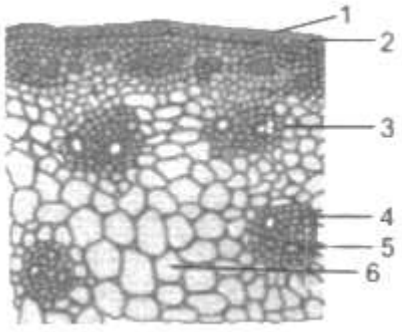
a) (i), (iii) and (v)

b) (iii) and (v)

c) (iii), (iv) and (v)

d) (ii), (iv) and (v)

107. Identify the given diagram and choose the correct answer for labelled 1, 2, 3, 4, 5, and 6 of the given diagram. **[4]**



a) Dicot stem - 1 - Epidermis, 2 - Hypodermis, 3 - Vascular bundles, 4 - Phloem, 5 - Xylem, 6 - Ground tissue

b) Monocot stem - 1 - Epidermis, 2 - Hypodermis, 3 - Vascular bundles, 5 - Xylem, 4 - Phloem, 6 - Ground tissue

c) Monocot stem - 1 - Epidermis, 2 - Hypodermis, 3 - Vascular bundles, 4 - Phloem, 5 - Xylem, 6 - Ground tissue

d) Monocot leaf - 1 - Epidermis, 2 - Hypodermis, 3 - Vascular bundles, 4 - Phloem, 5 - Xylem, 6 - Ground tissue

108. The transverse section of a plant shows the following anatomical features: **[4]**

i. A large number of scattered vascular bundles surrounded by bundle sheath.

ii. Large conspicuous parenchymatous ground tissue.

iii. Vascular bundles are conjoint and closed.

iv. Phloem parenchyma absent.

Identify the category of plant and its part:

a) Dicotyledonous stem

b) Monocotyledonous root

c) Dicotyledonous root

d) Monocotyledonous stem

109. A colourblind man marries the daughter of a normal woman and a colourblind man. The ratio of carrier daughters, colourblind daughters, normal sons, and colourblind sons born to this couple will be: **[4]**

a) 1 : 1 : 1 : 1

b) 1 : 2 : 2 : 1

c) 2 : 1 : 1 : 2

d) 1 : 0 : 1 : 0

110. An abnormal human baby with XXX chromosomes was born due to: **[4]**

a) Fusion of two sperms and one ovum

b) Formation of abnormal sperms in the father

c) Fusion of two ova and one sperm

d) Formation of abnormal ova in the mother

111. A complex of ribosomes attached to a single strand of RNA is known as **[4]**

a) Okazaki fragment.

b) polypeptide.

c) polymer.

d) polysome.

112. Removal of introns and joining of exons in a defined order during transcription is called: **[4]**

a) Slicing
b) Splicing
c) Looping
d) Inducing

113. Which of the following is not related with mesosome? **[4]**

a) This structure also found in eukaryotes
b) They also help in respiration, secretion processes, to increase the surface area of the plasma membrane and enzymatic content.
c) It present in form of vesicles, tubules and lamellae
d) They help in cell wall formation, DNA replication and distribution to daughter cells

114. Transmembrane protein present: **[4]**

a) Across the cell membrane
b) In between the two layers of cell membrane
c) On outer surface of cell membrane
d) On inner surface of cell membrane

115. Which of the following is a wrong statement about Golgi apparatus? **[4]**

i. Camillo Golgi (1898) first observed densely stained reticular structures near the nucleus.
ii. The Golgi cisternae are concentrically arranged near the nucleus with distinct convex cis or the forming face and concave trans or the maturing face.
iii. The Golgi apparatus principally performs the function of packaging materials.
iv. Materials to be packaged in the form of vesicles from the ER fuse with the trans face of the Golgi apparatus and move towards the forming face.
v. A number of proteins synthesised by ribosomes on the endoplasmic reticulum are modified by Golgi apparatus.

vi. Golgi apparatus is the important site of formation of proteins and lipids.

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

116. Short lived immunity acquired from mother to foetus across the placenta or through mother's milk to the infant is categorised as: **[4]**

a) Innate non-specific immunity
b) Cellular immunity
c) Passive immunity
d) Active immunity

117. Necessary steps for achieving good health are **[4]**

i. awareness about diseases.
ii. vaccination.
iii. proper disposal of wastes.
iv. maintenance of hygienic food and water resources.
v. water resources.

The correct combination having necessary steps are

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

118. Marijuana is extracted from: **[4]**

a) Ergot fungus
b) Papaver somniferum
c) Dried leaves and flowers of Cannabis sativa
d) Cocoa plant

119. Which one of the following statements is correct? **[4]**

a. Benign tumours show the property of metastasis.
b. Heroin accelerates body functions.
c. Malignant tumours may exhibit metastasis.
d. Patients who have undergone surgery are given cannabinoids to relieve pain.

a) Benign tumours show the property of metastasis.

b) Heroin accelerates body functions.

c) Patients who have undergone surgery are given cannabinoids to relieve pain.

d) Malignant tumours may exhibit metastasis.

120. At which of the following stages, the chromosomes appear single, thin and thread like? **[4]**

a) Pachytene

b) Zygotene

c) Leptotene

d) Diplotene

121. Environmental resistance includes factor: **[4]**

a) All of these

b) Shortage of food

c) Limited space

d) Diseases and predation

122. Maximum biomass and variable organism are found in: **[4]**

a) Pond

b) River

c) Lake

d) Estuary

123. Secondary sewage treatment is mainly a: **[4]**

a) Chemical process

b) Physical process

c) Biological process

d) Mechanical process

124. Which one of the following plant is commonly used as green manure? **[4]**

a) Acacia nilotica

b) Dalbergia sissoo

c) Cassia fistula

d) Crotalaria juncea

125. Rajaji National park is in: **[4]**

a) Uttarakhand

b) Rajasthan

c) Assam

d) Karnataka

126. Match the column and select correct option for animal and area where it find? **[4]**

Column I (Animals)	**Column II (Country)**
(A) Dodo	(i) Africa
(B) Quagga	(ii) Russia
(C) Thylacine	(iii) Mauritius
(D) Steller's sea cow	(iv) Australia
(E) Passenger pigeon	(v) North America

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

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

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

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

127. Cryopreservation of gametes of threatened species in viable and fertile condition can be referred to as: **[4]**

a) In situ conservation of biodiversity

b) Advanced ex-situ conservation of biodiversity

c) In situ cryo-conservation of biodiversity

d) In situ conservation by sacred groves

128. The centriole, which had undergone duplication during S-phase of interphase, begins to move towards opposite poles of the cell in which phase? **[4]**

a) Metaphase

b) Anaphase

c) Prophase

d) Telophase

129. In plant cell cytokinesis occurs by: **[4]**

a) Both Cell furrow formation and Cell plate formation

b) Cytokinesis not occurs after karyokinesis

c) Cell plate formation

d) Cell furrow formation

130. Chemiosmotic theory of ATP synthesis in the chloroplasts and mitochondria is based on: **[4]**

a) Membrane potential
b) Proton gradient
c) Accumulation of K ions
d) Accumulation of Na ions

131. Given below are two reactions (P and Q) representing photosynthesis in organisms - A and B respectively. **[4]**

ReactionP: $CO_2 + 2H_2O \longrightarrow [CH_2O] + H_2O + O_2$

Reaction Q: $CO_2 + 2H_2S \longrightarrow [CH_2O] + H_2O + 2S$

Select the statement that can be concluded about these organisms.

a. Organism A performs anoxygenic photosynthesis whereas organism B performs oxygenic photosynthesis.
b. Organism A could be a cyanobacterium and organism B could be a plant.
c. Organism A could be a plant and organism B could be a photosynthetic bacterium.
d. Both (a) and (c)

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

132. $NADPH_2$ is generated through _____ pigment systems: **[4]**

a) Magnesium
b) Both Photosystem-I and Photosystem-II
c) Photosystem-I
d) Photosystem-II

133. The conversion of PGA into glyceraldehyde 3-phosphate occurs during **[4]**

a) regeneration
b) photorespiration
c) carboxylation
d) reduction

134. In which of the following steps of Glycolysis a water molecule is released? **[4]**

a) 2-Phosphoenol pyruvate $\longrightarrow$ Pyruvic acid
b) 2-Phosphoglycerate $\longrightarrow$ Phosphoenol pyruvate

c) Fructose-6-phosphate $\longrightarrow$ Fructose 1, 6-diphosphate

d) 2-Phosphoglycerate $\longrightarrow$ Phosphoenol pyruvate

135. The process of growth is determined by: **[4]**

a) Increase in size and dry weight

b) Increase in weight only

c) Increase in dry weight

d) Increase in size

ZOOLOGY

136. Which one of the following pairs of animals comprises jawless fishes? **[4]**

a) Lampreys and hagfishes

b) Lampreys and eels

c) Mackerals and Rohu

d) Guppies and hagfishes

137. Which of the following cell type is capable of giving rise to other cell types in sponges? **[4]**

a) Thesocytes

b) Pinacocytes

c) Collenocytes

d) Archaeocytes

138. All vertebrates are chordates but all chordates are not vertebrates, why? **[4]**

a) Ventral hollow nerve cord remains throughout life in some chordates.

b) Notochord is replaced by vertebral column in adult of some chordates.

c) All chordates possess notochord throughout their life.

d) All chordates possess vertebral column.

