NEET (UG) 2024

SAMPLE PAPER - 1

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. The SI unit of electron mobility is: **[4]**

   a) msV^{-1} b) $ms^{-1}V$

   c) $m^2s^{-1}V^{-1}$ d) $m^2s^{-2}V^{-2}$

2. The length, breadth and thickness of a block are given by l = 12 cm, h = 6 cm and t = 2.45 cm. The volume of the block according to the idea of significant figures should be: **[4]**

   a) $1 \times 10^2\ cm^3$ b) $1.763 \times 10^2\ cm^3$

   c) $2 \times 10^2\ cm^3$ d) $3 \times 10^2\ cm^3$

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

   a) 15.3 sec b) 12.2 sec

   c) 9.0 sec d) 17.2 sec

4. Four consecutive pipes eject water with a velocity of 6 m/s by making an angle of 60^o with the vertical and obtain a range of R_1m. If a motor is installed in a pipe, then the velocity of projection increases by 0.5 m/s for every 10 minute functioning of motor. What will be the difference in the range of projection after 40 minutes working of motor and that of initial range for same angle of projection? (g = 10 m/s^2) **[4]**

   a) 1.86 m b) 2.42 m

   c) 2.08 m d) 1.42 m

5. If two numerically equal forces P and P acting at a point produce a resultant force of magnitude P itself, then the angle between the two original forces is: **[4]**

a) 60° b) 90°

c) 120° d) 0°

6. Which of the following statement is false for the momentum of two moving objects? **[4]**

a)

Mass	Velocity	Momentum
$m_1 = m$	$v_1 < v$	$p_1 > p$
$m_2 > m$	$v_2 = v$	$p_2 > p$

b)

Mass	Velocity	Momentum
$m_1 < m$	$v_1 = v$	$p_1 > p$
$m_2 > m$	$v_2 = v$	$p_2 < p$

c)

Mass	Velocity	Momentum
$m_1 > m$	$v_1 > v$	$p_1 > p$
$m_2 < m$	$v_2 > v$	$p_2 = p$

d)

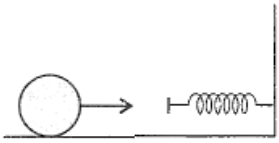
Mass	Velocity	Momentum
$m_1 = m$	$v_1 > v$	$p_1 > p$
$m_2 = m$	$v_2 = v$	$p_2 = p$

7. The potential energy of a certain spring, when stretched through a distance s, is 10 joule. The amount of work (in joule) that must be done on this spring to stretch it through additional distance 5 will be: **[4]**

a) 30 b) 10

c) 20 d) 40

8. A mass of 0.5 kg moving with a speed of 1.5 m/s on a horizontal smooth surface, collides with a nearly weightless spring of force constant K = 50 N/m. The maximum compression of the spring would be: **[4]**



a) 0.12 m b) 1.5 m

c) 0.5 m d) 0.15 m

9. A uniform rod AB of mass m and length l is at rest on a smooth horizontal surface. An impulse J is applied to the end B perpendicular to the rod in horizontal direction. **[4]**

Speed of particle P at a distance l/6 from the centre towards A of the rod after time $t = \frac{\pi ml}{12J}$ is:

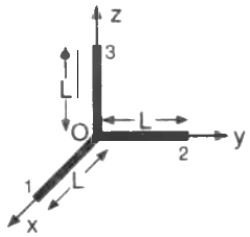
a) $\frac{J}{\sqrt{2m}}$

b) $2\frac{J}{m}$

c) $\frac{J}{m}$

d) $\sqrt{2}\frac{J}{m}$

10. Three thin rods each of length L and mass M are placed along x, y and z-axes in such a way that one end of each of the rods is at the origin. The moment of inertia of this system about z-axis is: **[4]**



a) $\frac{2ML^2}{3}$

b) $\frac{4ML^2}{3}$

c) $\frac{ML^2}{3}$

d) $\frac{5ML^2}{3}$

11. The earth circles the sun once a year. The work which would have to be done on the earth to bring it to rest relative to the sun is: (Ignore the rotation of the earth about its own axis. Given that mass of the earth = 6×10^{24} kg and distance between the sun and the earth is 1.5×10^{8} km) **[4]**

a) 2.7×10^{31} J

b) -2.7×10^{33} J

c) 2.7×10^{33} J

d) 2.7×10^{30} J

12. If B is the bulk modulus of a metal and a pressure P is applied uniformly on all sides of the metal with density D, then the fractional increase in density is given by: **[4]**

a) $\frac{P}{B}$

b) $\frac{BD}{P}$

c) $\frac{B}{P}$

d) $\frac{PD}{B}$

13. A mass of 50g of water in a closed vessel, with surroundings at a constant temperature takes 2 minutes to cool from 30°C to 25°C. A mass of 100 g of another liquid in an identical vessel with identical surroundings takes the same time to cool from 30° C to 25° C. The specific heat of the liquid is: **[4]**
(The water equivalent of the vessel is 30g.)

a) 0.5 kcal/kg

b) 2.0 kcal/kg

c) 3 kcal/kg

d) 7 kcal/kg

14. A wire 3 m in length and 1mm in diameter at 30°C is kept in a low temperature at -170°C and is stretched by hanging a weight of 10 kg at one end. The change in length of the wire is: ($Y = 2 \times 10^{11}$ N/m^2, g = 10 m/s^2 and $\alpha = 1.2 \times 10^{5}$/^{o}C **[4]**

a) 52 mm

b) 2.5 mm

c) 5.2 mm

d) 25 mm

15. The temperature of the system decreases in the process of: **[4]**

a) adiabatic expansion

b) isothermal compression

c) free expansion

d) isothermal expansion

16. Increase in temperature of a gas-filled in a container would lead to: **[4]**

a) Increase in its kinetic energy

b) Decrease in its pressure

c) Increase in its mass

d) Decrease in intermolecular distance

17. Two particles P and Q describe SHM of same amplitude a, frequency v along the same straight line. The maximum distance between the two particles is $a\sqrt{2}$. The **[4]**

initial phase difference between the particles is:

a) $\frac{\pi}{6}$

b) zero

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

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

18. The frequency of a tuning fork is 256 Hz. The velocity of sound in air is 344 ms^{-1}. The distance travelled (in meters) by the sound during the time in which the tuning fork completes 32 vibrations is: **[4]**

a) 21

b) 86

c) 129

d) 43

19. Two identical sounds S_1 and S_2 reach at a point P in phase. The resultant loudness at point P is ndB higher than the loudness of S_1. The value of n is: **[4]**

a) 2

b) 4

c) 6

d) 5

20. A comb runs through one's dry hair attracts small bits of paper. This is due to: **[4]**

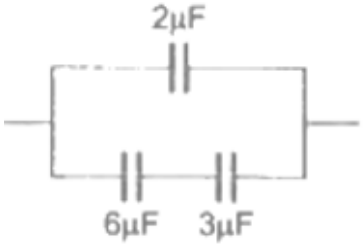
a) the comb possesses magnetic properties

b) paper is a good conductor

c) comb is a good conductor

d) the atoms in the paper get polarised by the charged comb

21. The combined capacitance of the arrangement shown in the adjoining figure (in μF) is: **[4]**



a) 1

b) 4

c) $\frac{30}{11}$

d) $\frac{8}{11}$

22. Which of the following materials is the best conductor of electricity? **[4]**

A. Platinum
B. Gold
C. Silicon
D. Copper

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

23. A moving coil galvanometer converted into an ammeter reads upto 0.03 A by connecting a shunt of resistance 4r across it and ammeter reads upto 0.06 A when a shunt of resistance r is used. What is the maximum current which can be sent through this galvanometer, if no shunt is used? **[4]**

a) 0.02 A
b) 0.03 A
c) 0.01 A
d) 0.04 A

24. A tangent galvanometer has a coil of 25 turns and a radius of 15 cm. The horizontal component of the earth's magnetic field is 3×10^{-5} T. The current required to produce a deflection of 45° in it is: **[4]**

a) 3.6×10^{-5}A
b) 1.2 A
c) 0.14 A
d) 0.29 A

25. Curie law χT = constant, relating magnetic susceptibility (χ) and absolute temperature (T) of magnetic substances, is obeyed by: **[4]**

a) all magnetic substances
b) Ferromagnetic substances
c) paramagnetic substances
d) diamagnetic substances

26. The flux linked with a circuit is given by: $\phi = t^3 + 3t - 7$. The graph between t (x-axis) and induced emf (y-axis) will be a: **[4]**

i. straight line through the origin
ii. straight line with positive intercept
iii. straight line with negative intercept
iv. parabola not through the origin

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

27. An electric bulb in series with a large inductor when connected across a DC source takes a little time before reaching a stable glow. If an iron core is inserted into the inductor, the delay will: **[4]**

a) decrease

b) remain the same

c) increase

d) may change in either direction depending upon the values of inductance and resistance

28. The natural frequency of a L-C circuit is equal to : **[4]**

a) $\frac{1}{2\pi\overline{LC}}$

b) $\frac{1}{2\pi}\sqrt{L/C}$

c) $\frac{1}{2\pi\sqrt{LC}}$

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

29. The intensity of X-rays depends upon the number of: **[4]**

a) Neutron

b) Protons

c) Positrons

d) Electrons

30. Light enters from air into a given medium at an angle of 45^{o} with interface of the air-medium surface. After refraction, the light ray is deviated through an angle of 15^{o} from its original direction. The refractive index of the medium is: **[4]**

a) 1.414

b) 1.732

c) 2.732

d) 1.333

31. In case of diffraction at single slit if the wavelength of light becomes equal to the aperture of slit, on the screen we shall observe: **[4]**

a) non-uniform illumination

b) diffraction band

c) image of slit

d) uniform illumination

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

a) red light of any intensity

b) yellow light of intensity which is less than I

c) green light of any intensity

d) yellow light of intensity which is more than I

33. An electron of mass m_e and a proton of mass $m_p = 1836\ m_e$ are moving with the same speed. The ratio of their de Broglie wavelength $\frac{\lambda_{electron}}{\lambda_{proton}}$ will be **[4]**

a) $\frac{1}{1836}$

b) 918

c) 1

d) 1836

34. The total energy of an electron in the second excited state of the hydrogen atom is -1.51 eV The kinetic and potential energies of the electron in this state are respectively: **[4]**

a) 3.02 eV, -1.51 eV

b) 1.51 eV, - 3.02 eV

c) -3.02 eV, 1.51 eV

d) -1.51 eV, 3.02 eV

35. 1 curie is equal to: **[4]**

a) 3.7×10^7 disintegrations/sec

b) 3.7×10^{10} disintegrations/sec

c) 5×10^7 disintegrations/sec

d) 3×10^{10} disintegrations/sec

PHYSICS (Section-B)

Attempt any 10 questions

36. Two bodies are having kinetic energies in the ratio 16 : 9. If they have same linear momentum, the ratio of their masses respectively is: **[4]**

a) 4 : 3

b) 3 : 4

c) 16 : 9

d) 9 : 16

37. A meter stick of mass 400 gm is pivoted at one end and displaced through an angle of 60°. The increase in its potential energy is: **[4]**

a) 1 J

b) 3 J

c) 0 J

d) 2 J

38. If mass M is split into two parts m and (M - m) which are then separated by a distance, the ratio of $\frac{m}{M}$ that maximizes the gravitational force between the two parts is: **[4]**

a) 1:2 b) 1:1

c) 2:1 d) 1:4

39. A planet radiates heat at a rate proportional to the fourth power of its surface temperature T. If such a steady temperature of the planet is due to an exactly equal amount of heat received from the sun then which of the following statement is true? **[4]**

a) The planet's surface temperature varies inversely as the square root of its distance from the sun.

b) The planet's surface temperature is proportional to the fourth power of its distance from the sun.

c) The planet's surface temperature varies directly as the square of its distance from the sun.

d) The planet's surface temperature varies inversely as the distance of the sun.

40. If two sound waves: $y_1 = 0.3\sin 596\pi\left(t - \frac{x}{330}\right)$ and $y_2 = 0.5 \sin 604\pi\left(t - \frac{x}{330}\right)$ are superposed. What will be: **[4]**

i. the frequency of the resultant wave

ii. the frequency at which the amplitude of resultant wave varies?

a) 300,4 b) 300, 2

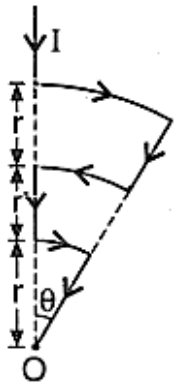
c) 600, 4 d) 600, 8

41. The frequency of the fundamental note in a wire stretched under tension T is f. If the tension is increased to 25 T, then the frequency of the fundamental note will be: **[4]**

a) f b) 5 f

c) 10 f d) 25 f

42. Shown in the figure is a conductor carrying a current I. The magnetic field intensity at the point O (common centre of all the three arcs) is: **[4]**



a) $\frac{11\mu_0 I\theta}{24\pi r}$

b) $\frac{5\mu_0 I\theta}{24\pi r}$

c) zero

d) $\frac{\mu_0 I\theta}{24\pi r}$

43. An iron rod is placed parallel to the magnetic field of intensity 2000 A/m. The magnetic flux through the rod is 6×10^{-4} Wb and its cross-sectional area is 3 cm^2. The magnetic permeability of the rod in Wb/Am is: **[4]**

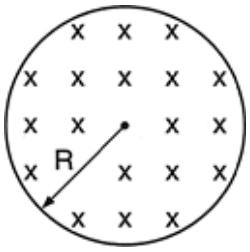
a) 10^{-3}

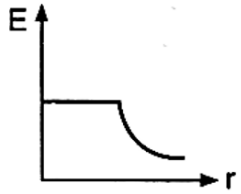
b) 10^{-2}

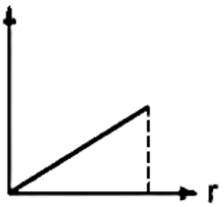
c) 10^{-4}

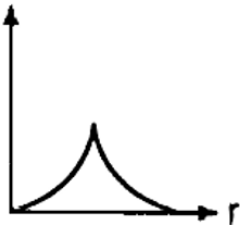
d) 10^{-1}

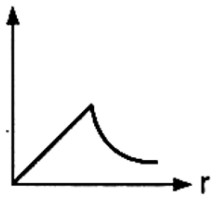
44. A cylindrical space of radius R is filled with a uniform magnetic induction B parallel to the axis of the cylinder. If B changes at a constant rate, the graph showing the variation of induced electric field with distance r from the axis of cylinder is: **[4]**



a) 

b) 

c) 

d) 

45. In LCR circuit if the resistance increases, the quality factor: **[4]**

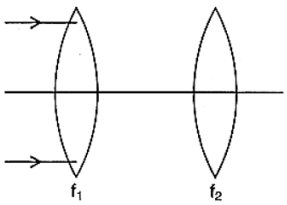
a) increases finitely

b) Rises finitely

c) remains constant

d) decreases finitely

46. A parallel beam of light is incident on a system of two convex lenses of focal lengths $f_1 = 20$ cm and $f_2 = 10$ cm. What should be the distance between the two lenses so that rays after refraction from both the lenses pass undeviated? **[4]**



a) 30 cm

b) 60 cm

c) 40 cm

d) 90 cm

47. Two mirrors at an angle $\theta°$ produce 5 images of a point. The number of images produced when θ is decreased to $\theta° - 30^o$ is: **[4]**

a) 9

b) 11

c) 12

d) 10

48. The value of de Broglie wavelength of an electron moving with a speed of 6.6×10^5 ms^{-1} is approximately: **[4]**

a) o
211 A

b) o
311 A

c) o
111 A

d) o
11 A

49. Which of the following is not correct about the Bohr model of the hydrogen atom? **[4]**

a) An electron in an atom could revolve in certain stable orbits without the emission of radiant energy.

b) Electron revolves around the nucleus only in those orbits for which angular momentum $L_n = \frac{nh}{2\pi}$.

c) Bohr's model is applicable to all atoms.

d) When an electron makes a transition from one of its stable orbits to a lower orbit than a photon emitted with energy hv = $E_f - E_i$.

