NEET (UG) 2024

SAMPLE PAPER - 6

Time Allowed: 3 hours and 20 minutes **Maximum Marks: 720**

General Instructions:

- The test is of 3 hours and 20 minutes and it contains 200 questions. Internal choice is given within the sections.
- For each correct response, the candidate will get 4 marks.
- For each incorrect response, one mark will be deducted from the total scores.
- The maximum marks are 720.

PHYSICS (Section-A)

1. If $\int \frac{dx}{\sqrt{8ax-x^2}} = a^n \sin^{-1}\left(\frac{x-4a}{4a}\right)$. where **x** and **a** represent distance, then the value of **n** using dimensional analysis is **[4]**

   a) 1 b) 2

   c) -1 d) 0

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

   a) $\frac{dyne}{cm^2}$ b) dyne × cm^4

   c) $\frac{dyne}{cm^3}$ d) dyne × cm^5

3. A particle is moving on a straight-line path with constant acceleration directed along the direction of instantaneous velocity. Choose the correct statement from the following: **[4]**

   a) Average velocity < average speed b) Average velocity = instantaneous velocity

c) Particle may reverse the direction of motion

d) Distance covered = magnitude of displacement

4. If $\vec{A} \times \vec{B} = \vec{B} \times \vec{A}$, then the angle between $\vec{A}$ and $\vec{B}$ is: **[4]**

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

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

c) π

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

5. A stone is projected at angle 30^{o} to the horizontal. The ratio of kinetic energy of the stone at point of projection to its kinetic energy at the highest point of flight will be: **[4]**

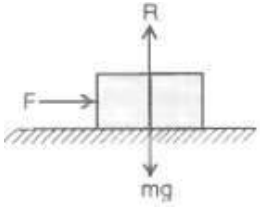
a) 1 : 4

b) 4 : 3

c) 1 : 2

d) 4 : 1

6. A block of mass 2 kg is placed on the floor. The coefficient of static friction is 0.4. A force F of 2.5 N is applied on the block as shown in figure. The force of friction between the block and the floor is: **[4]**



a) 2.5 N

b) 0.5 N

c) 1.5 N

d) 3.5 N

7. In order to do work: **[4]**

i. force must act at any angle to the displacement.

ii. force may not act in the same direction as is the displacement.

iii. must act along the direction of displacement.

iv. must act normal to the direction of displacement.

a) iii and iv

b) iv and i

c) only ii

d) i and ii

8. A force $\vec{F} = (\hat{i} + 5\hat{j} + \hat{k})$N is acting on a particle. The particle is first displaced from (0, 0, 0) **[4]**

m to (1, 1, 0) m along the path x = y and then (1, 1, 0) m to (2, 2, 2) m along the path x = 2m, y = 2m. The total work done in the complete path is

a) 6 J
b) 14 J
c) 10 J
d) 12 J

9. The motion of the centre of mass of system of two particles is not affected by the internal forces: **[4]**

a) irrespective of their directions
b) only when the forces are perpendicular to each other
c) when the angle between the lines of action of the forces lies betw een 0° and 90°
d) only when they act along the line joining the particles

10. Three identical uniform rods each of length 1 m and mass 2 kg are arranged to form an equilateral triangle. What is the moment of inertia of the system about an axis passing through one corner and perpendicular to the plane of the triangle? **[4]**

a) $5\ \text{kg-m}^2$
b) $3\ \text{kg-m}^2$
c) $\frac{3}{2}\text{kg} - \text{m}^2$
d) $4\ \text{kg-m}^2$

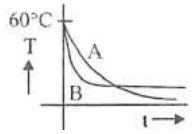
11. In planetary motion, **[4]**

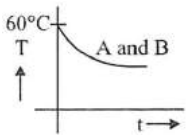
a) neither the angular momentum nor angular speed remains constant
b) the total angular momentum remains constant
c) the angular speed remains constant
d) the linear speed remains constant

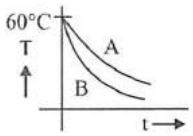
12. The coefficient of elasticity usually **[4]**

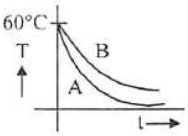
a) decreases with temperature
b) is independent of temperature
c) increases with temperature
d) increases on reducing stress

13. Two identical beakers A and B contain equal volumes of two different liquids at 60°C each and left to cool down. The liquid in A has a density of 8×10^2 kg/m^3 and specific heat of 2000 J kg^{-1} K^{-1} while the liquid in B has a density of 10^3 kg m^{-3} and specific heat of 4000 J kg^{-1} K^{-1}. Which of the following best describes their temperature versus time graph schematically? (assume the emissivity of both the beakers to be the same) **[4]**

a) 

b) 

c) 

d) 

14. Four spheres A, B, C and D of different metals but of same radius are kept at same temperature. The ratios of their densities and specific heats are 2:3:5:1 and 3:6:2:4. Which sphere will show the fastest rate of cooling (initially)? **[4]**

a) B

b) A

c) C

d) D

15. In an adiabatic change, the pressure P and temperature T of a monoatomic gas are related as $P \propto T^C$, where C equals. **[4]**

a) $\frac{2}{5}$

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

c) $\frac{5}{2}$

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

16. The energy of all molecules of a monatomic gas having a volume V and pressure P is $\frac{3}{2}PV$. **[4]**

The total translational kinetic energy of all molecules of a diatomic gas at the same volume and pressure is

a) 5/2PV

b) 3/2PV

c) 1/2PV

d) 3PV

17. A simple pendulum attached to the ceiling of a stationary lift has a time period T. The distance y covered by the lift moving upwards varies with time t as $y = t^2$ where y is in meters and t in seconds. If $g = 10 m/s^2$, pendulum will be: **[4]**

a) $\sqrt{\frac{5}{4}}T$

b) $\sqrt{\frac{4}{5}}T$

c) $\sqrt{\frac{6}{5}}T$

d) $\sqrt{\frac{5}{6}}T$

18. In a closed organ pipe, the 1st resonance occurs at 50cm. At what length of pipe, the 2nd resonance will occur? **[4]**

a) 50 cm

b) 200 cm

c) 100 cm

d) 150 cm

19. Two waves of equal amplitude A and equal frequency travel in the same direction in a medium. The amplitude of the resultant wave is: **[4]**

a) between 0 to 2A

b) 2A

c) A

d) 0

20. A charge is placed at the centre of cube of side a then flux linked with one of its given faces will be **[4]**

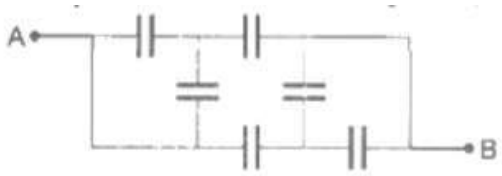
a) $\frac{Q}{4\pi\varepsilon_0 a^2}$

b) $\frac{Q}{6\varepsilon_0}$

c) $\frac{Q}{\varepsilon_0}$

d) $\frac{Q}{\varepsilon_0 a^2}$

21. A network of six identical capacitors, each of value C, is made as shown in the figure. The equivalent capacitance between the points A and B is: **[4]**



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

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

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

d) $\frac{4C}{3}$

22. The value of current I in the following circuit is: **[4]**

a) 13A

b) -3A

c) 23A

d) 3A

23. A moving coil galvanometer of resistance 100 Ω is converted to ammeter by resistance of 0.1 Ω in the circuit. Galvanometer gives full-scale deflection at 100 μA. The minimum current in the circuit for maximum deflection is: **[4]**

a) 1.001 mA

b) 1000.1 mA

c) 10.01 mA

d) 100.1 mA

24. Two points A and B are situated along the extended axis of a 2 cm long bar magnet at distances x and 2x cm respectively from the pole nearer to the points. The ratio of the magnetic fields at A and B will be: **[4]**

a) 4 : 1 approximately

b) 4 : 1 exactly

c) 8 : 1 exactly

d) 8 : 1 approximately

25. A thin rectangular magnet suspended freely has a period of oscillation T. Now, it is broken into two halves. One piece is made to oscillate freely in the same field. If new period of oscillation is T' then (T'/T) is : **[4]**

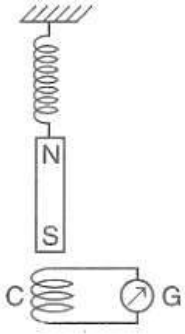
a) $\frac{1}{2}$

b) $\frac{1}{4}$

c) 2

d) $\frac{1}{2\sqrt{2}}$

26. A magnet NS is suspended from a spring and while it oscillates the magnet moves in and out of the coil C. If the coil is now connected to a galvanometer G as shown in the figure, then as the magnet oscillates, G shows: **[4]**



i. no deflection

ii. deflection on one side

iii. deflection to the left and right with constant amplitude

iv. deflection to the left and right but amplitude steadily decreases

a) ii and iii

b) iii and iv

c) only iv

d) i and ii

27. By a change of current from 5 to 10 amperes in 0.1 seconds, the self-induced emf is 10 volt. The change in the energy of the magnetic field of a coil will be **[4]**

a) 5 J

b) 7.5 J

c) 9 J

d) 6 J

28. A 220 volt input is supplied to a transformer. The output circuit draws a current of 2.0 ampere at 440 volts. If the efficiency of the transformer is 80%, the current drawn by the primary windings of the transformer is: **[4]**

a) 5.0 ampere

b) 2.5 ampere

c) 3.6 ampere

d) 2.8 ampere

29. The graph between the frequency v of K_α, X-ray line and the atomic number Z of the target material is: **[4]**

a) a hyperbola

b) a parabola

c) a straight line

d) an ellipse

30. In a Huygen's eye-piece, with an eye-piece of focal length F, the distance between the eye-piece and field lens should be: **[4]**

a) F

b) 2F

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

d) 3F

31. Two independent monochromatic sources are said to be incoherent because the detector of light intensity requires time to detect intensity at a given position, that is: **[4]**

a) equal to 10^{-8} sec

b) nearly equal to 10^{-8} sec

c) much greater than 10^{-8} sec

d) much less than 10^{-8} sec

32. The kinetic energy of the electron is E when the incident light has wavelength λ. To increase the KE to 2E, the incident light must have wavelength: **[4]**

a) $\frac{hc}{E\lambda - hc}$

b) $\frac{h\lambda}{E\lambda + hc}$

c) $\frac{hc\lambda}{E\lambda - hc}$

d) $\frac{hc\lambda}{E\lambda + hc}$

33. Consider a beam of electrons (each electron with energy E_0) incident on a metal surface kept in an evacuated chamber. Then: **[4]**

a) no electrons will be emitted as only photons can emit electrons

b) electrons can be emitted but all with an energy, E_0

c) electrons can be emitted with any energy, with a maximum of E_0

d) electrons can be emitted with any energy, with a maximum $E_0 - \phi$ (ϕ is the work function)

34. Critical potential for an element is: **[4]**

a) the charge present in eV

b) that voltage at which sparking occurs in air

c) the energy in eV required to ignite the atom

d) the energy in eV required to raise the orbital electron to a higher energy level to knock it off from the atom

35. Two samples X and Y contain equal amount of radioactive substances. If $\frac{1}{16}$th of the sample X and $\frac{1}{256}$th of the sample Y, remain after 8 hours then the ratio of half-period of X and Y is: **[4]**

a) 2 : 1

b) 1 : 16

c) 1 : 4

d) 1 : 2

PHYSICS (Section-B)

Attempt any 10 questions

36. An elevator in a building can carry a maximum of 10 persons, with the average mass of each person being 68 kg. The mass of the elevator itself is 920 kg and it moves with a constant speed of 3 m/s. The frictional force opposing the motion is 6000 N. If the elevator is moving up with its frill capacity, the power delivered by the motor to the elevator ($g = 10\ m/s^2$) must be at least: **[4]**

a) 56300 W

b) 62360 W

c) 48000 W

d) 66000 W

37. A ring and a disc of different masses are rotating with the same kinetic energy. If we apply a retarding torque τ on the ring, it stops after making n revolutions; After how many revolutions will the disc stop if the retarding torque on it is also τ? **[4]**

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

b) 2n

c) n

d) 4n

38. Two concentric shells have masses M and m and their radii are R and r respectively, where R > r. What is the gravitational potential at their common centre, what is the gravitational **[4]**

intensity at a point for which x < r?

a) $\frac{Gm}{r^2}$

b) $\frac{Gm}{x^2}$

c) $\frac{GM}{R^2}$

d) Zero

39. The electrical resistance (in ohms) of a certain thermometer varies with temperature according to the approximate law: $R = R_0\left[1 + \alpha\left(T - T_0\right)\right]$ where a = constant. The resistance is 101.6 Ω at the triple point of water 273.16 K and 165.5 Ω at the normal melting point of lead (600.5 K). The temperature when the resistance is 123.4 Ω is: **[4]**

a) 111.67 K

b) 358.4 K

c) 278.8 K

d) 384.8 K

40. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be: **[4]**

a) 523 Hz

b) 536 Hz

c) 537 Hz

d) 524 Hz

41. The fundamental frequency of a closed pipe is 200 Hz. If $\left(\frac{3}{4}\right)^{th}$ of the pipe is filled with water, the frequency of the first overtone of the pipe now is: **[4]**

a) 2400 Hz

b) 440 Hz

c) 880 Hz

d) 220 Hz

42. A moving coil galvanometer of resistance 100 Ω is converted to an ammeter by the resistance of 0.1 Ω in the circuit. Galvanometer gives full-scale deflection at 100μA. The minimum current in the circuit for maximum deflection is: **[4]**

a) 1000.1 mA

b) 1.001 mA

c) 100.1 mA

d) 10.01 mA

43. A neutral point is obtained at the centre of a vertical circular coil carrying current. The angle between the plane of the coil and the magnetic meridian is: **[4]**

a) 60^o

b) 0^o

c) 90^o

d) 45^o

44. Two similar circular loops carry equal currents in the same direction. On moving loops further apart, the electric current will: **[4]**

i. increase in both

ii. decrease in both

iii. remain unaltered

iv. increase in one and decrease in the second

a) only i

b) ii and iii

c) iv and i

d) iii and iv

45. In a series LCR circuit alternating emf (e) and current (i) are given by the equation $v = v_0 \sin \omega t$, $i = i_0 \sin\left(\omega t + \frac{\pi}{3}\right)$. The average power dissipated in the circuit over a cycle of AC is: **[4]**

a) $\frac{v_0 i_0}{2}$

b) $\frac{v_0 i_0}{4}$

c) Zero

d) $\frac{\sqrt{3}}{2} v_0 i_0$

46. An object is at a distance of 20 m from a convex lens of focal length 0.3 m. The lens forms an image of the object. If the object moves away from the lens at a speed of 5 m/s, the speed and direction of the image will be **[4]**

a) 1.16×10^{-3} m/s towards the lens

b) 3.22×10^{-3} m/s towards the lens

c) 2.26×10^{-3} m/s away from the lens

d) 0.92×10^{-3} m/s away from the lens

47. If the speed of red colour and blue colour light beams in glass (refractive index μ) are v_r and v_b, respectively, then: **[4]**

a) $v_r = v_b = c$

b) $v_r > v_b$

c) $v_r = v_b = \frac{c}{\mu}$

d) $v_r < v_b$

48. The uncertainty in the momentum of a particle is 10^{-30} kg-m/s. The minimum uncertainty in its position will be: **[4]**

a) 10^{-16} m

b) 10^{-12} m

c) 10^{-4} m

d) 10^{-8} m

49. The radius of electron's second stationary orbit in Bohr's atom is R. The radius of 3rd orbit will be **[4]**

a) 9 R

b) 2.25 R

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

d) 3 R

50. In nuclear reaction, there is conservation of: **[4]**

a) momentum only

b) energy only

c) mass only

d) mass, energy, and momentum

CHEMISTRY (Section-A)

