NEET (UG) 2024

SAMPLE PAPER - 2

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. Which of the following physical quantities is/are dimensionless? **[4]**

   a) Strain b) Angle

   c) Specific gravity d) All of these

2. The dimensions of light year are: **[4]**

   a) [T] b) [L]

   c) $[T^{-1}]$ d) $[L^{-1}]$

3. A body travels 200 cm in the first two seconds and 220 cm in the next 4 sec with deceleration. The velocity of the body at the end of the 7th second is: **[4]**

   a) 20 cm/s b) 15 cm/s

   c) 10 cm/s d) 5 cm/s

4. A force of $(3\hat{i} + 4\hat{j})$ newton acts on a body and displaces it by $(3\hat{i} + 4\hat{j})$ metres. The **[4]**

   work done by the force is:

   a) 10 J b) 16 J

   c) 12 J d) 25 J

5. The angle between the vectors A and B is θ. The value of the triple product $A \cdot (B \times A)$ **[4]**

   is

   a) Zero

b) A^2B

c) $A^2B\cos\theta$

d) $A^2B\sin\theta$

6. Tyres are made circular because: **[4]**

a) they face less friction

b) they look beautiful

c) they can be inflated

d) they require less material

7. Force acting on a particle moving in a straight line varies with the velocity of the particle v as $F = \frac{K}{v}$, where K is a constant. The work done by this force in time t is **[4]**

a) 2Kt

b) $\frac{2K}{v^2}t$

c) Kt

d) $\frac{K}{v^2}t$

8. A nucleus of uranium decays at rest into nuclei of thorium and helium. Then **[4]**

a) The helium nucleus has less kinetic energy than the thorium nucleus.

b) The helium nucleus has more momentum than the thorium nucleus.

c) The helium has more kinetic energy than the thorium nucleus.

d) The helium nucleus has less momentum than the thorium nucleus.

9. The acceleration of the centre of mass of a uniform solid disc rolling down an inclined plane of angle $'\alpha'$ is: **[4]**

a) $\frac{1}{2}g\sin\alpha$

b) $\frac{1}{3}g\sin\alpha$

c) g sin α

d) $\frac{2}{3}g\sin\alpha$

10. Total angular momentum of a rotating body remains constant, if the net torque acting on the body is: **[4]**

a) zero

b) minimum

c) maximum

d) unity

11. The mass of moon is $\left(\frac{1}{81}\right)^{th}$ of mass of earth and g on moon is $\left(\frac{1}{6}\right)^{th}$ of g on earth. **[4]**

The ratio of moon to earth radii is

a) $\frac{6}{81}$

b) $\frac{81}{6}$

c) $\sqrt{\frac{2}{48}}$

d) $\sqrt{\frac{2}{27}}$

12. Two blocks of masses 2 kg and 3 kg are connected by a metal wire going over a smooth pulley. The breaking stress of the metal is $(\frac{120}{5\pi}) \times 10^6$ Nm^{-2}. If g = 10 ms^{-1}, then the minimum radius of the wire used if it is not to break is: **[4]**

a) 3 mm

b) 1 mm

c) 1.5 mm

d) 0.5 mm

13. A thin copper wire of length L increases in length by 1% when heated from 0° C to 100° C. If a thin copper plate of area 2L × L is heated from 0° C to 100° C, the percentage increase in its area will be: **[4]**

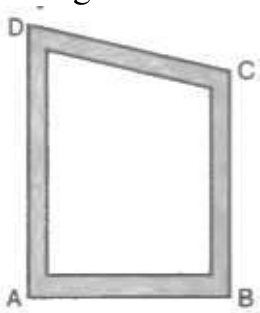
a) 4%

b) 3%

c) 2%

d) 1%

14. Water is enclosed in the glass tube ABCD and is warmed at A with a burner as shown in the figure. Which one of the following is correct? The water: **[4]**



a) circulates in a clockwise direction.

b) circulates in both directions simultaneously.

c) does not circulate at all.

d) circulates in anticlockwise direction.

15. An ideal monoatomic gas at 27 °C is compressed adiabatically to $\frac{8}{27}$ times of its present volume. The increase in temperature of the gas is: **[4]**

a) 375°C

b) 175°C

c) 402°C

d) 475°C

16. Consider a gas with density ρ and $\bar{c}$ as the root mean square velocity of its molecules contained in a volume. If the system moves as a whole with velocity v, Then the pressure exerted by the gas is: **[4]**

a) $\frac{1}{3}\rho(\bar{c}+v)^2$

b) $\frac{1}{3}\rho\left(\bar{c}^2-v\right)^2$

c) $\frac{1}{3}\rho\bar{c}^2$

d) $\frac{1}{3}\rho(\bar{c}-v)^2$

17. Which of the following is not simple harmonic function? **[4]**

a) $y = 1 - 2\sin^2 \omega t$

b) $y = a \sin 2\omega t + b \cos 2\omega t$

c) $y = a \sin 2\omega t + b \cos \omega t$

d) $y = \sqrt{a^2 + b^2}\,(\sin \omega t \cos \omega t)$

18. An organ pipe closed at one end has fundamental frequency 1500 Hz. The maximum number of overtones generated by this pipe which a normal person can hear is: **[4]**

a) 13

b) 14

c) 6

d) 9

19. A glass tube of length 1.5 m is filled completely with water. The water can be drained out slowly at the bottom of the tube. The total number of resonances obtained, when a tuning fork of frequency 606 Hz is put at the upper open end of the tube, will be (speed of sound is 340 metre/second): **[4]**