139. Which one of the following statements is totally wrong about the occurrence of notochord while the other three are correct? **[4]**

a) It is present only in larval tail in Ascidians

b) It is replaced by a vertebral column in adult frog

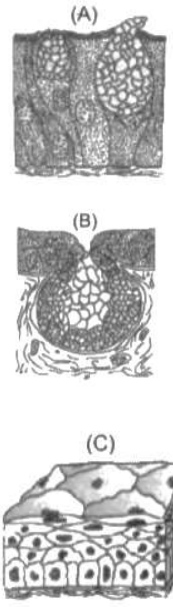
c) It is present throughout life in Amphioxus

d) It is absent throughout life in humans from the very beginning

140. Which of the following is/are included in Cnidarians? **[4]**

a) All of these
b) Aurelia
c) Obelia
d) Hydra

141. Match the figures in column II with characters given in column I and choose correct option: **[4]**

Column I		**Column II**
(i)	Unicellular gland.	
(ii)	Multicellular gland.	
(iii)	Compound epithelium.	
(iv)	Inner lining of ducts of salivary glands and of pancreatic ducts.	
(v)	Provide protection against chemical and mechanical stresses.	
(vi)	Goblet cells of the alimentary canal.	
(vii)	Salivary gland.	
(viii)	Consisting of isolated glandular cells.	
(ix)	Consisting of cluster of cells.	

a) (A) - (i), (vii), (viii); (B) - (ii), (vi), (ix); (C) - (iii), (iv), (v)
b) (A) - (iii), (iv), (v); (B) - (ii), (vii), (ix); (C) - (i), (vi), (viii)
c) (A) - (ii), (vii), (ix); (B) - (i), (vi), (viii); (C) - (iii), (iv), (v)
d) (A) - (i), (vi), (viii); (B) - (ii), (vii), (ix); (C) - (iii), (iv), (v)

142. Tendon is made up of: **[4]**

a) Elastic connective tissue fibers
b) Dense fibrous connective tissue
c) Collagen fibers
d) Elastic and inelastic connective tissue

143. The type of epithelial cells which line the inner surface of fallopian tubes, bronchioles and small bronchi are known as **[4]**

a) Columnar epithelium
b) Cubical epithelium
c) Squamous epithelium
d) Ciliated epithelium

144. Which of the following changes usually tends to occur in plain dwellers when they move to the high altitudes? **[4]**

1. Increased breathing rate.
2. Increased RBC production.
3. Increased WBC Production.
4. Increased thrombocyte count.

Choose the correct option.

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

145. Residual air is present in: **[4]**

a) Trachea and Bronchi and bronchioles
b) Lungs
c) Bronchi and bronchioles
d) Trachea

146. Approximate volume of air a healthy man can expire or inspire per minute is: **[4]**

a) 6000 - 8000 mL
b) 7000 - 9000 mL
c) 6000 - 7000 mL
d) 5000 - 6000 mL

147. Which of the following activity is more difficult during bronchial asthma? **[4]**

a) Expiration
b) Transportation of oxygen
c) Forced inspiration
d) Inspiration

148. Which of following statements is not true? **[4]**

a. The partial pressure of oxygen in deoxygenated blood is 40 mm Hg.

b. The partial pressure of oxygen in oxygenated blood is 95 mm Hg.

c. The partial pressure of oxygen in alveolar air is 104mm Hg.

d. The partial pressure of CO_2 in the alveolar air is 40 mm Hg.

a) Statement (c) is not true.
b) Statement (a) is not true.
c) Statement (b) is not true.
d) Statement (d) is not true.

149. Given below are few respiratory disorders. Identify occupational respiratory disorders amongst these. **[4]**

i. Coryza
ii. SARS
iii. Silicosis
iv. Asbestosis
v. Emphysema

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

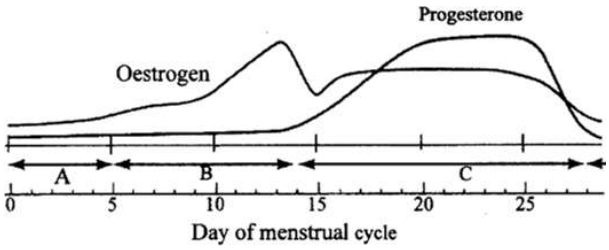
150. The fimbriae of fallopian tubes help in **[4]**

a) development of ovary
b) fertilisation
c) collection of the ovum after ovulation
d) development of ova

151. Ovulation occurs on the _____ day of menstrual cycle. **[4]**

a) 12-14th
b) 14-16th
c) 9-13th
d) 8-10th

152. Read the graph and correlate the uterine events that takes place according to the hormonal levels during the phases of menstrual cycle labelled as A, B, and C. **[4]**



a) A - Degeneration of endometrium, B - Regeneration of endometrium, C - Endometrium thickness increases and becomes vascularised to receive and implant embryo

b) A - Degeneration of endometrium, B - Myometrium thickens, and becomes vascularised to receive and implant embryo, C - Degeneration of endometrium

c) A - Degeneration of endometrium, B - Myometrium thickens, and becomes vascularised to receive and implant embryo, C - Regeneration of endometrium

d) A - Degeneration of endometrium, B - Endometrium thickness increases and becomes vascularised to receive and implant embryo, C - Regeneration of endometrium

153. The seminal plasma is rich in **[4]**

a) fructose and certain enzymes but it has low calcium.

b) fructose, calcium, and certain enzymes.

c) glucose and certain enzymes but it has no calcium.

d) fructose and calcium but it has no enzymes.

154. Test tube babies are given birth by the woman who is unable to: **[4]**

a) Fertilize, implant and develop the embryo

b) Complete the process of fertilization in the uterus

c) Implant and develop the embryo in the uterus

d) Develop the embryo upto 32-cells stage after fertilization

155. Consider the statements given below regarding contraceptive methods. **[4]**

i. The chances of conception are generally nil until mother breast-feeds the infant up to 2 years.

ii. Intra uterine devices like copper-Tare effective contraceptives.

iii. Contraception pills may be taken up to 1 week after coitus to prevent conception.

Select the option with correct statements.

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

156. Select the odd one out. **[4]**

AIDS, Genital herpes, Hepatitis-B, Gonorrhoea

a) Genital herpes
b) Gonorrhoea
c) AIDS
d) Hepatitis-B

157. Which evidence of evolution is related to Darwin's finches? **[4]**

a) Evidences from comparative anatomy.
b) Evidences from palaeontology.
c) Evidences from biogeographical distribution.
d) Evidences from embryology.

158. Which of the following is the vestigial organs of man? **[4]**

a) Caudal vertebrae, wisdom teeth and patella
b) Caudal vertebrae, vermiform appendix and ear muscles
c) Hair, cochlea and vermiform appendix
d) Hair, atlas and ear muscles

159. A condition in which body’s internal environment remains relatively constant with limits is called: **[4]**

a) Haemopoiesis
b) Homeostasis
c) Hematoma
d) Hemostatis

160. Trimethylamine is the excretory product in: **[4]**

a) Molluscs
b) Freshwater fishes
c) Amphibious
d) Marine teleost

161. Excretory organ of crustaceans are: **[4]**

a) Nephridia
b) Protonephridia
c) Green gland
d) Malpighian tubules

162. The glomerular filtrate possesses: **[4]**

a) Plasma minus cells
b) Blood minus cells proteins
c) Blood minus cells minus proteins
d) Blood minus proteins

163. The number of bones in the human body is: **[4]**

a) 203
b) 306
c) 206
d) 260

164. In **X** disorder, abnormal genes (mutations) interfere with the production of proteins needed to form healthy muscle. Identify X and its common cause. **[4]**

a) Both Muscular dystrophy, lack of a protein called dystrophin and Osteoporosis, increased levels of estrogen.
b) Muscular dystrophy, lack of a protein called dystrophin.
c) Osteoporosis, increased levels of estrogen.
d) Myasthenia gravis, increased levels of estrogen.

165. The junction between a motor neuron and the sarcolemma of the muscle fibre is called: **[4]**

a) Motor-end plate
b) Neuromuscular junction

c) Motor unit

d) All of these

166. Match the pairs of the human being listed under Column I with the functions given under Column II; choose the choice which gives the correct combination of the alphabets of the two columns: **[4]**

Column I	**Column II**
(A) Cerebral hemisphere	(p) Relaying impulses
(B) Thalamus	(q) Posture and balance
(C) Cerebellum	(r) Control of heart, stomach, lungs, etc.
(D) Medulla oblongata	(s) Reflex actions
	(t) Voluntary control, intelligence, hearing, speech, etc

a) (A)-(r), (B)-(s), (C)-(q), (D)-(t)

b) (A)-(t), (B)-(q), (C)-(p), (D)-(r)

c) (A)-(r), (B)-(q), (C)-(p), (D)-(s)

d) (A)-(t), (B)-(P), (C)-(q), (D)-(r)

167. The part of the brain, which has posterior choroid plexus: **[4]**

a) Cerebrum

b) Posterior brain

c) Diencephalon

d) Medulla

168. Broca's area is located in: **[4]**

a) Ventral part of temporal lobe

b) Dorsal part of optic lobe

c) Lateral part of frontal lobe

d) forward part of temporal lobe

169. Saltatory conduction occurs in: **[4]**

a) Both Non-myelinated fibres and Myelinated fibres

b) Myelinated fibres

c) Non-myelinated fibres

d) None of them

170. When a person suffers from a marked fall in blood pressure, it is helpful to administer to him the following hormone: **[4]**

a) Adrenaline
b) GH
c) Oxytocin
d) Thyroxine

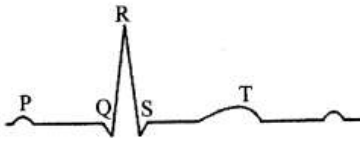
171. Growth hormone of pituitary is more effective in **[4]**

a) absence of thyroxine.
b) presence of thyroxine.
c) absence of insulin.
d) presence of adrenaline.