51. 5 L of an alkane requires 25 L of oxygen for its complete combustion. If all volumes are measured at constant temperature and pressure, the alkane is: **[4]**

a) Butane

b) Propane

c) Ethane

d) Isobutane

o **[4]**

52. The Bohr orbit radius for the hydrogen atom (n = 1) is approximately 0.530 A. The radius for the first excited state (n = 2) orbit is (in A)

o

a) 2.12 b) 0.13

c) 1.06 d) 4.77

53. Which of the following is the **correct** order of ionisation energy? **[4]**

A. $O^{2-} < F^{-} < Na^{+} < Mg^{2+}$

B. $F^{-} < O^{2-} < Na^{+} < Mg^{2+}$

C. $O^{2-} < Na^{+} < F^{-} < Mg^{2+}$

D. $Mg^{2+} < Na^{+} < F^{-} < O^{2-}$

a) D only b) C only

c) A only d) B only

54. What is the formal charge on the sulphur atom in SO_2? (Assume a Lewis dot structure in which all atoms obey the octet rule.) **[4]**

a) +2 b) -1

c) +1 d) -2

55. Which of the following molecular orbitals of O_2 are perpendicular to each other? **[4]**

a) π_{py} and πp_y^* b) π_{py} and π_{p_z}

c) π_{p_z} and πp_z^* d) σ_{2s} and σ_{1s}

56. Which of the alkaline earth metal halides given below is essentially covalent in nature? **[4]**

a) $SrCl_2$ b) $BeCl_2$

c) $CaCl_2$ d) $MgCl_2$

57. What happens when methane undergoes combustion in systems A and B respectively? **[4]**

System A	System B
Adiabatic system	Diathermic container

a)

System A	System B
Temperature falls	Temperature remains same

b)

System A	System B
Temperature remains same	Temperature arises

c)

System A	System B
Temperature rises	Temperature remains same

d)

System A	System B
Temperature falls	Temperature rises

58. pH of 0.01 mol dm^{-3} CH_3COOH ($K_a = 1.74 \times 10^{-5}$): **[4]**

a) 3.0 b) 3.4

c) 3.9 d) 3.6

59. It is found that V forms a double salt isomorphous with Mohr's salt. The oxidation number of V in this compound is: **[4]**

a) +4 b) -4

c) +3 d) +2

60. Identify the CORRECT statement. **[4]**

a) Oxidation number of an element cannot be a fraction.

b) Oxidation number of an element is always fixed.

c) Oxidation number of an element can never be zero.

d) Oxidation number can have a plus or minus sign associated with it.

61. Identify the element that has higher first ionization energy, from each of the following pairs, **[4]**

i. Be and B
ii. B and Al
iii. Al and Si
iv. In and TI

a) i-B, ii-B, iii-Al and iv-TI b) i-B, ii-Al, iii-Al and iv-In

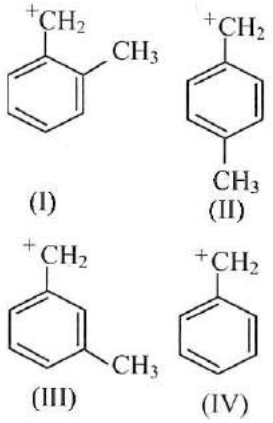
c) i-Be, ii-Al, iii-Si and iv-TI d) i-Be, ii-B, iii-Si and iv-TI

62. The hydride that is not electron deficient is **[4]**

a) AlH_3 b) B_2H_6

c) GaH_3 d) SiH_4

63. State the correct order of stability for the following carbocations: **[4]**



a) II > III > I > IV b) II > I > III > IV

c) IV > III > II > I d) IV > II > I > III

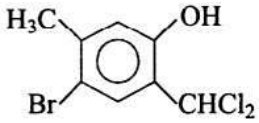
64. Which of the following has the shortest C-Cl bond? **[4]**

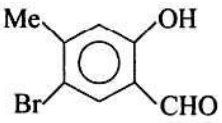
a) Cl-CH=CH-OCH_3 b) Cl-CH=CH_2

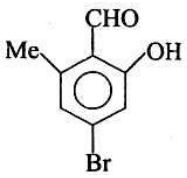
c) Cl-CH=CH-NO_2 d) Cl-CH=CH-CH_3

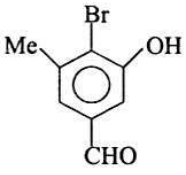
65. The product (Y) of the following sequence of reaction would be: **[4]**

$$\text{Me-C}_6\text{H}_4\text{-OH} \xrightarrow[(ii)\ H_3O^{\oplus}]{(i)\ CHCl_3 + NaOH,\ \Delta} (X) \xrightarrow{Br_2/Fe} (Y)$$

a) 

b) 

c) 

d) 

66. Given a solution containing **[4]**

i. methanol, 26% w/w

ii. ethanol, 36% w/w

iii. propanol, 38% w/w

The increasing order of mole fractions is _____.

a) ii < i < iii

b) i < ii < iii

c) iii < ii < i

d) ii < iii < i

[4]

67. For an ideal mixture of two liquids A and B, $\frac{P_A^\circ}{P_B^\circ} = \frac{5}{3}$ and mole fraction of A = 0.5. How many repeated distillations are to be done in order to get a small quantity of distillate containing at least 0.8-mole fraction of A?

a) 2

b) 1

c) 5

d) 3

68. If the cell reaction is spontaneous then: **[4]**

a) E^o_{red} is -ve

b) ΔG^o is +ve

c) ΔG is -ve

d) E^o_{red} is +ve

69. The rate of the reaction, A + B + C $\longrightarrow$ P is given by; $r = -\frac{d[A]}{dt} = K[A]^{\frac{1}{2}}[B]^{\frac{1}{2}}[C]^{\frac{1}{4}}$. The order of the reaction is: **[4]**

a) $\frac{1}{2}$

b) 2

c) 1

d) $\frac{5}{4}$

70. For the chemical reaction A $\rightarrow$ Products, it is found that the rate increases by a factor of 6.25 when the concentration of A is increased by a factor of 2.5. The order of this reaction with respect to A is: **[4]**

a) 0.5

b) 2

c) 1

d) 2.5

71. Transition metal with low oxidation number will act as **[4]**

a) An acid

b) None of these

c) A base

d) An oxidising agent

72. Which is the best procedure to follow if a student spills several drops of concentrated HCl on his hand? **[4]**

a) Rinse with large amounts of cold water.

b) Wash with concentrated sodium hydroxide solution.

c) Cover the area with solid sodium hydrogen carbonate.

d) Wrap the hand with sterile gauze.

73. Cerium (Z = 58) is an important member of the lanthanoids. Which of the following statements about Cerium is **incorrect**? **[4]**

a) The common oxidation states of Cerium are +3 and +4.

b) Cerium (IV) acts as an oxidising agent.

c) The +3 oxidation state of Cerium is more stable than the +4 oxidation state.

d) The +4 oxidation state of Cerium is not known in solutions.

74. Which is true for $[Ni(en)_2]^{2+}$? (Atomic number of nickel is 28) **[4]**

a) Diamagnetism, sp^3, tetrahedral, coordination number of Ni = 4

b) Paramagnetism, dsp^2, square planar, coordination number of Ni = 2

c) Paramagnetism, sp^3, tetrahedral, coordination number of Ni = 4

d) Diamagnetism, dsp^2, square planar, coordination number of Ni = 4

75. Which one amongst of the following isomerism is shown by $[Pt(NH_3)_2Cl_2]$? **[4]**

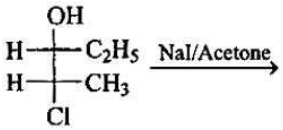
a) Conformational

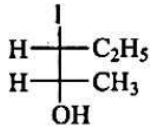
b) Optical

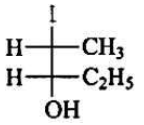
c) Structural

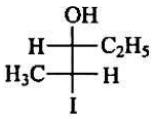
d) Geometrical

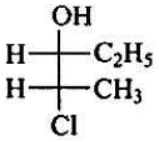
76. In the following reaction find the correct product: **[4]**



a) 

b) 

c) 

d) 

dilute $\xrightarrow{CO_2}$ **[4]**

77. A ← Sodium phenoxide → B. Predict A and B.

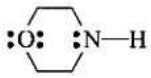
HCl $\xrightarrow{H^+}$

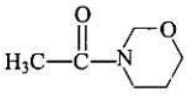
a) A = Benzoquinone, B = o-Cresol

b) A = Phenol, B = Salicylic acid

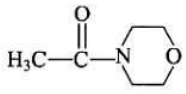
c) A = Benzoic acid, B = Phenol

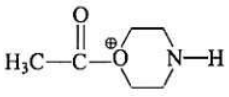
d) A = Benzene, B = Benzaldehyde **[4]**

78. $H_3C - \overset{O}{\overset{||}{C}} - Cl$ +  ⟶ Major product:

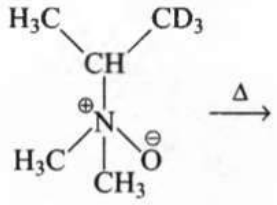
a) 

b) $Ph - \overset{O}{\overset{||}{C}} - NH_2$

c) 

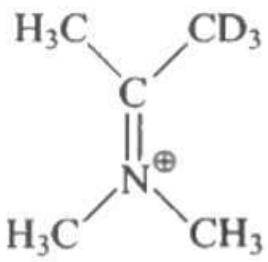
d) 

79. The major product formed in the following reaction is : **[4]**



a) $H_2C = CH - CD_3$

b) $H_2C = N - CH_3$

c) 

d) $H_3C - CH = CD_2$

(i) HCN

[4]

80. $D - (+) - Glyceraldehyde \rightarrow$

(ii) H_2O/H^+ (iii) HNO_3

The products formed in the above reaction are

a) Two optically inactive products

b) One optically inactive and one meso product

c) One optically active and one meso product

d) Two optically active products

81. Sucrose on hydrolysis gives: **[4]**

a) α-D-Glucose + β-D-Fructose

b) α-D-Fructose + β-D-Fructose

c) α-D-Glucose + β-D-Glucose

d) β-D-Glucose + α-D-Fructose

82. Nitration of aniline in strong acidic medium also gives m-nitroaniline because: **[4]**

a) Inspite of substituents nitro group always goes to only m-position.

b) In acidic (strong) medium aniline is present as anilinium ion.

c) In electrophilic substitution reactions amino group is meta directive.

d) In absence of substituents nitro group always goes to m-position.

83. Chlorine cannot displace: **[4]**

a) iodine from Nal

b) bromine from NaBr

c) fluorine from NaF

d) bromine from Nal

84. Which technique can be used to separate a mixture of powdered mothballs with plaster of paris? **[4]**

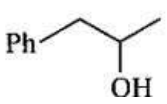
a) Chromatography

b) Fractional distillation

c) Sublimation

d) Crystallization

85. An organic compound containing one oxygen gives red colour with cerric ammonium nitrate solution, decolourise alkaline KMn04, respond iodoform test and show geometrical isomerism. It should be: **[4]**

a) 

b) $Ph - CH = CH - \overset{\overset{O}{||}}{C} - CH$

c) Ph-CH=CH-CH-CH_3

d) Ph-CH=CH-CH_2OH

CHEMISTRY (Section-B)

Attempt any 10 questions

86. What is the order of the boiling points (from lowest to highest) for the hydrogen halides? **[4]**

a) HF < HCl < HBr < HI

b) HCl < HF < HBr < HI

c) HF < HCl < HBr < HI

d) HCl < HBr < HI < HF

87. What is the average oxidation number of Br in Br_3O_8? **[4]**

a) $\frac{16}{3}$

b) +4

c) $\frac{+10}{3}$

d) +3

88. Borax is actually made of two tetrahedra and two triangular units joined together and should be written as $Na_2[B_4O_5(OH)_4].8H_2O$ **[4]**

Consider the following statements about borax:

A. Each boron atom has four B-O bonds.

B. Each boron atom has three B-O bonds.

C. Two boron atoms have four B-O bonds while the other two have three B-O bonds.

D. Each boron atom has one -OH group.

Select correct statement(s):

a) P and R

b) Q and R

c) P and Q

d) R and S

89. Which of the following does not represent the correct order of the properties indicated? **[4]**

A. F > Cl > Br > I (EN)

B. $Sc^{3+} > Ti^{2+} > Cr^{1+} >$ Mn (size)

C. O < S > Se > Te (EA)

D. $Fe^{2+} > Co^{2+} > Ni^{2+} > Cu^{2+}$ (unpaired electron)

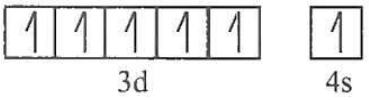
a) B only

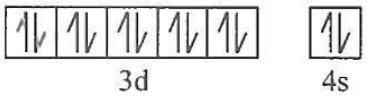
b) C only

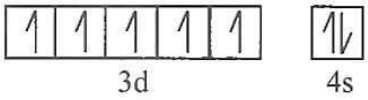
c) D only

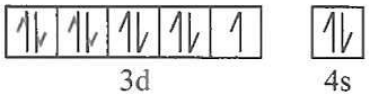
d) A only

90. Identify the INCORRECT match between the element and its valence shell configuration. **[4]**

a) Cr: 

b) Zn: 

c) Mn: 

d) Cu: 