50. The radioactive conversion of uranium into thorium is represented by the equation: **[4]**

$^{238}_{92}U \rightarrow {}^{234}_{50}Th + X$

What is X?

a) an alpha particle

b) a neutron

c) a proton

d) an electron

CHEMISTRY (Section-A)

51. An oxide of metal have 20% by mass oxygen, the equivalent mass of oxide is: **[4]**

a) 52

b) 40

c) 48

d) 32

52. Based on the information provided in the following table, identify the corresponding orbital and then arrange them in increasing order of energy. **[4]**

Shell number	Number of possible orientations of orbital in the shell	Orbital designation
3	3	i
4	3	ii
3	5	iii
4	1	iv

a) iii < i < ii < iv

b) iv < ii < i < iii

c) i < iv < iii < ii

d) ii < i < iv < iii

53. The radii of F, F^-, O and O^{-2} are in the order of **[4]**

a) $O^{2-} > F^{-} > F > O$

b) $O^{2-} > F^{-} > O > F$

c) $F^{-} > O^{2-} > F > O$

d) $O^{2-} > O > F^{-} > F$

54. Which of the following would result in the formation of strongest π - bond if the molecular axis is x-axis? **[4]**

a) $2p_z + 4p_z$

b) $2p_x + 2p_x$

c) $2p_y + 2p_y$

d) $2p_y + 3d_{xy}$

55. Which of the following statement is INCORRECT from the viewpoint of molecular orbital theory? **[4]**

i. Be_2 does not exist.

ii. O_2, $O2^{-}$, $O3^{+}$ are all paramagnetic.

iii. Bond strength of N_2 is maximum amongst the homonuclear diatomic molecules belonging to the second period.

iv. $N2^{+}$ is diamagnetic.

a) only iii

b) only ii

c) only i

d) only iv

56. Arrange the following in order of decreasing N-O bond length: **[4]**

a) $NO3^{-} > NO2^{+} > NO2^{-}$

b) $NO3^{-} > NO2^{-} > NO2^{+}$

c) $NO2^{-} > NO3^{-} > NO2^{+}$

d) $NO2^{+} > NO3^{-} > NO2^{-}$

57. 70 calories of heat is required to raise the temperature of 2 mole of ideal gas at constant pressure from $30^{o}C$ to $35^{o}C$. The amount of heat required to raise the temperature of same gas through $30^{o}C$ to $35^{o}C$ at constant volume is: **[4]**

a) 90

b) 70

c) 30

d) 50

58. pH of a saturated solution of $Ca(OH)_2$ is 9. The solubility product (K_{sp}) of $Ca(OH)_2$ is _____. **[4]**

a) 0.5×10^{-10}

b) 0.25×10^{-10}

c) 0.125×10^{-15}

d) 0.5×10^{-15}

59. Among the properties (i) reducing (ii) oxidising (iii) complexing the set of properties shown by CN^- ion towards metal species is: **[4]**

a) ii, iii

b) i, ii

c) iii, i

d) i, ii, iii

60. For the reaction, $N_2 + 3H_2 \longrightarrow 2NH_3$ if E_1 and E_2 equivalent masses of NH_3 and N_2 respectively, then $E_1 - E_2$ is: **[4]**

a) 4

b) 1

c) 2

d) 3

61. Select coloured alum. **[4]**

a) Chrome alum

b) All of these

c) Potash alum

d) Ammonium alum

62. Ayush, a student from KOTA, was trying to open an old glass bottle containing NaOH. But the glass stopper got stuck. Can you suggest a reason for this happening? **[4]**

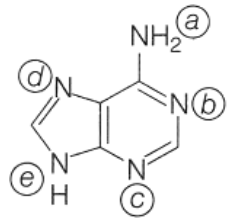
a) Solid Na_2CO_3 is formed in between by reaction of CO_2 of air and NaOH

b) A solid silicate is formed in between by the reaction of SiO_2 of glass with NaOH

c) Glass contains a boron compound which forms a precipitate with NaOH solution

d) There were particles of dirt in between

63. In the following compound **[4]**



the favourable site/s for protonation is/are

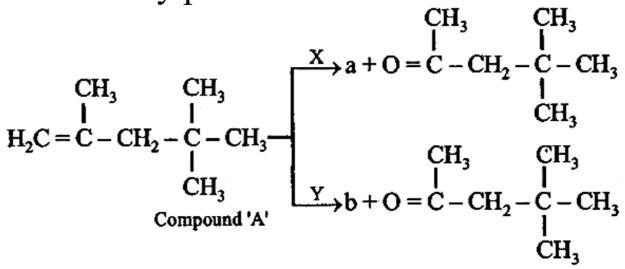
a) (a) and (e)

b) (a) and (d)

c) (a)

d) (b), (c) and (d)

64. A compound **A** on reaction with **X** and **Y** produces the same major product but different by product **a** and **b**. Oxidation of **a** gives a substance produced by ants. **[4]**



X and **Y** respectively are

a) $KMnO_4/H+$ and O_3, H_2O/Zn

b) $KMnO_4$(dilute), 273 K and $KMnO_4/H^+$

c) O_3, H_2O/Zn and $KMnO_4/H^+$

d) $KMnO_4/H^+$ and dil. $KMnO_4$, 273 K

65. On catalytic reduction with $\frac{H_2}{Pt}$ how many alkenes will give n-butane? **[4]**

a) 4

b) 1

c) 3

d) 2

66. 0.5 molal aqueous solution of a weak acid (HX) is 20% ionized. If k_f for water is 1.86 K-kg-mol^{-1}, the lowering in freezing point of the solution is: **[4]**

a) -0.56 K

b) -1.12 K

c) 0.56 K

d) 1.12 K

67. Spiegeleisen which is used in heavy machinery, is an alloy made of iron and _____. **[4]**

a) tin

b) antimony

c) copper

d) manganese

68. In a H_2 - O_2 fuel cell, combustion of hydrogen occurs and **[4]**

a) create potential difference between the two electrodes

b) produce high purity water

c) generate heat

d) remove adsorbed oxygen from electrode surface

69. The activation energies of two reactions are E_a and E_a' with $E_a > E_a'$. If the temperature of the reacting systems is increased from T_1 to T_2, predict which alternative is correct? **[4]**

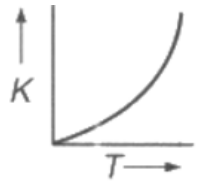
a) $\frac{K_1'}{K_1} < \frac{K_2'}{K_2}$

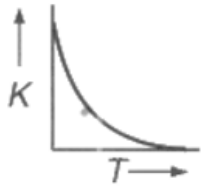
b) $\frac{K_1'}{K_1} > \frac{K_2'}{K_2}$

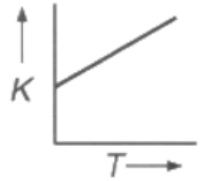
c) $\frac{K_1'}{K_1} = \frac{K_2'}{K_2}$

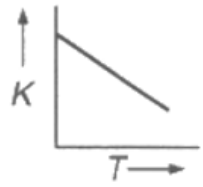
d) $\frac{K_1'}{K_1} > \frac{K_2'}{K_2}$

70. Plots showing the variation of the rate constant (k) with temperature (T) are given below. The plot that follows Arrhenius equation is: **[4]**

a) 

b) 

c) 

d) 

$4KOH, O_2$ **[4]**

71. $A \rightarrow 2B + 2H_2O$

– –

(Green)

$4HCl$

$3B \rightarrow 2C + MnO_2 + 2H_2O$

– –

(Purple)

H_2O,KI

$$2C \rightarrow 2A + 2KOH + D$$

In the above sequence of reactions, *A* and *D*, respectively, are

a) MnO_2 and KIO_3 b) KIO_3 and MnO_2

c) KI and K_2MnO_4 d) KI and $KMnO_4$

72. Identify the INCORRECT statement(s) among the following: **[4]**

i. Moist ammonia gas can be dried by using anhydrous $CaCl_2$.

ii. When metallic copper reacts with very dilute nitric acid, ammonium nitrite is one of the products.

iii. Phosphine is a weaker base than ammonia because the phosphorus atom is less electronegative than nitrogen.

iv. NaH_2PO_2 is an acidic salt and it is named as sodium hypophosphate.

a) All of these b) (i) and (iii)

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

73. In the preparation of $K_2Cr_2O_7$, sodium chromate is converted to sodium dichromate by treatment with _____. **[4]**

a) conc. H_2SO_4 b) Na_2CO_3

c) O_2 d) KCl

74. The complex used as an anti-cancer agent is **[4]**

a) mer-$Co(NH_3)_3Cl_3]$ b) cis-$[PtCl_2(NH_3)_2]$

c) $Na_2[CoCl_4]$ d) cis-$K_2[PtCl_2Br_2]$

75. Select the correct statement about $[CoF_6]^{3-}$: **[4]**

A. It is labile complex

B. It is low spin complex

C. Spin only magnetic moment of complex is 3.87 B.M.

D. All of the above

a) Only (D) b) Only (A)

c) Only (B)

d) Only (C)

76. A hydrocarbon with molecular formula C_4H_8 does not react with chlorine in dark but reacts with Cl_2 in diffused sunlight to give monochlorinated compound, C_4H_7CI. Identify the hydrocarbon. **[4]**

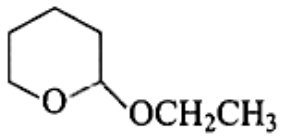
a) Cyclobutane

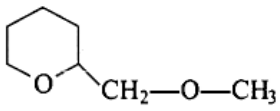
b) But-1-ene

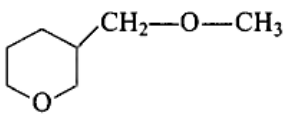
c) But-2-ene

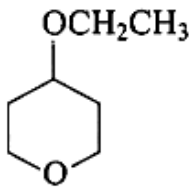
d) Methylcyclopropane

77.  $+ CH_3CH_2OH \xrightarrow{HCl}$ **[4]**

a) 

b) 

c) 

d) 

78. Acetophenone can be obtained by the distillation of: **[4]**

a) $(C_6H_5COO)_2Ca$ and $(CH_3COO)_2Ca$

b) $(C_6H_5COO)_2Ca$ and $(HCOO)_2Ca$

c) $(C_6H_5COO)_2Ca$

d) $(CH_3COO)_2Ca$

79. The most appropriate reagent for conversion of C_2H_5CN into $CH_3CH_2CH_2NH_2$ is: **[4]**

a) CaH_2

b) $NaBH_4$

c) $Na(CN)BH_3$

d) $LiAlH_4$

80. Which of the following is C—2 epimer of D-Glucose? **[4]**

a) D-Galactose

b) L-Glucose

c) D-Mannose

d) D-Fructose

81. An aldose is converted into its next higher homologue by: **[4]**

a) Killiani synthesis

b) Amadori rearrangement

c) Ruffs method

d) Wohl's method

82. Which of the following is urotropine? **[4]**

a) Heximethylene triamine b) Hexamethyl triamine

c) Hexamethylene tetramine d) Hexamethyl-diamine

83. The standard electrode potentials for metals A, B and C are +0.80 V, -0.74 V and -0.25 V, respectively. Select the CORRECT decreasing order of their strength to act as a reducing agent. **[4]**

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

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

84. Lassaigne's extract obtained from p-amino thiophenol on treatment with excess of sodium contain _____. **[4]**

a) only NaCN b) only Na_2S

c) only NaSCN d) NaCN and Na_2S

85. $MgCO_3 + Na_2HPO_4 \longrightarrow$ White precipitate **[4]**

The precipitate is of _____.

a) $MgCO_3$ b) $Mg(HCO_3)_2$

c) $MgNH_4(HCO_3)_3$ d) $MgNH_4PO_4$

CHEMISTRY (Section-B)

Attempt any 10 questions

86. If α, β and γ are the bond angles ($\angle$FAF where A is the central atom) in CF_4, POF_3 and SO_2F_2 respectively, the **correct** order is: **[4]**

a) $\alpha < \beta < \gamma$ b) $\alpha > \gamma > \beta$

c) $\alpha < \gamma < \beta$ d) $\alpha > \beta > \gamma$

87. Which of the following does NOT correctly represent the stock notation for the given compounds? **[4]**

a) $HAuCl_4$ - HAuCl(IV) b) MnO_2 - Mn(IV)O_2

c) V_2O_5 - V_2(V)O_5 d) CuO - Cu(II)O

88. Find the CORRECT match. **[4]**

Types of silicate	Example
i. Orthosilicate	a. Beryl

Types of silicate	Example
ii. Pyrosilicate	b. Asbestos
iii. Cyclic-silicate	c. Zircon
iv. Chain-silicate	d. Hemimorphite