172. Which is gastrointestinal hormone? **[4]**

a) Cholecystokinin
b) GIP
c) Secretin
d) All of these

173. Given below is the ECG of a normal human. Which one of its components is correctly interpreted below? **[4]**



a) Peak P and Peak R together - systolic and diastolic blood pressures
b) Peak P - Initiation of left atrial contraction only
c) Peak T - Initiation of total cardiac contraction
d) Complex QRS - One complete pulse

174. Right atrium or auricle in mammalian heart receives blood from **[4]**

a) Precavals and postcavals
b) Sinus venosus
c) Pulmonary veins
d) Precavals

175. Select incorrect statement. **[4]**

a) Lymph = (Plasma - Plasma proteins) + Few lymphocytes.
b) Plasma = Blood - (RBCs + WBCs + Platelets).
c) Lymphocytes = Formed elements - (RBC +

Thrombocytes + Monocytes + Granulocytes).

d) Serum = Blood - Plasma proteins.

176. During heat shock to the bacterium, the temperature used for giving thermal shock is: **[4]**

a) $100^{o}C$

b) $-196^{o}C$

c) $82^{o}C$

d) $42^{o}C$

177. Which of the following steps are catalysed by Taq polymerase in a PCR reaction? **[4]**

a) All of these

b) Denaturation of template DNA

c) Annealing of primers to template DNA

d) Extension of primer end on the template DNA

178. Match Column I with Column II and select the correct answer from the given codes. **[4]**

Column I	**Column II**
A. Transformation	(i) Sequences cut by restriction enzymes
B. Recognition site	(ii) Process by which DNA fragments are separated based on their size
C.Gel electrophoresis	(iii) Plasmid DNA that has incorporated human DNA
D. Recombinant DNA	(iv) Process by which bacteria take up pieces of DNA from the environment

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

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

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

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

179. The two polypeptides of human insulin are linked together by: **[4]**

a) Hydrogen bonds

b) Covalent bond

c) Phosphodiester bond

d) Disulphide bridges

180. Choose the correct option regarding retrovirus: **[4]**

a) A dsRNA virus

b) A DNA virus that can synthesise RNA during infection

c) An RNA virus that can synthesise DNA during infection

d) A ssDNA virus

S O L U T I O N

PHYSICS

1.

(c) $C^2N^{-1}m^{-2}$

Explanation:

$\left[\frac{1}{4\pi\varepsilon_0}\right] = \left[\frac{q^2}{Fr^2}\right] = \left[\frac{\text{Coulomb}^2}{\text{N}\times\text{m}^2}\right] = \left[\text{C}^2\text{N}^{-1}\text{m}^{-2}\right].$

2. **(a)** dyne $\times$ cm^4

Explanation:

Unit of a = unit of P $\times$ unit of V^2

$= \frac{\text{dyne}}{\text{cm}^2} \times \text{cm}^6 = \text{dyne} \times \text{cm}^4.$

3.

(c) c = $\frac{1}{\sqrt{\mu_0\varepsilon_0}}$

Explanation:

[C] = [LT^{-1}]

As $\mu_0 = \frac{B}{nI}$ (n = number of turns per unit length)

$\therefore [\mu_0] = \frac{[B]}{[nI]} = \frac{[\text{MT}^{-2}\text{A}^{-1}]}{[\text{L}^{-1}\text{A}]}$ = [MLT^{-2}A^{-2}]

As F = $\frac{1}{4\pi\varepsilon_0}\left(\frac{q_1q_2}{r^2}\right)$

$[\varepsilon_0] = \frac{[q_1q_2]}{[Fr^2]} = \frac{[\text{A}^2\text{T}^2]}{[\text{MLT}^{-2}\text{L}^2]}$ = [M^{-1}L^{-3}T^{4}A^2]

$\therefore \quad \frac{1}{\sqrt{[\mu_0\varepsilon_0]}} = \frac{1}{[\text{MLT}^{-2}\text{A}^{-2}\text{M}^{-1}\text{L}^{-3}\text{T}^4\text{A}^2]^{1/2}} = \frac{1}{[L^{-2}T^2]^{1/2}} = [LT^{-1}]$

4.

(d) 17.2 sec

Explanation:

17.2 sec

5. **(a)** 10 s

Explanation:

As the train and parrot are moving just in opposite directions, hence relative velocity of the parrot w.r.t. the train is given by = [10 - (-5)] ms^{-1} = 15 ms^{-1}. Hence ,Time taken by the parrot to cross the train is given by = $\frac{length}{relative\ velocity}$= $\frac{150}{15}$ = 10 sec.

6.

(b) If speed of a particle is constant, its acceleration must be zero.

Explanation:

If speed, that is magnitude of velocity is constant whereas the direction of velocity changes; we cannot say that velocity is constant. Therefore, the particle has non-zero acceleration.

7.

(c) 30°

Explanation:

$h = \frac{u^2 \sin^2 \theta}{2g} = \frac{(56)^2 \sin^2 \theta}{19.6}$

$\sin^2 \theta = \frac{40 \times 19.6}{(56)^2} = \frac{1}{4}$

$\sin \theta = \frac{1}{2}$ or $\theta = 30^\circ$

8.

(c) $\frac{2\pi}{3}$

Explanation:

$C = [A^2 + B^2 + 2AB \cos \frac{2\pi}{3}]^{1/2}$

$= [A^2 + B^2 + 2A^2 (-\frac{1}{2})]^{1/2} = A = B$

9.

(c) 3g

Explanation:

Acceleration when string becomes horizontal,

a = 3g

10.

(d) $\frac{F}{3}$

Explanation:

$T_2 = \frac{6}{6+6+6} F = \frac{F}{3}$

11. **(a)** $\frac{Mv}{M-4}$

Explanation:

Applying the principle of momentum conservation,

$Mv = (M - 4)v'$

since the speed of the α -particle is zero]

$\Rightarrow v' = \frac{Mv}{M-4}$

12.

(b) 0.379 m

Explanation:

Given, m_1 = 4g, u_1 = 300m/s

m_2 = 0.8kg = 800g, u_2 = 0m/s

From law of conservation of momentum,

$m_1u_1 + m_2u_2 = m_1V_1 + m_2v_2$

Let the velocity of combined system = vm/s

then,

$4 \times 300 + 800 \times 0 = (800 + 4) \times v \Rightarrow v = \frac{1200}{804}$ = 1.49 m/s

Now, μ = 0.3 (given)

$a = \mu g \Rightarrow a = 0.3 \times 10 = 3$ m/s^2 (take g = 10 m/s^2)

then, from $v^2 = u^2 + 2as$

$(1.49)^2 = 0 + 2 \times 3 \times s \Rightarrow s = \frac{(1.49)^2}{6}$ s $= \frac{2.22}{6}$ = 0.379 m

13.

(b) $x = \left(\frac{2a}{b}\right)^{\frac{1}{5}}$

Explanation:

$U(x) = \frac{a}{x^{10}} - \frac{b}{x^5}$

For stable equilibrium, $\frac{dU}{dx} = 0$

$\therefore \frac{dU}{dx} = \frac{-10a}{x^{11}} + \frac{5b}{x^6} = 0$

$\Rightarrow x^5 = \frac{2a}{b}$

$\therefore x = \left(\frac{2a}{b}\right)^{\frac{1}{5}}$

14. **(a)** $\frac{4MR^2}{9\sqrt{3}\pi}$

Explanation:

Maximum possible volume of cube will occur when

$\sqrt{3}a$ = 2R (a = side of cube)

$\therefore a = \frac{2}{\sqrt{3}}R$

Now, density of sphere, $\rho = \frac{M}{\frac{4}{3}\pi R^3}$

Mass of cube, m = (volume of cube)(ρ) = (a^3)(ρ)

$= \left[\frac{2}{\sqrt{3}}R\right]^3 \left[\frac{m}{\frac{4}{3}\pi R^3}\right] = \left(\frac{2}{\sqrt{3}\pi}\right)M$

Now, moment of inertia o f the cube about the said axis is

$I = \frac{ma^2}{6} = \frac{\left(\frac{2}{\sqrt{3}\pi}\right)M\left(\frac{2}{\sqrt{3}}R\right)^2}{\sigma}$

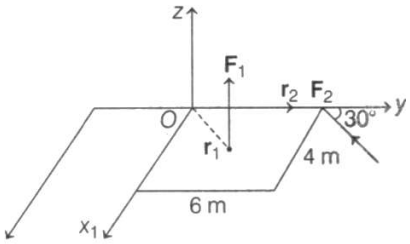
$= \frac{4MR^2}{9\sqrt{3}\pi}$

15.

(b) $(3\hat{\mathbf{i}} - 2\hat{\mathbf{j}} + 3\hat{\mathbf{k}})F$

Explanation:

According to the question as shown in the figure below,



$\mathbf{r}_1 = 2\hat{\mathbf{i}} + 3\hat{\mathbf{j}}$ and $\mathbf{r}_2 = 6\hat{\mathbf{j}}$

F_1 = F $\hat{\mathbf{k}}$ and F_2 = (-sin 30^o $\hat{\mathbf{i}}$ - cos 30^o $\hat{\mathbf{j}}$) F

Moment of force is given as, τ = r $\times$ F

where, r is the perpendicular distance and F is the force.

$\therefore$ Moment due to F_1

$\tau_1 = (2\hat{\mathbf{i}} + 3\hat{\mathbf{j}}) \times (F\hat{\mathbf{k}})$

= -2F $\hat{\mathbf{j}}$ + 3F $\hat{\mathbf{i}}$ ...(i)

Moment due to F_2

$\tau_2 = (6\hat{\mathbf{j}}) \times \left(-\sin 30^\circ \hat{\mathbf{i}} - \cos 30\hat{\mathbf{j}}\right) F$

= 6 sin 30^o F $\hat{\mathbf{k}}$ = 3F $\hat{\mathbf{k}}$ ...(ii)

$\therefore$ Resultant torque,

$\tau = \tau_1 + \tau_2 = 3F\hat{\mathbf{i}} - 2F\hat{\mathbf{j}} + 3F\hat{\mathbf{k}}$

$= (3\hat{\mathbf{i}} - 2\hat{\mathbf{j}} + 3\hat{\mathbf{k}})F$

16.