91. Symmetrical cleavage in diborane is given by: **[4]**

a) C_5H_5N

b) all of these

c) Me_2O

d) MH

92. Two substances A and B are present such that [A] = 4 [B] and half-life of A is 5 minute and of B is 15 minute. If they start decaying at the same time following first order, how much time later will the concentration of both of them would be same: **[4]**

a) 5 minute

b) 10 minute

c) 15 minute

d) 12 minute

93. The potential for the cell: $Pt\left|\begin{matrix}Fe^{2+}\\Fe^{3+}\end{matrix}\right|\left|Cr_2O_7^{2-},\ Cr^{3+},\ H^{+}\right|Pt$ in which [Fe^{3+}] are 0.5 M and 0.75 M respectively and $\left[Cr_2O_7^{2-}\right]$, and [$Cr^{3+}$] and [$H^{+}$] are 2M, 4M and 1M respectively is: **[4]**

Given, $Fe^{3+} + e \longrightarrow Fe^{2+}$ $E^o = 0.770$ V

$14H^+ + 6e + \left[Cr_2O_7^{2-}\right] \longrightarrow 2Cr^{3+} + 7H_2O$ $E^o = 1.35$ V

a) -0.56 V

b) +0.56 V

c) +0.60 V

d) -0.60 V

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

a) 10^{-14}

b) 1.8×10^{-16}

c) 1.8×10^{-12}

d) 1.018×10^{-14}

95. The rate constant k, for the reaction $N_2O_5(g) \rightarrow 2NO_2(g) + 1/2\ O_2(g)$ is $2.3 \times 10^{-2}\ s^{-1}$ **[4]**

Which equation given below describes the change of $\left[N_2O_5\right]$ and $\left[N_2O_5\right]_t$ correspond to concentration of $\left[N_2O_5\right]$ initially and at time t?

a) $Log\left[N_2O_5\right]_t = log\left[N_2O_5\right]_0 + kt$

b) $\ln\dfrac{\left[N_2O_5\right]_0}{\left[N_2O_5\right]_t} = kt$

c) $\left[N_2O_5\right]_0 = \left[N_2O_5\right]_t e^{kt}$

d) $\left[N_2O_5\right]_t = \left[N_2O_5\right]_0 + kt$

96. Which oxide is neutral? **[4]**

a) CO

b) N_2O

c) NO

d) All of these

97. In which of the following reaction oxidation number of underlined atom will be +6 in at least one of the product? **[4]**

a) $S\,O_2F_2 \xrightarrow[-]{\text{Hydrolysis}}$

b) All of these

c) $XeF_6 \xrightarrow[-]{\text{Hydrolysis}}$

d) $XeF_4 \xrightarrow[-]{\text{Hydrolysis}}$

98. Which among the following is the **best** oxidising agent in acidic medium? **[4]**

a) CrO_4^{2-}

b) MoO_3

c) WO_3

d) $Cr_2O_7^{2-}$

99. If excess of $AgNO_3$ solution is added to 100 mL of a 0.024 M solution of dichlorobis (ethy .ene diamine) cobalt (III) chloride, how many mole of AgCl be precipitated? **[4]**

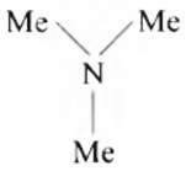
a) 0.0012

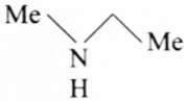
b) 0.0024

c) 0.0048

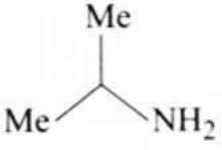
d) 0.0016

100. An amine reacts with benzene sulphonyl chloride to form a white precipitate which is insoluble in aq. NaOH. The amine is: **[4]**

a) 

b) 

c) 

d) 

BOTANY (Section-A)

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

a) Indica

b) Mangifera

c) Anacardiaceae

d) Sapindales

102. Which of the following taxonomic category is being described by the statements given below (i-iii)? **[4]**

i. It is the basic unit of classification.

ii. It is defined as the group of individuals which resemble in their morphological and reproductive characters and interbreed amongst themselves and produce fertile off springs.

iii. Human beings belong to the sapiens which is grouped in the genus Homo.

a) Kingdom

b) Family

c) Species

d) Genus

103. The first to isolate plant viruses was: **[4]**

a) D. Ivanowski

b) R.M. Smith

c) W.M. Stanley

d) F.C. Stakman

104. The motile bacteria are able to move by: **[4]**

a) Flagella

b) Fimbriae

c) Cilia

d) Pili

105. The embryo sac is monosporic when it develops from: **[4]**

a) Three megaspores of a megaspore tetrad

b) The megaspore mother cell where cytokinesis does not take place

c) Two functional megaspores of megaspore tetrad

d) One of the four megaspores of a megaspore tetrad

106. Male cones and megasporophylls are born on different trees in: **[4]**

a) All of these

b) Cedrus

c) Cycas

d) Pinus

107. Sperms of both Funaria and Pteris were released together near the archegonia of Pteris. Only its sperms enter the archegonia as **[4]**

a) Pteris archegonia repel Funaria sperms.

b) Funaria sperms get killed by Pteris sperms.

c) Funaria sperms are less mobile.

d) Pteris archegonia release chemical to attract its sperms.

108. Megaspore mothercell differentiates in the **[4]**

a) hilum
b) integuments
c) nucellus near the micropylar region.
d) nucellus near chalaza region.

109. The plant part which consists of two generations one within the other is: **[4]**

a) Seed
b) Embryo
c) Unfertilized ovule
d) Germinated pollen grain

110. Radical enclosed in a sheath which called: **[4]**

a) Radical sheath
b) Coleorhiza
c) Coleoptile
d) Both Coleoptile and Coleorhiza

111. Which of the following absent in most of the monocotyledons? **[4]**

a) Phloem fibres or bast fibres
b) Phloem parenchyma
c) Companion cells
d) Sieve tubes

112. Pith is not well developed in: **[4]**

a) Monocot root
b) Dicot Stem
c) Dicot root
d) Monocot stem

113. A man and a woman, who do not show any apparent signs of a certain inherited disease, have seven children (2 daughters and 5 sons). Three of the sons suffer from the given disease but none of the daughters is affected. Which of the following mode of inheritance do you suggest for this disease? **[4]**

a) Autosomal recessive
b) Sex-linked recessive
c) Autosomal domina
d) Sex-linked dominant

114. The X body of Henking was observed in: **[4]**

a) Half of the eggs during oogenesis
b) All sperms during spermatogenesis
c) Half of the sperms during spermatogenesis
d) All eggs during oogenesis

115. During DNA replication the term **leading strand** is applied to the one which always replicates in: **[4]**

a) $5' \rightarrow 3'$ direction continuously
b) $5' \rightarrow 3'$ direction discontinuously

c) $3' \rightarrow 5'$ direction continuously

d) $3' \rightarrow 5'$ direction discontinuously

116. According to wobble concept the G base in the anticodon can recognize the following base/s in the codon: **[4]**

a) U or C

b) All of these

c) C only

d) T or C

117. In prokaryotes, which type of ribosome is present? **[4]**

a) 70 S

b) 60 S

c) 50 S

d) 30 S

118. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells? **[4]**

a) Endoplasmic reticulum

b) Golgi bodies

c) Peroxisomes

d) Polysomes

119. Which of the following is primarily concerned with protection against germs? **[4]**

a) Kidney

b) Thyroid

c) Liver

d) Lymphatic tissue

120. The carcinogenic ingredient of tobacco smoke is: **[4]**

a) CO_2

b) Polycyclic aromatic hydrocarbon

c) Carbon monoxide

d) Nicotine

121. Four different steps that occur during meiosis are given in the following list: **[4]**

i. Complete separation of chromatids.

ii. Pairing of homologous chromosomes.

iii. Lining up of paired chromosomes on equator.

iv. Crossing over between chromatids.

These steps would occur in the order

a) (ii), (i), (iii), (iv)

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

c) (iii), (ii), (iv), (i)

d) (i), (ii), (iv), (iii)

122. In which of the following interactions both partners are adversely affected? **[4]**

a) Competition

b) Mutualism

c) Parasitism

d) Predation

123. Most animals are tree dwellers in a **[4]**

a) tropical rainforest

b) temperate deciduous forest

c) coniferous forest

d) thorn woodland

124. Which of the following is not used as a biopesticide? **[4]**

a) Nucleopolyhedrovirus

b) Xanthomonas campestris

c) Trichoderma harzianum

d) Bacillus thuringiensis

125. Which one is correct? **[4]**

i. In last 500 year 784 species extincted

ii. Steller's sea cow and tiger recently extincted

iii. In last 200 year 27 species disappear

iv. More than one correct

a) (i)

b) (iii)

c) (iv)

d) (ii)

126. An in situ method of conservation is: **[4]**

a) National park

b) Cryopreservation

c) Botanical garden

d) Genetic engineering

127. Match the following: **[4]**

State	Sanctuary
(a) Andhra Pradesh	(i) Barsey rhododendron sanctuary
(b) Gujarat	(ii) Dandeli wildlife sanctuary
(c) Sikkim	(iii) Manjira wildlife sanctuary
(d) Karnataka	(iv) Sansagir wildlife sanctuary

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

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

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

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

128. Mitosis is characterized by: **[4]**

a) Reduction division

b) Equal division

c) Both reduction and equal division

d) Paining of homologous chromosomes

129. Mitosis was first observed by: **[4]**

a) Fleming/Walter
b) Strasburger
c) Alexander Fleming
d) Farmer and Moore

130. Choose the correct statement: **[4]**

A. Molecule phosphoenol pyruvate (PEP) is present in the mesophyll cells
B. C_4 plants respond to lower temperature and show low rate of photosynthesis
C. PS-II has P_{680} reaction centre that absorbs green light at 680 nm
D. First product is oxaloacetic acid (OAA) in C_3 pathway

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

131. Jan Ingenhousz showed that small bubbles were formed around the green parts of an aquatic plant in bright sunlight (not in dark). These bubbles were of **[4]**

a) H_2O
b) CO_2
c) H_2
d) O_2

132. Select the correct step of photorespiration. **[4]**

a. Serine is converted into glyceric acid in mitochondrion.
b. Glycine is converted into serine with release of one CO_2 molecule in mitochondrion.
c. Glycine is converted into serine with release of one CO_2 molecule in peroxisome.
d. Glyceric acid is phosphorylated to form 3-phosphoglyceric acid in mitochondrion.

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

133. Source of protons within the chloroplasts is: **[4]**

a) Rubisco
b) Carbon dioxide
c) Excited chlorophyll
d) Water

134. Though vertebrates are aerobes, but their (i) show anaerobic respiration during (ii). During this, (iii) of skeletal muscle fibres is broken down to release lactic acid and energy. Lactic acid, if accumulates causes muscle fatigue. **[4]**
Fill up the blanks (i), (ii), and (iii) in the above paragraph and select the correct option.

a) (i) - cardiac muscles, (ii) - heavy exercise, (iii) - glycogen
b) (i) - Skeletal muscles, (ii) - heavy exercise, (iii) - glycogen

c) (i) - Skeletal muscles, (ii) - heavy exercise, (iii) - glucose

d) (i) - Skeletal muscles, (ii) - mild exercise, (iii) - glycogen

135. Which PGRs involved in growth-promoting or called plant growth promoters? **[4]**

a) Gibberellins

b) All of these

c) Auxins

d) Cytokinins

BOTANY (Section-B)

Attempt any 10 questions

136. Reproduction is synonymous with growth in : **[4]**

a) Bacteria

b) Amoeba

c) Unicellular algae

d) All of these

137. Bacteria reproduce by: **[4]**

a) Fission

b) All of these

c) Conjugation

d) Spores

138. Red colour of red algae is due to: **[4]**

a) r-phycoerythrin

b) Carotenoids

c) r-phycocyanin

d) Xanthophylls

139. An Hemianatropous ovule is one in which micropyle is: **[4]**

a) In straight line of funiculus

b) At right angles to funiculus

c) Parallel to funiculus

d) Oblique to funiculus

140. A student was given a sample of flower to identify X and Y on the basis of the information given below. **[4]**
X is the outermost whorl of the flower and contains Y. Y is green, leaf like and protect the other whorls of the **flower**.

a) X - Sepals; Y - Corolla

b) X - Corolla; Y - Fruit

c) X - Androecium; Y - Ovary

d) X - Calyx; Y - Sepals

141. The genotype of a plant showing the dominant phenotype can be determined by: **[4]**

a) Test cross

b) Dihybrid cross

c) Pedigree

d) Back cross

142. DNA fingerprinting is related to: **[4]**

a) Techniques used in the identification of fingerprints of different persons.

b) Molecular analysis of profiles of DNA samples

c) Techniques used for molecular analysis of different specimens of RNA

d) Analysis of DNA samples using imprinting devices

143. The Golgi complex plays a major role: **[4]**

a) in digesting proteins and carbohydrates.

b) in post-translational modification of proteins and glycosylation of lipids.

c) In traping light quanta and transforming them into chemical energy.

d) As energy transferring organelle.

144. Pollution from animal excreta and organic waste from the kitchen can be most profitably minimized by: **[4]**

a) Vermiculture

b) Storing them in underground storage tanks

c) Using them for producing biogas

d) Using them directly as biofertilizers.