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

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

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

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

89. If electronegativity of X be 3.2 and that of Y be 2.2, the percentage ionic character of XY is: **[4]**

a) 19.5

b) 9.5

c) 18.5

d) 29.5

90. Which of the following is the main cause of late discovery of neutron? **[4]**

a) All of these

b) Neutron in nucleus moves very fast

c) Neutron is highly unstable particle

d) Neutron is chargeless particle

91. Which is the correct oxidation state of lead? **[4]**

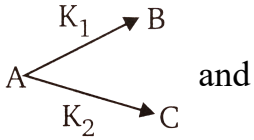
a) + 1, + 2

b) + 3, + 4

c) + 4

d) + 2, + 4

92. A substance undergoes first order decomposition. The decomposition follows two parallel first-order reactions as: **[4]**



and

$K_1 = 1.26 \times 10^{-4}$ sec^{-1}

$K_2 = 3.8 \times 10^{-4}$ sec^{-1}

The percentage distribution of B and C are:

a) 60% B and 40% C

b) 80% B and 20% C

c) 90% B and 10% C

d) 76.83% B and 23.17% C

93. The molar conductivity of a weak monobasic acid at infinite dilution is 388.5 S cm^2 mol^{-1} at 25°C. Find conductivity of 0.1 M solution of this acid if degree of dissociation is 6%. **[4]**

a) 2.33×10^{-3} S cm^{-1} b) 2.33×10^{-2} S cm^{-1}

c) 2.33×10^{-4} S cm^{-1} d) 2.33×10^{-1} S cm^{-1}

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

a) $Ag \mid AgCl \mid Cl^-$ b) $Pt \mid Fe^{3+}, Fe^{2+}$

c) $\frac{1}{2} F_2 \mid F^-$ d) $MnO_4^- \mid Mn^{2+}$

95. The rate constant of a first order reaction is 3×10^{-6} per sec. If the initial concentration is 0.10 M, the initial rate of reaction is **[4]**

a) $3 \times 10^{-8} Ms^{-1}$ b) $3 \times 10^{-5} Ms^{-1}$

c) $3 \times 10^{-7} Ms^{-1}$ d) $3 \times 10^{-6} Ms^{-1}$

96. Which of the following is paramagnetic with bond order 0.5? **[4]**

a) N_2 b) O^{2-}

c) F_2 d) H_2^+

97. How many of the following statements are CORRECT? **[4]**

i. Bi_2O_5 is more acidic than As_2O_5.

ii. As_2O_3 and Sb_2O_3 are amphoteric.

iii. Bi_2O_3 is amphoteric.

iv. P_4O_6 is purely acidic.

a) 3 b) 2

c) 1 d) 4

98. Which of the following is **CORRECT** about basic strength of hydroxide? **[4]**

a) $Sc(OH)_3 > Y(OH)_3 > La(OH)_3$ b) $La(OH)_3 \approx Y(OH)_3 > Sc(OH)_3$

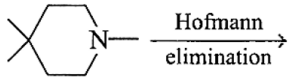
c) $La(OH)_3 > Y(OH)_3 > Sc(OH)_3$ d) $Y(OH)_3 > La(OH)_3 > Sc(OH)_3$

99. Spin only magnetic moment of an octahedral complex of Fe^{2+} in the presence of a strong field ligand in BM is: **[4]**

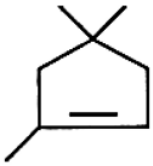
a) 4.89 b) 3.46

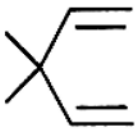
c) 2.82 d) 0

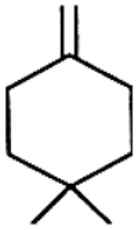
100. Repeated Hofmann elimination reaction (exhaustive methylation followed by heating with AgOH) will often remove a nitrogen atom from an amine molecule. Which of the following compounds is the likely product in this case? **[4]**



a) 

b) 

c) 

d) 

BOTANY (Section-A)

101. Man belongs to which Genus? **[4]**

a) Homo b) Hominidae

c) Sapiens d) Primata

102. Choose correct statement for growth : **[4]**

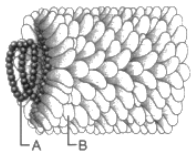
a) Non-living objects grow by increasing the body mass. Growth is exhibited by non-living objects by accumulation of material on its surface. Growth, therefore, cannot be taken as a defining property of living organisms.

b) Increase in body mass is considered as growth

c) Both 2 and 3

d) Non-living objects are also grown by the accumulation of material on the surface

103. What does the given diagram represent? Also, identify labels A & B. **[4]**



a) TMV-A-Capsid-B-RNA
b) CMV-A-DNA-B-Capsid
c) TMV-A-RNA-B-Capsid
d) TMV-A-DNA-B-Capsid

104. Archaebacteria differ from Eubacteria in: **[4]**

a) Mode of reproduction
b) Cell shape
c) Mode of nutrition
d) Cell wall structure

105. Dicot embryo consists of: **[4]**

a) Radicle, plumule and cotyledons only
b) Radicle, plumule, cotyledons, endosperm
c) Radicle, plumule and endosperm
d) Radicle and plumule only

106. **[4]**

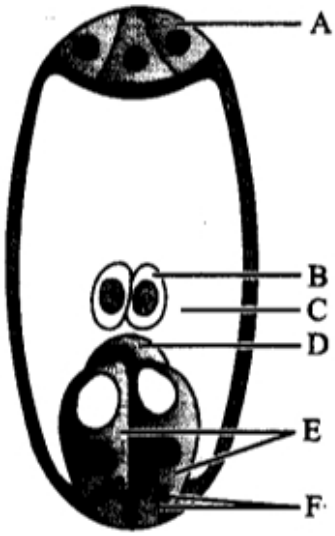
Column I	Column II
a. Peritrichous flagella	(i) Ginkgo
b. Living fossil	(ii) Macrocystis
c. Rhizophore	(iii) E. coli
d. Smallest flowering plant	(iv) Selaginella
e. Largest perennial algae	(v) Wolffia

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

107. Which one of the following is considered important in the development of seed habit? **[4]**

a) Halplontic life cycle
b) Heterospory
c) Free-living gametophyte
d) Dependent sporophyte

108. The diagram given below represents different cells of a typical angiospermic embryo sac labelled from A to F. Identify these cells and select the correct option. **[4]**



a) A-Filiform apparatus; B-Central cell; C-Polar nuclei; D-Antipodals; E-Egg; F-Synergids

b) A-Antipodals; B-Polar nuclei; C-Central cell; D-Egg; E-Synergids; F-Filifonn apparatus

c) A-Antipodals; B-Central cell; C-Polar nuclei; D-Egg; E-Synergids; F-Synergids

d) A-Filiform apparatus; B-Polar nuclei; C-Central cell; D-Synergids; E-'Egg; F-Antipodals

109. The stamens represent the **[4]**

a) male gametophyte

b) Male gametes

c) microsporophylls

d) microsporangia

110. Palmately compound leaves found in: **[4]**

a) Neem

b) Silk cotton

c) Both neem and silk cotton

d) Banana

111. The ovary is half inferior in: **[4]**

a) Sunflower

b) Plum

c) Mustard

d) Brinjal

112. There are usually two to four xylem and phloem patches present in: **[4]**

a) Monocot root

b) Dicot stem

c) Monocot stem

d) Dicot root

113. Which of the following pairs in wrongly matched? **[4]**

a) XO type sex determination : Grasshopper

b) ABO blood grouping : Co-dominance

c) Starch synthesis in pea : Multiple alleles

d) T.H. Morgon : Linkage

114. In a cross between a male and female, both heterozygous for sickle cell anemia gene, what percentage of the progeny will be diseased? **[4]**

a) 75%

b) 50%

c) 100%

d) 25%

115. Identify the labels A, B, C, and D in the given structure of tRNA and select the correct option. **[4]**

a) A - Amino acid binding site, B - DHU loop, C - Anticodon loop, D - T ΨC loop

b) A - Amino acid binding site, B - T ΨC loop, C - Anticodon loop, D - DHU loop

c) A - Amino acid binding site, B - Anticodon loop, C - DHU loop, D - T ΨC loop

d) A - Amino acid binding site, B - DHU loop, C - T ΨC loop, D - Anticodon loop

116. Which of the following pairs is correctly matched? **[4]**

a) Triplet and Codon

b) Okazaki fragments and Splicing

c) Central dogma and Codon

d) RNA polymerase and RNA primer

117. Which of the following pair of organelles does not contain DNA? **[4]**

a) Chloroplast and Vacuoles

b) Mitochondria and Lysosomes

c) Lysosomes and Vacuoles

d) Nuclear envelope and Mitochondria

118. Which of the following is not a feature of the plasmids? **[4]**

a) Single-stranded

b) Independent replication

c) Circular structure

d) Transferable

119. A condition that occurs when the immune system mistakenly attacks and destroys healthy body tissue is called **[4]**

a) immunisation

b) autoimmunity

c) immunodeficiency
d) allergy

120. Cocaine is a stimulant, which may cause addiction. lt is an alkaloid obtained from **[4]**

a) Papaver
b) Rauwolfia
c) Eucalyptus
d) Erythroxylum

121. In telophase of mitosis, the mitotic spindle breaks down and nuclear membranes form. This is essentially the opposite of what happens in **[4]**

a) metaphase
b) interphase
c) S phase
d) prophase

122. In an area, a population with large size individuals having long life span, more parental care and slow development was present. The type of population growth curve will be **[4]**

a) All of these
b) S-shaped
c) J-shaped
d) Z-shaped

123. The process of accumulation of a dark coloured amorphous substance that is highly resistant to microbial action and undergoes decomposition at an extremely slow rate is called: **[4]**

a) organisation
b) mineralisation
c) transformation
d) humification

124. Which one of the following is being tried in India as a biofuel substitute for fossil fuels? **[4]**

a) Azadirachta
b) Jatropha
c) Aegilops
d) Musa

125. Which one has the largest species variety in India? **[4]**

a) Potato
b) Maize
c) Rice
d) Wheat

126. Protected bird is: **[4]**

a) Pavo
b) Both Pavo and Choriotes
c) Choriotes
d) Columba

127. Species which suffered a near-extinction from ingesting the carrion of diclofenac-treated cattle is/are: **[4]**

a) Himalayan Wolf and Bengal tiger
b) Bengal tiger and white rumped vulture
c) Only white rumped vulture
d) Striped Hyena and white rumped vulture

128. In which phase of the cell cycle are the chromosomes inactive, condensed, and not transcribed to messenger RNA? **[4]**

a) G_1 phase
b) S phase
c) M phase
d) G_2 phase

129. In which phase of mitosis of chromosomes are arranged the equator of the cell? **[4]**

a) Prophase
b) Telophase
c) Anaphase
d) Metaphase

130. Which statement is correct for photosynthesis regarding light? **[4]**

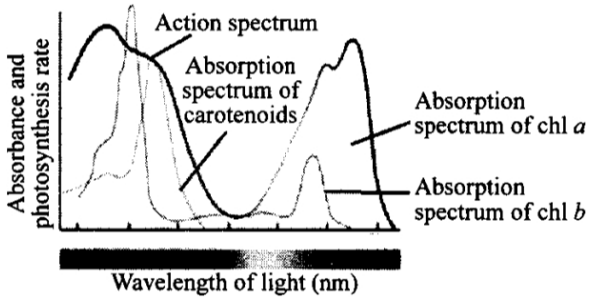
i. There is a linear relationship between incident light and CO_2 fixation rates at low light intensities
ii. At higher light intensities, gradually the rate does not show further increase as other factors become limiting
iii. Light saturation occurs at 10 per cent of the full sunlight. Hence, except for plants in shade or in dense forests, light is rarely a limiting factor in nature
iv. Increase in incident light beyond a point causes the breakdown of chlorophyll and a decrease in photosynthesis
v. When light intensity increase than first rate of photosynthesis increase than becomes constant due to CO_2 becomes limiting factor

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

131. In C_4 pathway or C_4 photosynthesis carbon dioxide fixation occurs in chloroplast of: **[4]**

a) Palisade tissue
b) Guard cells
c) Bundle sheath
d) Spongy mesophyll

132. Select the statement that can be concluded from the graph given below. **[4]**



a. The action spectrum shows a graphic representation of amount of light of different wavelengths absorbed by a pigment.
b. Absorption spectrumdepictsthe relative rates of photosynthesis at different wavelengths of light.
c. Action spectrum corresponds closely to absorption spectrum of chl a.
d. Green light falling in the range of wavelength 500-580nm is most effective for photosynthesis.

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

133. Select the correct statement **[4]**

a. Photorespiration is a useful process
b. Photorespiration occurs in C4 plants
c. C3 plants are efficient than C4 plants
d. None of these

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

134. Old trees obtain O_2 from: **[4]**

a) All of these
b) Lenticels
c) Stomata
d) Leaf scars

135. Which one of the following is not an effect of gibberellin? **[4]**

a) Induce dormancy
b) Increase the length of sugarcane stem
c) Delay senescence of fruits
d) Increase the length of grapes stalks

BOTANY (Section-B)

Attempt any 10 questions

136. Biological Name of Mango is: **[4]**

a) Mangifera domestica
b) Mangifera indica
c) Timarendus indica
d) Triticum aestivum

137. Which of the following organism are known as chief producers in the oceans? **[4]**

a) Diatoms
b) Euglenoid
c) Dinoflagellates
d) Cyancbacteria

138. Which of the following are source of agar? **[4]**

a) Gracilaria
b) Gelidium
c) Chlorella
d) Both Gelidium and Gracilaria

139. Pollinia are sac-like structures: **[4]**

a) In which anther lobes are present
b) Which secrete yellow substance called pollen kitt
c) Which are found in megasporangia
d) In which pollen grains are present in mass

140. The ovary is half inferior in flowers of: **[4]**

a) Cotton
b) Peach
c) Cucumber
d) Guava

141. Select the correct statements regarding honeybees. **[4]**

i. The queen bee and the worker bees develop from fertilised eggs and are sexuually females.
ii. Males (drones) develop parthenogenetically from unfertilised eggs.
iii. Queen bee feeds upon royal jelly and the worker bees feed upon bee bread.