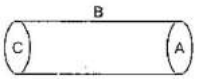
a) 7

b) 4

c) 1

d) 5

20. A hollow cylinder has a charge q coulomb within it. If ϕ is the electric flux in units of V-m associated with the curved surface B, the flux linked with the plane surface A in unit of V-m will be: **[4]**



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

b) $\frac{q}{\varepsilon_0} - \phi$

c) $\frac{1}{2}\left(\frac{q}{\varepsilon_0} - \phi\right)$

d) $\frac{q}{2\varepsilon_0}$

21. If a conductor has a potential zero and there are no charges anywhere else outside, then: **[4]**

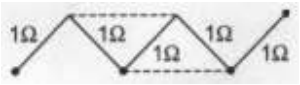
a) both there must be charges on the surface or inside itself and there cannot be any charge in the body of the conductor

b) there cannot be any charge in the body of the conductor

c) there must be charges on the surface or inside itself

d) there must be charges only on the surface

22. A circuit consists of five identical conductors as shown in the adjoining figure. The two similar conductors are added as indicated by the dotted lines. The ratio of resistances before and after addition will be: **[4]**



a) 6 ($\frac{-}{5}$)

b) 7 ($\frac{-}{5}$)

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

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

23. A current is passed through a straight wire. The magnetic field established around it has its lines of force **[4]**

i. circular and endless

ii. oval in shape and endless

iii. straight

iv. all are true

a) iii and iv

b) iv and i

c) ii and iii

d) only i

24. Two straight horizontal parallel wires are carrying the same current in the same direction; d is the distance between the wires. You are provided with a small freely suspended magnetic needle. At which of the following positions will the orientation of the needle be independent of the magnitude of the current in the wires **[4]**

a) Anywhere on the circumference of a vertical circle of radius d and centre halfway between the wires

b) At a distance $\frac{d}{2}$ from any of the wires in the horizontal plane

c) At a distance $\frac{d}{2}$ from any of the wires

d) At points halfway between the wires in the horizontal plane

25. The magnetic induction at a point on the axis of a magnet is proportional to: **[4]**

a) r^{-3}

b) r

c) r^{-2}

d) r^{3}

26. A varying magnetic flux linking a coil is given by: $\phi = xt^2$. If at a time t = 3 s, the emf induced is 9 V, then the value of X is: **[4]**

a) $-0.66\ wbs^{-2}$

b) $-1.5\ wbs^{-2}$

c) $1.5\ wbs^{-2}$

d) $0.66\ wbs^{-2}$

27. A capacitor C is charged by a battery of emf V_0 volt. The battery is then disconnected and a pure inductor of L henry is connected across it so that LC oscillations are set up. Then, the value of the maximum current in the inductor coil is: **[4]**

a) $V_0\sqrt{\frac{L}{C}}$

b) $\frac{V_0}{\sqrt{LC}}$

c) $V_0\sqrt{LC}$

d) $V_0\sqrt{\frac{C}{L}}$

28. A transformer rated at 10 kW is used to connect a 5 kV transmission line to a 240 V circuit. The ratio of turns in the windings of the transformer is: **[4]**

a) 104

b) 40

c) 20.8

d) 5

29. The electric field of an electromagnetic wave in free space is given by $\vec{E} = 10\cos(10^7 t + kx)\hat{j}$ V/m where t and X are in seconds and meters respectively. It can be inferred that: **[4]**

i. the wavelength λ is 188.4 m

ii. the wave number k is 0.33 rad/m

iii. the wave amplitude is 10 V/m

iv. the wave is propagating along +x direction

Which one of the following pairs of statements is correct?

a) ii and iv

b) i and iii

c) i and ii

d) ii and iii

30. The nearer point of the hypermetropic eye is 40 cm. The lens to be used for its correction should have the power: **[4]**

a) +1.5 D

b) +2.5 D

c) +0.5 D

d) -1.5 D

31. In Young's double-slit experiment the separation d between the slits is 2 mm, the wavelength λ of the light used is 5896 A^{o} and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.20^{o}. To increase the fringe angular width to 0.21^{o} (with same λ and D) the separation between the slits needs to be changed to: **[4]**

a) 1.7 mm

b) 1.8 mm

c) 2.1 mm

d) 1.9 mm

32. Light of wavelength 0.6 μm from a sodium lamp falls on a photocell and causes the emission of photoelectrons for which the stopping potential is 0.5 volt. With light of wavelength 0.40 μm from a mercury vapour lamp the stopping potential is 1.5 volt; then the value of h/e is: **[4]**

a) 4×10^{-15} V-s

b) 4×10^{-8} V-s

c) 0.25×10^{15} V-s

d) 4×10^{-59} V-s

33. In photoelectric effect, the number of photoelectrons emitted is proportional to: **[4]**

a) intensity of incident beam

b) velocity of incident beam

c) frequency of incident beam

d) work function of photo cathode

34. Consider a spectral line resulting from the transition n = 5 to n = 1 in the atoms and ions given below. The shortest wavelength is produced by: **[4]**

a) singly ionised helium

b) deuterium atom

c) ten times ionised sodium atom

d) helium atom

35. Mass spectrometric analysis of potassium and argon atoms in a Moon rock sample shows that the ratio of the number of (stable) ^{40}Ar atoms present to the number of (radioactive) ^{40}K atoms is 10.3. Assume that all the argon atoms were produced by the decay of potassium atoms, with a half-life of 1.25×10^{9} yr. How old is the rock? **[4]**

a) 2.95×10^{9} yr

b) 2.95×10^{11} yr

c) 4.37×10^{11} yr

d) 4.37×10^{9} yr

PHYSICS (Section-B)