145. During which stage in the complete oxidation of glucose is the greatest number of ATP formed from ADP? **[4]**

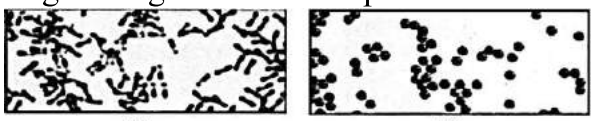
a) Krebs cycle

b) Electron transport chain

c) Glycolysis

d) During conversion of pyruvic acid to Acetyl Co A

146. In given figure A and B represents: **[4]**



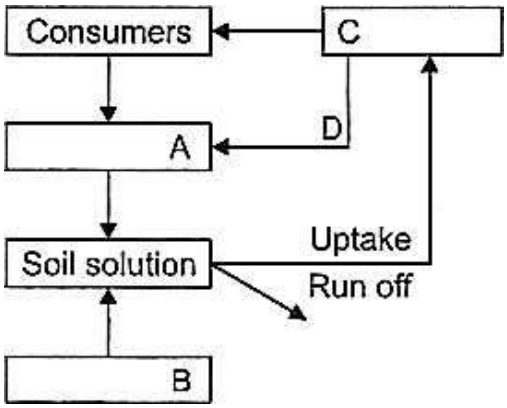
a) Bacteria: (A) Rod-shaped, (B) Spherical shaped

b) Bacteria: (A) Spherical shaped, (B) Rod-shaped

c) Fungus: (A) Rod-shaped, (B) Spherical shaped

d) Virus: (A) Rod-shaped, (B) Spherical shaped

147. Given below is a simplified model of phosphorus cycling in a terrestrial ecosystem with four blanks (A-D). Identify the blanks. **[4]**



a) A-Producers, B-Litter fall, C-Rock minerals, D-Detritus

b) A-Litter fall, B-Producers, C-Rock minerals, D-Detritus

c) A-Rock minerals, B-Detritus, C-Litter fall, D-Producers

d) A-Detritus, B-Rock minerals, C-Producer, D-Litter fall

148. Which of the following statement is false with respect to the application of auxins? **[4]**

a) Produce and hyper elongation effect

b) Inhibits lateral bud growth

c) Control direction of growth of plants

d) Initiate and promote cell division actively particularly in tissue culture

149. Functions of auxins include **[4]**

a) inducing parthenocarpy in tomato.

b) promoting flowering in pineapple.

c) use as herbicides to kill dicot weeds.

d) All of these

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

a) regeneration

b) photorespiration

c) carboxylation

d) reduction

ZOOLOGY (Section-A)

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

a) chemoreceptor

b) Segmentation

c) tangoreceptor

d) thermoreceptor

152. Scientific name of house cat is: **[4]**

a) Panthera domestica

b) Panthera indica

c) Felis domesticus

d) Felis leo

153. What type of digestion is found in coelenterates? **[4]**

a) Extracellular
b) Intracellular
c) Extracellular and intracellular
d) None of these

154. Read the following statements and answer the question. **[4]**

i. They have hard and non-pliable ground substance rich in calcium salts and collagen fibres.
ii. They support and protect softer tissues and organs.
iii. Osteocytes are present in the spaces called lacunae.
iv. They also interact with skeletal muscles attached to them to bring about movements.

Which of the following types of tissue is being described by above statements?

a) Neurons
b) Cartilage
c) Bone
d) Blood

155. Which is not a type neuroglia? **[4]**

a) Astrocyte
b) Oligodendrocyte
c) Schwann cell
d) All the above are neuroglia.

156. Cartilagenous rings in respiratory passage are present in: **[4]**

a) Trachea and initial part of bronchi only
b) Traches only
c) Trachea, bronchi and all bronchioles
d) Trachea, bronchi and initial bronchioles only

157. Due to increasing air-borne allergens and pollutants, many people in urban areas are suffering from respiratory disorder causing wheezing due to **[4]**

a) inflammation of bronchi and bronchioles.
b) benign growth on mucous lining of nasal cavity.
c) proliferation of fibrous tissues and damage of the alveolar walls.
d) reduction in the secretion of surfactants by pneumocytes.

158. Which of the following cartilage in laryngotracheal chamber of the frog is absent? **[4]**

a) Crecoid
b) Arytenoid
c) Arytenoid and cricoid
d) Thyroid

159. Which of the following sequences is correct to initiate inspiration? **[4]**

i. The contraction of external intercostal muscles raises the ribs and sternum.
ii. Volume of thorax increases in the dorsoventral axis.
iii. Intrapulmonary pressure decreases.

iv. Diaphragm contraction.

v. Air rushes into lungs.

vi. Volume of thorax increases in the anterior-posterior axis.

a) (i), (ii), (iv), (v), (iii), (vi)

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

c) (i), (ii), (iv), (vi), (iii), (v)

d) (vi), (v), (i), (ii), (iii), (iv)

160. During CO_2 transport, HCO_3 diffuses from erythrocytes to plasma and in turn upsets the ionic balance momentarily. In order to keep the ionic balance, an equal number of Cl^- pass into the erythrocytes from plasma. The process is known as: **[4]**

a) Carbonation

b) Hamburger phenomenon

c) Bicarbonate shift

d) Bohr's effect

161. Gestation period is the duration: **[4]**

a) From gastrulation to parturition

b) Between fertilization and parturition

c) Between ovulation to nurilation

d) From zygote to gastrulation

162. The clitoris is a tiny finger-like structure which lies at the: **[4]**

a) Lower junction of the two labia minora below the urethral opening

b) Upper junction of the two labia minora above the urethral opening

c) Lower junction of the two labia minora above the urethral opening

d) Upper junction of the two labia minora below the urethral opening

163. Vitelline membrane is _____ egg membrane: **[4]**

a) Tertiary

b) Fertilization

c) Secondary

d) Primary

164. Sterilisation techniques are generally fooled proof methods of contraception with the least side effects. Yet, this is the last option for couples because: **[4]**

i. It is almost irreversible

ii. The misconception that it will reduce sexual urge

iii. It is a surgical procedure

iv. If lack of sufficient facilities in many parts of the country

a) (ii) and (iv)

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

c) (i) and (iii)

d) (ii) and (iii)

165. Tubectomy is a method of sterilization in which: **[4]**

a) Uterus is removed surgically

b) Small part of the fallopian tube is removed or tied up

c) Small part of vas deferens is removed or tied up

d) Ovaries are removed surgically

166. Swan-necked flask experiment was done by: **[4]**

a) Louis Pasteur

b) Aristotle

c) Robert Koch

d) F. Redi

167. Which one of the following scientist's name is correctly matched with the theory put forth by him? **[4]**

a) Pasteur-Theory of inheritance of acquired characters.

b) Darwin-Mutation theory of evolution.

c) de Vries-Theory of natural selection.

d) None of these

168. In Prawn, excretion is carried out by: **[4]**

a) Malpighian tubules

b) Protonephridia

c) Green glands

d) Flame cells

169. In kidney of man renal pyramids are seen in: **[4]**

a) Hilus

b) Medulla

c) Pelvis

d) Cortex

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

a. The ascending limb of loop of Henle is impermeable to water.
b. The descending limb of loop of Henle is impermeable to water.
c. The ascending limb of loop of Henle is permeable to water.
d. The descending limb of loop of Henle is permeable to electrolytes.

a) Statement d is correct

b) Statement c is correct

c) Statement b is correct

d) Statement a is correct

171. The pivot joint between atlas and axis is a type of: **[4]**

a) Fibrous Joint

b) Cartilaginous Joints

c) Saddle Joint

d) Synovial Joints

172. The actin filament is made up of: **[4]**

a) Actin, troponin, and tropomyosin

b) Actin, tropomyosin

c) Actin, troponin

d) Myosin, troponin

173. Movement of our limbs, jaws, tongue, etc., requires **[4]**

a) amoeboid movement

b) muscular movement

c) flagellar movement

d) ciliary movement

174. If a patient suffers a stroke that destroys the optic tract on the right side of the brain, which of the following visual defects will result? **[4]**

a) The patient will not perceive images of objects striking the left half of the retina in the left eye.

b) The patient will not perceive images of objects striking the right half of the retina in the right eye.

c) There will be no vision in the left eye, but vision will be normal in the right eye.

d) Neither of any eye will perceive objects in the right side of the patient's field of view.

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

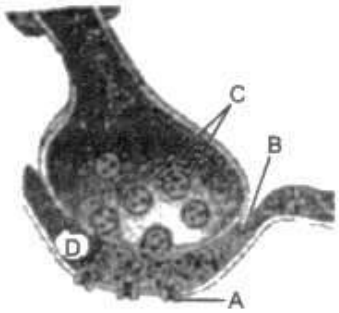
a) Ventral part of temporal lobe

b) Dorsal part of optic lobe

c) Lateral part of frontal lobe

d) forward part of temporal lobe

176. A diagram showing axon terminal and synapse is given. Identify correctly at least two of A-D. **[4]**



a) C - Neurotransmitter, D - Ca^{++}

b) A - Neurotransmitter, B - Synaptic cleft

c) B - Synaptic connection, D - K^{+}

d) A - Receptor, C - Synaptic vesicles

177. Hormones produced by anterior lobe of pituitary **[4]**

a) regulate water balance in body.

b) stimulate thyroid and other endocrine glands.

c) control calcium level in blood.

d) initiate alarm reaction.

178. Choose the correct answer among the following options: **[4]**

(A) Epinephrine	(i) Stimulates muscle growth
(B) Testosterone	(ii) Decrease in blood pressure
(C) Glucagon	(iii) Breakdown of liver glycogen content
(D) Atrial natriuretic factor	(iv) Increases heartbeat

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

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

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

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

179. What is the volume of blood drained by heart in one ventricular stroke? **[4]**

a) 1 litre

b) 70 ml

c) 500 ml

d) 800 ml

180. Pulse pressure is: **[4]**

a) Diastolic pressure

b) Difference between systolic pressure and diastolic pressure

c) Systolic pressure and diastolic pressure

d) Systolic pressure

181. Kidney shaped nucleus is present in: **[4]**

a) Monocyte

b) Neutrophil

c) Eosinophil

d) Lymphocyte

182. Why foreign DNA cannot pass through cell membrane? **[4]**

a) It is hydrophobic.

b) It is hydrophilic.

c) It is heavy.

d) It is rich in proteins.

183. Identify the wrong statement with regard to Restriction Enzymes. **[4]**

a) They are useful in genetic engineering.

b) Each restriction enzyme functions by inspecting the length of a DNA sequence.

c) They cut the strand of DNA at palindromic sites.

d) Sticky ends can be joined by using DNA ligases.

184. Transgenic plants are the ones **[4]**

a) generated by introducing foreign DNA into a cell and regenerating a

plant from that cell.

b) grown in artificial medium after hybridisation in the field.

c) produced by a somatic embryo in artificial medium.

d) produced after protoplast fusion in artificial medium.

185. What is the full form of ADA? **[4]**

a) Arginine deaminase

b) Adenosine deoxy aminase

c) Adenosine deaminase

d) Aspartate deaminase

ZOOLOGY (Section-B)

Attempt any 10 questions

186. In which of the following adults are radially symmetrical but larvae are bilaterally symmetrical? **[4]**

a) Hemichordates

b) Echinoderms

c) Annelids

d) Molluscs

187. Match the followings and choose the correct option: **[4]**

(A) Adipose tissue	(i) Nose
(B) Stratified epithelium	(ii) Blood
(C) Hyaline cartilage	(iii) Skin
(D) Fluid connective tissue	(iv) Fat storage

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

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

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

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

188. The heart sound murmurs is heard during: **[4]**

a) Leaking of blood though valves

b) Closing bicuspid and tricuspid valves

c) Closer of semilunar valves

d) All of these

189. Each haemoglobin molecule can carry maximum of: **[4]**

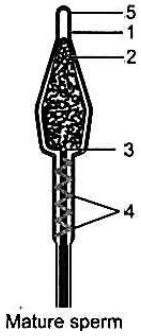
a) Two molecules of O_2

b) Four molecules of O_2

c) one molecules of O_2

d) Three molecules of O_2

190. In the given diagram identify parts named 1 to 5: **[4]**



a) 1-Nucleus, 2-Tail, 3-Mitochondria, 4-Acrosome, 5-Centriole

b) 1-Acrosome, 2-Centriole, 3-Mitochondria, 4-Plasma membrane, 5-Tail

c) 1-Nucleus, 2-Mitochondria, 3-Plasma membrane, 4-Centriole, 5-Neck

d) 1-Acrosome, 2-Nucleus, 3-Centriole, 4-Mitochondria, 5-Galea capitis

191. In the context of amniocentesis, which of the following statement is incorrect? **[4]**

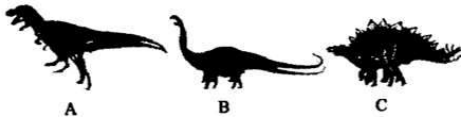
a) It can be used for the detection of down syndrome

b) It can be used for the detection of cleft palate

c) It is used for prenatal sex determination

d) It is usually done when a woman is between 14-16 weeks pregnant

192. Refer to the given figure and select the correct option regarding A, B, and C. **[4]**



a)

Options	A	B	C
(D)	Stegosaurus	Tyrannosaurus	Brachiosaurus

b)

Options	A	B	C
(A)	Brachiosaurus	Brachiosaurus	Stegosaur

c)

Options	A	B	C
(B)	Triceratops	Tyrannosaurus	Brachiosaurus

d)

Options	A	B	C
(C)	Tyrannosaurus	Brachiosaurus	Stegosaur

193. What will happen if one kidney of a person is removed? **[4]**

a) He/She will still survive and remain normal

b) Urination will stop

c) Urea will go on accumulating in blood

d) He/She will die due to blood poisoning

194. Which one is a bone of the skull? **[4]**

a) Tibia
b) Femur
c) Pterygoid
d) Atlas

195. The hindbrain consists of: **[4]**

a) Medulla oblongata + cerebellum
b) Pons + cerebellum
c) Medulla oblongata + cerebellum + pons
d) Hypothalamus + cerebellum

196. 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.

197. Cretinism is due to less secretion of: **[4]**

a) Parathyroid gland
b) Adrenal gland
c) Thyroid gland
d) Pituitary gland

198. Heart beat can be initiated by: **[4]**

a) Sinu-auricular node
b) Sodium ion
c) Sinu-ventricular node
d) Purkinje fibres

199. Which one is a true statement regarding DNA polymerase used in PCR? **[4]**

a) It serves as a selectable marker
b) It is used to ligate introduced DNA in recipient cell
c) It is isolated from a virus
d) It remains active at high temperature

200. Which of the following transgenic animals are used in testing safety of polio vaccine before they are used on human? **[4]**

a) Transgenic cow
b) Transgenic mice
c) Transgenic sheep
d) Transgenic monkey

Solution

SAMPLE PAPER - 6

PHYSICS (Section-A)

1.

(d) 0

Explanation: Dimension of L.H.S is,

$$\int \frac{[L]}{\sqrt{8[L][L]-[L]^2}} = \frac{[L]}{\sqrt{\left[L^2\right]}} = [L^0] \ldots(i)$$

Since, the trigonometric functions are dimensionless and 'a' represents length, the dimension of RHS are

$$a^n \sin^{-1}\left(\frac{x-4a}{4a}\right) = [L]^n \ldots(ii)$$

Equating (i) and (ii) we get,

$L^0 = L^n$

$\Rightarrow$ n = 0

2.

(b) dyne $\times$ cm^4

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

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

3.

(d) Distance covered = magnitude of displacement

Explanation: Distance covered = magnitude of displacement

4.

(c) π

Explanation: This relation is possible only when the angle between two vectors is either 0 or π. Hence, answer π is correct.

5.