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

142. Nucleoside is: **[4]**

a) Nitrogenous base + Sugar + Phosphate
b) Nitrogenous base + Phosphate
c) Nitrogenous base + Sugar
d) Sugar + Phosphate

143. Which dye is used to stain chromosomes? **[4]**

a) Acetocarmine
b) All of these

c) Haematoxylin
d) Feulgen

144. Citric acid is produced by: **[4]**

a) Acetobacter suboxydans
b) Spergillus niger
c) Candida utilis
d) Aspergillus fumigatus

145. Mitochondria supply most of its necessary biological energy through: **[4]**

a) Breaking down of protein
b) Oxidizing substrates of TCA cycle
c) Breaking down of sugar
d) Reducing NADP

146. Streptomyces ramosus is the source of the antibiotic: **[4]**

a) Aureomycin
b) Chloromycetin
c) Terramycin
d) Erythromycin

147. An inverted pyramid of ___(A)___ may occasionally be observed in ___(B)____ communities. **[4]**

a) (A)-biomass; (B)-marine
b) (A)-energy; (B)-forest
c) (A)-energy; (B)-grassland
d) (A)-biomass; (B)-grassland

148. Ethylene increases: **[4]**

a) Respiration
b) Climactric temperature
c) Photosynthesis
d) Transpiration

149. Which one of the following pairs, is not correctly matched? **[4]**

a. Gibberellic acid - Leaf fall
b. Cytokinin - Cell division
c. IAA - Cell wall elongation
d. Abscissic acid - Stomatal closure

a) Gibberellic acid - Leaf fall
b) IAA - Cell wall elongation
c) Cytokinin - Cell division
d) Abscissic acid - Stomatal closure

150. The first product of CO_2 fixation in Hatch and Slack (C_4) cycle in plants is: **[4]**

a) Formation of phosphoglyceric acid in mesophyll cells
b) Formation of oxaloacetate by carboxylation of phosphoenol pyruvate (PEP) in bundle sheath cells

c) Formation of oxaloacetate by carboxylation of phosphoenol pyruvate (PEP) in the mesophyll cells

d) Formation of bundle sheath cells

ZOOLOGY (Section-A)

151. The vector host for sleeping sickness is : **[4]**

a) Butterfly

b) House fly

c) Tse-tse fly

d) Mosquito

152. Which one feature is common to Amphioxus, frog, sea horse and crocodile ? **[4]**

a) A three-chambered heart

b) Pharyngeal gill slits, at least in the developmental stages

c) Skeleton formed of cartilage and bones

d) Dorsal solid nerve chord

153. Scales are found in: **[4]**

a) None of these

b) Fishes

c) Reptiles

d) Both Reptiles and Fishes

154. Nervous tissue is not found in **[4]**

a) nerves

b) brain

c) spinal cord

d) tendons

155. Pseudopodia of Amoeba are similar to: **[4]**

a) Suckers of Taenia

b) Teeth in rabbit

c) Legs of cockroach

d) Spicules of Leucosolenia

156. O_2 dissociation curve is plotted between pO_2 and _____. **[4]**

a) RBC/mm^3 of biood

b) pCO_2

c) % Hb saturation

d) Hb concentration

157. Which of the following primarily responsible for regulation of respiration? **[4]**

a) Cerebrum region of the brain

b) Medulla region of the brain

c) All of these

d) Pons region of the brain

158. Tidal Volume and Expiratory Reserve Volume of an athlete is 500 mL and 1000 mL respectively. What willl be his Expiratory Capacity if the Residual Volume is 1200 mL? **[4]**

a) 1500 mL
b) 2700 mL
c) 2200 mL
d) 1700 mL

159. Read the following statements and select the correct one. **[4]**

a. The hydrogen ions released from carbonic acid combines with haemoglobin to form haemoglobinic acid.
b. Oxyhemoglobin of erythrocytes is alkaline.
c. More than 70 % of CO_2 is transferred from the tissue to the lungs in the form of carbamino compounds.
d. In a healthy person, the haemoglobin content is more than 25 gm per 100 mL .

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

160. A large proportion of oxygen is left unused in the human blood even after its uptake by the body tissues. This O_2 **[4]**

a) Is enough to keep oxyhemoglobin saturation at 90%
b) Helps in releasing more O_2 to the epithelium tissues
c) Raises the pCO_2 of blood to 75 mm of Hg
d) Acts as a reserve during muscular exercise

161. In which of the following stage blastocoel is formed? **[4]**

a) Gastrula
b) None of these
c) Morula
d) Blastula

162. In which stage of menstrual cycle corpus luteum can be seen in the ovary? **[4]**

a) Follicular
b) Ovulatory
c) All of these
d) Luteal

163. When there is no fertilisation, the corpus luteum **[4]**

a) begins new cycle.
b) Ends new cycle.
c) Stops secreting progesterone
d) starts producing progesterone

164. Which of the following approaches does not give the defined action of contraceptive? **[4]**

a) Hormonal contraceptives - Prevent/retard entry of sperms, prevent ovulation and fertilization

b) Vasectomy - Prevents spermatogenesis

c) Intrauterine devices - Increase phagocytosis of sperms, suppress sperm motility and fertilizing capacity of sperms

d) Barrier methods - Prevent fertilization

165. One could be free of STD infections by which of the following principles given below: **[4]**

a) Always use condoms during coitus

b) In case of doubt, one should go to a qualified doctor for early detection and get complete treatment if diagnosed with a disease

c) Avoid sex with unknown paitners/multiple partners

d) All of these

166. **Ontogeny repeats phylogeny** is expressed in: **[4]**

a) capitulation theory

b) Mutation theory

c) Natural selection theory

d) Recapitulation theory

167. In evolution, the studies can be made at molecular level. For example, the proteins present in the blood of man and apeare similar. The base sequence in nucleic acids and amino acids sequence in proteins of related organism is alike. These are the examples which are specifically referred to in **[4]**

a) molecular analogy

b) convergent evolution

c) molecular homology

d) homoplastic appearance

168. Which of the following is removed from our body by lungs ? **[4]**

a) CO_2 and H_2O

b) Ammonia

c) H_2O only

d) CO_2 only

169. Glomerular capsule and convoluted tubules always lie within the _____. **[4]**

a) renal medulla

b) renal capsule.

c) renal cortex
d) renal pelvis

170. The glomerular filtrate consists of: **[4]**

a) Urea, sodium chloride, fibrinogen and water
b) Urea, glucose, salts, water and protein
c) Glucose, amino acids, urea, oxytocin and calcitonin
d) Urea, glucose, salts, and water

171. Select the correct function of vertebral column in humans. **[4]**

a) Supports the head
b) All of the these
c) Protects the spinal cord
d) Provides surface as an attachment for ribs and musculature of back.

172. In mammals, the number of the cervical vertebra is: **[4]**

a) 5
b) 7
c) 12
d) 10

173. Muscular dystrophy is a: **[4]**

a) Infectious disorder
b) Genetic disorder
c) Autoimmune disorder
d) All of these

174. Ill and IV ventricles remain connected by: **[4]**

a) Iter
b) Foramen of Monro
c) Paracoel
d) Rhinocoel

175. Neurotransmitter which is not a simulator: **[4]**

a) Gamma-amino butyric acid
b) Acetylcholine
c) Dopamine
d) Serotonin

176. If a person has lost his memory in an accident, the following part of the brain have got injured: **[4]**

a) Diencephalon
b) Cerebrum
c) Cerebellum
d) Medulla oblongans

177. Use of an artificial kidney during haemodialysis may result in: **[4]**

1. Nitrogenous waste build-up in the body

2. Non-elimination of excess potassium ions
3. Reduced absorption of calcium ions from gastrointestinal tract
4. Reduced RBC production

a) (1) and (4) are correct
b) (1) and (2) are correct
c) (3) and (4) are correct
d) (2) and (3) are correct

178. Geradiol is a pheromone of: **[4]**

a) Butterfly
b) Honeybee
c) All of these
d) Silk moth

179. Factor affecting heart rate is: **[4]**

a) Alcohol
b) All of these
c) Adrenaline
d) Decrease in concentration of CO_2

180. Which one is the correct route through which pulse making impulse travels in the heart? **[4]**

a) AV node → SA node → Purking fibres → Bundle of His → Heart muscles
b) SA node → AV node → Bundle of His → Purkinje fibres → Heart muscles
c) AV node → Bundle of His → SA node → Purkinje fibres → Heart muscles
d) SA node → Purkinje fibres → Bundle of His → AV node → Heart muscles

181. Closed blood vascular system occurs in: **[4]**

a) Cockroach
b) Leech
c) Housefly
d) Earthworm

182. Which of the following is not correctly matched for the organism and its cell wall degrading enzyme? **[4]**

a) Bacteria - Lysozyme
b) Plant cells - Cellulase
c) Fungi - Chitinase
d) Algae - Methylase

183. Imagine a gel through which DNA fragments have moved in response to an applied electrical current. The band on this gel that is farthest from the top (i.e., from the place where the DNA fragments were added to the 'well') represents the **[4]**

a) ligase used to bind the DNA fragments together.

b) shortest fragments of DNA.

c) longest fragments of DNA.

d) restriction enzyme used to cut the DNA into fragments.

184. Transgenic animals are those which have: **[4]**

a) RNA in some of its cells

b) Proteins in all of its cells

c) RNA in all of its cells

d) DNA in all of its cells

185. Which part of the tobacco plant is infected by Meloidogyne incognita? **[4]**

a) Root

b) Leaf

c) Stem

d) Flower

ZOOLOGY (Section-B)

Attempt any 10 questions

186. Which of the following condition is possible in Aschelminthese? **[4]**

a) Viviparity

b) None of these

c) Both Oviparity and Viviparity

d) Oviparity

187. Histamine secreting cells are found in **[4]**

a) Connective tissues

b) Lungs

c) nervous tissue

d) muscular tissue

188. Renal portal system is absent in: **[4]**

a) Reptiles

b) Birds

c) Amphibians

d) Reptiles and amphibians

189. Name the pulmonary disease in which alveolar surface area involved in gas exchange is drastically reduced due to damage in the alveolar walls: **[4]**

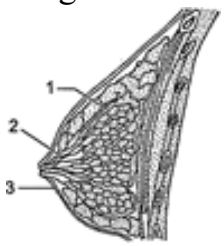
a) Asthma

b) Emphysema

c) Pneumonia

d) Pleurisy

190. Diagrammatic representation of mammary gland and given number represents: **[4]**



a) All are incorrect

b) 1-Mammary alveolus, 2-Ampulla, 3-Areola

c) 1-Ampulla, 2-Mammary duct, 3-Areola

d) 1-Ampulla, 2-lactiferous duct, 3-Nipple

191. Select the correct statement regarding IUDs. **[4]**

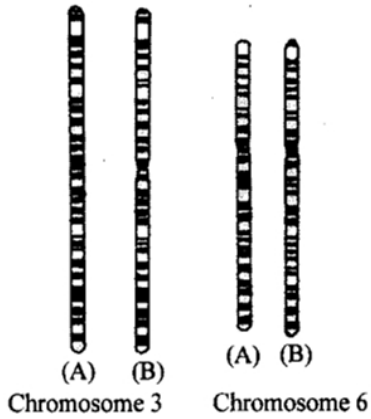
a) In India, use of IUDs is one of the most widely accepted methods of contraception these days.

b) IUDs are metal objects which are inserted in the uterus of the female through vagina by expert doctors.

c) IUDs may be categorised as non-medicated, copper releasing, and hormone releasing IUDs.

d) All of these

192. The given image is the diagrammatic representation of banding pattern in chromosomes 3 and 6 of man (A) and chimpanzee (B). The result shows DNA of man is very closely related to that of apes. This study provides which type of evidence for evolution? **[4]**



a) Evidences from biogeographic distribution

b) Palaeontological evidences

c) Evidences from comparative morphology and anatomy

d) Molecular evidences

193. Liquid which collects in the cavity of Bowman's capsule: **[4]**

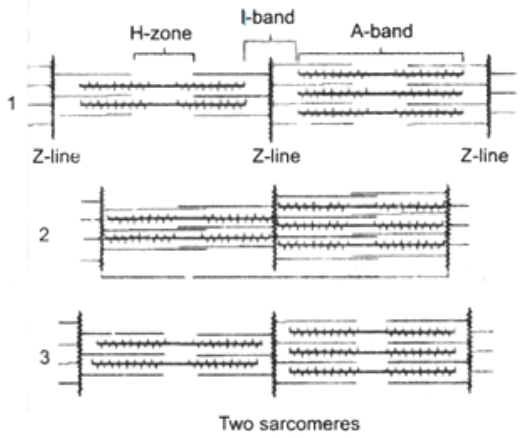
a) Concentrated urine

b) Sulphates and water

c) Glycogen and water

d) Plasma minus blood protein

194. The given diagrams representing 3 different conditions of the sliding-filament theory of muscle contraction (movement of the thin filaments and the relative size of the I-band and H-zones). Identify these conditions: **[4]**



a) 1-Maximally contracted, 2-Contracting, 3-Relaxed

b) 1-Relaxed, 2-Maximally contracted, 3-Contracting

c) 1-Relaxed, 2-Contracting, 3-Maximally contracted

d) 1-Contracting, 2-Relaxed, 3-Maximally contracted

195. Association areas of the brain are **[4]**

a) always motor areas.

b) neither sensory nor motor areas.

c) Both sensory and motor areas.

d) always sensory areas.

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

a) FSH

b) vasopressin.

c) oxytocin

d) LH

197. Prolonged hyperglycemia leads to a complex disorder called: **[4]**

a) Diabetes keto aciaosis

b) Diabetes mellitus

c) Diabetes insipidus

d) Glycosuria

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

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

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

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

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

199. Which of the following is not a feature of the plasmid? **[4]**

a) Small, circular double-stranded

b) Independent replication

c) Circular structure

d) Single-stranded

200. Who first realized the use of yeast in fermentation? **[4]**

a) Christian Hansen

b) A. Spike

c) D.A. Jackson

d) Louis Pasteur

Solution

SAMPLE PAPER - 1

PHYSICS (Section-A)

1.