Attempt any 10 questions

36. A pump is required to lift 1000 kg of water per minute from a well of depth 10 m and eject it with a speed of 10 ms^{-1}. The horse-power of the engine needed is: (Assume g = 10 m/sec^2) **[4]**

a) 5.35

b) 4.33

c) 2.35

d) 3.33

37. A cracker is thrown into air with a velocity of 10 m/s at an angle of 45° with the vertical. When it is at a height of (1/2)m from the ground, it explodes into a number of pieces which follow different parabolic paths. What is the velocity of centre of mass, what is the minimum velocity of the centre of mass in its path? (g = 10 m s^{-2}) **[4]**

a) $5\sqrt{2} ms^{-1}$

b) $10\sqrt{2} ms^{-1}$

c) $5\ ms^{-1}$ d) $10\ ms^{-1}$

38. Two identical spheres of radius R made of the same material are kept at a distance d apart. Then the gravitational attraction between them is proportional to: **[4]**

a) d^4 b) d^{-2}

c) d^2 d) d

39. A circular hole is made in a steel square plate. The plate is now heated and allowed to expand. Which of the following statements is correct? **[4]**

a) Nothing can be said about change in radius of the hole because ratio of initial radius of hole to initial dimension of the plate is not known.

b) Radius of the hole will remain constant

c) Radius of the hole starts to decrease

d) Radius to the hole starts to increase

40. If the intensity ratio of the two waves is 4:1, the ratio of their amplitudes is: **[4]**

a) 4:1 b) 1:4

c) 2:1 d) 1:2

41. A standing wave is formed on a string fixed at both the ends. The individual waves, i.e., the incident wave and reflected waves are **[4]**
y_1 (x, t) = a sin (kx - ωt)

and y_2 (x, t) = a sin (kx - ωt) respectively. The two waves have same wavelength λ.

The position of nodes is given as:

a) $x = \frac{(2n+1)\lambda}{2}$, n = 0, 1, 2, 3 .....

b) $x = n\lambda$, n = 0, 1, 2, 3 .....

c) $x = \frac{n\lambda}{2}$, n = 0, 1, 2, 3, ...

d) $x = (2n + 1)\lambda$, n = 0, 1, 2, 3 .....

42. A magnet of total magnetic moment $10^{-2}\hat{i}$ A-m^2 is placed in a time varying magnetic field, $B\hat{i}(\cos\omega t)$, where B = 1T and ω = 0.125 rad/s. The work done for reversing the direction of the magnetic moment at t = 1s is **[4]**

a) 0.014 J
b) 0.01 J
c) 0.028 J
d) 0.007 J

43. A wheel having metal spokes of 1 m long between its axle and the rim is rotating in a magnetic field of flux density 5×10^{-5} T normal to the plane of the wheel. An emf of $\frac{22}{7}$ mV is produced between the rim and the axle of the wheel. The rate of rotation of the wheel in radians per second is: **[4]**

a) 10
b) 40
c) 30
d) 20

44. A loop of wire is placed in a magnetic field $\vec{B} = 0.02\hat{i}$ T. Then the flux through the loop if its area vector $\vec{A} = 30\hat{i} + 16\hat{j} + 23\hat{k}$ cm^2 is: **[4]**

a) 30 μWb
b) 46 μWb
c) 138 μWb
d) 60 μWb

45. The power dissipated in an AC circuit is zero if the circuit is: **[4]**

a) either purely inductive or purely capacitive
b) purely capacitive only
c) purely inductive only
d) purely resistive

46. A beam of light composed of red and green rays is incident obliquely at a point on the face of rectangular glass slab. When coming out on the opposite parallel face, the red and green rays emerge from: **[4]**

a) one point propagating in the same directions

b) two points propagating in two different non-parallel directions

c) one point propagating in two different directions

d) two points propagating in two different parallel directions

47. An astronomical telescope having an objective of focal length 100 cm is focussed on the moon. Find the distance through which the eye-piece should be pulled back to focus an object situated at a distance 80 m from the objective. **[4]**

a) $\frac{10}{79}$ cm

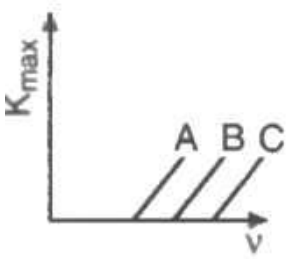
b) $\frac{8000}{79}$ cm

c) $\frac{100}{79}$ cm

d) $\frac{1000}{79}$ cm

48. For three different metals A, B, C photo-emission is observed one by one. The graph of maximum kinetic energy versus frequency of incident radiation are sketched as : **[4]**

a)