(b) Length of day would increase

Explanation:

Length of day would increase

17.

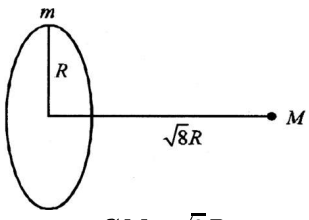
(d) $\frac{\sqrt{8}}{27} \cdot \frac{\mathrm{GmM}}{\mathrm{R}^2}$

Explanation:

Gravitational field of ring

$E = \frac{-Gmx}{\left(R^2+x^2\right)^{3/2}}$

Force between sphere and ring



$F = \frac{GMm\sqrt{8}R}{\left[R^2+8R^2\right]^{3/2}}$

$\Rightarrow F = \frac{\sqrt{8}GMm}{27R^2}$

18.

(c) 1/2

Explanation:

$F = \frac{Gm(M-m)}{r^2}$

For maximum force, $\frac{dF}{dm} = 0$

$\frac{d}{dm}\left(\frac{GmM}{r^2} - \frac{Gm^2}{r^2}\right) = 0$

M - 2m = 0 $\Rightarrow \frac{m}{M} = \frac{1}{2}$

19. **(a)** the smallest at the top and gradually increases down the rod

Explanation:

For a hanging heavy uniform rod, at any cross-section, the load is only of the part of the rod which is below it. At its lowest point, the load is zero which gradually increases as we go up. Since the cross-section is the same, the stress increases as we go up. The maximum stress will be at the top and so will be the effect of elongation. Since the transverse strain is proportional to longitudinal strain, hence the diameter of the rod will be smallest at the top and gradually increase down the rod.

20.

(c) 0.30%

Explanation:

As $\frac{\Delta L}{L}$ = 0.10% = 0.001 and ΔT = 100^{o}C, hence using $\frac{\Delta L}{L}$ = aΔT,

we get; a = $\frac{0.001}{100} = \frac{10^{-5}}{^{\circ}\text{C}}$

$\therefore \gamma = 3\alpha = \frac{3\times10^{-5}}{^{\circ}\text{C}}$

and $\frac{\Delta V}{V} = \gamma\Delta T = 3 \times 10^{-5} \times 100 = 3 \times 10^{-3}$ = 0.30%

21.

(c) option (ii)

Explanation:

The specific heat of a gas is the amount of heat required to increase the temperature of one mole of the gas through the unit degree. During different processes, the work done by gas

may be different. Hence, the specific heat of a gas depends on the process followed. Since the number of processes that are possible is infinite, therefore, gas has an infinite number of specific heats.

22. **(a)** 1.24×10^5 J

    Explanation:

    Since volume of water remains constant, then work done

    $\Delta W = PdV = 0$

    According to first pair of thermodynamics

    $dQ = dU + dW$

    $dU = dQ$

    $= ms\Delta T$

    $= 1 \times 4148 \times (60 - 30)$

    $= 4148 \times 30$

    $= 124440$ J $= 1.24 \times 10^5$ J

23. **(a)** 12.48×10^2joule

    Explanation:

    $U = \frac{3}{2}RT$

    $\Delta U = \frac{3}{2}R\Delta T = \frac{3}{2} \times 8.32 \times 100 = 12.48 \times 10^2$ joule

24.

    (b) $\frac{3}{2}$

    Explanation:

    Given: $P \propto T^3$

    or $PT^{-3} = K$ ...(i)

    For adiabatic process:

    PV^{γ} = constant (C)

    or $P\left(\frac{RT}{P}\right)^{\gamma} = C$

    or $P^{1-\gamma}T^{-\gamma} = C'$

    or $PT^{\gamma/1-\gamma} = C'' = K$ ...(ii)

    Comparing eqn. (i) and (ii), we get;

    $\frac{\gamma}{1-\gamma} = -3$ or $\gamma = \frac{3}{2}$

25.

    (b) All molecules have the same speed.

    Explanation:

    Molecules of an ideal gas move randomly at different speeds.

26.

(b) $2\sqrt{3}$s

Explanation:

Period of motion of a pendulum is given by

$T = 2\pi\sqrt{\frac{l}{g}}$ ...(i)

On the surface of earth, let period of motion is T_e and acceleration due to gravity is g_e

$\therefore T_e = 2\pi\sqrt{\frac{l}{g_e}}$ ...(ii)

On the another planet, let period of motion is T_p and gravitational acceleration is g_p

$\therefore T_p = 2\pi\sqrt{\frac{l}{g_p}}$ ...(iii)

($\because$ Pendulum is same, so l will be same)

From Eqs. (ii) and (iii),

$\frac{T_e}{T_p} = \frac{2\pi\sqrt{\frac{l}{g_e}}}{2\pi\sqrt{\frac{l}{g_p}}} = \sqrt{\frac{g_p}{g_e}}$ ...(iv)

Now, $g_e = \frac{GM_e}{R_e^2}$ and $g_p = \frac{GM_p}{R_p^2}$

Given, $M_p = 3M_e$ and $R_p = 3R_e$

$\therefore g_p = \frac{G\times 3M_e}{9R_e^2} = \frac{1}{3}\cdot\frac{GM_e}{R_e^2} = \frac{1}{3}g_e$

$\Rightarrow \quad \frac{g_p}{g_e} = \frac{1}{3}$ or $\sqrt{\frac{g_p}{g_e}} = \frac{1}{\sqrt{3}}$ ...(v)

From Eqs. (iv) and (v), $T_p = \sqrt{3}\, T_e$

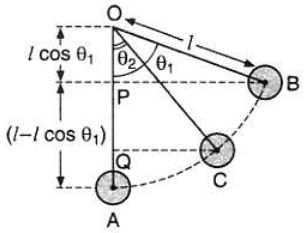
or $T_p = 2\sqrt{3}$ s ($\because T_e = 2$s)

27. **(a)** mgl(cos θ_2 - cos θ_1)

Explanation:

PE at point B - TE

= mg $\times$ AP = mg (l - l cos θ)



PE at point C = mg $\times$ AQ - mg(l - l cos θ_2)

If KE of the bob at the point C is E, then according to the law of conservation of energy,

E + mg (l - l cos θ_2) = mg(l - l cos θ_1)

$\therefore$ E = mgl(cos θ_2 - cos θ_1)

28.

(c) $\frac{\Delta n}{n} = \left(\frac{1}{2}\right) \frac{\Delta T}{T}$

Explanation:

The fundamental frequency n of vibration is given by:

$n = \frac{1}{2L}\sqrt{\frac{T}{m}} = \left(\frac{1}{2L\sqrt{m}}\right) T^{1/2} = KT^{1/2}$

$\therefore \log n = \log K + \frac{1}{2} \log T$

or $\frac{\Delta n}{n} = \frac{1}{2}\left(\frac{\Delta T}{T}\right)$

29.

(c) remain same

Explanation:

$I \propto A^2 n^2$

$\therefore \frac{I_1}{I_2} = \left(\frac{A_1}{A_2}\right)^2 \left(\frac{n_1}{n_2}\right)^2$

$= \left(\frac{A_1}{3A_1}\right)^2 \left(\frac{3n_1}{n_1}\right)^2$ ... $(\because A_2 = 3A_1, n_2 = \frac{1}{3}n_1)$

$= 1$

$\therefore I_2 = I_1$

30.

(c) Only when the Gaussian surface is an equipotential surface

Explanation:

Only when the Gaussian surface is an equipotential surface.

31.

(b) 40 μF and 10 μF

Explanation:

Equivalent capacitance in series combination (C') is given by

$\frac{1}{C'} = \frac{1}{C_1} + \frac{1}{C_2} \Rightarrow C' = \frac{C_1 C_2}{C_1 + C_2}$

For parallel combination equivalent capacitance

$C' = C_1 + C_2$

For parallel combination

$q = 10(C_1 + C_2)$

$q_1 = 500\ \mu C$

$500 = 10(C_1 + C_2)$

$C_1 + C_2 = 50\ \mu F$ ...(i)

For Series Combination-

$q_2 = 10\frac{C_1 C_2}{(C_1 + C_2)}$

$80 = 10\frac{C_1C_2}{50}$ From equation ...(ii)

$C_1C_2 = 400$ ...(iii)

From equation (i) and (ii)

$C_1 = 10\ \mu F$, $C_2 = 40\ \mu F$

$= 40\ \mu F$ and $10\ \mu F$

32.

(d) 4.34×10^4 J

Explanation:

Current in silver voltmeter $i_1 = \frac{m_1}{z_1 t_1}\frac{1}{(11.2\times10^{-4})} \times (30 \times 60) = 0.5A i_2 = \frac{m_2}{z_2 t_2}$

$i_2 = \frac{1.8}{(6.6\times10^{-4})\times(30\times60)} = 1.82$ A

SO, the total current gives by battery $i = i_1 + i_2 = 2.01$ A

The energy supplied by the battery = EiLW = $(12) \times (2.01) \times (30 \times 60) = 4.34 \times 10^4$ J

33. **(a)** 34

Explanation:

Multiplying power = $\frac{I}{I_g} = \frac{S+G}{S} = \frac{111+3663}{111} = 34$

34.

(d) 0.8×10^7erg

Explanation:

W = $MB(\cos\theta_1 - \cos\theta_2)$

When the magnet is rotated from 0^o to 60^o, then work done is 0.8 J.

$0.8 = MB(\cos 0^\circ - \cos 60^\circ) = \frac{MB}{2}$

$\therefore$ MB = 1.6 N-M

In order to rotate the magnet through an angle of 30°, i.e., from 60° to 90°, the work done is,

$W' = MB(\cos 60^\circ - \cos 90^\circ) = MB\left(\frac{1}{2} - 0\right)$

$= \frac{MB}{2} = \frac{1.6}{2} = 0.8$ J $= 0.8 \times 10^7$ erg

35.