(c) $m^2s^{-1}V^{-1}$

Explanation: Mobility, $\mu_e = \frac{\text{Drift velocity } \left(v_d\right)}{\text{Electric field } (E)}$

$= \frac{m^{-1}}{Vm^{-1}} = m^2s^{-1}V^{-1}$

2.

(c) 2×10^2 cm^3

Explanation: Dimensions of the block ,

Length (l) = 12 cm

Breadth (b) = 6 cm

Height (h) = 2.45 cm

volume of the block = lbh

$V = 12 \times 6 \times 2.45$

$V = 176.4$ cm^3

$V = 176.4 \times (10^2 \times 10^2)$ cm^3

$V = 1.764 \times 10^2$ cm^3

$V = 2 \times 10^2$ cm^3

3.

(d) 17.2 sec

Explanation: 17.2 sec

4.

(b) 2.42 m

Explanation: For $\theta = 30^o$,

$R_1 = \frac{\sqrt{3}u_1^2}{2g} = \frac{\sqrt{3} \times 6^2}{2 \times 10} = 3.12$ m

When the motor works for 40 minutes, velocity will increase by 2 m/s of the initial

i.e., $u_2 = 6 + 2 = 8$ m/s

For $\theta = 30^o$,

$R_2 = \frac{\sqrt{3}u_2^2}{2g} = \frac{\sqrt{3} \times 8^2}{2 \times 10} = 5.54$ m

$\therefore$ $R_2 - R_1 = 5.54 - 3.12 = 2.42$ m

5.

(c) 120°

Explanation: Using vector law

$R^2 = P^2 + Q^2 + 2PQ \cos\theta$

As vectors have same magnitude so, $|\vec{R}| = |\vec{Q}| = |\vec{P}|$

$\therefore$ $p^2 = P^2 + P^2 + 2PP \cos\theta$

or $P^2 = 2P^2 + 2 \cos\theta$

or $P^2 = 2P^2(1 + \cos\theta)$

or $\frac{1}{2} = 1 + \cos\theta$

or $\cos\theta = -\frac{1}{2}$

$\therefore \ \theta = 120^{o}$

So, the angle between 2 vectors is 120 degree.

6.

(b)

Mass	**Velocity**	**Momentum**
$m_1 < m$	$v_1 = v$	$p_1 > p$
$m_2 > m$	$v_2 = v$	$p_2 < p$

Explanation: Momentum of a body is, p = mv

$\therefore$ for m = constant, $p \propto v$ and

for v = constant, $p \propto m$

Also, for p = constant, $m \propto \frac{1}{v}$

Hence, for $v_1 = v_2 = v$, if $m_1 < m$, then $p_1 > p$ and $m_2 > m \Rightarrow p_2 > p$

7. **(a)** 30

Explanation: 30

8.

(d) 0.15 m

Explanation: Loss of KE = Gain in elastic PE

$\frac{1}{2}mv^2 = \frac{1}{2}Kx^2$

or $0.5 \times (1.5)^2 = 50 \times x^2$

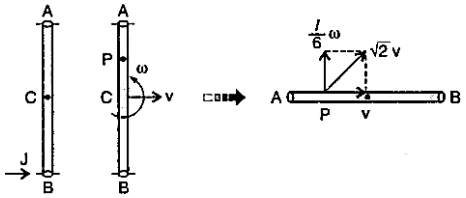
$\therefore \quad x^2 = \frac{0.5 \times (1.5)^2}{50} = \frac{(1.5)^2}{109}$

$\therefore \quad x = \frac{1.5}{10} = 0.15$ m

9.

(d) $\sqrt{2}\frac{J}{m}$

Explanation:



Let v and cω be the linear and angular speeds of the rod after applying an impulse J at B. Then from, Impulse = change in momentum

we have, mv = J or $v = \frac{J}{m}$ ...(i)

$I\omega = J \cdot \frac{l}{2}$

or $\frac{ml^2}{12} \cdot \omega = J \cdot \frac{l}{2}$

or $\omega = \frac{6J}{ml}$ ...(ii)

After the given time,

$t = \frac{\pi ml}{12J}$

the rod will rotate an angle,

$\theta = \omega t = \left(\frac{6J}{ml}\right)\left(\frac{\pi ml}{12J}\right) = \frac{\pi}{2}$

$\frac{l}{6} \cdot \omega = \left(\frac{I}{6}\right)\left(\frac{6J}{ml}\right) = \frac{J}{m} = v$

$\therefore \quad \left|\vec{v}_p\right| = \sqrt{2}v = \sqrt{2}\frac{J}{m}$

10. **(a)** $\frac{2ML^2}{3}$

Explanation: $I_z = I_1 + I_2 + I_3$

$= \frac{ML^2}{3} + \frac{ML^2}{3} + 0 = \frac{2ML^2}{3}$

(Because z-axis is passing through one end of each of two rods aligned along x and y-axes)

11.

(b) -2.7×10^{33} J

Explanation: $\omega = \frac{2\pi}{T} = \frac{2\pi}{365 \times 24 \times 3600}$

$= \frac{2\pi}{3.15 \times 10^7} = 1.99 \times 10^{-7}$ rad/s

$W = K_f - T_t = 0 - \frac{1}{2}mv^2$

$= -\frac{1}{2} \times 6 \times 10^{24} \times (1.5 \times 10^{11} \times 1.99 \times 10^{-7})^2$

$= -2.7 \times 10^{33}$ J

12. **(a)** $\frac{P}{B}$

Explanation: $D = \frac{M}{V}, D' = \frac{M}{V - \Delta V}$

$\frac{D'}{D} = \frac{V}{V - \Delta V} = \left(1 - \frac{\Delta V}{V}\right)^{-1} = 1 + \frac{\Delta V}{V}$

$\frac{D' - D}{D} = \frac{D'}{D} - 1 = \frac{\Delta V}{V}$

$\frac{\Delta V}{V} = \frac{P}{B}$

$\therefore \frac{D' - D}{D} = \frac{P}{B}$

or fractional increase in density = $\frac{P}{B}$

13. **(a)** 0.5 kcal/kg

Explanation: As the surrounding is identical, the vessel is the identical time taken to cool both water and liquid (from 30°C to 25°C) is same 2 minutes, therefore

$$\left(\frac{dQ}{dt}\right)_{water} = \left(\frac{dQ}{dt}\right)_{liquid}$$

or, $\frac{\left(m_W C_W + W\right)\Delta T}{t} = \frac{\left(m_l C_l + W\right)\Delta T}{t}$

(W = water equivalent of the vessel)

or, $m_W C_W = m_l C_l$

$\therefore$ Specific heat of liquid, $C_l = \frac{m_W C_W}{m_l}$

$= \frac{50 \times 1}{100} = 0.5$ kcal/kg

14.

(c) 5.2 mm

Explanation: The contraction in the length of the wire due to change in temperature

$= \alpha LT = (1.2 \times 10^{-5}) \times 3 \times (-170 - 30)$

$= -7.2 \times 10^{-3}$m

The expansion in the length of wire due to stretching force

$= \frac{FL}{YA} = \frac{(10 \times 10) \times 3}{\left(2 \times 10^{11}\right)\left(0.75 \times 10^{-6}\right)} = 2 \times 10^{-3}$ m

The resultant change in length

$= -7.2 \times 10^{-3} + 2 \times 10^{-3}$m

$= -5.2 \times 10^{-3}$m $= -5.2$ mm

A negative sign shows a contraction.

15. **(a)** adiabatic expansion

Explanation: In adiabatic expansion we know that dQ = 0

$\therefore$ dQ = dU + PdV or 0 = dU + PdV

PdV = -dU

Thus, work done decreases internal energy which is a function of temperature. Hence, temperature also decreases.

16. **(a)** Increase in its kinetic energy

Explanation: An increase in temperature would lead to the increase in kinetic energy of gas (assuming gas as to be ideal) as $U = \frac{F}{2}nRT$

17.

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

Explanation: $y_1 = a \sin 2\pi vt$ and $y_2 = a \sin (2\pi vt + \phi)$

$y = y_2 - y_1 = a[\sin (2\pi vt + \phi) - \sin 2\pi vt]$

$= 2a \sin \frac{\phi}{2} \cos [2\pi vt + \frac{\phi}{2}]$

$\therefore$ Maximum value of $y = 2a \sin \frac{\phi}{2}$

Now, $2a \sin \frac{\phi}{2} = a\sqrt{2}$

or $\sin \frac{\phi}{2} = \frac{1}{\sqrt{2}}$ or $\phi = \frac{\pi}{2}$

18.

(d) 43

Explanation: Distance travelled by sound

$= 32\lambda = 32\left[\frac{V}{n}\right] = 32\left[\frac{344}{256}\right] = 43\text{m}$

19.

(c) 6

Explanation: Let a be the amplitude due to S_1 and S_2 individually

Loudness due to S_1 - $I_1 = Ka^2$

Loudness due to $S_1 + S_2 = 1 = K\,(2a)^2 = 4I_1$

$\therefore \quad n = 10\log_{10}\left(\frac{4I_1}{I_1}\right) = 10\log_{10}(4) = 6$

20.

(d) the atoms in the paper get polarised by the charged comb

Explanation: The comb gets charged and induces opposite charges in paper. The field due to the charges in the comb polarises the atoms in the paper. Finally, it attracts the paper because opposite charges are induced.

21.

(b) 4

Explanation: In lower line, $C_l = \frac{6 \times 3}{6+3} = 2\mu\text{F}$ ($\because$ 6 μF and 3 μF are in series)

For circuit, the lower line (2 μF) and the upper line (2 μF) are in parallel.

$\therefore$ C = 2 + 2 = 4 μF

22.

(c) Only D

Explanation: Copper

23. **(a)** 0.02 A

Explanation: Let R be the resistance of the ammeter and *I* be the maximum current passing through the ammeter.

In the first case, 0.03 A is main current and in the second case, 0.06 A is main current.

$I = \frac{0.03 \times 4r}{(R+4r)}$ (for first case)

$I = \frac{0.06 \times r}{(R+r)}$ (for second case)

$\frac{0.03 \times 4r}{(R+4r)} = \frac{0.06 \times r}{(R+r)}$

R + 4r = 2R + 2r or R = 2r

The value of $I = \frac{0.03 \times 4r}{2r+4r} = \frac{0.03 \times 4r}{6r} = 0.02\text{A}$

This is the maximum value of current in ammeter.

24.

(d) 0.29 A

Explanation: In a tangent galvanometer,

$i = \frac{2rB_H}{\mu_0 N}\tan\theta$

$\therefore i = \frac{2 \times 15 \times 10^{-2} \times 3 \times 10^{-5}}{4\pi \times 10^{-7} \times 25} \times \tan 45°$

$= 0.29$ A

25. **(c)** paramagnetic substances
Explanation: paramagnetic substances

26. **(c)** only iv
Explanation: $\phi = t^3 + 3t - 7$

$e = -\frac{d\phi}{dt} = -(3t^2 + 3)$

ev/st graph: $y = -3x^2 - 3$, this is parabola, not through origin.

27. **(c)** increase

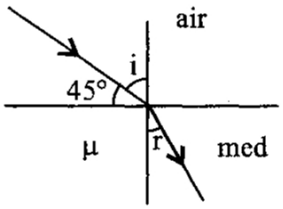
Explanation: By inserting iron core, L increases (electrical inertia increases), so decay time increases.

28. **(c)** $\frac{1}{2\pi\sqrt{LC}}$

Explanation: $\frac{1}{2\pi\sqrt{LC}}$

29. **(d)** Electrons
Explanation: The intensity of X−rays depends upon the number of electrons striking the target.

30. **(a)** 1.414
Explanation: $i = 45^o$, $D = 15^o$
$D = i - r$
$15^o = 45^o - r \Rightarrow r = 30^o$
$n_1 \sin 1 = n_2 \sin r$ (from snells's law)
$1 \sin 45^o = \mu \sin 30^o$
$\frac{1}{\sqrt{2}} = \mu \frac{1}{2} \Rightarrow \mu = \sqrt{2} = 1.414$



31. **(a)** non-uniform illumination
Explanation: In case of diffraction at single slit, the closest angular position of minimum will be given by:

$d\sin\theta = 1 \times \lambda$, i.e., $\theta = \sin^{-1}\left(\frac{\lambda}{d}\right)$

If $\lambda = d, \theta \rightarrow \frac{\pi}{2}$, i.e., central maximum will extend from $\frac{-\pi}{2}$ to $\frac{\pi}{2}$.

So, neither image of slit nor pattern will be observed but the whole screen will be illuminated.

32.

(c) green light of any intensity

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

33.

(d) 1836

Explanation: de-broglie wavelength, $\lambda = \frac{h}{p}$

$\lambda_e = \frac{h}{m_e \times v}$ and $\lambda_p = \frac{h}{m_p \times v}$

$\therefore \frac{\lambda_e}{\lambda_p} = \frac{m_p}{m_e} = \frac{1836 m_e}{m_e} = 1836$

34.

(b) 1.51 eV, - 3.02 eV

Explanation: In the second excited state,

Total energy, E = -1.51 eV

Kinetic energy, K = -E = -(-1.51 eV)

= +1.51 eV

Potential energy, U = 2E = 2 (-1.51 eV)

= -3.02 eV

35.

(b) 3.7×10^{10} disintegrations/sec

Explanation: 1 Ci is equal to 37 billion 3.7×10^{10} disintegrations/sec

PHYSICS (Section-B)

36.

(d) 9 : 16

Explanation: K.E. $= \frac{P^2}{2\,m}$

$\therefore \frac{K_1}{K_2} = \frac{p_1^2}{2\,m_1} \times \frac{2\,m_2}{p_2^2} = \frac{m_2}{m_1} = \frac{16}{9}$

$\therefore \frac{m_1}{m_2} = \frac{9}{16}$

37. **(a)** 1 J

Explanation: Here

Mass of stick, m = 0.4 kg

Length of stick, l = 1m

Initial Potential energy $= \frac{mgl}{2} = \frac{0.4 \times 10 \times 1}{2} = 2J$

At 60° angle,

Final Potential energy $= \frac{mgl\left(1 - \cos 60^\circ\right)}{2} = \frac{0.4 \times 10 \times 1\,(1 - 0.5)}{2} = 1J$

So, Its potential energy decreased by 2 − 1 = 1 J

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

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

For F to be maximum $\frac{dF}{dm} = 0$ (as M and r are constants)

$$\frac{d}{dm}\left[\frac{G}{r^2}\left(mM - m^2\right)\right] = 0$$

i.e., M - 2m = 0

or $\frac{m}{M} = \frac{1}{2}$

39. **(a)** The planet's surface temperature varies inversely as the square root of its distance from the sun.