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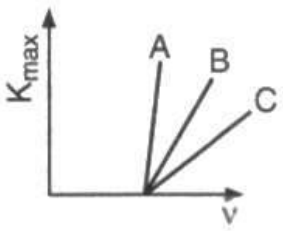
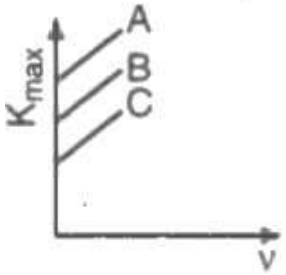
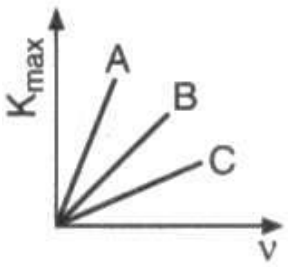


c)



d)



49. E_n and J_n denote the total energy magnitude and the angular momentum‘of an electron in the nth allowed orbit of a Bohr atom. Then: **[4]**

a) $E_n \propto \frac{1}{J_n^2}$

b) $E_n \propto J_n^2$

c) $E_n \propto J_n$

d) $E_n \propto \frac{1}{J_n}$

50. A sample of radioactive material A, that has an activity of 10 mCi (1 Ci = 3.7×10^{10} decays/s) has twice the number of nuclei as another sample of a different radioactive material B which has an activity of 20 mCi. The correct choices for half-lives of A and B would then be respectively **[4]**

a) 20 days and 5 days

b) 5 days and 10 days

c) 20 days and 10 days

d) 10 days and 40 days

CHEMISTRY (Section-A)

51. Excess of NaOH (aq) was added to 100 mL of $FeCl_3$ (aq) resulting into 2.14 g of $Fe(OH)_3$. The molarity of $FeCl_3$ (aq) is: **[4]**

a) 0.3 M

b) 0.6 M

c) 1.8 M

d) 0.2 M

52. An electron is continuously accelerated in vacuum tube under applied potential difference. Calculate the change in kinetic energy if de Broglie wavelength is decreased by 2%. **[4]**

a) 3%

b) 1%

c) 2%

d) 4%

53. Decreasing order of size of ions is: **[4]**

a) $Br^- > Cl^- > S^{2-} > N^{3-}$

b) $Br^- > S^{2-} > Cl^- > N^{3-}$

c) $N^{3-} > S^{2-} > Cl^- > Br^-$

d) $N^{3-} > Cl^- > S^{2-} > Br^-$

54. A hybrid orbital of s and p-orbitals generally contribute to: **[4]**

a) either σ and π bond

b) σ bond only

c) can not be predicted

d) π bond only

55. In which choice are the sodium halides listed in order of increasing lattice energy? **[4]**

a) NaCl, NaBr, NaF

b) NaF, NaCl, NaBr

c) NaBr, NaCl, NaF

d) NaCl, NaF, NaBr

56. Which of the property increases towards the bottom in a group? **[4]**

a) Solubility and thermal stability of alkaline earth metal sulphates.

b) Solubility and ionic character of alkaline earth metal carbonates.

c) Thermal stability and ionic character of alkali metal carbonates.

d) Solubility and covalent character of alkali metal fluoride.

57. Which of the following is incorrect regarding the first law of thermodynamics? **[4]**

a) It introduces the concept of the entropy

b) It introduces the concept of the internal energy

c) It is not applicable to any cyclic process

d) It is a restatement of the principle of conservation of energy

58. For the reaction, $C(s) + CO_2(g) \rightleftharpoons 2CO(g)$, the partial pressures of CO_2 and CO are 2.0 and 4.0 atm respectively at equilibrium. The K_p for the reaction is: **[4]**

a) 2.0

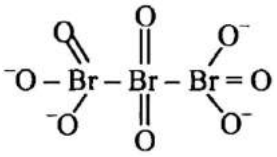
b) 0.5

c) 8.0

d) 4.0

59. The CORRECT structure of tribromooctaoxide is _____. **[4]**

a)



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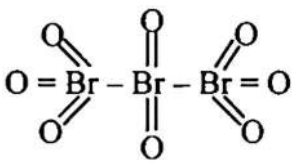

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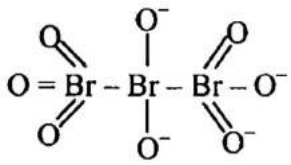
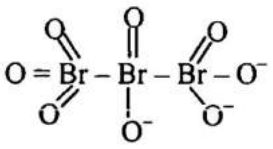


d)



60. The equivalent mass of $MnSO_4$ is half its molar mass when it is converted to: **[4]**

a) Mn_2O_3

b) MnO_4^{2-}

c) MnO_2

d) $MnO^{\overline{4}}$

61. Which of the following statement is CORRECT? **[4]**

i. The melting point and boiling points of C is low when compared to the other group 14 elements.

ii. CO_2 is a liquid while the dioxides of all other members are solids at room temperature.

iii. C has minimum tendency to show catenation.

iv. C is not affected by alkalies.

a) Option (iv)

b) Option (iii)

c) Option (i)

d) Option (ii)

62. The correct order of dipole moment is: **[4]**

a) $NF_3 < CH_4 < NH_3 < H_2O$

b) $H_2O < NH_3 < NF_3 < CH_4$

c) $CH_4 < NF_3 < NH_3 < H_2O$

d) $NF_3 < NH_3 < CH_4 < H_2O$

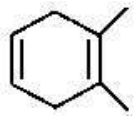
63. Which one of the following pairs represents stereoisomerism? **[4]**