(d) 100 A-m

Explanation:

For vibration magnetometer,

$T^2 = \frac{4\pi^2 I}{MH}$

Given: $\frac{4\pi^2 I}{T^2} = 36 \times 10^{-4}$ ...(i)

For deflection magnetometer,

$H = \frac{\mu_0}{4\pi} \times \frac{2M}{d^3}$

Given: $\frac{4\pi d^3}{2\mu_0} = \frac{10^8}{36}$

From eqns. (i) and (ii)

$M = \frac{4\pi^2 I}{T^2 H} = \frac{4\pi^2 I}{T^2\left(\frac{2\mu_0}{4\pi d^3}\right)M}$

or $M^2 = \frac{\left(4\pi^2 I/T^2\right)}{\left(2\mu_0/4\pi d^3\right)} = \frac{36\times10^{-4}}{\left(36/10^8\right)} = 10^4$

$\therefore$ M = 100 A-m

36.

(c) 0.02 wb

Explanation:

$\vec{B} = \frac{1}{\pi}\left(\frac{wb}{m^2}\right)$

Area of the disc normal to B is $\pi R^2 \cos 60°$

Flux = B x Area normal

$\therefore$ Flux = $\frac{1}{2}\times$ 0.04 = 0.02 wb

37.

(c) none of these

Explanation:

The magnetic flux through some surfaces is proportional to the number of field lines passing through that surface.

38. **(a)** 1

Explanation:

In steady-state current passing through the solenoid

i = $\frac{E}{R} = \frac{10}{10}$ = 1A

39.

(b) $\vec{E} \times \vec{B}$

Explanation:

We know that;

The direction of propagation of the electromagnetic wave is perpendicular to the plane of oscillation of electric and magnetic field of the EM wave.

Thus,

If, $\vec{E}$ and $\vec{B}$ are electric and magnetic field vectors of the EM wave, the direction of its propagation will be given by $\vec{E} \times \vec{B}$

As in an EM wave, the vectors $\vec{E}$ and $\vec{B}$ are perpendicular to each other, the direction of the wave propagation will be perpendicular to the plane containing the electric and magnetic field vectors.

40.

(d) 15 cm (concave)

Explanation:

For lens u = u = wants to see = −30cm = -30cm and v = v = can see = −10cm

$\therefore \frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{-10} - \frac{1}{(-30)}$

$\Rightarrow$ f = -15cm

41. **(a)** 4

Explanation:

4

42.

(d) the wavelength of the incident light

Explanation:

the wavelength of the incident light

43.

(d) 310 nm

Explanation:

If λ_0 be the threshold wavelength and λ be the wavelength of the incident light, the condition for photoelectron emission is $\lambda < \lambda_0$

Thus, the threshold wavelength is the longest wavelength for photoelectron emission.

So, work function: $W = \frac{hc}{\lambda_0}$

or, $\lambda_0 = \frac{hc}{W} = \frac{(6.62\times10^{-34})(3\times10^{8})}{4\times1.6\times10^{-19}}$ = 3.10 $\times$ 10^{-7} m = 310 $\times$ 10^{-9} m = 310 nm

44.

(c) $\Lambda_n \approx A + \frac{B}{\lambda_n^2}$

Explanation:

Wavelength of emitted photon from nth state to the ground state,

$\frac{1}{\Lambda_n} = RZ^2\left(\frac{1}{1^2} - \frac{1}{n^2}\right)$

$\Lambda_n = \frac{1}{RZ^2}\left(1 - \frac{1}{n^2}\right)^{-1}$

Since n is very large, using binomial theorem

$\Lambda_n = \frac{1}{RZ^2}\left(1 + \frac{1}{n^2}\right)$

$\Lambda_n = \frac{1}{RZ^2} + \frac{1}{RZ^2}\left(\frac{1}{n^2}\right)$

As we know, $\lambda_n = \frac{2\pi r}{n} = 2\pi\left(\frac{n^2h^2}{4\pi^2mZe^2}\right)\frac{1}{n} \propto n$

$\Lambda_n \approx A + \frac{B}{\lambda_n^2}$

45. **(a)** production of more neutrons during fission

Explanation:

Due to the production of neutrons, a chain of nuclear fission is established which continues until the whole of the source substance is consumed.

CHEMISTRY

46.

(d) $\frac{1}{9.108 \times 6.023} \times 10^{8}$

Explanation:

9.108×10^{-31} kg = 1 electron

$\therefore 1 \text{ kg} = \frac{1}{9.108 \times 10^{-31}}$ electron

$= \frac{1}{9.108 \times 10^{-31}} \times \frac{1}{6.023 \times 10^{23}}$ mole electron

47.

(c) 1.7 N

Explanation: 1.7 N

48.

(d) Cu^{+}

Explanation:

Cu^{+} has $3d^{10}$ configuration.

49.

(d) 2

Explanation:

Ni : $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^8, 4s^2$

Ni^{2+}: _____ $3d^8$ or 

50.

(d) $\frac{5}{36}R$

Explanation:

$\bar{v} = RZ^2 \left(\frac{1}{2^2} - \frac{1}{3^2}\right)$

$= R\left(\frac{1}{4} - \frac{1}{9}\right) = \frac{5R}{36}$

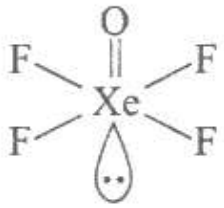
51. **(a)** Contraction of atoms of elements after lanthanum due to poor shielding of the f-subshell electron.

Explanation:

Contraction of atoms of elements after lanthanum due to poor shielding of the f-subshell electron.

52. **(a)** Square pyramidal

Explanation:



53.

(d) $S_2O_3^{2-}$

Explanation:

$$^{-}O - \overset{\overset{S}{\|}}{\underset{\underset{S}{\|}}{S}} - O^{-}$$

54. **(a)** $\underline{N}H_3 + H^+ \rightarrow NH_4^+$

Explanation:

$NH_3\ (sp^3) \longrightarrow NH_4^+\ (sp^3)$

55.

(b) X if T = 315 K

Explanation:

For a given value of T,

i. If $\triangle_r G°$ becomes < 0, the forward direction will be spontaneous and then the major and minor components will be Y and X respectively.

ii. If $\triangle_r G°$ becomes > 0, the forward direction will be non-spontaneous and then the major and minor components will be X and Y respectively.

$\triangle_r G° = 120 - \frac{3}{8} \times 315 = 1.875$

i.e $\triangle_r G° > 0$, major component = X

56.

(c) D - Z

Explanation:

Shorter the bond, more is bond energy.

The bond D − Z has maximum covalent bond energy which is equal to 486.

Hence, D − Z bond has the shortest bond length.

57.

(b) HPO_4^{2-}

Explanation:

HPO_4^{2-}

58.

(c) $\lambda_c = \lambda_\infty$ - (B)$\sqrt{C}$

Explanation:

According to Debye Huckel Onsager equation,

$\lambda_c = \lambda_\infty$ - (B)$\sqrt{C}$

where, λ_c = limiting equivalent conductivity at concentration C

λ_∞ = limiting equivalent conductivity at infinite dilution

C = concentration

59.

(d) Only (iv)

Explanation:

$2NO_2 + 2OH^- \longrightarrow NO_2^- + NO_3^- + H_2O$

60. **(a)** C

Explanation:

$$\underset{+2}{\overset{\downarrow}{C}}\ \underset{-2}{\overset{\downarrow}{dO}} + \underset{+2}{\overset{\downarrow}{C}}\ \underset{-2}{\overset{\downarrow}{O}} \rightarrow \underset{0}{\overset{\downarrow}{Cd}} + \underset{+4}{\overset{\downarrow}{C}}\ \underset{-2}{\overset{\downarrow}{O_2}}$$

61.

(d) Ca_3P_2

Explanation:

$$\underset{(X)}{Ca_3P_2} + 6H_2O \rightarrow 3Ca(OH)_2 + \underset{(Y)}{2PH_3}$$

$$\underset{(Y)}{2PH_3} + 3CuSO_4 \rightarrow CU_3P_2 + 3H_2SO_4$$

62. **(a)** PbF_4 is covalent in nature

Explanation:

PbF_4 and SnF_4 are ionic in nature.

63.

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

Explanation:

i - c, ii - e, iii - a, iv - d

64.

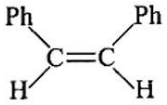
(d) structure

Explanation:

structure

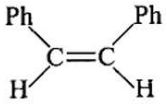
65.

(c)



Explanation:

$$\text{Ph - CH = CH - Ph} \xrightarrow[CCl_4]{Cl_2} Ph-\overset{Cl}{\overset{|}{C}}H-\underset{Cl}{\overset{|}{C}}H-Ph \xrightarrow{2NaNH_2} Ph-C\equiv C-Ph \xrightarrow[CaCO_3]{H_2,\,Pd}$$



66.

(b) 38.0 torr and 0.589

Explanation:

Total V.P. of solution = $P_A^\circ X_A + P_B^\circ X_B$

Given, P_A° = 74.7 torr, P_B° = 22.3 torr

$n_{benzene}$ = 1.5 mol, $n_{toluene}$ = 3.5 mol

$n_{solution}$ = 1.5 + 3.5 = 5 mol

$x_A = \frac{n_{benzene}}{n_{solution}} = \frac{1.5}{5} = 0.3$

$x_B = \frac{n_{toluene}}{n_{solution}} = \frac{3.5}{3} = 0.7$

Total V.P. of solution = (0.3 $\times$ 74.7 + 0.5 $\times$ 22.3) torr

= (22.4 + 15.6) torr = 38 torr

Mole fraction of benzene in vapour form = $\frac{22.4}{38}$ = 0.589

67. **(a)** eight

Explanation:

Depression in freezing point will be eight times by the formula,

$\Delta T_f = \frac{1000 K_f \times W_B}{M_B W_A}$

$\Delta T_f \propto \frac{W_B}{W_A}$

68. **(a)** Osmotic pressure

Explanation:

Osmotic pressure is a colligative property which is used for finding the molecular weight of polymer because other colligative properties give very low measurement values which is difficult to measure accurately.