Explanation: Rate of loss of energy by unit area of the planet = σT^4, where σ is the Stefan's constant. Let Q be the total energy emitted by the sun every second. If d is the distance of the planet from the sun, then Q falls uniformly over the inner surface of the sphere of radius d. Rate of gain of heat by unit area of planet

= $\frac{Q}{4\pi d^2}$

For the steady temperature of the planet

$\sigma T^4 = \frac{Q}{4\pi d^2}$

$T^4 = \frac{Q}{4\pi\sigma d^2}$ or $T = \left(\frac{Q}{4\pi\sigma d^2}\right)^{1/4}$

or $T \propto \frac{1}{\sqrt{d}}$

40.

(b) 300, 2

Explanation: $y = y_1 + y_2 = 2A\cos\frac{2\pi\left(n_1 - n_2\right)f'}{2}\sin\frac{2\pi\left(n_1 + n_2\right)r'}{2}$

where $y_1 = A\sin 2\pi n_1\left(t - \frac{x}{v}\right) = A\sin 2\pi n_1 t'$ and $y_2 = A\sin 2\pi n_2\left(t - \frac{x}{v}\right) = A\sin 2\pi n_2 t'$

Now, $2\pi n_1 = 596\pi$ or $n_1 = 298$ Hz

$2\pi n_2 = 604\pi$ or $n_2 = 302$ Hz

i. Frequency of the resultant wave = $\frac{\left(n_1 + n_2\right)}{2} = 300$Hz

ii. Frequency of the amplitude = $\frac{\left(n_2 - n_1\right)}{2} = \frac{302 - 298}{2} = 2$Hz

41.

(b) 5 f

Explanation: The frequency obtained from a stretched wire = $\frac{n}{2l}\sqrt{\frac{T}{\mu}}$, where n is the harmonic, l =

length of the wire, T is the tension and μ the mass per unit length.

The fundamental frequency, f = $\frac{1}{2l}\sqrt{\frac{T}{\mu}}$

If for the same wire, the tension is increased 25 times one gets a fundamental frequency 5 times the original frequency, i.e, 5 f

42. **(b)** $\frac{5\mu_0 I\theta}{24\pi r}$

Explanation: Since, magnetic field at the centre of an arc is equal to

$B = \frac{\mu_0 I}{4\pi r}\theta$

Hence, net $B = \frac{\mu_0 I}{4\pi}\left[\frac{1}{r} - \frac{1}{2r} + \frac{1}{3r}\right]\theta$

$= \frac{5\mu_0 I\theta}{24\pi r}$

43. **(a)** 10^{-3}

Explanation: We know that,

$\mu = \frac{B}{H}$

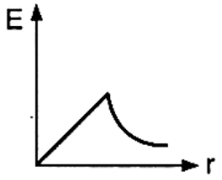
$= \frac{\left(\frac{\phi}{A}\right)}{H}$

$= \frac{\phi}{HA}$

$= \frac{6\times 10^{-4}}{2000\times 3\times 10^{-4}}$

$\therefore \mu = 10^{-3}$ Wb/Am

44. **(d)**



Explanation: For $r \le R$: $\oint \vec{E}\cdot\overrightarrow{dl} = \frac{d\phi}{dt}$

or $E(2\pi r) = \left(\pi r^2\right)\left(\frac{dB}{dt}\right)$

or $E \propto r$

i.e., The E - r graph is a straight line passing through the origin.

For $x \ge R$: $\oint \vec{E}\cdot\overrightarrow{dl} = \frac{d\phi}{dt}$

or $E(2\pi r) = \left(\pi R^2\right)\left(\frac{dB}{dt}\right)$

i.e., $E \propto \frac{1}{r}$

or E - r graph is a rectangular hyperbola.

45.

(d) decreases finitely

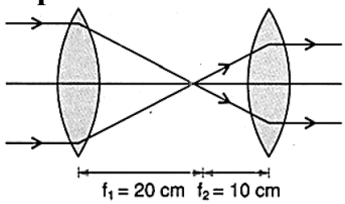
Explanation: The Q factor of series resonant circuit is given by:

$Q = \frac{\omega_r L}{R}$ ...(i)

It is evident from eqn. (i) that as R is increased, Q factor of the circuit is decreased.

46. **(a)** 30 cm

Explanation:



As shown in figure, the distance between the lenses should be 30 cm.

47.

(b) 11

Explanation: Number of images = $\frac{360^\circ}{\theta}$ - 1 (where θ is in degrees)

$\therefore\ 5 = \frac{360^\circ}{\theta} = -1$ or $\theta = \frac{360^\circ}{6} = 60^o$

New angle, $\theta' = \theta - 30^o = 60^o - 30^o = 30^o$

Number of images = $\frac{360^\circ}{30^\circ} - 1 = 11$

48.

(d) 11 Å

Explanation: $\lambda = \frac{h}{mv} = \frac{6.6 \times 10^{-34}}{9 \times 10^{-31} \times 6.6 \times 10^5}$

11×10^{-10} m = 11 Å

49.

(c) Bohr's model is applicable to all atoms.

Explanation: Bohr's model is applicable to all atoms.

50. **(a)** an alpha particle

Explanation: The mass number of X must be 238 - 234 = 4 and the atomic number of X must be 92 - 90 = 2.

CHEMISTRY (Section-A)

51.

(b) 40

Explanation: Eq. of metal oxide = Eq. of oxygen

$\frac{100}{E} = \frac{20}{8}$

$\therefore$ E = 40

52.

(c) i < iv < iii < ii

Explanation:

Shell number	Number of possible orientations of orbital in the shell	Orbital designation
3	3	i = 3p
4	3	ii = 4p
3	5	iii = 3d
4	1	iv = 4s

53.

(b) $O^{2-} > F^{-} > O > F$

Explanation: Radii are in the following order $O^{2-} > F^{-} > O > F$

O^{2-} and F^{-} are isoelectronic and O, F belong to the same period.

54.

(c) $2p_y + 2p_y$

Explanation: 2pπ - 2pπ bond is the strongest π-bond.

55.

(d) only iv

Explanation: $N_2^+ = KK\sigma 2s^2 \sigma^* 2s^2 \pi 2p_k^2 \equiv \pi 2p_v^2 \sigma 2p_x^1$

Due to presence of one unpaired electron, N_2^+ is paramagnetic.

56.

(b) $NO_3^- > NO_2^- > NO_2^+$

Explanation: B.O. $\overset{\oplus}{O} = N = O$ $\quad$ $O - \overset{\Theta}{N} = O$; $\quad$ $\overset{\Theta}{O} - N = \overset{O^{\Theta}}{O}$

$= 2.0$ $\quad$ $= 1.5$ $\quad$ $\overset{\oplus}{} = 1.33$

57.

(d) 50

Explanation: $\Delta Q = n \cdot C_p \cdot \Delta T$ ... as gas is heated at constant pressure from given data, n = 2 moles & ΔQ = 70 cal

$\therefore$ $70 = 2 \times C_p \times (35 - 30)$

$\therefore$ $C_p = 7$ cal/g mol/^oC

As $C_p - C_v = R$

$\therefore$ $C_v = C_p - R = 7 - 2 = 5$ cal/g mol/^oC

$\therefore$ as $\Delta Q = n C_v \Delta T$ ... To heat gas at constant volume

$\therefore$ $\Delta Q = 2 \times 5 \times (35 - 30) = 50$ cal

58.

(d) 0.5×10^{-15}

Explanation: pH = 9

$\therefore$ pOH = 14 - 9 = 5

$[OH^-] = 1 \times 10^{-5}$ M

$Cs(OH)_{2(s)} \rightleftharpoons Ca_{aq}^{2+} S + 2OH^- 2S = 1 \times 10^{-5} M$

Since $2S = 1 \times 10^{-5}$, $S = 0.5 \times 10^{-5}$

Now $K_{sp} = [Ca^{2+}][OH^-]^2$

$= S \times (2S)^2$

$= 0.5 \times 10^{-5} \times (1 \times 10^{-5})^2$

$= 0.5 \times 10^{-15}$

59.

(c) iii, i

Explanation: Among the properties (i) reducing, (ii) oxidizing, (iii) complexing, the set of properties shown by CN^- ion towards metal species is c, a The CN^- ion acts as ligand and reducing agent.

In $K_3[Fe(CN)_6]$ and $K_4[Fe(CN)_6]$, CN^- ion acts as complexing agent.

60.

(b) 1

Explanation: $N_2\,0 + 3H_2 \longrightarrow 2-3NH_3$

So, eq. wt of $N_2 = \frac{28}{6} = E_2$

Similarly, eq wt of $NH_3 = \frac{17}{3} = E_1$

$E_1 - E_2 = 1$

61. **(a)** Chrome alum

Explanation:

$\underbrace{K_2SO_4 \cdot Cr_2(SO_4)_3 \cdot 24H_2O}_{\text{Green coloured (Chrome alum)}}$

62.

(b) A solid silicate is formed in between by the reaction of SiO_2 of glass with NaOH

Explanation: A solid silicate is formed in between by the reaction of SiO_2 of glass with NaOH.

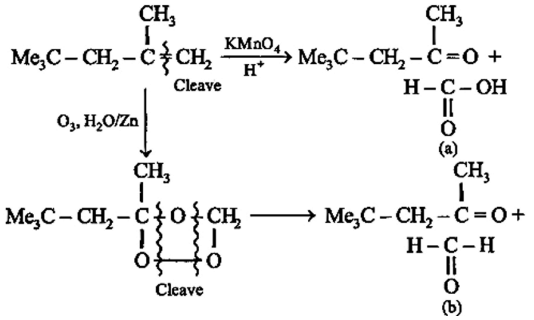
63.

(d) (b), (c) and (d)

Explanation: All sites (a, b, c, d, e) of the given molecule have lone pair on N-atoms. Higher the ease of donation of Ip of electrons of N, more favourable will be the site for protonation. Ease of donation of Ip of electrons, i.e. Lewis basicity inversely depends on the percentage of s-character in the hybridisation of 'N' which will decide the electronegativity of 'N'. At 'a' and 'e' N-atoms are sp^3 (s% = 25) hybridised, whereas at 'b', 'c' and 'd', N-atoms are sp^2 (s% = 33) hybridised. So, 'b', 'c' and 'd' are the favourable sites for protonation (H^+ is a Lewis acid, i.e. electrons acceptor).

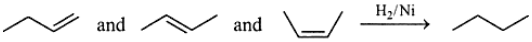
64. **(a)** $KMnO_4/H+$ and O_3, H_2O/Zn

Explanation:



65.

(c) 3

Explanation: 

66.

(d) 1.12 K

Explanation: ΔT = molality $\times K_f' \times (1 + \alpha)$

Given $\alpha = 0.2$, molality = 0.5, $K_f' = 1.86$

$\therefore \Delta T = 0.5 \times 1.2 \times 1.86 = 1.116$ K

67.

(d) manganese

Explanation: manganese

68. **(a)** create potential difference between the two electrodes

Explanation:

Fuel cell involves direct conversion of chemical energy into electrical energy.

$$\text{At anode : } \quad 2H_2(g) + 4OH^- \longrightarrow 4H_2O(l) + 4e$$

$$\text{At cathode : } O_2 + 2H_2O(l) + 4e \longrightarrow 4OH^-(aq)$$

$$H_2 + \frac{1}{2}O_2 \longrightarrow H_2O(l); \quad E° = +\text{ve.}$$

69.

(d) $\frac{K_1'}{K_1} > \frac{K_2'}{K_2}$

Explanation: More is the energy of activation, lesser is rate constant

$\left(K = Ae^{-E_a/RT}\right)$

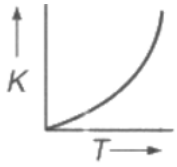
Thus since $E_a > E_a'$

$\therefore$ $K_1 < K_2$

and $K_i' < K_2'$

$\therefore$ $\frac{K_1'}{K_1} > \frac{K_2'}{K_2}$

70. **(a)**



Explanation: $K = Ae^{-E_a/RT}$ i.e., K increase exponentially, with rise in temperature.

71. **(a)** MnO_2 and KIO_3

Explanation: When MnO_2(A) is fused with alkali in presence of air then potassium manganate (B) is formed. Potassium manganate (B) is of green colour which disproportionate in a neutral or acidic solution to produce potassium permanganate (C). Potassium permanganate (C) in presence of acidic medium oxidises iodide to iodate.

The reaction can be shown as:

$$1.\ 2\overset{+4}{MnO_2}\ (A) \xrightarrow[\Delta]{4KOH,\ \overset{0}{O_2}} 2\underset{(B)\ Potassium\ manganate}{K_2\overset{+6\ -2}{MnO_4}} \quad \underset{(Gree)}{\overset{-2}{}} + 2H_2O$$

$$2.\ 3K_2\overset{+6}{MnO_4}(B) \xrightarrow{4HCl} 2\underset{(C)\ PotassiumPermanganate\ (purple)}{KMn\overset{+7}{O_4}} + MnO_2 + 2H_2O + 4KCl$$

$$3.\ 2\underset{(C)}{KMn\overset{+7}{O_4}} \xrightarrow{KI,\ H_2O} 2\underset{(A)}{\overset{+4}{MnO_2}} + 2KOH + \underset{(D)}{KIO_3}$$

Thus, A and D are MnO_2 and KIO_3 respectively.

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

Explanation:

$$\overset{Anhydrous}{CaCl_2} \xrightarrow[CaCl_2 \cdot yNH_3]{H_2O + NH_3} CaCl_2 \cdot xH_2O$$

- Cu does not react with V. dil. HNO_3
- NaH_2PO_2 = Basic

73. **(a)** conc. H_2SO_4

Explanation: In the preparation of $K_2Cr_2O_7$, sodium chromate is converted to sodium dichromate by treatment with concentrated sulphuric acid.