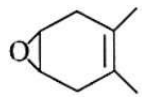
a) Optical isomerism and geometrical isomerism

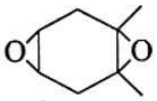
b) Chain isomerism and rotational isomerism

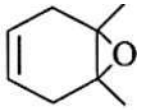
c) Structural isomerism and geometrical isomerism

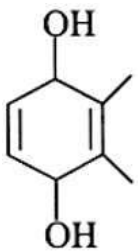
d) Linkage isomerism and geometrical isomerism

64.  $\xrightarrow{\text{Excess } CF_3CO_3H}$ **[4]**

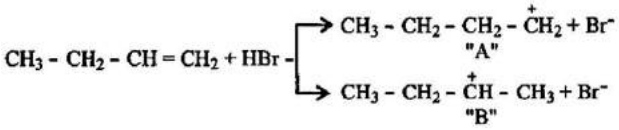
a) 

b) 

c) 

d) 

65. Choose the correct statement regarding the formation of carbocation A and B given **[4]**



a) Carbocation B is more stable and formed relatively at faster rate

b) Carbocation A is more stable and formed relatively at slow rate

c) Carbocation B is more stable and formed relatively at slow rate

d) Carbocation A is more stable and formed relatively at faster rate

66. Assuming each salt to be 90% dissociated which of the following will have highest osmotic pressure? **[4]**

a) Decimolar Na_2SO_4

b) Decimolar $BaCl_2$

c) Decimolar $Al_2(SO_4)_3$

d) A solution obtained by mixing equal volumes of decimolar $BaCl_2$, decimolar Na_2SO_4 and filtering

67. Which solution is isotonic with human RBC's? **[4]**

a) 0.32 N

b) 0.02 N

c) 0.48 N

d) 0.16 N

68. In the electrochemical cell: **[4]**
Zn $|ZnSO_4(0.01\ m)||CuSO_4(1.0\ m)|$ Cu, the emf of this Daniel Cell is E_1. When the concentration of $ZnSO_4$ is changed to 1.0 M and that of $CuSO_4$ changed to 0.01 M, the emf changes to E_2. From the following, which one is the relationship between E_1 and E_2?

(Given, $\frac{RT}{F} = 0.059$)

a) $E_1 < E_2$

b) $E_1 = E_2$

c) $E_1 > E_2$

d) $E_2 = 0 \neq E_1$

69. $Ag^+ + NH_3 \rightleftharpoons [Ag(NH_3)^+]$; $K_1 = 6.8 \times 10^{-3}$ **[4]**

$[Ag(NH_3)]^+ + NH_3 \rightleftharpoons [Ag(NH_3)_2]^+$; $K_2 = 1.6 \times 10^{-3}$

then the formation constant of $[Ag(NH_3)_2]^+$ is:

a) 6.8×10^{-5}

b) 6.8×10^{-6}

c) 1.08×10^{-6}

d) 1.08×10^{-5}

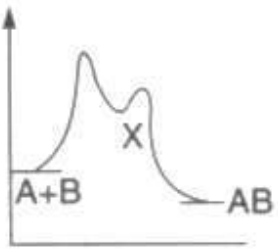
70. For an exothermic chemical process occurring in two steps as; **[4]**

i. $A + B \longrightarrow X$ (slow);

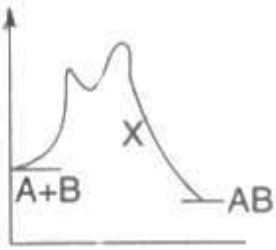
ii. $X \longrightarrow AB$ (fast)

The progress of the reaction can be best described by:

a)

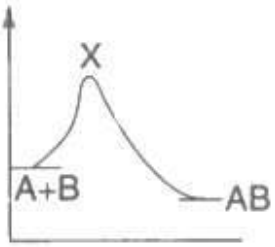


b)



c) All are correct

d)



71. Which of the following oxidation states is the most common among the lanthanoids? **[4]**

a) 2

b) 4

c) 5

d) 3

72. Identify an amphoteric oxide. **[4]**

a) SiO_2

b) CO_2

c) K_2O

d) SnO_2

73. Which of the following ions does not liberate hydrogen gas on reaction with dilute acids? **[4]**

a) Ti^{2+}

b) V^{2+}

c) Mn^{2+}

d) Cr^{2+}

74. Which of the following statements is INCORRECT? **[4]**

i. $[Co(NH_3)_6]^{3+}$ is more stable than $[Co(NH_3)_6]^{2+}$.

ii. $[Mn(H_2O)_6]^{2+}$ is more stable than $[Co(H_2O)_6]^{2+}$.

iii. $[Co(en)_3]^{3+}$ is more stable than $[Co(NH_3)_6]^{3+}$.

iv. $[Ag(CN)_2]^-$ is more stable than $[Ag(NH_3)_2]^+$.

a) Option (iv)

b) Option (i)

c) Option (ii)

d) Option (iii)