(b) 4 : 3

Explanation: Let u be the speed of projectile at initial point.

$\therefore$ $KE = \frac{1}{2}mu^2$

At maximum height speed = u cos 30^o

$$\therefore \text{KE} = \frac{1}{2}\,\text{m}\left(\text{ucos30}^\circ\right)^2$$

$$\frac{\text{KE}_{\text{initial}}}{\text{KE}_{\text{top}}} = \frac{\frac{1}{2}\,\text{m}(\text{u})^2}{\frac{1}{2}\,\text{m}\left(\text{ucos}\,30^\circ\right)^2} = \frac{4}{3}$$

6. **(a)** 2.5 N
   Explanation: $f_S = \mu_S R = \mu_S mg = 0.4 \times 2 \times 9.8 = 7.84$ N
   Applied force < f_S
   Hence, under the applied force, the block does not move. So, long as the block does not move, the adjustable friction force is always equal to the applied force. Thus, the frictional force is 2.5 N.
7. **(c)** only ii
   Explanation: The displacement can take place in any direction except at 90° (because W = 0 in that case).
8. **(b)** 14 J
   Explanation: $\vec{F}$ is a constant force, therefore work done will not depend on path.

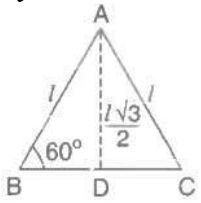
$$\therefore \text{W} = \int_{(0,0,0)}^{(2,2,2)} \vec{F} \cdot ds$$

$$= \int_{(0,0,0)}^{(2,2)} (\hat{i} + 5\hat{j} + \hat{k}) \cdot (dx\hat{i} + dy\hat{j} + dz\hat{k})$$

$$= \int_{(0,0,0)}^{(2,2,2)} (dx + 5dy + dz)$$

$$= [x + 5y + z]_{(0,0,0)}^{(2,2,2)} = 14 \text{ J}$$

9. **(a)** irrespective of their directions
   Explanation: irrespective of their directions
10. **(b)** 3 kg-m^2
    Explanation:
    Suppose the axis, about which MI of the system is to be determined, passes through the comer A and is perpendicular to the plane of the triangle. Now, moment of inertia of the system about the desired axis,



$I = I_1 + I_2 + I_3$

where I_1 and I_2 are the moments of inertia of two rods AB and AC while I_3 is the moment of inertia of 3rd rod BC.

Now, $I_1 = I_2$ = moment of inertia of a rod of length l and mass M about an axis passing through its one end and $\perp$ to its length

i.e., $I_1 = I_2 = \frac{Ml^2}{12} + \frac{Ml^2}{4} = \frac{Ml^2}{3}$ (according to theorem of parallel axes)

Similarly, MI or 3rd rod,

$I_3 = (I)_{\text{point}}\, D + M(AD)^2$

$= \frac{Ml^2}{12} + M\left(\frac{\sqrt{3}l}{2}\right)^2 = \frac{Ml^2}{12} + \frac{Ml^2}{4} \times 3 = \frac{10Ml^2}{12}$

Thus, $I = I_1 + I_2 + I_3 = \frac{Ml^2}{3} + \frac{Ml^2}{3} + \frac{10Ml^2}{12}$

$= \frac{18Ml^2}{12} = \frac{3Ml^2}{2} = \frac{3}{2} \times 2 \times 1 = 3\text{kg} - \text{m}^2$

11.

(b) the total angular momentum remains constant

Explanation: In planetary motion, there is no external torque. Hence from the equation

$\frac{d\vec{L}}{dt} = \vec{\tau}_{\text{ext.}}$

if $\vec{\tau}_{\text{ext.}} = 0$

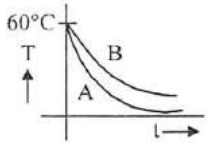
$\Rightarrow$ L = costant

12. **(a)** decreases with temperature

Explanation: decreases with temperature

13.

(d)



Explanation: Rate of Heat loss = $\text{mS}\left(\frac{dT}{dt}\right) = \text{e}\sigma\text{AT}^4$

$-\frac{dT}{dt} = \frac{e\sigma \times A \times T^4}{\rho \times Vol. \times S} \Rightarrow -\frac{dT}{dt} \propto \frac{1}{\rho S}$

$$\frac{\left(-\frac{dT}{dt}\right)_A}{\left(-\frac{dT}{dt}\right)_B} = \frac{\rho_B}{\rho_A} \times \frac{S_B}{S_A} = \frac{10^3}{8 \times 10^2} \times \frac{4000}{2000}$$

$$\Rightarrow \left(-\frac{dT}{dt}\right)_A > \left(-\frac{dT}{dt}\right)_B$$

So, A cools down at faster rate.

14. **(a)** B

Explanation: Since the radius and volume of all the four spheres are equal, the ratio of their masses will be 2:3:5:1.

Heat capacity = [mass/(specific heat)]

∴ The ratio of heat capacities will be 6:18:10:4. The sphere having the maximum heat capacity will show the fastest rate of cooling.

15. **(c)** $\frac{5}{2}$

Explanation: We know that for an adiabatic change the value of constant,

$C = \frac{\gamma}{\gamma - 1}$

For MA gas: $\gamma = \frac{5}{3}$

$$\therefore \quad C = \frac{(\frac{5}{3})}{(\frac{5}{3}) - 1} = \frac{5}{2}$$

16. **(b)** 3/2PV

Explanation: Energy of 1 mol of gas = $\frac{f}{2}RT = \frac{f}{2}PV$

Where f = degree of freedom

Monatomic or diatomic gases possess an equal degree of freedom for translational motion and that is equal to 3, i.e., f = 3

$\therefore E = \frac{3}{2}PV$

17.

(d) $\sqrt{\frac{5}{6}}T$

Explanation: $\sqrt{\frac{5}{6}}T$

18.

(d) 150 cm

Explanation: The resonance length in a closed organ pipe is

$l = (2n + 1)\frac{\lambda}{4}$

Hence, the first resonance length in a closed organ pipe is

$l_1 = (2(0)+1)\frac{\lambda}{4}$

$l_1 = \frac{\lambda}{4} = 50$ cm ... (given)

Now, the second resonance length in a closed organ pipe is

$l_1 = (2(1)+1)\frac{\lambda}{4}$

$l_1 = \frac{3\lambda}{4} = (3)\ (50) = 150$ cm

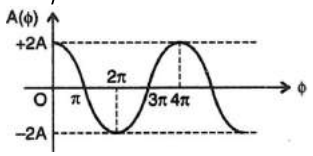
19. **(a)** between 0 to 2A

Explanation:

Two waves of equal amplitude and equal frequency interfere such that the amplitude of the resultant wave is:

$A(\phi) = 2A\cos\left(\frac{\phi}{2}\right)$

From the cosine graph, it can be seen that the amplitude of the resultant wave is a function of ϕ and hence its magnitude varies between O and 2A.



20.

(b) $\frac{Q}{6\varepsilon_0}$

Explanation: As the charge at the centre of the cube, the flux through each surface is the same. Using Gauss's law,

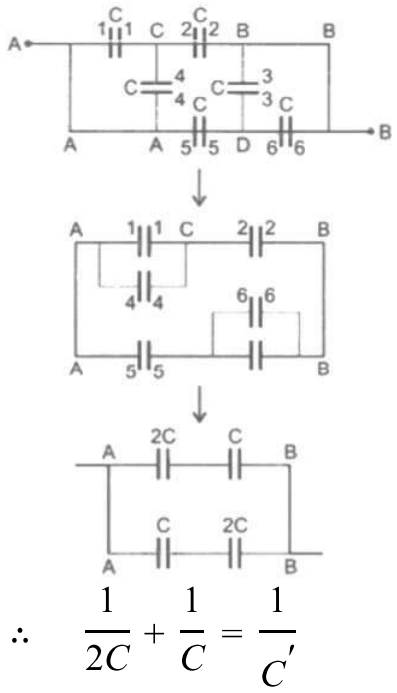
$$6\phi = \frac{Q}{\epsilon_0}$$

$$\Rightarrow \ \phi = \frac{Q}{6\epsilon_0}$$

21.

(d) $\frac{4C}{3}$

Explanation:



$$\therefore \quad \frac{1}{2C} + \frac{1}{C} = \frac{1}{C'}$$

or C' = 2C/3

Now, C' and C' are in parallel in two rows.

Hence, $C_{\text{total}} = 2 \times \frac{2C}{3} = \frac{4C}{3}$

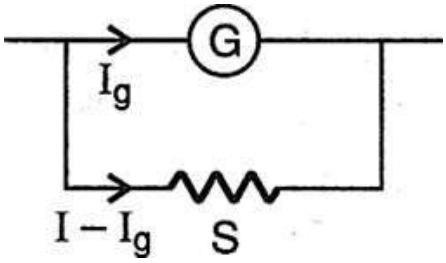
22. **(a)** 13A

Explanation:

23.

(d) 100.1 mA

Explanation:



A galvanometer can be converted into an ammeter by connecting a resistance in parallel.
Let galvanometer's full scale
current be Ig and current in the circuit be I.
Hence, $I_gG = (I - I_g)S$
or $I_g (G + S) = IS$

$$\therefore \quad I = \frac{I_g(G+S)}{S}$$

$$= \frac{100 \times 10^{-6}(100+0.1)}{0.1} = 100.1 \text{ mA}$$

24.

(d) 8 : 1 approximately
Explanation: For a magnet,

$$B = \frac{\mu_0}{4\pi}\frac{2M}{r^3} \text{ (nearly)}$$

$$\text{or } \frac{B_2}{B_1} = \left(\frac{r_1}{r_2}\right)^3$$

$$\text{or } \frac{B_2}{B_1} = \left(\frac{x}{2x}\right)^3$$

$$\text{or } \frac{B_2}{B_1} = \frac{1}{8}$$

Thus, $B_1 : B_2 = 8 : 1$ (approximately)

25. **(a)** $\frac{1}{2}$

Explanation: Time period of a magnet is

$$T = 2\pi\sqrt{\frac{I}{MB}}$$

where the moment of inertia of the magnet is $I = \frac{ml^2}{12}$ (m = mass of the magnet) and the magnetic moment associated with the magnet is $M = \mu(2l)$ (where μ = pole strength)

$$T' = 2\pi\sqrt{\frac{I'}{M'B}}$$

Here, $I' = \frac{1}{12}\left(\frac{m}{2}\right)\left(\frac{l}{2}\right)^2 = \frac{I}{8}$

and $M' = \frac{M}{2}$

$\therefore \frac{T'}{T} = \sqrt{\left(\frac{I'}{T}\right)\left(\frac{M}{M'}\right)}$

$= \sqrt{\frac{(I/8}{I}\Big] \times \left[\frac{M}{(M/2)}\right]}$

$= \frac{1}{2}$

26.

(c) only iv

Explanation: We know that when the south pole of a magnet moves downward through the coil, then-current induced in the coil flows clockwise non-linearly, which opposes the downward motion of the magnet. And when the south pole of a magnet moves upward, then the current induced in the coil flows anticlockwise non-linearly, which opposes the upward motion of the magnet. Thus, the current and its amplitude are changing with the motion of the magnet. Therefore as the magnet oscillates, G shows deflection to the left and right, but the amplitude steadily decreases.

27.

(b) 7.5 J

Explanation: $|e| = L\frac{\Delta I}{\Delta t}$

or L = $\frac{|e|\Delta t}{\Delta I} = \frac{10 \times 0.1}{(10 - 5)} = 0.2$ H

Magnetic field energies for currents I_1 and I_2 are

$U_1 = \frac{1}{2}LI_i^2$ and $U_2 = \frac{1}{2}LI_2^2$

ΔU = Change in energy = U_2 - U_1

or $\Delta U = \frac{1}{2}LI_2^2 - \frac{1}{2}LI_1^2 = \frac{L}{2}\left(I_2^2 - I_1^2\right)$

$= \frac{0.2}{2}[(10)^2 - (5)^2] = 7.5$ J

28. **(a)** 5.0 ampere

Explanation: Here,

Input voltage, $V_p = 220$ V

Output voltage, $V_s = 440$ V

Input current, I_p = ?

Output current, $I_s = 2$ A

Efficiency of the transformer, $\eta = 80\%$

Efficiency of the transformer, $\eta = \dfrac{\text{Output power}}{\text{Input power}}$

$\eta = \dfrac{V_s I_s}{V_p I_p}$

or $I_p = \dfrac{V_s I_s}{\eta V_p} = \dfrac{(440\text{V})\,(2\text{A})}{\left(\dfrac{80}{100}\right)(220\text{V})}$

$= \dfrac{(440\text{V})\,(2\text{A})\,(100)}{(80)\,(220\text{V})} = 5\text{ A}$

29.

(b) a parabola

Explanation: The graph between the frequency v of K_α, X-ray line and the atomic number Z of the target material is a parabola.

30.

(d) 3F

Explanation: 3F

31.

(c) much greater than 10^{-8} sec

Explanation: Detector takes a time much greater than 10^{-8} sec to detect the intensity at a given point. (Resolution time for human eye = $\left(\dfrac{1}{20}\right)$ sec.)

32.

(d) $\dfrac{hc\lambda}{E\lambda + hc}$

Explanation: $\dfrac{hc}{\lambda} = \text{hv}_0 + \text{E}$

$\dfrac{hc}{x} = \text{hv}_0 + 2\text{E}$

$\therefore \dfrac{hc}{\lambda} - \text{E} = \text{hv}_0 = \dfrac{hc}{x} - 2\text{E}$

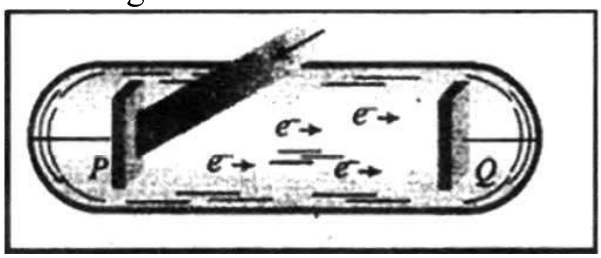
Hence, $x = \dfrac{hc\lambda}{E\lambda + hc}$

33.

(c) electrons can be emitted with any energy, with a maximum of E_0

Explanation:

If a beam of electrons having energy E_0 is incident on metal surface kept in an evacuated chamber. The electrons can be emitted with maximum energy E_0 (due to elastic collision) and with any energy less than E_0, when part of incident energy of the electron is used in liberating electrons from the surface of the metal.



34.