$2Na_2CrO_4 + H_2SO_4 \rightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$

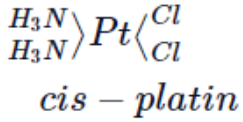
74.

(b)

cis-$[PtCl_2(NH_3)_2]$

Explanation:

A platinum complex cis-$[PtCl_2(NH_3)_2]$ known as cis-platin is used as an anticancer agent.



$cis - platin$

75.

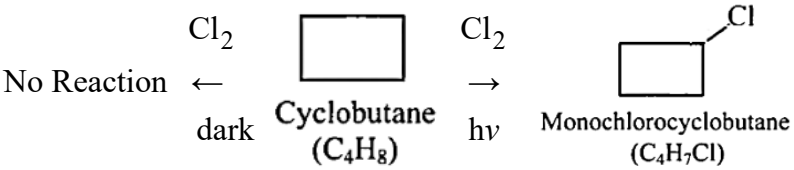
(b) Only (A)

Explanation: $[CoF_6]^{3-}$ has W.F.L. and thus, making the complex labile

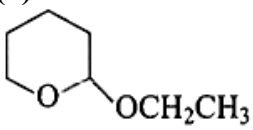
76. **(a)** Cyclobutane

Explanation:

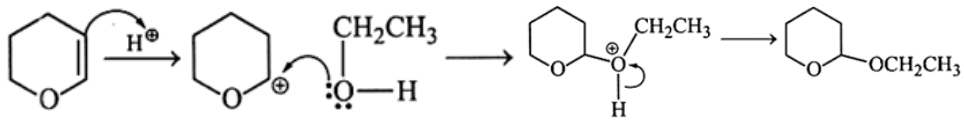
C_4H_8 can either be an alkene or a cycloalkane. Since it does not give any reaction in dark, it cannot be an alkene (as alkenes do react). Also, it gives a monochlorinated compound on its reaction with Cl_2 in diffused sunlight, that means all the 8 hydrogen atoms should be equivalent, which means that the hydrocarbon is cyclobutane.



77. **(a)**



Explanation:



78. **(a)** $(C_6H_5COO)_2Ca$ and $(CH_3COO)_2Ca$

Explanation: $(C_6H_5COO)_2Ca$ and $(CH_3COO)_2Ca$

79.

(d) $LiAlH_4$

$$LiAlH_4$$

Explanation: $CH_3CH_2 - C \equiv N \rightarrow CH_3CH_3 - CH_2 - NH_2$

$NaBH_4$ does not reduce R-CN.

80.

(c) D-Mannose

Explanation: D-Mannose

81. **(a)** Killiani synthesis

Explanation: Killiani synthesis

82.

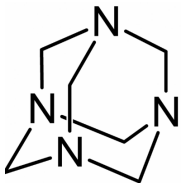
(c) Hexamethylene tetramine

Explanation: Urotropine:

Formaldehyde forms hexamethylenetetramine with ammonia.

$6HCHO + 4NH_3 Hexamethylene\ tetramine \rightarrow (CH_{12})N_4 + 6H_2O$

This is used as a urinary antiseptic in medicine, in name of 'Urotropine'.



83. **(a)** B > C > A

Explanation: The ability of metals to act as reducing agents decreases as the standard reduction potential $\left(E^o_{\text{red}}\right)$ values become more positive.

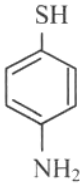
$\therefore$ The correct order is $\underset{-0.74\ V}{B} > \underset{-0.25\ V}{C} > \underset{0.80\ V}{A}$

84.

(d) NaCN and Na_2S

Explanation:

p-aminothiophenol is,



It contains N and S. Hence, sodium thiocyanate is formed. However, if Lassaigne's extract is prepared by treating the organic compound with excess sodium, thiocyanate decomposes to give cyanide and sulphide ions.

$NaSCN + 2Na \longrightarrow NaCN + Na_2S$

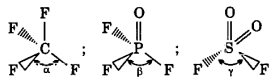
85.

(d) $MgNH_4PO_4$

Explanation: $MgNH_4PO_4$

CHEMISTRY (Section-B)

86. **(a)** $\alpha < \beta < \gamma$

Explanation: 

$\alpha < \beta < \gamma$

87. **(a)** $HAuCl_4$ - HAuCl(IV)

Explanation: $\underset{\downarrow\ +1}{H}\ \underset{\downarrow\ +3}{Au}\ \underset{\downarrow\ -1}{Cl_4} - HAu(III)Cl_4$

88.

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

Explanation: i - c, ii - d, iii - a, iv - b

89. **(a)** 19.5

Explanation: $EN_x - EN_y = 3.2 - 2.2 = 1$

$\Delta = 1$ [Δ A = difference of electronegativity values between x and y]

% ionic character = $16\ \Delta + 3.5\Delta^2 = 19.5$

90.

(c) Neutron is highly unstable particle

Explanation: Neutron in the free state immediately decomposes to proton and electron which makes

its detection very difficult outside the nucleus.

$_0^1n \rightarrow {}_1^1p + {}_{-1}^0e$

91.

(d) + 2, + 4

Explanation: + 2, + 4

92.

(d) 76.83% B and 23.17% C

Explanation: 76.83% B and 23.17% C

93. **(a)** 2.33×10^{-3} S cm^{-1}

Explanation: 2.33×10^{-3} S cm^{-1}

94.

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

Explanation: Reduction of MnO_4^- is pH dependent.

In acidic medium

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

In neutral medium

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

In basic medium

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

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

95.

(c) $3 \times 10^{-7}\ Ms^{-1}$

Explanation: Given,

Rate constant, $k = 3 \times 10^{-6} sec^{-1}$

Initial concentration, [A] = 0.10M

As we know,

Rate $= K \times [A]$

$= 3 \times 10^{-6} \times 0.1 = 3 \times 10^{-7} M sec^{-1}$

96.

(d) H_2^+

Explanation: $H_2^+ = \sigma 1s^1$ (According to molecular orbital theory)

$$\text{Band order} = \frac{\text{bonding electrons - antibonding electrons}}{2}$$

$$= \frac{1 - 0}{2} = 0.5$$

H_2^+ is paramagnetic due to the presence of one unpaired electron.

97.

(b) 2

Explanation: Statements ii and iv are correct while statements i and iii are incorrect. Bi_2O_5 is less acidic than As_2O_5. Bi_2O_3 is basic.

98.

(c) $La(OH)_3 > Y(OH)_3 > Sc(OH)_3$

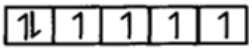
Explanation: Size = $Sc^{3+} < Y^{3+} < La^{3+}$

Ionic character = $Sc(OH)_3 < Y(OH)_3 < La(OH)_3$

Basic strength = $Sc(OH)_3 < Y(OH)_3 < La(OH)_3$

99.

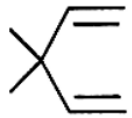
(d) 0

Explanation: Fe^{2+} : [Ar]$3d^6 4s^0$: 

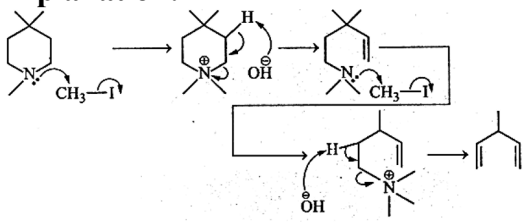
In the presence of strong field ligand, pairing occurs and there will be no unpaired electron.

100.

(c)



Explanation:



BOTANY (Section-A)

101. **(a)** Homo

Explanation: The biological name of humans is Homo sapiens where Homo is a genus name and sapiens is a species name. Hence, Homo is the genus of humans.

102.

(c) Both 2 and 3

Explanation: Non-living objects grow by increasing the body mass. Growth is exhibited by non-living objects by accumulation of material on its surface. Growth, therefore, cannot be taken as a defining property of living organisms.

103.

(c) TMV-A-RNA-B-Capsid

Explanation: The given diagram represents Tobacco Mosaic Virus (TMV).
A represents RNA and B represents the capsid.

104.

(d) Cell wall structure

Explanation: Archaebacteria are special since they live in some of the most harsh habitats such as extreme salty areas (halophiles), hot springs (thermoacidophiles), and marshy areas (methanogens). Archaebacteria differ from other bacteria in having a different cell wall structure and this feature is responsible for their survival in extreme conditions.

105. **(a)** Radicle, plumule and cotyledons only

Explanation: Dicot embryo consists of the radicle, plumule, cotyledons, and sometimes endosperm. Radicles develop into roots, plumule develops into shoot and cotyledons will help in providing nourishment to the growing embryo.

106.

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

Explanation: The given match i.e. a-(iii), b-(i), c-(iv), d-(v), e-(ii) is correct.

107.

(b) Heterospory

Explanation: In the heterosporous species, the development of the zygotes into young embryos takes place within the female gametophytes. This event is a precursor to the seed habit.

108.

(b) A-Antipodals; B-Polar nuclei; C-Central cell; D-Egg; E-Synergids; F-Filifonn apparatus

Explanation: Three cells grouped together at the micropylar end constitute the egg apparatus which, in turn, consists of two synergies (labelled as E) and one egg cell (labelled as D). The special cellular thickenings at the micropylar tip of synergies is the filiform apparatus (labelled as F). Antipodals (labelled as A) are the three cells which are at the chalazal end. The large central cell (labelled as C) has two polar nuclei (labelled as B).

109.

(c) microsporophylls

Explanation: Microsporophylls are the leaf-like structures that bear the microsporangia and stamens of the angiosperms bear the microsporangia in their anthers these represent the modified microsporophylls.

110.

(b) Silk cotton

Explanation: In palmately compound leaves, the leaflets are attached at a common point, i.e. at the tip of the petiole, as in silk cotton (Bombax) and Cannabis.

111.

(b) Plum

Explanation: If the ovary is located in the center and other parts are located on the rim of the thalamus, such type of flower is called perigynous. The ovary is half inferior. Plum has half inferior ovary.

112.

(d) Dicot root

Explanation: In Dicot root vascular bundles are diarch to hexarch (Based on the number of xylem arch).

113.

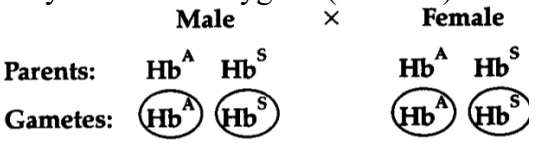
(c) Starch synthesis in pea : Multiple alleles

Explanation: Starch synthesis in pea : Multiple alleles

114.

(d) 25%

Explanation: Sickle cell anemia is an example of auto-somal recessive disorder. It is caused due to frameshift mutation, which leads to the replacement of valine in the place of glutamic acid. It is transmitted from parent to offspring when both the partners are heterozygous carriers. It is expressed only in the homozygous (Hb^SHb^S) individuals that are about only 25%.



♀ \ ♂	Hb^A	Hb^S
Hb^A	Hb^AHb^A Normal	Hb^AHb^S Carrier
Hb^S	Hb^AHb^S Carrier	Hb^SHb^S Sickle cell

Normal: 25%
Carriers: 50%
Sickle cell: 25%

115.

(b) A - Amino acid binding site, B - T ΨC loop, C - Anticodon loop, D - DHU loop

Explanation: tRNA or transfer RNA is a single-stranded molecule and takes the shape of a clover leaf. In the process of translation, tRNA brings amino acid and reads the genetic code and acts as an adapter molecule. In the given structure of tRNA, the labels A, B, C, and D are amino acid binding site (amino acid binding site), T ΨC loop, anticodon loop (codon recognition site), and DHU loop(amino acid recognition site), respectively.

116.

(c) Central dogma and Codon

Explanation: Central dogma and Codon

117.

(c) Lysosomes and Vacuoles

Explanation: Lysosomes and Vacuoles do not have DNA.

118. **(a)** Single-stranded
Explanation: Plasmid DNA is small, circular, and double-stranded instead of Single-stranded.

119. **(b)** autoimmunity
Explanation: Autoimmunity is the failure of an organism in recognising its own constituent parts as self, which allows an immune response against its own cells and tissues.

120. **(d)** Erythroxylum
Explanation: Cocaine is obtained from the coca plant, *Erythroxylum coca*.

121. **(d)** prophase
Explanation: The mitotic spindle forms and the nuclear membrane disperses during prophase.

122. **(b)** S-shaped
Explanation: In an area where a population with large size individuals having a long life span, more parental care and slow development, the type of population growth curve will be S-shaped. called the sigmoid curve.
This type of growth curve represents that on introduction to a new area, the population grows slowly at the beginning followed by a sharp exponential increase in the growth rate which is further followed by the stationary growth phase where the population is maintained at the constant level. This shows that once a population achieves a maximum value it becomes stable where the growth rate is equal to the death rate.

123. **(d)** humification
Explanation: The process of 'humification' can occur naturally in soil or in the production of compost. It leads to accumulation of nutrient rich dark amorphous substance called humus.

124. **(b)** Jatropha
Explanation: Jatropha oil is a vegetable oil produced from the seeds of Jatropha. This oil can be processed to produce a high quality biodiesel that can be used in a standard diesel car.

125. **(c)** Rice
Explanation: India has 6,000 species variety of rice. Hence, rice has the largest species variety or diversity in India.

126. **(b)** Both Pavo and Choriotes
Explanation: Both Pavo and Choriotes

127. **(b)** Bengal tiger and white rumped vulture
Explanation: These include the Asiatic lion, the Bengal tiger, the snow leopard, and the Indian white-rumped vulture, which, by ingesting the carrion of diclofenac-laced cattle, nearly went extinct.

128. **(c)** M phase
Explanation: In the M (mitosis) phase the chromosomes are in a highly condensed state with DNA tightly wrapped around histones. In this state DNA cannot be transcribed. The rest of the cell cycle - G_1, S, and G_2 phases-constitute interphase. In interphase, the chromosomes exist in a looser, more extended form. In this form DNA is transcribed to messenger RNA and protein synthesis takes place, and, in Sphase only, DNA can be replicated.