75. Which of the following has an unchanged oxidation number? **[4]**

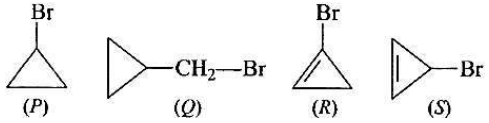
a) Fe

b) O

c) Na

d) P

76. Arrange the following in the decreasing order of reactivity toward S_N2 reaction- **[4]**



a) P > Q > R > S

b) Q > S > R > P

c) S > R > P > Q

d) Q > S > P > R

77. The C - O bond length in phenol is less than that in alcohol. This is because of _____. **[4]**

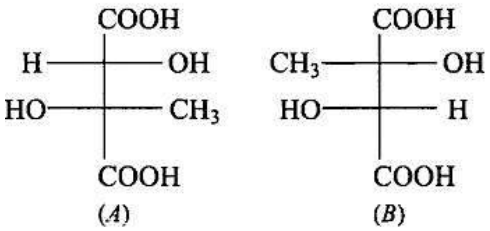
a) partial double bond character of C - O bond

b) +I effect of OH group.

c) partial negative charge on carbon

d) higher electronegativity of O-atom

78. The structures A and B represent: **[4]**



a) diastereomers

b) enantiomers

c) racemic mixture

d) homomers

79. The compound which gives an oily nitrosamine on reaction with nitrous acid at low temperature is : **[4]**

a) CH_3NH_2

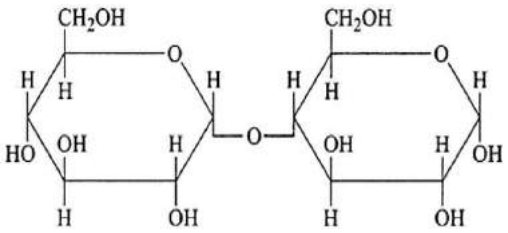
b) $(CH_3)_3$ N

c) $(CH_3)_2$ $CHNH_2$

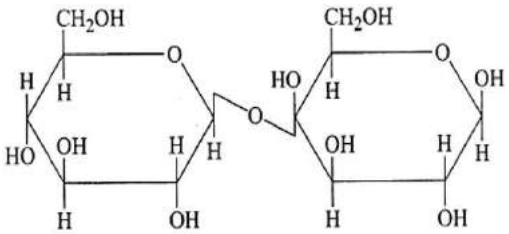
d) CH_3 - NH - CH_3

80. In disaccharides, if the reducing groups of monosaccharides, i.e., aldehydic or ketonic groups are bonded, these are non-reducing sugars. Which of the following disaccharide is a non-reducing sugar? **[4]**

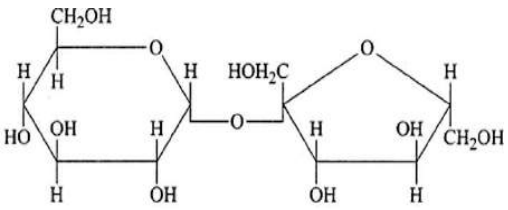
a)



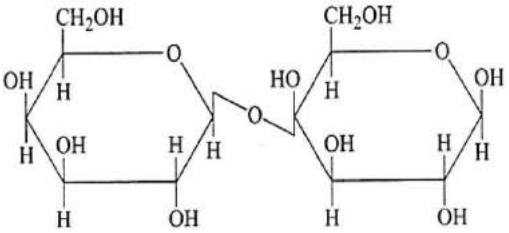
b)



c)



d)



81. Among the following vitamins the one whose deficiency causes rickets (bone deficiency) is **[4]**

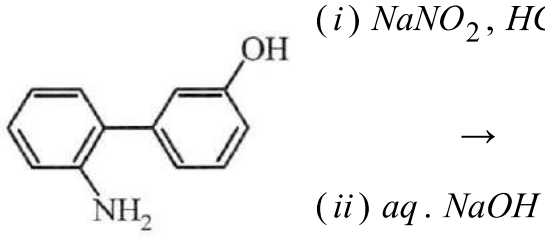
a) Vitamin D

b) Vitamin B

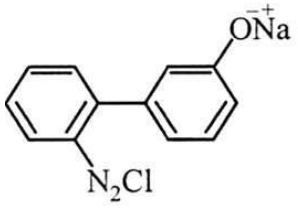
c) Vitamin A

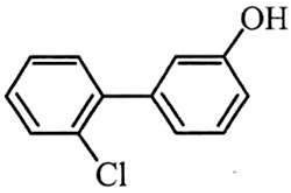
d) Vitamin C

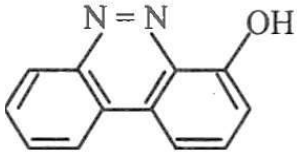
82. The major product of the following reaction is **[4]**



a) 

b) 

c) 

d) 

83. Which of the following is correct for oxidizing agent? **[4]**

a) It gains electrons.

b) It undergoes oxidation.

c) Its oxidation number increases.

d) Its oxidation number does not change.

84. In gas chromatography: **[4]**

a) Gas is a stationary phase and gas is also a mobile phase.

b) Only solid is the stationary phase and liquid is the mobile phase.

c) Only solid is stationary phase and gas is the mobile phase.

d) Solid and liquid is stationary phase and gas is the mobile phase.