(d) the energy in eV required to raise the orbital electron to a higher energy level to knock it off from the atom

Explanation: the energy in eV required to raise the orbital electron to a higher energy level to knock it off from the atom

35. **(a)** 2 : 1

Explanation: As $\frac{N}{N_0} = \left(\frac{1}{2}\right)^n$

where number of half-lives, n = $\frac{t}{T}$

For x-sample: $\frac{1}{16} = \left(\frac{1}{2}\right)^{8/T_x}$ or $\left(\frac{1}{2}\right)^4 = \left(\frac{1}{2}\right)^{8/T_x}$

$\therefore\ 4 = \frac{8}{T_x}$ ...(i)

For y-sample: $\frac{1}{256} = \left(\frac{1}{2}\right)^{8/T_y}$ or $\left(\frac{1}{2}\right)^8 = \left(\frac{1}{2}\right)^{8/T_y}$

$\therefore\ 8 = \frac{8}{T_y}$ ...(ii)

Dividing eqn. (i) by eqn. (ii), we get

$\frac{4}{8} = \frac{8}{T_x} \times \frac{T_y}{8} = \frac{T_y}{T_x}$

$\therefore\ \frac{T_x}{T_y} = \frac{2}{1}$

PHYSICS (Section-B)

36.

(d) 66000 W

Explanation: Net force on the elevator = force on elevator + frictional force

$\Rightarrow$ F= (10m + M)g + f

where, m = mass of person, M = mass of elevator, f = frictional force

$\Rightarrow$ F = (10 $\times$ 68 + 920) $\times$ 9.8 + 600 $\Rightarrow$ F = 22000N

$\Rightarrow$ P = FV = 22000 $\times$ 3 = 66000 W

37.

(c) n

Explanation: Work done by the retarding torque = initial KE

i.e, $\tau\theta = K$

Since, τ is same, hence θ or the number of revolutions will also be same.

38.

(d) Zero

Explanation: The point lies inside both the shells, hence gravitational field due to both is zero.

39.

(d) 384.8 K

Explanation: Here R_0 = 101.6 Q. at temperature T_0 = 273.16 K, = 165.5 at a temperature T_1 = 600.5 K and at a temperature T_2, resistance R_2 = 123.4 Ω

Using the relation :

$R = R_0\left[1 + \alpha\left(T - T_0\right)\right]$, we have

$R_1 = R_0\left[1 + \alpha\left(T_1 - T_0\right)\right]$

$R_2 = R_0\left[1 + \alpha\left(T_2 - T_0\right)\right]$

$$\therefore \frac{R_2 - R_0}{R_1 - R_0} = \frac{\left(T_2 - T_0\right)}{\left(T_1 - T_0\right)}$$

$$\therefore T_2 = T_0 + \left[\frac{R_2 - R_0}{R_1 - R_0}\right]\left(T_1 - T_0\right)$$

$$= 273.16 + \left[\frac{123.4 - 101.6}{165.5 - 101.6}\right](600.5 - 273.16)$$

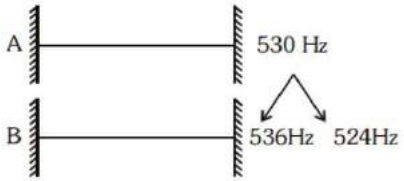
= 384.8 K

40.

(d) 524 Hz

Explanation:

Guitar string i.e. string is fixed from both ends



Frequency $\propto \sqrt{(Tension)}$

If tension in B slightly decrease then frequency of B decrease.

If B is 536 Hz, as the frequency decreases, beats with A also decreases.

If B is 524 Hz, as the frequency decreases, beats with A increases.

$\therefore$ original frequency of B will be 524 HZ.

41. **(a)** 2400 Hz

Explanation: Fundamental frequency of closed pipe,

$n = \frac{v}{4l} = 200$ Hz ... (i)

If $(\frac{3}{4})^{th}$ of the pipe is fdled with water, then remaining length of air column is $\frac{l}{4}$.

$\Rightarrow$ x = 4

$\therefore \frac{n'}{n} = 4$

$\therefore$ n' = 4n = 800 Hz

first overtone = 3 $\times$ fundamental frequency

= 3 $\times$ 800 Hz

= 2400 Hz ... [From(i)]

42.

(c) 100.1 mA

Explanation: A galvanometer can be converted into an ammeter by connecting a resistance in parallel'. Let galvanometer's full scale . current be Ig and current in the circuit be I.

Hence, $I_gG = (I - I_g)S$

or $I_g(G + S) = IS$

$\therefore I = \frac{I_g(G+S)}{S}$

$= \frac{100 \times 10^{-6}(100+0.1)}{0.1} = 100.1$mA

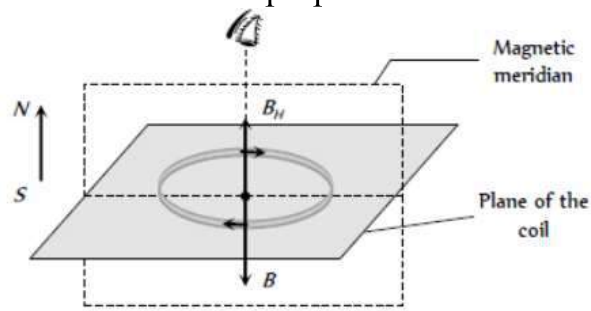
43.

(c) 90^o

Explanation:

Magnetic meridian is a vertical N−S plane, the earth's magnetic field (B_H) lies in it. (For more details see magnetism). To obtain neutral point at the centre of coil, magnetic field

due to current (B) and B_H must cancel each other. Hence plane of the coil and magnetic meridian must be perpendicular to each other as shown



44. **(a)** only i
Explanation: increase in both

45.
(b) $\frac{v_0 i_0}{4}$
Explanation: We know that,
$P_{avg} = V_{rms} I_{rms} \cos\phi$

$$= \left(\frac{v_0}{\sqrt{2}}\right)\left(\frac{I_0}{\sqrt{2}}\right)\left(\cos\frac{\pi}{3}\right)$$

$$= \frac{v_0 i_0}{4}$$

46. **(a)** 1.16×10^{-3} m/s towards the lens
Explanation: Lens formula is given as

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \text{ .....(i)}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{f} + \frac{1}{u}$$

$$\Rightarrow \frac{uf}{u+f} = v$$

$$\Rightarrow \frac{v}{u} = \frac{f}{u+f} \text{ .....(ii)}$$

Now, by differentiating Eq. (i), we get

$$0 = -\frac{1}{v^2} \cdot \frac{dv}{dt} + \frac{1}{u^2} \cdot \frac{du}{dt} \text{ [} \because \text{ f ((focal length of a lens is constant)]}$$

$$\text{or } \frac{dv}{dt} = \frac{v^2}{u^2}\frac{du}{dt}$$

$\Rightarrow \frac{dv}{dt} = \left(\frac{f}{u+f}\right)^2 \cdot \frac{du}{dt}$ [using Eq. (ii)]

Given, f = 0.3 m, u = - 20 m, du/dt = 5 m/s

$\therefore \frac{dv}{dt} = \left(\frac{0.3}{0.3-20}\right)^2 \times 5 = \left(\frac{3}{197}\right)^2 \times 5$

$= 1.16 \times 10^{-3}$ m/s

Thus, the image is moved with a speed of 1.16×10^{-3} m/s towards the lens.

47.

(b) $v_r > v_b$

Explanation: $v_r > v_b$

48.

(c) 10^{-4} m

Explanation: The product of uncertainties in the simultaneous measurement of position and momentum, energy and time, angular momentum and angular displacement is of the order of h (or h)

where $h = \frac{h}{2\pi}$

$\therefore \Delta p \cdot \Delta x \geq h$

where Δp is uncertainty in the measurement of the momentum of a particle.

The minimum uncertainty in the position of the particle will be

$\Delta x = \frac{h}{\Delta p}$

Here, $\Delta p = 10^{-30}$ kg-ms^{-1}

$\therefore \Delta x = \frac{1.034 \times 10^{-34}}{10^{-30}}$

$= 10^{-4}$ m

49.

(b) 2.25 R

Explanation: We have

$R_2 = R \Rightarrow 2^2 R_1 = R \Rightarrow R_1 = \frac{R}{4}$

$R_3 = R_1 \times 3^2 = 9R_1 = \frac{9R}{4} = 2.25R$

50.

(d) mass, energy, and momentum

Explanation: In any nuclear reaction mass, energy, and momentum all are conserved.

CHEMISTRY (Section-A)

51.

(b) Propane

Explanation: Since the compound undergoing combustion is an alkane. Hence the combustion reaction can be written as

$$\underset{5L}{C_nH_{2n+2}} + \underset{25L}{\left(\frac{3n+1}{2}\right)} O_2 \;\; nCO_2 \; + \; (n \; + \; 1)\, H_2O$$

Since volumes are measured at constant T & P, hence according to Avogadro's law

Volume $\propto$ mole

1 L alkane requires $\frac{3n+1}{2}$ L of O_2

5 L alkane requires 25L of O_2

$$\frac{1}{5} = \frac{\frac{3n+1}{2}}{25}$$

$\therefore$ n = 3

Hence alkane is propane (C_3H_8)

52. **(a)** 2.12

Explanation: $r_2 = r_1 \times 2^2 = 0.530 \times 4 = 2.120 \overset{o}{A}$

53.

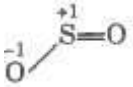
(c) A only

Explanation: $O^{2-} < F^- < Na^+ < Mg^{2+}$

54.

(c) +1

Explanation:



55.

(b) π_{py} and π_{p_z}

Explanation: π_{py} and π_{p_z} are perpendicular to each other.

56.

(b) $BeCl_2$

Explanation: $BeCl_2$

57.

(c)

System A	System B
Temperature rises	Temperature remains same

Explanation: Adiabatic boundary does not allow heat exchange thus heat generated in container can't escape out thereby increasing the temperature.
In case of Diathermic container, heat flow can occur to maintain the constant temperature.

58.

(b) 3.4

Explanation: pH for weak acid is given by:

$$pH = \frac{1}{2}[pK_a - \log C]$$

$$= \frac{1}{2}[-\log (1.74 \times 10^{-5}) - \log 0.01]$$

$$= 3.4$$

59.

(d) +2

Explanation: Isomorphous substances are substances capable of crystallizing in a form similar to that of another compound or mineral.
V forms VSO_4 which is isomorphous with $FeSO_4.(NH_4)_2SO_4.6H_2O$.
Hence, the oxidation state of V in V SO_4 is +2.

60.

(d) Oxidation number can have a plus or minus sign associated with it.

Explanation: Oxidation number can have a plus or minus sign associated with it.

61.

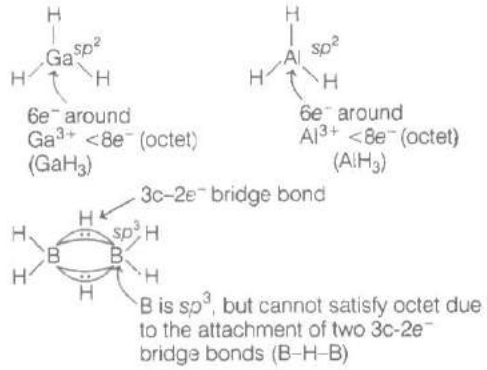
(d) i-Be, ii-B, iii-Si and iv-TI

Explanation: In case of (i), Be (s-block) has higher first ionization energy than B (p-block) because of the smaller size and higher effective nuclear charge in the former. Be has s-orbital $[He]2s^2$ which is completely filled and there are no unpaired electrons in its p-orbitals.
In case of B, there is a high tendency to lose one unpaired electron which is present in its 2p-orbital because p-electrons are held less strongly than s-electrons.
In case of (ii), the decrease in ionization enthalpy from B to AI is associated with an increase in size.
In case of (iii), there is an increase in ionization enthalpy across the period i.e. AI to Si as there is an increase in effective nuclear charge.
In case of (iv), TI has higher ionization enthalpy than In due to the inert pair effect.

62.

(d) SiH_4

Explanation: GaH_3, AlH_3 and are the hydrides of group-13 (ns^2np^1), whereas SiH_4 is the anhydride of group 14.



So, B_2H_6, AlH_3 and GaH_3 are electron deficient hydrides. But, SiH_4 is an electron precise hydride of group-14 (ns^2np^2), i.e. these hydrides can have the required number of electrons to write their conventional Lewis structures.

63.

(b) II > I > III > IV

Explanation: Stability of carbocation increases with the introduction of electron donating groups (+1 effect), i.e., here $-CH_3$ group is the electron donor. This $-CH_3$ group along with the resonance of the benzyl group contributes to the stability of carbocations. Ortho and para methyl substituents are electron donating and hence they are the most stable followed by meta and the one without any substituent would be least stable of all. In between ortho and para substituents, it is the para-substituted carbocation that is more stable as the orthosubstituted carbocation is stearically hindered.

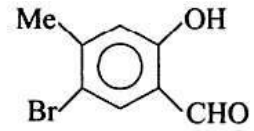
64.

(c) $Cl\text{-}CH{=}CH\text{-}NO_2$

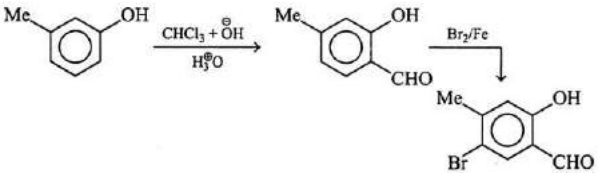
Explanation: In $Cl\text{-}CH{=}CH\text{-}NO_2$ double bond character in carbon-chlorine bond is maximum due to resonance and so the bond length is shortest.

65.

(b)



Explanation:



66.

(c) iii < ii < i

Explanation: Let us assume that the total mass of the solution is 100 g.

26 g of methanol = $\frac{26}{32}$ = 0.8125 mole

36 g of ethanol = $\frac{36}{46}$ = 0.7826 mole

38 g of propanol = $\frac{38}{60}$ = 0.6333 mole

Total moles = 0.8125 + 0.7826 + 0.6333
= 2.2284

$x_{methanol} = \frac{0.8125}{2.2284} = 0.3646$

$x_{ethanol} = \frac{0.7826}{2.2284} = 0.3512$

$x_{propanol} = \frac{0.6333}{2.2284} = 0.2842$

The increasing order of mole fraction is propanol < ethanol < methanol, iii < ii < i.

67.

(d) 3

Explanation: 3

68.

(c) ΔG is -ve

Explanation: As we know,

For a spontaneous cell reaction $E^o_{cell} > 0$ and according to $\Delta G^o = -nFE^o$ = -ve and $Q < K_c$ so reaction moves forward to attain equilibrium.