69.

(d) same osmotic pressure

Explanation:

A solution of $\frac{M}{2}$ NaCl is isotonic with M glucose. The required condition is $\pi_1 = \pi_2$.

70.

(b) infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte, whatever be the nature of the other ion of the electrolyte.

Explanation:

Kohlrausch's law states that at infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte, whatever be the nature of the other ion of the electrolyte.

71.

(b) 1.212 V

Explanation:

$E^{\circ}_{Fe^{2+}/Fe}$ = -0.441 V

$E^{\circ}_{Fe^{3+}/Fe}$ = -0.771 V

$E^{\circ}_{cell} = E^{\circ}_{OP_{Fe/Fe^{2+}}} + E^{\circ}_{RP_{Fe^{3+}/Fe^{2+}}}$ (see redox change)

= +0.441 + 0.771 = 1.212 V

72.

(d) remains same

Explanation:

In the case of attacked electrodes, the metal dissolves at anode and deposites at the cathode.

[$Ag \longrightarrow Ag^{+} + e$ (anode);

$Ag^{+} + e \longrightarrow Ag$ (cathode)]

Thus the concentration of salt does not change.

73. **(a)** Rate = $k[A][B]^2$

Explanation:

In general, for nth order reaction, the unit of rate constant = $(Concentration)^{1-n}$ $(time)^{-1}$

So, $1 - n = -2 \Rightarrow n = 3$

Thus, the unit of rate constant M^{-2} s^{-1} indicates that the given reaction must be third order.

Rate = $k[A][B]^2$ is third order overall.

74.

(b) Molecularity of the reaction is 2

Explanation:

Molecularity of the reaction is 2

75.

(b) SO_2

Explanation:

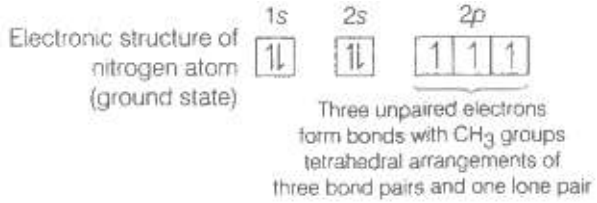
When SO_2 gas is passed through acidified $KMnO_4$ solution, the solution turns colourless.

$2KMnO_4 + 5SO_2 + 2H_2O \rightarrow K_2SO_4 + 2MnSO_4 + 2H_2SO_4$

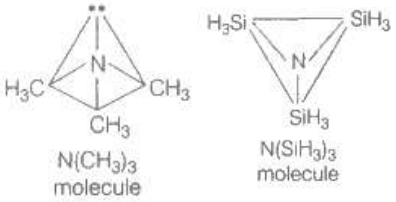
76. **(a)** $(SiH_3)_3$ N is planar and less basic than $(CH_3)_3$ N

Explanation:

The correct statement is that $(SiH_3)_3N$ is planar and less basic than $(CH_3)_3N$. The compounds trimethylamine $(CH_3)_3N$ and triethylamine $(SiH_3)_3N$ have similar formulae but have totally different structures. In trimethylamine the arrangement of electrons is as follows:



In trisilylamine, three sp^2 orbitals are used for a-bonding, giving a plane triangular structure.



77.

(b) [Xe] $4f^7 5d^1 6s^2$

Explanation:

[Xe] $4f^7 5d^1 6s^2$

78. **(a)** en

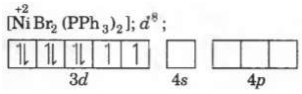
Explanation:

en (ethylenediamine) is a bidenate ligand.

79.

(b) It is tetrahedral with one unpaired electron.

Explanation:



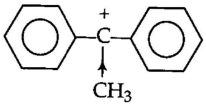
80.

(c) $C_6H_5C(CH_3)(C_6H_5)Br$

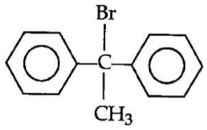
Explanation:

As we know that S_N1 reaction proceeds via formation of a carbocation intermediate.

Thus, more stable is the carbocation more reactive is the aryl halide towards S_N1.

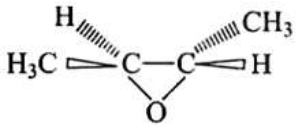


Here in this compound +1 effect of -CH_3 and delocalization of +ve charge on two phenyl rings the magnitude of positive charge on carbon is reduced and hence it will be most stable carbocation.

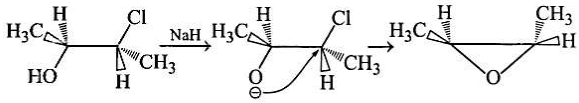
Hence,  will undergo S_N1 faster.

81.

(d)



Explanation:



82.

(b) Alcohol is a better proton donor than the conjugate acid of hydroxide ions.

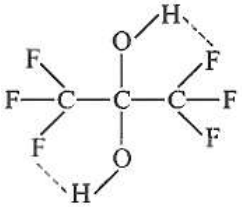
Explanation:

The conjugate acid of hydroxide ions (i.e., water) is a better proton donor than alcohol.

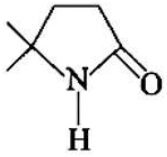
83.

(c) $F_3C - \overset{O}{\overset{\|}{C}} - CF_3$

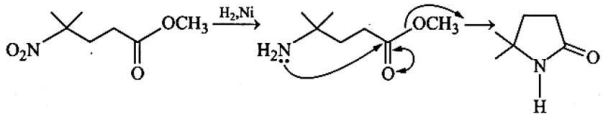
Explanation:

$$F_3C - \overset{O}{\overset{\|}{C}} - CF_3 \xrightarrow{H_2O}$$ 

84. **(a)**



Explanation:



85.

(d) Vitamin B_{12}

Explanation:

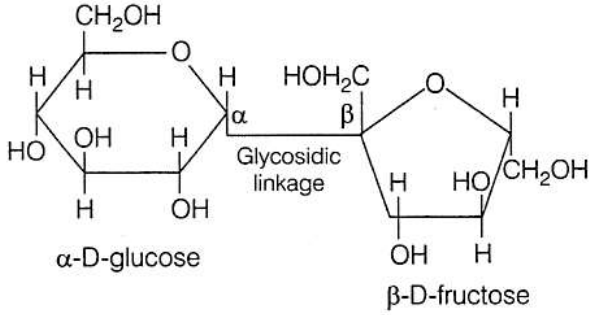
Because cobalt is also an essential trace element for humans and found at the center of B_{12} and produces red blood cells.

86.

(c) The glycosidic linkage is present between C_1 of α-glucose and C_1 of β-fructose

Explanation:

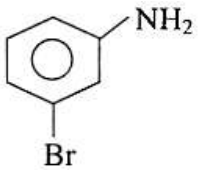
Statement-(b) is not true for sucrose. It is linked through a glycosidic linkage between C-l of α-glucose and C-2 of β-fructose. Since, the reducing groups of glucose and fructose are involved in glycosidic bond formation, sucrose is a non-reducing sugar.



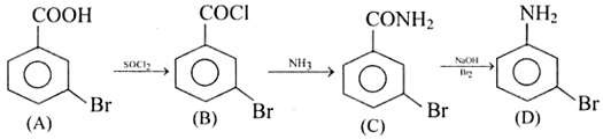
On hydrolysis with acids or enzyme, sucrose gives equimolar mixture of D-(+)-glucose and D-(-)-fructose.

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{HCl} \underset{D-(+)-glucose}{C_6H_{12}O_6} + \underset{D-(-)-fructose}{C_6H_{12}O_6}$$

87. **(a)**



Explanation:



88.

(b) 0.281 V

Explanation:

$E_{\left(\frac{Cu^{2+}}{Cu}\right)} = E^{o}_{\left(\frac{Cu^{2+}}{Cu}\right)} - \frac{0.059}{n}\log[\frac{1}{[Cu^{2+}]}$

$= 0.34 - \frac{0.059}{2}\log\frac{1}{0.01}$

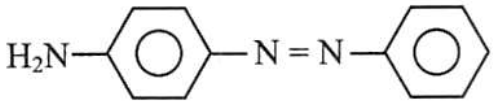
$= 0.3400 - 0.059 = 0.281$ V

89. **(a)** NaCN

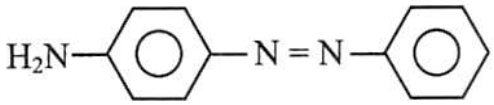
Explanation:

During the fusion of an organic compound with sodium metal, nitrogen of the organic compound is converted into NaCN.

90. **(a)**



Explanation:



BOTANY

91.

(d) Sapindales

Explanation:

Mango is included in Order Sapindales.

92. **(a)** William Harvey

Explanation:

William Harvey discovered of the circulation of the blood.

93. **(a)** This species was first described by Linnaeus

Explanation:

Mangifera indica Linn indicates that this species was first described by Linnaeus as in binomial nomenclature, the name of author appears after the species name. This method of mentioning the author's name is called a citation.

94.

(d) Fission

Explanation:

Bacteria increase their cell number or individuals mainly by binary fission. Rest of the processes are mostly used during unfavourable conditions.

95. **(a)** Trees, shrubs, and herbs

Explanation:

Aristotle classified plants on the basis of their morphological characters into trees, shrubs, and herbs.

96.

(c) Both wall of sporangium and sporogenous cells

Explanation:

Both wall of sporangium and sporogenous cells

97.

(c) one male gamete and two polar nuclei.

Explanation:

Endosperm develops from primary endosperm cell (PEC) which is formed from the fusion of two polar nuclei of the central cell with a male gamete.