85. Blue borax bead is obtained with **[4]**

a) Zn

b) Fe

c) Co

d) Cr

CHEMISTRY (Section-B)

Attempt any 10 questions

86. Which species is non-polar? **[4]**

a) OCl_2

b) HCl

c) NCl_3 d) CCl_4

87. Two Faraday of electricity is passed through a solution of $CuSO_4$. The mass of copper deposited at the cathode is (at. mass of Cu = 63.5 u) **[4]**

a) 2 g b) 127 g

c) 63.5 g d) 0 g

88. Which of the following reactions would proceed in the forward direction? **[4]**

A. $\left[Co\left(NH_3\right)_6\right]^{3+} + 3en \rightleftharpoons \left[Co(en)_3\right]^{3+} + 6NH_3$

B. $2Na\left[Al(OH)_4\right] + CO_2 \longrightarrow 2Al(OH)_3 + Na_2CO_3 + H_2O$

C. $AIN + H_2O \longrightarrow Al(OH)_3 + NH_3$

D. All of the above

a) (A) only b) (D) only

c) (B) only d) (C) only

89. Which of the following orders for electron affinity is/are CORRECT? **[4]**

a. S > O < Se
b. Cl > F
c. S > O
d. O > S
e. N > P
f. C > N

a) a, b, c, f b) b, c, d, e

c) a, b, c, e d) b, c, f

90. An electron in a Bohr's stationary orbit can go to a higher stationary orbit _____. **[4]**

a) by absorption of electromagnetic radiation of a particular frequency b) by emission of electromagnetic radiation

c) by absorption of any electromagnetic radiation d) without any absorption or emission of electromagnetic radiation

91. Which oxides exist as individual molecules? **[4]**

i. Al_2O_3

ii. SiO_2

iii. P_4O_{10}

a) ii only

b) ii and iii only

c) i and iii only

d) iii only

92. How long would it take 10.0 g of a product to be formed if the reaction rate is 0.40 g min^{-1}? **[4]**

a) 30 min

b) 10 min

c) 18 min

d) 25 min

93. 0.44 mole of electrons were passed through four electrolyte solutions for 1 second connected in series. If the solutions are of $AICI_3$, $ZnSO_4$, $AuCl_3$ and $AgNO_3$, find the CORRECT decreasing order of the amount of each metal deposited at cathode of each cell. (M.W. : Al = 27, Zn = 65.4, Ag = 108, Au = 197) **[4]**

a) Al > Zn > Au > Ag

b) Ag > Au > Zn > Al

c) Au > Ag > Zn > Al

d) Al > Zn > Ag > Au

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

a) Acetic acid, $C_2H_4O_2$

b) Hydrochloric acid, HCl

c) Ammonia, NH_3

d) Fructose, $C_6H_{12}O_6$

95. At 30^oC, the half life for the decomposition of AB_2 is 200 s and is independent of the initial concentration of AB_2. The time required for 80% of the AB_2 to decompose is (**Given:** log 2 = 0.30; log 3 = 0.48) **[4]**

a) 467s

b) 532s

c) 323s

d) 200s

96. Which among the following does not exist? **[4]**

a) XeF_2

b) KrF_2

c) NeF_2 d) $XeOF_4$

97. Which of the following statements is incorrect about ozone? **[4]**

i. Ozone turns starch iodide paper to blue colour.

ii. When ozone decomposes to give oxygen, ΔS is positive.

iii. Ozone oxidizes potassium iodide to iodine.

iv. Ozone oxidizes moist iodine to periodic acid.

a) Option (iv) b) Option (i)

c) Option (ii) d) Option (iii)

98. Four successive members of the first-row transition elements listed below with atomic numbers. Which one of them is expected to have the highest $E^{o}_{M^{3+}/M^{2+}}$ value? **[4]**

a) Mn (Z = 25) b) Fe (Z = 26)

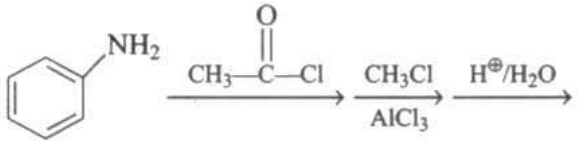
c) Cr (Z = 24) d) Co (Z = 27)

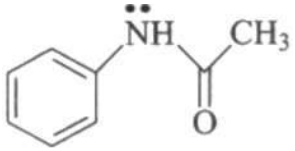
99. Which one is the most likely structure of $CrCl_3.\ 6H_2O$ if $\frac{2}{3}$ of total chlorine of the compound is ppt. by adding $AgNO_3$ to its aqueous solution: **[4]**

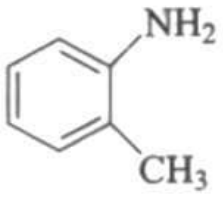
a) $\left[CrCl_2\left(H_2O\right)_4\right]Cl \cdot 2H_2O$ b) $\left[CrCl\left(H_2O\right)_5\right]Cl_2 \cdot H_2O$

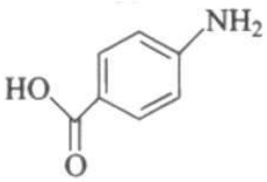
c) $\left[CrCl_3\left(H_2O\right)_3\right] \cdot 3H_2O$ d) $CrCl_3.6H_2O$

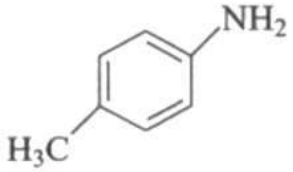
100. Identify major product of following sequence of reaction: **[4]**



a) 

b) 

c) 

d) 