129. **(d)** Metaphase
Explanation: Metaphase is a stage in the cell cycle where all the genetic material is condensing into chromosomes. These chromosomes then become visible. It is the stage in which the nuclear envelope

disappears completely so that the nucleoplasm comes in contact with the cytoplasm. Chromosomes are arranged at the equator and form a sort of metaphase plate.

130. **(a)** All of these
Explanation: All of these

131.
(d) Spongy mesophyll
Explanation: C_4 pathway is called so because it is found in C_4 plants. It is a cyclic process. It is also known as a Hatch-Slack pathway. In C_4 pathway, initial carbon dioxide fixation occurs in chloroplasts of mesophyll because primary CO_2 acceptor phosphoenolpyruvate (PEP) is present in the mesophyll. PEP (phosphoenolpyruvate) is a three-carbon molecule. The enzyme that catalyzes this CO_2 fixation is PEP carboxylase or PEPcase. The mesophyll cells of C_4 plants lack the enzyme RuBisCO. The 4-carbon oxaloacetic acid (OAA) is formed in the mesophyll cells which is further converted into the malic acid or aspartic acid and then transported into bundle sheath cells. In the bundle sheath cells, these C_4 acids are broken down to release CO_2 and a three-carbon molecule.

132.
(d) Statement (b) is correct.
Explanation: Absorption and action spectra, together, show the wavelengths at which there is maximum absorption by chlorophyll a (in the blue and the red regions), higher rate of photosynthesis occurs.

133.
(b) Statement (d) is correct.
Explanation: Photorespiration is a wasteful process as there is loss of photosynthetically fixed carbon and no energy rich compounds are formed. Photorespiration does not occur in C4 plants. C4 plants are photosynthetically efficient than C3 plants.

134. **(a)** All of these
Explanation: Trees release oxygen when they use energy from sunlight to make glucose from carbon dioxide and water. A glucose molecule contains six carbon atoms, so that's a net gain of one molecule of oxygen for every atom of carbon added to the tree.

135.
(c) Delay senescence of fruits
Explanation: Gibberellins do not induce dormancy. Instead, they are used for breaking seed and bud dormancy.

BOTANY (Section-B)

136.
(b) Mangifera indica
Explanation: The biological Name of Mango is *Mangifera indica.*

137. **(a)** Diatoms
Explanation: Diatoms are microscopic and float passively in water currents (plankton). Diatoms are the chief ‘producers’ in the oceans.

138.
(d) Both Gelidium and Gracilaria
Explanation: Agar, one of the commercial products obtained from Gelidium and Gracilaria are used to grow microbes and in preparations of ice-creams and jellies. Gelidium and Gracilaria are some of the ecologically important algae.

139.
(d) In which pollen grains are present in mass
Explanation: In which pollen grains are present in mass

140.
(b) Peach
Explanation: In flowers of rose, peach, plum, etc., the gynoecium is situated in the centre and other parts of the flower are located on the rim of the thalamus almost at the same level. The ovary is said to be half inferior

141.

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

Explanation: Haplodiploidy is a sex determination system in which males develop from unfertilised eggs and are haploid, and females develop from fertilised eggs and are diploid.

142.

(c) Nitrogenous base + Sugar

Explanation: Nitrogenous base + Sugar

143.

(b) All of these

Explanation: All of these

- Acetocarmine used for staining chromosomes, it gives pink colour.
- Hemotoxyline is used for staining nuclei , it gives violet color.
- Feulgen's stain is used for DNA .,It gives purple or red colour.

144.

(b) Spergillus niger

Explanation: Spergillus niger

145.

(b) Oxidizing substrates of TCA cycle

Explanation: Oxidizing substrates of TCA cycle

146.

(c) Terramycin

Explanation: Terramycin

147. **(a)** (A)-biomass; (B)-marine

Explanation: An inverted pyramid of biomass may occasionally be observed in marine communities.

148. **(a)** Respiration

Explanation: Ethylene enhances the respiration rate during the ripening of the fruits. This rise in the rate of respiration is called respiratory climactic.

149. **(a)** Gibberellic acid - Leaf fall

Explanation: Gibberellic acid is a simple weakly acidic plant growth hormone which promotes cell elongation of both leaves and stems in general and internodal length of genetically dwarf plants in particular. It is in general a growth promoting hormone and does not inhibit growth. So leaf abscission is not associated with gibberellic acid but with abscisic acid.

150.

(c) Formation of oxaloacetate by carboxylation of phosphoenol pyruvate (PEP) in the mesophyll cells

Explanation: The C_4 acid OAA is formed in the mesophyll cells. It then forms other 4-carbon compounds like malic acid or aspartic acid in the mesophyll cells itself, which are transported to the bundle sheath cells. In the bundle sheath cells, these C_4 acids are broken down to release CO_2 and a 3-carbon molecule. The 3-carbon molecule is transported back to the mesophyll where it is converted to PEP again, thus, completing the cycle.

ZOOLOGY (Section-A)

151.

(c) Tse-tse fly

Explanation: The vector host for sleeping sickness is Tse-tse fly which is a blood sucking insect and transmits disease to animals and man.

152.

(b) Pharyngeal gill slits, at least in the developmental stages

Explanation: Amphioxus, frog, sea horse, and crocodile, all animals mentioned are Chordates which have paired pharyngeal gill slits in some of the developmental stages.

153.

(d) Both Reptiles and Fishes

Explanation: Chondrichthyes have placoid scales. Osteichthyes have cycloid/ctenoid scales. Reptiles have epidermal scales or scutes. Hence, both reptiles and fishes have scales on their skin.

154.

(d) tendons

Explanation: Tendon is a fibrous connective tissue having a great strength, but the flexibility of its cells is limited. It does not contain nervous tissue but connects muscles to bones.

155. **(c)** Legs of cockroach
Explanation: Amoeba has a false leg known as pseudopodia which serves two important functions, locomotion and food capture. Hence, the pseudopodia of Amoeba is similar to the legs of a cockroach.

156. **(c)** % Hb saturation
Explanation: O_2 dissociation curve is plotted between pO_2 and %Hb saturation. This curve is an important tool for understanding how our blood carries and releases oxygen.

157. **(b)** Medulla region of the brain
Explanation: Medulla region of the brain

158. **(a)** 1500 mL
Explanation: Tidal Volume = 500 ml
Expiratory Reserve Volume = 1000 ml
Expiratory Capacity = TV + ERV
= 500 + 1000
= 1500 ml

159. **(b)** Statement (a) is correct.
Explanation: Haemoglobinic acid is very weak acid which is formed inside the red blood cells when the hydrogen ions produced by the dissociation of carbonic acid combine with haemoglobin.

160. **(d)** Acts as a reserve during muscular exercise
Explanation: A large proportion of oxygen remains unused in the human blood even after its uptake by the body tissues. This O_2 acts as a reserve during muscular exercise.

161. **(d)** Blastula
Explanation: The blastula is usually a spherical layer of cells (the blastoderm) surrounding a fluid-filled or yolk-filled cavity (the blastocoel). Hence, blastocoel is formed in the blastula stage.

162. **(d)** Luteal
Explanation: Luteal

163. **(a)** begins new cycle.
Explanation: In the absence of fertilisation, the corpus luteum degenerates. This causes disintegration of the endometrium leading to menstruation, marking a new cycle.

164. **(b)** Vasectomy - Prevents spermatogenesis
Explanation: Vasectomy is a surgical method in males

165. **(d)** All of these
Explanation: All of these

166. **(d)** Recapitulation theory
Explanation: Recapitulation theory

167. **(c)** molecular homology
Explanation: Molecular evolution is a change in the sequence composition of cellular molecules to explain biological changes at the molecular and cellular level using principle of evolutionary biology and population genetics.

168. **(a)** CO_2 and H_2O
Explanation: Lung is a primary organ of respiration in humans. It facilitates gaseous exchange where

oxygen is taken in whereas carbon dioxide is given out. Therefore, lungs help in expelling or eliminating carbon dioxide which is a waste substance for the body. Along with carbon dioxide, the lungs also give out water in the form of water vapour. The lungs eliminate around 18 L of carbon dioxide per hour and 400 mL of water as vapour per day.

169. **(c)** renal cortex
Explanation: Glomerular capsule and convoluted tubules always lie within the renal cortex. The renal cortex is the outer part of the kidney. The renal cortex is surrounded on its outer edges by the renal capsule, a layer of fatty tissue. Together, the renal cortex and capsule house and protect the inner structures of the kidney.

170. **(d)** Urea, glucose, salts, and water
Explanation: Water and many dissolved substances from blood are filtered into the lumen of the Bowman's capsule through glomerular filtration. The glomerular filtrate contains a large amount of water and organic substances like urea, glucose, amino acids and vitamins. It does not contain proteins and fats.

171. **(b)** All of the these
Explanation: The vertebral column protects the spinal cord, supports the bead and serve as a point of attachment for ribs and musculature of back. Sternum is a flat bone on the vertebral midline of thorax.

172. **(b)** 7
Explanation: 7

173. **(b)** Genetic disorder
Explanation: Muscular dystrophy: Progressive degeneration of skeletal muscle mostly due to a genetic disorder.

174. **(a)** Iter
Explanation: Ill and IV ventricles remain connected by iter, that is, the iter lies between the third and the fourth ventricles.

175. **(a)** Gamma-amino butyric acid
Explanation: Gamma-amino butyric acid

176. **(b)** Cerebrum
Explanation: If a person has lost his memory in an accident, his cerebrum might have injured. The cerebrum is the largest part of the human brain, associated with the higher brain function such as intelligence, thinking, memory, and other mental abilities.

177. **(c)** (3) and (4) are correct
Explanation: Haemodialysis removes waste, salt, and extra water to prevent them from building up in the body. It keeps a safe level of certain chemicals in our blood such as potassium, sodium and bicarbonate helping to control blood pressure. Also, there will be reduced absorption of calcium ions from the gastrointestinal tract. It reduce the production of RBC due to the deficiency of erythropoietin.

178. **(b)** Honeybee
Explanation: Honeybee

179. **(b)** All of these
Explanation: Low levels of carbon dioxide in the blood cause low levels of hydrogen ions in the brain, leading to a decrease in the rate and depth of pulmonary ventilation. Alcohol causes a temporary increase in the heart rate and blood pressure. Adrenaline makes the heart beat faster, increases blood flow to the brain and muscles.

180.
(b) SA node → AV node → Bundle of His → Purkinje fibres → Heart muscles
Explanation: SA node → AV node → Bundle of His → Purkinje fibres → Heart muscles

181.
(d) Earthworm
Explanation: Earthworm

182.
(d) Algae - Methylase
Explanation: Algae - Methylase

183.
(b) shortest fragments of DNA.
Explanation: Migration through the electrophoresis gel is a function of the size of the DNA fragments, with small fragments moving farthest as they are able to "squeeze" through the gel matrix more easily.

184.
(d) DNA in all of its cells
Explanation: Transgenic animals are those, which have foreign DNA in all of its cells.

185. **(a)** Root
Explanation: Meloidogyne incognita is a nematode which infects the roots of the tobacco plants and causes a great reduction in the yield.

ZOOLOGY (Section-B)

186.
(d) Oviparity
Explanation: In Aschelminthes, sexes are separate, that is, they are dioecious where males and females are distinct.

187. **(a)** Connective tissues
Explanation: Histamine, involved in allergic and inflammatory reactions, is secreted by mast cells that are found in connective tissue. They are small oval cells having abundant large granules in the cytoplasm.

188.
(b) Birds
Explanation: Birds

189.
(b) Emphysema
Explanation: Emphysema is an inflation or abnormal distension of the bronchioles or alveolar sacs of the lungs. Many of the septa between the alveoli are destroyed and much of the elastic tissue of the lungs is replaced by connective tissue.

190.
(b) 1-Mammary alveolus, 2-Ampulla, 3-Areola
Explanation: 1-Mammary alveolus, 2-Ampulla, 3-Areola

191.
(d) All of these
Explanation: IUDs are inserted by trained doctors or expert nurses in the uterus through vagina and they are ideal contraceptives for the females who want to delay pregnancy and/or space children. Itis one of most widely accepted methods of contraception in India. These IUDs are presently available as the non-medicated IUDs, copper releasing IUDs, and the hormone releasing IUDs.

192.
(d) Molecular evidences
Explanation: At the cellular and molecular level, living things are remarkably similar to each other. These fundamental similarities are most easily explained by evolutionary theory: life shares a common ancestor. Such evidences are called molecular evidences. Palaeontological evidences are the evidences from the study of fossils of ancient animals and plants preserved in rocks. Biogeography is concerned with the origins and evolutionary histories of species on a long time scale, and also with the current interactions of species with their environments and each other on a much shorter time scale.

193.

(d) Plasma minus blood protein

Explanation: The blood in the glomerulus is filtered through minutes pores called filtration slits present in the wall of Bowman's capsule. This phenomenon is called glomerular filtration and the filtrate is called as glomerular filtrate. The relatively larger molecules like blood proteins cannot pass through the minute pores hence ultrafiltration. The filtrate is collected by the cavity of Bowman's capsule and passed to the tubule. Hence liquid which collects in the cavity of Bowman's capsule is plasma minus blood proteins.

So, the correct answer is 'Plasma minus blood proteins'.

194.

(b) 1-Relaxed, 2-Maximally contracted, 3-Contracting

Explanation: 1-Relaxed, 2-Maximally contracted, 3-Contracting

195.

(b) neither sensory nor motor areas.

Explanation: The cerebral cortex contains motor areas, sensory areas and large regions that are neither clearly sensory nor motor in function. These regions are called as the association areas. These are responsible for complex functions like intersensory associations, memory and communication.

196.

(b) vasopressin.

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

197.

(b) Diabetes mellitus

Explanation: Diabetes mellitus

198.

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

Explanation: Systemic circulation is the movement of the blood between heart and rest of the body (tissues) and the back to the heart. The oxygenated blood moves from the left auricle into the left ventricle. From here the blood moves into the aorta which ultimately divides into arteries that carry oxygenated blood to various tissues in the body. From the tissues deoxygenated blood is carried by the veins into the right atrium via superior vena cava and inferior vena cava.

199.

(d) Single-stranded

Explanation: A plasmid is a small, circular double-stranded DNA molecule that is separate from the main chromosome. It is found in bacteria and some yeast.

200.

(d) Louis Pasteur

Explanation: Louis Pasteur