98.

(b) Insects

Explanation:

Insects

99.

(b) Presence of vessel elements and absence of archegonia

Explanation:

Members of order Gnetales posses vessels and show absence of archegonia.

100.

(d) Salvinia-Prothallus

Explanation:

Prothallus is the gametophyte in most of the pteridophytes in which both male and female sex organs called antheridia and archegonia are present. But salvinia is heterosporous and produces male and female gametes on different plant so it do not possess prothallus.

101.

(c) Directly from a spore

Explanation:

When a moss first grows from the spore, it starts as a germ tube which lengthens and branches into a filamentous complex known as a protonema, which develops into a leafy gametophore, the adult form of a gametophyte in bryophytes. Moss spores germinate to form an algae-like filamentous structure called the protonema.

102.

(c) All of these

Explanation:

A flagellum is a long, whip-like structure that helps some single-celled organisms move. It is composed of microtubules. They help propel cells and organisms in a whip-like motion. The flagellum of eukaryotes usually moves with an "S" motion and is surrounded by the cell membrane. Red algae, Blue-Green algae, and higher plants lack flagella in their cells.

103.

(c) Three cell

Explanation:

Three cell

104.

(d) All of these

Explanation:

On the basis of megaspores contributing to the development of embryo sac, a number of mitotic divisions occur in the functional megaspore. There are three types of embryo sacs:

i. Monosporic embryo sac: In this type of embryo sac, out of the four megaspores, one megaspore at the chalazal side takes part in the formation of the embryo sac. The nucleus divides three times to form 8 nuclei. This type is called the Polygonum type.

ii. Bisporic embryo sac: In this type of embryo sac, two megaspores take part in the formation of the embryo sac. The nucleus of two megaspores undergo two mitotic divisions and the resulting embryo sac is 8 nucleate.

iii. Tetrasporic embryo sac: In this type of embryo sac, all four megaspores take part in the formation of the embryo sac. All the four haploid nuclei remain in a common cytoplasm and forming a coenomegaspore. The final organization of the embryo sac is 8-nucleate. Hence, the 8-nucleate embryo sac can be monosporic, bisporic, and tetrasporic.

105.

(c) $\overset{\frown}{\mathrm{P\ A}}$

Explanation:

Presence of tepals and epitepalous stamens in a flower can be denoted by $\overset{\frown}{\mathrm{P\ A}}$.

106.

(b) (iii) and (v)

Explanation:

(iii) and (v) statements are incorrect.

The corrected statements are given below:

- In basal placentation, the placenta develops at the base of the ovary and a single ovule is attached to it.
- In mustard and argemone, Parietal placentation is present.

107.

(c) Monocot stem - 1 - Epidermis, 2 - Hypodermis, 3 - Vascular bundles, 4 - Phloem, 5 - Xylem, 6 - Ground tissue

Explanation:

The diagram is of transverse section of a Monocot stem - 1 - Epidermis, 2 - Hypodermis, 3 - Vascular bundles, 4 - Phloem, 5 - Xylem, 6 - Ground tissue.

108.

(d) Monocotyledonous stem

Explanation:

Closed vascular bundles are scattered and surrounded by bundle sheath embedded in large parenchymatous ground tissue is characteristic of monocot stem. The vascular bundles are open, conjoint, and arranged in a ring with inconspicuous pith in the dicot stem. In roots, the vascular tissues are arranged radially.

109. **(a)** 1 : 1 : 1 : 1

Explanation:

1 : 1 : 1 : 1

110.

(d) Formation of abnormal ova in the mother

Explanation:

The karyotype XXX represents that it is a female which results from the fusion of a sperm with X chromosome with an ovum with two X chromosomes.So, abnormal ova are produced in them

111.

(d) polysome.

Explanation:

A polyribosome (or polysome) is a complex of an mRNA molecule and two or more ribosomes that act to translate mRNA instructions into polypeptides.

112.

(b) Splicing

Explanation:

Splicing is the removal of intervening sequences of introns and the joining of expressing sequences or exons in a specific order during transcription.

113. **(a)** This structure also found in eukaryotes

Explanation:

Mesosome which is formed by the extensions of the plasma membrane into the cell. These extensions are in the **form of vesicles, tubules and lamellae.** They help in cell wall formation, DNA replication and distribution to daughter cells. They also help in respiration, secretion processes, to increase the surface area of the plasma membrane and enzymatic content.

114. **(a)** Across the cell membrane

Explanation:

Integral proteins that go through the membrane are called transmembrane proteins. They have hydrophobic regions within the interior of the membrane and hydrophilic regions at the outer membrane surface.

115. **(a)** (iv) and (vi)

Explanation:

(iv) and (vi)

116.

(c) Passive immunity

Explanation:

Passive immunity

117.

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

Explanation:

Good health is maintained by balanced diet, personal hygiene, regular exercise, awareness about disease, vaccination against infectious diseases, proper disposal of wastes, control of vectors and maintenance of hygienic food and water resources.

118.

(c) Dried leaves and flowers of Cannabis sativa

Explanation:

Dried leaves and flowers of Cannabis sativa

119.

(d) Malignant tumours may exhibit metastasis.

Explanation:

Tumouris of two types: benign and malign.Malign or malignant tumour exhibits metastasis.It is the phenomenon in which cancer cells spread to distant sites through body fluids to develop secondary tumour.

120.

(c) Leptotene

Explanation:

Leptotene also known as leptonema is the first stage of prophase I during which individual chromosomes begin to condense into long strands within the nucleus which are loosely interwoven. However, the two sister chromatids are still so tightly bound that they are indistinguishable from one another. They possess a string of swollen areas called chromomeres.

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

Explanation:

All of these

122. **(a)** Pond

Explanation:

Pond

123.

(c) Biological process

Explanation:

Secondary sewage treatment is mainly biological process.

124.

(d) Crotalaria juncea

Explanation:

Green manure is an organic substance that increases the fertility of the soil. Crotalaria juncea is grown into and ploughed to a soil that decomposes and increases the fertility.

125. **(a)** Uttarakhand

Explanation:

Uttarakhand

126. **(a)** (A)-(iii); (B)-(i); (C)-(iv); (D)-(ii); (E)-(v)

Explanation:

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

127.

(b) Advanced ex-situ conservation of biodiversity

Explanation:

Cryopreservation is an advanced method of ex situ conservation. It involves preservation at -196^{o}C in liquid nitrogen. It can maintain tissue culture, embryos, animal cells tissues, spermatozoa indefinitely. The cryopreserved material is revived through special technique, when required.

128.

(c) Prophase

Explanation:

Prophase is the first phase of mitosis, the process that separates the duplicated genetic material carried in the nucleus of a parent cell into two identical daughter cells. In prophase condensation of chromosomal material (Chromosomes form), centriole begins to move towards opposite poles of the cell, Initiation of the assembly of the mitotic spindle, the microtubules.

129.

(c) Cell plate formation

Explanation:

Cytokinesis occurs by a special mechanism in higher-plant cells in which the cytoplasm is partitioned by the construction of a new cell wall, the cell plate, inside the cell. The position of the cell plate is determined by the position of a preprophase band of microtubules and actin filaments.

130.

(b) Proton gradient

Explanation:

According to the chemiosmosis theory of ATP generation. The ATP is generated utilizing the electrochemical gradient generated due to the accumulation of protons in the thylakoid lumen of chloroplast or peri-mitochondrial space in mitochondria. The accumulation of protons gives rise to an electric gradient, due to the accumulation of positive charge and a chemical gradient due to the accumulation of hydrogen atom. When protons move along this electrochemical gradient through F_0 - F_1 ATP synthase enzyme complex, ATP generation occurs.

131. **(a)** Statement (c) is correct.

Explanation:

Since oxygen is evolved in reaction P, the equation represents oxygenic photosynthesis which occurs in green plants and cyanobacteria whereas no oxygen is evolved as per equation Q,

this is anoxygenic photosynthesis which occurs in photosynthetic bacteria which do not use water an electron donor and forms sulphur instead of oxygen.

132.

(b) Both Photosystem-I and Photosystem-II

Explanation:

Both Photosystem-I and Photosystem-II

133.

(d) reduction

Explanation:

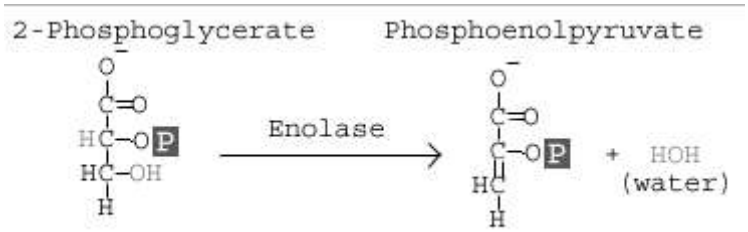
During reduction stage of Calvin cycle, a glucose molecule is formed through a series of reactions. Each molecule of 3PGA is phosphorylated using ATP and 1, 3-bisphosphoglyceric acid is formed. Each molecule of 1,3-bisphosphoglyceric acid is converted into glyceraldehyde 3-phosphate (G3P) using NADPH. Glyceraldehyde 3-phosphate is converted into one molecule of glucose through a series of reactions that are reversal of glycolysis. So, this is also called glycolytic reversal.

134.

(d) 2-Phosphoglycerate ⟶ Phosphoenol pyruvate

Explanation:

During the formation of phosphoenol pyruvate (PEP) from 2-phosphoglycerate, a water molecule is eliminated. This reaction is catalysed by the enzyme enolase. This is a step of glycolysis. This reaction takes place in the cytoplasm.



135. **(a)** Increase in size and dry weight

Explanation:

Increase in size and dry weight

ZOOLOGY

136. **(a)** Lampreys and hagfishes

Explanation:

Lamprey and, Hagfish are Cyclostomes which are jawless fishes.