69.

(d) $\frac{5}{4}$

Explanation: $\frac{5}{4}$

70.

(b) 2

Explanation: $r = K[A]^m$; $6.25r = K[2.5\ A]^m$

$\therefore\ 6.25 = (2.5)^m$

$\therefore\ m = 2$

71.

(d) An oxidising agent

Explanation: Transition metal which have low oxidation number show the oxidising nature because of great tendency to lose the electron.

72. **(a)** Rinse with large amounts of cold water.

Explanation: Rinse with large amounts of cold water.

73.

(d) The +4 oxidation state of Cerium is not known in solutions.

Explanation: Ce^{4+} is a good oxidising agent.

74.

(d) Diamagnetism, dsp^2, square planar, coordination number of Ni = 4

Explanation: $\left[Ni(en)_2\right]^{2+} \Rightarrow dsp^2$ square planar,

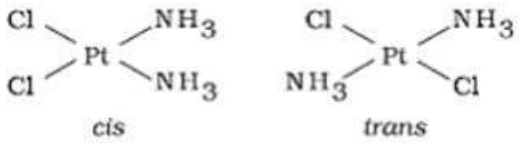
$d^8 \rightarrow$ diamagnetic

75.

(d) Geometrical

Explanation:

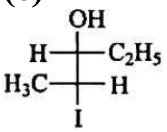
$[Pt(NH_3)_2Cl_2]$ forms Geometrical isomers. It is a square planar complex that exists in the *cis* and the *trans* form.



Geometrical isomers (cis and trans) of $Pt(NH_3)_2Cl_2$

76.

(c)

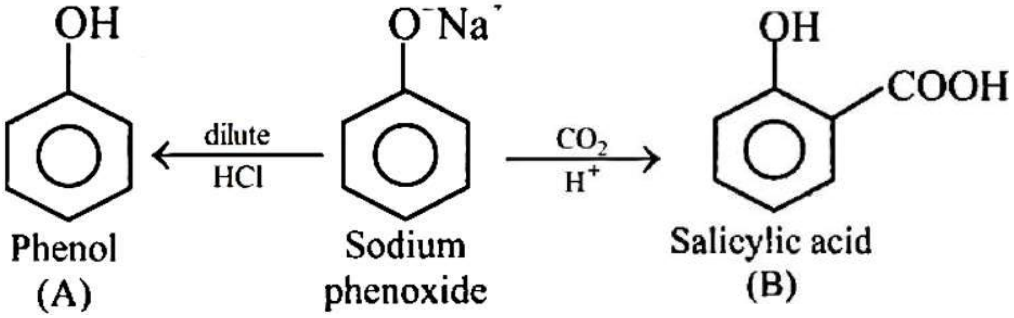


Explanation: S_N2 reaction (Finkelstein reaction) proceed with inversion of configuration.

77.

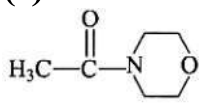
(b) A = Phenol, B = Salicylic acid

Explanation:

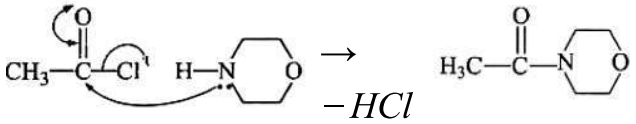


78.

(c)



Explanation:



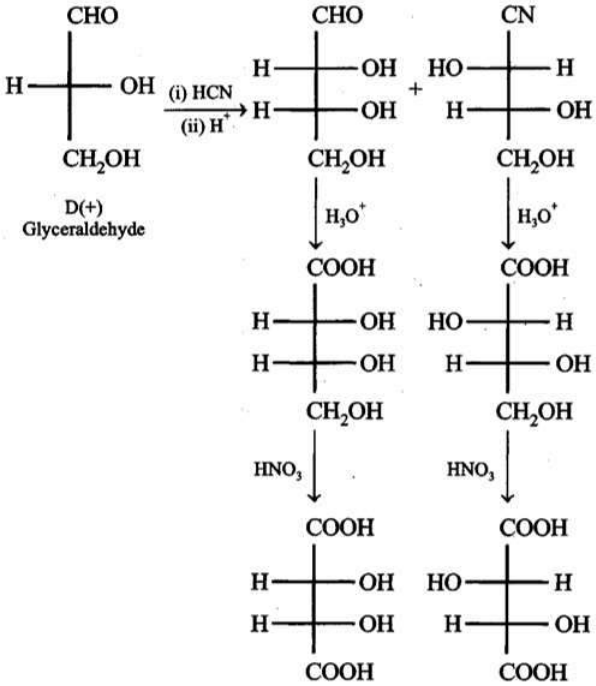
79. **(a)** $H_2C = CH - CD_3$

Explanation: $H_2C = CH - CD_3$

80.

(c) One optically active and one meso product

Explanation:



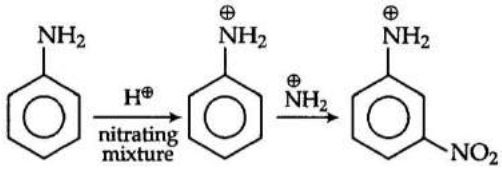
81. **(a)** α-D-Glucose + β-D-Fructose

Explanation: α-D-Glucose + β-D-Fructose

82.

(b) In acidic (strong) medium aniline is present as anilinium ion.

Explanation: In acidic medium aniline is present as anilinium ion.



In acidic medium, aniline is protonated to form anilinium ion which is m-directing. Hence besides para (51%) and ortho (2%), meta product (47%) is also formed in significant yield.

83.

(c) fluorine from NaF

Explanation: Cl_2 is placed above F_2 in electrochemical series, halogen placed below in electrochemical series replaces the other from its solution.

84.

(c) Sublimation

Explanation: Naphthalene is the component present in mothballs and if it is mixed with plaster of Paris, can be easily separated by sublimation.

85.

(c) Ph-CH=CH-CH-CH_3

Explanation: Ph-CH=CH-CH-CH_3

CHEMISTRY (Section-B)

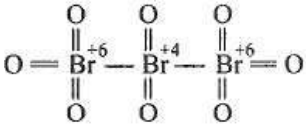
86.

(d) HCl < HBr < HI < HF

Explanation: HCl < HBr < HI < HF

87. **(a)** $\frac{16}{3}$

Explanation:



Average oxidation no. of Br = $\frac{+6\ +4\ +6}{3} = \frac{+16}{3}$

88.

(d) R and S

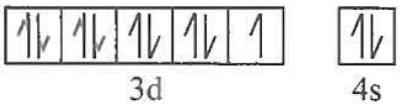
Explanation: R and S

89. **(a)** B only

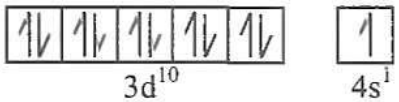
Explanation: $Sc^{3+} > Ti^{2+} > Cr^{1+} >$ Mn (size)

90.

(d)

Cu: 

Explanation:

Cu: 

91.

(b) all of these

Explanation: all of these

92.

(c) 15 minute

Explanation: Amount of A left in halves = $\frac{\left[A_0\right]}{2^n 1}$

Amount of B left in n_2 halves = $\frac{\left[B_0\right]}{2^n 2}$

If $\frac{[A_0]}{2^{n_1}} = \frac{[B_0]}{2^{n_2}}$ after A decays for n_1 halves and B decays for n_2 halves

$\because$ $[A_0] = 4[B_0]$

$\therefore$ $4 = \frac{2^{n_1}}{2^{n_2}}$ or $2^2 = 2^{n_1 - n_2}$

$\therefore$ $n_1 - n_2 = 2$

$\therefore$ $n_2 = n_1 - 2$

Also $T = n_1 \times t_{1/2}$ A and $T = n_2 \times t_{1/2}$ B

$\therefore$ $\frac{n_1 \times t_{1/2}A}{n_2 \times t_{1/2}B} = 1$

$\therefore$ $\frac{n_1}{n_2} = \frac{15}{5}$ or $n_1 = 3n_2$

Thus $n_1 = 3$ and $n_2 = 1$ Thus $T = 3 \times 5 = 15$ minute

93.

(b) +0.56 V

Explanation: +0.56 V

94.

(b) 1.8×10^{-16}

Explanation: 1.8×10^{-16}

95.

(b) $\ln\frac{[N_2O_5]_0}{[N_2O_5]_t} = kt$

Explanation: Unit of rate constant corresponds to the first-order reaction and the rate constant for the first-order reaction is expressed as

$k = \frac{2 \cdot 303}{t}\log\frac{a}{(a-x)}$

$or\ k = \frac{l}{t}\ln\frac{\text{a(initial)}}{a-x(\text{ after time t })}$

$\ln\frac{[N_2O_5]_0}{[N_2O_5]_t} = kt$

96.

(d) All of these

Explanation: Only three oxides of non-metals are neutral; two of nitrogen N_2O and NO and one of carbon CO. Note that H_2O is amphoteric.

97.

(b) All of these

Explanation:

a. $\overset{+6}{H_2SO_4}$

b. $Xe + \overset{+6}{XeO_3}$

c. $\overset{+6}{XeO_3}$

98.

(d) $Cr_2O_7^{2-}$

Explanation: $Cr_2O_7^{2-}$

99.

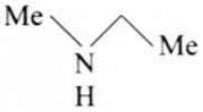
(b) 0.0024

Explanation: $\left[CoCl_2(en)_2\right]Cl + \left[AgNO_3\right] \rightarrow AgCl\downarrow$

$100 \times 0.024 = 2.4$ 2.4

100.

(b)



Explanation: 2^o amine show this reaction.

BOTANY (Section-A)

101.

(d) Sapindales

Explanation: Mango is included in Order Sapindales.

102.

(c) Species

Explanation: All the given descriptions are related to taxonomic category called species. Species, the lowest category in the taxonomic hierarchy, is the basic unit of taxonomy. It is the group of individual organisms with fundamental similarities.

103.

(c) W.M. Stanley

Explanation: W.M. Stanley (1935) first isolated and showed that viruses could be crystallized and crystals consist largely of proteins. They are inert outside their specific host cell.

104. **(a)** Flagella

Explanation: Fimbriae help bacteria to adhere to surface of the host cell.

Cilia are shorter than flagella but it is the long flagella that help in motility. Pili helps in the transfer of genetic material.

105.

(d) One of the four megaspores of a megaspore tetrad

Explanation: One of the four megaspores of a megaspore tetrad

106.

(c) Cycas

Explanation: In cycas male cones and megasporophylls are borne on different trees. Thus Cycas is a monoecious plant.

107.

(d) Pteris archegonia release chemical to attract its sperms.

Explanation: Sperms of both Funaria and Pteris were released together near the archegonia. But only the sperms of Pteris enter the archegonia, as Pteris archegonia releasesa chemical malic acid to attract its sperms for fertilization.

108.

(c) nucellus near the micropylar region.

Explanation: Ovules generally differentiate a single megaspore mother cell (MMC) in the micropylar region of the nucellus.

109. **(a)** Seed

Explanation: A seed is the small embryonic plant that is surrounded by a seed coat. Here, the embryo is developed from zygote which represents the future sporophyte. The seed coat develops from the integument of the ovule and thus, represents the part of the old sporophyte. Thus, the seed represents two-generation present one within others.

110.

(b) Coleorhiza

Explanation: The plumule and radicle are enclosed in sheaths which are called coleoptile and coleorhiza respectively.

111.

(b) Phloem parenchyma

Explanation: Phloem parenchyma is absent in most of the monocotyledons. They store food materials. Ray parenchyma help in the radial conduction of food materials.

112.

(d) Monocot stem

Explanation: Pith is not well developed in monocot stem rather pith cavity is present containing water.

113.

(b) Sex-linked recessive

Explanation: The disease is common in males than females because males are hemizygous. Since only sons suffer so the trait understudy is sex-linked.

114.

(c) Half of the sperms during spermatogenesis

Explanation: The X body of Henking was observed in half of the sperms during spermatogenesis. During his experiments on insects, Henking found the traces of a nuclear structure all through the process of spermatogenesis which he named it as X body. He also

observed that, after spermatogenesis, exact half of the sperms received this X body, while the remaining half did not. Later, scientists found out that this X body of Henking was actually a chromosome and hence, named it X chromosome.

115. **(a)** $5' \rightarrow 3'$ direction continuously
Explanation: $5' \rightarrow 3'$ direction continuously

116. **(a)** U or C
Explanation: U or C

117. **(a)** 70 S
Explanation: All prokaryotes have 70S (where S = Svedberg units) ribosomes. The 70 S ribosomes are comparatively smaller in size and have a sedimentation coefficient of the 70S and a molecular weight of $2.7x10^6$ dalton. They have two subunits 50S and 30S.

118.
(b) Golgi bodies
Explanation: Golgi apparatus has many functions. It produces materials for secretion, takes part in the transformation of membranes, the formation of a number of glycoproteins (E.g. mucin from goblet cells), glycolipids, complex heteropolysaccharides (E.g. mucilage from root cap cells), hormones, melanin, the matrix of connective tissue, middle lamella of the plant cell wall, acrosome of human sperm and lysosomes.
Peroxisomes are the storage organelles of the peroxidase enzyme.
Polysomes are a cluster of ribosomes used for the translation process. The endoplasmic reticulum is the organelle that completes the post-translational modification of a protein.

119.
(d) Lymphatic tissue
Explanation: Lymphatic tissue

120.
(b) Polycyclic aromatic hydrocarbon
Explanation: Polycyclic aromatic hydrocarbon

121.
(b) (ii), (iv), (iii), (i)
Explanation: Crossing over is a biological occurrence that happens during **meiosis** when the paired homologs, or chromosomes of the same type, are lined up. So if you have two Chromosome 1s lined up, one strand of one Chromosome 1 will break and it will reanneal with a similar breakage on the other Chromosome 1.

122. **(a)** Competition
Explanation: The interaction in which both the organisms require the same limited resource, it is called competition.

123. **(a)** tropical rainforest
Explanation: Tropical rainforests have a very dense plant cover. They also experience a large amount of precipitation; thus the forest floor is always damp. Thus, the conditions there have led animals to get adapted to arboreal habitats. Most animals found there are tree dwellers as almost every space on the forest floor is occupied by the vegetation.

124.
(b) Xanthomonas campestris

Explanation: Xanthomonas campestris is a bacterial species that causes a variety of plant diseases.