137.

(d) Archaeocytes

Explanation:

Archaeocytes may be converted into other types of cells and are also called as undifferentiated totipotent cells.

138.

(b) Notochord is replaced by vertebral column in adult of some chordates.

Explanation:

All chordates have a notochord but only in adult of some chordates or vertebrates, the notochord is replaced by a cartilaginous or bony vertebral column. So, all chordates are not vertebrates. All vertebrates are chordates as they have notochord during the embryonic stage.

139.

(d) It is absent throughout life in humans from the very beginning

Explanation:

Humans are vertebrates belonging to Class Mammals in which the notochord is replaced by a cartilaginous or bony vertebral column in the adult.

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

Explanation:

Obelia, Aurelia, and Hydra are aquatic, sessile, or free-swimming, radially symmetrical animals belonging to phylum Cnidaria, and hence all are cnidarians.

141.

(d) (A) - (i), (vi), (viii); (B) - (ii), (vii), (ix); (C) - (iii), (iv), (v)

Explanation:

Image A is a unicellular gland consisting of isolated glandular cells or goblet cells of the alimentary canal.

Image B is a multicellular gland consisting of a cluster of cells such as the salivary gland.

Image C represents a compound epithelium made of more than one layer (multi-layered) of cells. Their main function is to provide protection against chemical and mechanical stresses. They cover the dry surface of the skin,

the moist surface of the buccal cavity, pharynx, the inner lining of ducts of salivary glands, and of pancreatic ducts.

Hence, the correct match is (A) - (i), (vi), (viii); (B) - (ii), (vii), (ix); (C) - (iii), (iv), (v).

142.

(b) Dense fibrous connective tissue

Explanation:

A tendon is composed of dense fibrous connective tissue made up primarily of collagenous fibres.

143.

(d) Ciliated epithelium

Explanation: Ciliated epithelium

144. **(a)** (i) and (ii)

Explanation:

When a person moves to higher altitudes, PO_2 and total atmospheric pressure decrease. Hypoxia stimulates the juxta-glomerular cells of the kidney to release erythropoietin hormone, which stimulates erythropoiesis in the bone marrow, causing polycythemia. Hypoxia increases the breathing rate and number of RBC.

145.

(b) Lungs

Explanation:

Residual volume (RV) is the volume of air remaining in the lungs after maximum forceful expiration. In other words, it is the volume of air that cannot be expelled, thus causing the alveoli to remain open at all times. The residual volume remains unchanged regardless of the lung volume at which expiration was started.

146. **(a)** 6000 - 8000 mL

Explanation:

Approximate volume of air a healthy man can expire or inspire per minute is 6000 - 8000 mL.

147. **(a)** Expiration

Explanation:

Expiration

148.

(d) Statement (d) is not true.

Explanation:

The partial pressure of CO_2 in deoxygenated blood is 40 mm of Hg.

149.

(c) (iii) and (iv)

Explanation:

Silicosis and asbestosis are known as occupational disorders as they occur due to one's occupation. Workers working in industries where silica and asbestos are used can suffer from these respiratory disorders.

150.

(c) collection of the ovum after ovulation

Explanation:

The edges of the infundibulum possess finger-like projections called fimbriae, which help in collection of the ovum after ovulation.

151. **(a)** 12-14th

Explanation:

Both LH and FSH attain a peak level in the middle of cycle (about fourteenth day). Rapid secretion of LH leading to its maximum level during the mid-cycle called LH surge induces rupture of Graafian follicle and thereby the release of ovum (ovulation).

152. **(a)** A - Degeneration of endometrium, B - Regeneration of endometrium, C - Endometrium thickness increases and becomes vascularised to receive and implant embryo

Explanation:

During menstrual phase (A), endometrium degenerates. The menstrual phase is followed by the follicular phase (B). During this phase, oestrogen made by the maturing ovarian follicle causes the glands to grow and the endometrium regenerates. Follicular phase is followed by luteal phase during which corpus luteum secretes large amounts of progesterone which is essential for maintenance of the endometrium.

153.

(b) fructose, calcium, and certain enzymes.

Explanation:

Secretions of male accessory glands such as seminal vesicles, prostate, and bulbourethral glands constitute the seminal plasma which is rich in fructose, calcium, and certain enzymes.

154.

(b) Complete the process of fertilization in the uterus

Explanation:

Complete the process of fertilization in the uterus

155.

(c) Only (ii)

Explanation:

Intra uterine devices like copper-Tare effective contraceptives.

156.

(b) Gonorrhoea

Explanation:

Gonorrhoea is a sexually transmitted disease caused by a bacterium whereas AIDS, hepatitis-B, and genital herpes are caused by viruses.

157.

(c) Evidences from biogeographical distribution.

Explanation:

Galapagos Islands are a chain of 14 islands in the Pacific Ocean on the west coast of South America. Charles Darwin visited these islands during his famous voyage on HMS Beagle (name of his ship) in 1835. The flora and fauna of these islands resemble with those of the South American mainland with which the Galapagos Islands were once connected. However, Darwin's finches (birds of Galapagos Islands) influenced Darwin to think about the evolutionary change. These birds designated as Darwins' finches by Dr. David Lack (1947) do not resemble the birds of the South American species. These finches were the first to reach the Galapagos Islands as migrants from the mainland (South America). When they reached the islands, they faced many problems for obtaining food. They had to change their feeding habits.

158.

(b) Caudal vertebrae, vermiform appendix and ear muscles

Explanation:

Caudal vertebrae, vermiform appendix and ear muscles

159.

(b) Homeostasis

Explanation:

Homeostasis

160.

(d) Marine teleost

Explanation:

Certain marine molluscs, crustaceans, and teleost fishes first form trimethylamine from their ammonia by a process known as methylation. Then, the trimethylamine is oxidized to trimethylamine oxide for excretion. This oxide is soluble in water, but non-toxic.

161.

(c) Green gland

Explanation:

Green gland are the excretory organ of crustaceans.

162.

(c) Blood minus cells minus proteins

Explanation:

Blood minus cells minus proteins

163.

(c) 206

Explanation:

Every single person has a skeleton made up of many bones. These bones give your body structure, let you move in many ways, protect your internal organs, and more. It's time to look at all your bones the adult human body has **206** of them.

164.

(b) Muscular dystrophy, lack of a protein called dystrophin.

Explanation:

Muscular dystrophy (MD) is a group of muscle diseases that results in increasing weakening and breakdown of skeletal muscles over time. This damage and weakness is due to the lack of a protein called dystrophin, which is necessary for normal muscle function. The absence of this protein can cause problems with walking, swallowing, and muscle coordination. The disorders differ in which muscles are primarily affected, the degree of weakness, how fast they worsen, how and when symptoms begin.

165.

(b) Neuromuscular junction

Explanation:

The junction between a motor neuron and the sarcolemma of a muscle fiber is called a neuromuscular junction.

166.

(d) (A)-(t), (B)-(P), (C)-(q), (D)-(r)

Explanation:

(A)-(t), (B)-(P), (C)-(q), (D)-(r)

167.

(d) Medulla

Explanation:

The choroid plexus is located in the posterior medullary velum which partially forms the roof of the fourth ventricle.

168.

(c) Lateral part of frontal lobe

Explanation:

Broca's area is located in a region called the inferior frontal gyrus, found in the frontal lobe.

169.

(b) Myelinated fibres

Explanation:

Myelinated fibres

170. **(a)** Adrenaline

Explanation:

Adrenaline

171.

(b) presence of thyroxine.

Explanation:

Growth hormone of pituitary is more effective in presence of thyroxine hormone.

172.

(d) All of these

Explanation:

All of these

173.

(d) Complex QRS - One complete pulse

Explanation:

The QRS complex shows one complete pulse. It represents the depolarisation of the ventricles, which initiates the ventricular contraction. The contraction starts shortly after Q and marks the beginning of the systole.

174. **(a)** Precavals and postcavals

Explanation:

The superior and inferior vena cavas (pre and post caval) are the great veins which empty blood in the right auricle.

Superior Vena Cava is the veins of the head, neck, upper extremities, and chest all drain into the superior vena cava, which goes to the heart. It is formed by the union of the right and left brachiocephalic veins, which drain the head, neck, and upper extremities. The azygos vein drains the veins of the chest wall and empties into the superior vena cava just before the latter empties into the heart.

Inferior Vena Cava is much longer than the superior vena cava and returns the blood from the parts of the body below the diaphragm. It begins in the lower abdomen with the union of the two common iliac veins. It then ascends along the back wall of the abdomen, through a groove in the posterior part of the liver, through the diaphragm, and finally through the lower thorax to empty into the right atrium of the heart.

175.

(d) Serum = Blood - Plasma proteins.

Explanation:

Serum = Blood - Plasma proteins

176.

(d) $42^{o}C$

Explanation:

Recombinant DNA can be forced into competent cells by incubating the cells with recombinant DNA on ice, followed by placing them briefly at $42^{o}C$ (heat shock), and then putting them back on ice.

177.

(d) Extension of primer end on the template DNA

Explanation:

Extension of primer end on the template DNA

178.

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

Explanation:

Transformation is a procedure through which a piece of DNA is introduced in a host bacterium, the DNA fragments resulting from digestion of DNA by restriction endonucleases can be separated by a technique known as gel electrophoresis, each restriction endonuclease recognises a specific palindromic nucleotide sequence in the DNA called recognition site, and recombinant DNA is composed of DNA from two different sources or organisms.

179.

(d) Disulphide bridges

Explanation:

Human insulin is made up of 51 amino acids arranged in two polypeptide chains. Chain A has 21 amino acids and chain B has 30 amino acids. The two polypeptide chains are interconnected by disulphide bridges or S - S - linkages.

180.

(c) An RNA virus that can synthesise DNA during infection

Explanation:

A retrovirus is RNA virus which is capable to synthesize DNA during infection.