125. **(a)** (i)
Explanation: In last 500 year 784 species extincted

126. **(a)** National park
Explanation: National park

127.
(b) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)
Explanation:
- Manjira wildlife sanctuary Located across the Manjira River, this wildlife sanctuary is situated in the Medak district in Andhra Pradesh (now in Telangana).
- Also known as Sasan-Gir, or Gir forest, this is a forest and wildlife sanctuary in Gujarat, established in 1965.
- The Varsey Rhododendron Sanctuary or Barsey Rhododendron Sanctuary occupies 104 km^2 in the Singalila Range in western Sikkim. It borders on Nepal to the west, and on the state of West Bengal to the south across the Rambong Khola stream.
- Dandeli Wildlife Sanctuary is the second largest sanctuary in Karnataka.

128.
(b) Equal division
Explanation: Mitosis is characterized by equal division as it maintains the same number of chromosomes.

129.
(b) Strasburger
Explanation: Eduard **Strasburger** was the **first** to characterise in detail, and to name, the **first** three phases of **mitosis** as prophase, metaphase and anaphase (**Strasburger** 1884; Harris 2001; Zacharias 2001).

130. **(a)** A
Explanation: A

131.
(d) O_2
Explanation: The small bubbles formed around the green parts of an aquatic plant in bright sunlight in the experiment performed by Jan Ingenhousz were of oxygen.

132.
(c) Statement (b) is correct.
Explanation: During photorespiration, RuBP, instead of CO_2, binds with O_2 and splits into one molecule of 3-phosphoglyceric acid (3C) and 2-phosphoglycolic acid (2C). Phosphate group of 2-phosphoglycolic acid is removed to form glycolic acid. Glycolic acid is then transported to peroxisome where it is converted into glycine which is then transported to mitochondrion. In mitochondrion, glycine is converted into serine with release of one CO_2 molecule.

133.
(d) Water
Explanation: Water

134.

(c) (i) - Skeletal muscles, (ii) - heavy exercise, (iii) - glucose

Explanation: Muscle fatigue is the reduction in force of contraction of a muscle after prolonged stimulation. In the absence of oxygen, skeletal muscle of human beings can contract for a short time, but it gets fatigued soon. This is due to the fact that in the absence of oxygen, products of glycolysis mainly lactic acid is not disposed of and accumulates in the muscles.

135.

(b) All of these

Explanation: All of these

BOTANY (Section-B)

136.

(d) All of these

Explanation: Reproduction is synonymous with growth in unicellular organisms like bacteria, unicellular algae or Amoeba, in which growth occurs with the increase in number of cells.

137.

(b) All of these

Explanation: Bacteria generally reproduce by fission and generally in unfavourable conditions it reproduces by spores. Conjugation is a type of sexual reproduction in bacteria.

138. **(a)** r-phycoerythrin

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

139.

(b) At right angles to funiculus

Explanation: At right angles to funiculus

140.

(d) X - Calyx; Y - Sepals

Explanation: Calyx of the flower contains sepals which are green in colour and look like leaf and protect the other whorls of the flower. Corolla is present inside the calyx and made up of petals. Petals are different in color and shapes and protect the other whorls present inside it. It attracts insects for pollination due to its color. Androecium is present inside the corolla and made up of stamens. Each stamen contains filament, anther and a connective.

141. **(a)** Test cross

Explanation: In a test cross, an organism showing a dominant phenotype (whose genotype is to be determined) is crossed with a recessive parent instead of self-crossing.

142.

(b) Molecular analysis of profiles of DNA samples

Explanation: Molecular analysis of profiles of DNA samples

143.

(b) in post-translational modification of proteins and glycosylation of lipids.

Explanation: Golgi complex plays a major role in post-translational modification (PTM) of proteins and glycosylation of lipids. PTM is a step-in protein biosynthesis. Proteins are created on ribosomes translating mRNA into polypeptide chains. These polypeptide chains

undergo PTM, such as folding, cutting and other processes, before becoming the mature protein product. Proteins synthesised by the rough endoplasmic reticulum and lipids synthesised by smooth endoplasmic reticulum reach the cisternae of the Golgi apparatus. Here, they combine with carbohydrates to form glycoproteins and glycolipids. This process is called glycosylation.

144. **(c)** Using them for producing biogas
Explanation: Water pollution from animal excreta and organic wastes from the kitchen can be minimized many folds by using them for producing biogas. Anaerobic decomposition of these organic substances produces biogas.

145. **(b)** Electron transport chain
Explanation: During electron transport chain stage of respiration of complete oxidation of glucose, the greatest number of ATP is formed from ADP in the inner wall of mitochondria.

146. **(a)** Bacteria: (A) Rod-shaped, (B) Spherical shaped
Explanation: Bacteria: (A) Rod-shaped, (B) Spherical shaped

147. **(d)** A-Detritus, B-Rock minerals, C-Producer, D-Litter fall
Explanation: A-Detritus, B-Rock minerals, C-Producer, D-Litter fall

148. **(d)** Initiate and promote cell division actively particularly in tissue culture
Explanation: Initiate and promote cell division actively particularly in tissue culture

149. **(d)** All of these
Explanation: Auxins promote stem elongation, inhibit growth of lateral buds (maintain apical dominance). They are produced in the stem, buds, and root tips.

150. **(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.

ZOOLOGY (Section-A)

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

152. **(c)** Felis domesticus
Explanation: The scientific name of a house cat is Felis domesticus.

153.

(c) Extracellular and intracellular

Explanation: In Coelenterates, digestion is both extracellular and intracellular.

154.

(c) Bone

Explanation: All the given statements are associated with bone. Bone is a rigid body tissue consisting of cells embedded in an abundant, hard intercellular material. This material consists of two important components-collagen and calcium phosphate. It forms the major portion of the human skeleton. Bones support and protect the various organs of the body produce red and white blood cells, store minerals and enable mobility.

155.

(d) All the above are neuroglia.

Explanation: All these cells are neuroglia. Ependymal cells and microglia are also neuroglia. Broadly, neuroglia support neurons and do not transmit electrical impulses like neurons do.

156.

(d) Trachea, bronchi and initial bronchioles only

Explanation: The tracheae, primary, secondary and tertiary bronchi, and initial bronchioles are supported by incomplete cartilagenous rings.

157. **(a)** inflammation of bronchi and bron-chioles.

Explanation: Asthma is an allergic disorder in which a wheezing sound is produced due to inflammation of bronchi and bronchioles.

158.

(d) Thyroid

Explanation: Thyroid

159.

(c) (i), (ii), (iv), (vi), (iii), (v)

Explanation: The correct sequence to initiate inspiration is
(i), (ii), (iv),(vi), (iii), and (v).

160.

(b) Hamburger phenomenon

Explanation: About 70% of CO_2 is converted to bicarbonate ions (HCO_3^-) and transported in plasma. CO_2 diffuses into RBCs, combines with water and forms carbonic acid (H_2CO_3). H_2CO_3 being unstable quickly dissociates into H^+ and HCO_3^-.

HCO_3^- ions are quite diffusible. Therefore, HCO_3^- diffuses from RBCs into the plasma. To maintain the ionic balance Cl^- ions move from the plasma into the RBCs. This exchange is called chloride shift or Hamburger's phenomenon.

161.

(b) Between fertilization and parturition

Explanation: Between fertilization and parturition

162.

(b) Upper junction of the two labia minora above the urethral opening

Explanation: The clitoris is a tiny finger-like structure which lies at the upper junction of the two labia minora above the urethral opening.

163. **(d)** Primary
Explanation: Primary

164. **(b)** (i), (ii), (iii) and (iv)
Explanation: Sterilisation techniques are surgical procedures involving vas deferens to be cut and tied in males and involving fallopian tubes to be cut and tied in females to prevent gamete transport. Though these techniques are highly effective, these are used as a last option by most couples because of poor reversibility, some misconceptions like absence of ejaculation and lowering of sexual urge.

165. **(b)** Small part of the fallopian tube is removed or tied up
Explanation: In tubectomy, a small part of the fallopian tube is removed and tied up through a small incision in the abdomen or through vagina.

166. **(a)** Louis Pasteur
Explanation: Louis Pasteur

167. **(d)** None of these
Explanation: Lamarck put forth the theory of inheritance of acquired characters, Darwin proposed theory of natural selection, and de Vries proposed mutation theory of evolution.

168. **(c)** Green glands
Explanation: Prawns are arthropods. In Prawn, excretion is carried out by green glands. They have one pair of green glands. It filters the nitrogenous waste from the body. It opens at the base of each antenna.

169. **(b)** Medulla
Explanation: Medulla

170. **(d)** Statement a is correct
Explanation: The descending limb of loop of Henle is permeable to water but impermeable to electrolytes but while the ascending limb is impermeable to water but permeable to electrolytes.

171. **(d)** Synovial Joints
Explanation: The six types of synovial joints are the pivot, hinge, saddle, plane, condyloid and ball and socket joints. Pivot joints are found in the neck region between atlas and axis.

172. **(a)** Actin, troponin, and tropomyosin
Explanation: Actin, troponin, and tropomyosin

173. **(b)** muscular movement

Explanation: The contractile property of the muscles is effectively used for locomotion and other movements by human beings and majority of multicellular organisms.

174.

(b) The patient will not perceive images of objects striking the right half of the retina in the right eye.

Explanation: When the right optic tract is destroyed, perception of images formed on the right half of the retina is lost, so nothing is visible at the left side of a person's field of view.

175.

(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.

176.

(c) B - Synaptic connection, D - K^+

Explanation: B - Synaptic connection, D - K^+

177.

(b) stimulate thyroid and other endocrine glands.

Explanation: Hormones secreted from anterior pituitary glands stimulates thyroid and other endocrine glands like adrenal, parathyroid, ovary, testes, pancreas, etc.

178.

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

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

179.

(b) 70 ml

Explanation: During a cardiac cycle, each ventricle pumps out approximately 70 mL of blood which is called the stroke volume. Hence, the volume of blood drained by the heart in one ventricular stroke is 70 mL of blood.

180.

(b) Difference between systolic pressure and diastolic pressure

Explanation: Pulse pressure is the difference between systolic and diastolic blood pressure. It is measured in millimeters of mercury. It represents the force that the heart generates each time it contracts.

181. **(a)** Monocyte

Explanation: Monocytes have a kidney-shaped nucleus. These cells are actively motile and phagocytic cells.

182.

(b) It is hydrophilic.

Explanation: DNA is hydrophilic molecule, so it cannot pass through cell membrane of host.

183.

(d) Sticky ends can be joined by using DNA ligases.

Explanation: Sticky ends contain free or hanging or unpaired nitrogen bases which can pair to complementary bases present on other DNA segments required to create

recombinant DNA. A ligase is required in absence of sticky ends to join together two segments of DNA.

184. **(a)** generated by introducing foreign DNA into a cell and regenerating a plant from that cell.

Explanation: The plants produced through genetic engineering contain gene or genes usually from an unrelated organism. Such genes are called transgenes and the plants having transgenes are called transgenic plants. Recombinant DNA techniques are being used to improve crop plants by increasing their productivity, by making them more nutritious, and by developing disease resistance. Transgenic plants have a natural resistance to herbicides and pests. In the future, plants may have an ability to fix atmospheric nitrogen and an increased ability to grow arid and salty soils.

185.

(c) Adenosine deaminase

Explanation: Adenosine deaminase

ZOOLOGY (Section-B)

186.

(b) Echinoderms

Explanation: The adult echinoderms are radially symmetrical but larvae are bilaterally symmetrical.

187.

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

Explanation: Adipose tissue is specialized to store fats. The stratified epithelium is found in the skin. Hyaline cartilage is found in the nose. Fluid connective tissue is present in the blood.

Hence, the correct match pairs are:

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

188. **(a)** Leaking of blood though valves

Explanation: A heart murmur is a blowing, whooshing, or rasping sound heard during a heartbeat. The heart sound murmurs is heard during leakage of blood through valves.

189.

(b) Four molecules of O_2

Explanation: Each haemoglobin molecule can carry a maximum of four molecules of O2.

$Hb_4 + 4O_2^- \rightarrow Hb_4O_8$

190.

(d) 1-Acrosome, 2-Nucleus, 3-Centriole, 4-Mitochondria, 5-Galea capitis

Explanation: 1-Acrosome, 2-Nucleus, 3-Centriole, 4-Mitochondria, 5-Galea capitis

191.

(b) It can be used for the detection of cleft palate

Explanation: It can be used for the detection of cleft palate

192.

(d)

Options	A	B	C
(C)	Tyrannosaurus	Brachiosaurus	Stegosaurus

Explanation: In the given figure, A. represents Tyrannosaurus, B. represents Brachiosaurus, and C. represents Stegosaurus.

193. **(a)** He/She will still survive and remain normal
Explanation: Another kidney will enlarge in size to perform extra work of missing kidney (compensatory hypertropy).

194. **(c)** Pterygoid
Explanation: Pterygoid is a process that extends from sphenoid bone of skull to form a plate like structure. Above the glenoid cavity of scapula is present two processes- acromian and coracoid. Coracoid process is like a hook and is smaller than acromian process projecting upwards. Atlas is first cervical vertebra. Arytenoidis a cartilage that forms part of larynx.

195. **(c)** Medulla oblongata + cerebellum + pons
Explanation: The brain is divided into three regions (i) Forebrain (ii) Midbrain and (iii) Hindbrain.
The forebrain is the largest part of the brain. It is the main thinking region. It is made up of cerebrum, hypothalamus and thalamus. The midbrain does not have any further divisions. The hindbrain consists of cerebellum, pons and medulla.

196. **(b)** presence of thyroxine.
Explanation: Growth hormone of pituitary is more effective in presence of thyroxine hormone.

197. **(c)** Thyroid gland
Explanation: Hypothyroidism during pregnancy causes defective development and maturation of the growing baby leading to stunted growth (cretinism), mental retardation, low intelligence quotient, abnormal skin, deaf-mutism, etc. In adult women, hypothyroidism may cause the menstrual cycle to become irregular.

198. **(a)** Sinu-auricular node
Explanation: The heartbeat is triggered by electrical impulses that travel down a special pathway through the heart. SA node (sinoatrial node) is known as the heart's natural pacemaker as the impulse starts in the SA node.

199. **(d)** It remains active at high temperature
Explanation: DNA polymerase had to be replenished after every cycle due to unstability at the high temperatures which are needed for denaturation. This problem was solved in 1987 with the discovery of a heat-stable DNA polymerase called Taq, an enzyme isolated from the thermophilic bacterium, Thermus aquaticus, which inhabits hot springs.

200.

(b) Transgenic mice

Explanation: Transgenic mice are developed to tests the safety of polio vaccine before being used on human.