BOTANY (Section-A)

101. Match the entities in Column I with Column II. **[4]**

Column I	Column II
(A) Dogs	(i) Species
(B) Systematics	(ii) Genus
(C) Lowest category	(iii) Family
(D) Mangifera	(iv) Evolutionary relationships
(E) Solanaceae	(v) Taxa

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

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

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

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

102. Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature? **[4]**

a) The first word in a biological name represents the genus name, and the second is a specific epithet

b) When written by hand, the names are to be underlined

c) Biological names can be written in any language

d) The names are written in Latin and are italicised

103. During the rainy season ground surface become slippery due to: **[4]**

a) Slime moulds

b) Fungi

c) Blue green algae

d) Bryophytes

104. Mode of nutrition in bacteria is: **[4]**

a) Parasitic

b) Chemosynthetic and photosynthetic

c) All of these

d) Saprophytic

105. the male gametes are formed by: **[4]**

a) Vegetative cell

b) Generative cell

c) Tube cells

d) microspore mother cell.

106. The sex organs in bryophytes are: **[4]**

a) Monocellular

b) Multicellular

c) Unicellular

d) Unicellular or multicellular

107. Life cycle of Ectocarpus and Fucus respectively are: **[4]**

a) Haplodiplontic, Diplontic

b) Haplontic, Diplontic

c) Haplo-diplontic, Haplontic

d) Diplontic, Haplodiplontic

108. In angiosperms embryo sac is usually developed from: **[4]**

a) Microspore

b) Integument

c) Microspore mother cell

d) Megaspore mother cell

109. Number of meiotic divisions required to produce 200 seeds of pea would be: **[4]**

a) 250

b) 300

c) 200

d) 400

110. Why is vivipary an undesirable character for annual crop is absent in the seeds of plants? **[4]**

a) It reduces the vigour of plant.

b) The seeds exhibit long dormancy.

c) The seeds cannot be stored under normal conditions.

d) It adversely affects the fertility of the plant.

111. Which of the following meristems appear early in life of a plant and contribute to the formation of the primary plant body? **[4]**

a) Primary meristems

b) Secondary meristems

c) Cambium

d) Lateral meristems

112. Water containing cavities in vascular bundles are found in: **[4]**

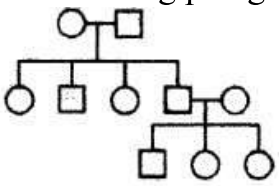
a) Cycas

b) Maize

c) Sunflower

d) Pinus

113. The following pedigree chart shows **[4]**



a) recessive and autosomal

b) dominant and sex-linked

c) dominant and autosomal

d) recessive and sex-linked

114. Mendelian ratio 9 : 3 : 3 : 1 is due to **[4]**

a) Law of purity of gametes

b) Law of segregation

c) Law of unit characters

d) Law of independent assortment

115. The new strand synthesised, in small pieces and then joined together during DNA replication, is called **[4]**

a) All of these

b) Leading strand

c) Lagging strand

d) Dead strand

116. DNA replication enzymes are given below. Select their correct sequence in DNA replication. **[4]**

i. Helicase

ii. Primase

iii. SSB

iv. DNA ligase

v. DNA polymerase

a) (iv) → (i) → (iii) → (v) → (ii)

b) (i) → (ii) → (iii) → (v) → (iv)

c) (i) → (iii) → (ii) → (v) → (iv)

d) (iii) → (ii) → (i) → (v) → (iv)

117. Glycocalyx differs in composition and thickness among different bacteria, in some it could be a loose sheath and called them: **[4]**

a) Capsule
b) Mucilage
c) Slime layer
d) All of these

118. Which of the following is a feature of modern cell theory? **[4]**

a) All of these
b) All new cells arise from pre-existing cells.
c) Function of organism is an integrated effort of cells.
d) All living organisms are composed of cells and products of cells.

119. DPT vaccine is given for: **[4]**

a) Tetanus, polio, plague
b) Diphtheria, pertussis, tetanus
c) Diphtheria, leprosy, pertussis
d) Diphtheria, polio, Tetanus

120. Cells which are destroyed by HIV: **[4]**

a) T-lymphocytes
b) All lymphocytes
c) All WBC
d) All blood corpuscles

121. In animal cells, cytokinesis involves **[4]**

a) the contraction of the contractile ring of microfilament.
b) depolymerisation of kinetochore microtubules.
c) a protein kinase that phosphorylates other enzymes.
d) the separation of sister chromatids.

122. Which of the following is not a controlling factor of population density? **[4]**

a) Socio-economic factor
b) Demographic factor
c) Psychological factor
d) All of these

123. GFC started with: **[4]**

a) Man
b) Goat
c) Flower
d) Grass

124. Norin-10 gene is: **[4]**

a) Dwarf gene of tomato
b) Dwarf gene of rice
c) Smut resistant gene of wheat
d) Dwarf gene of wheat

125. Ex situ conservation is carried out in: **[4]**

a) Biosphere reserve
b) Zoo
c) National park
d) Sanctuary

126. What is true for National Park? **[4]**

a) No human activity is allowed
b) Cattle grazing is allowed in buffer zone
c) Tourism is allowed in buffer zone
d) Hunting is allowed in core zone

127. The animals which are in danger of extinction of which is also possible are known as? **[4]**

a) Endangered
b) Rare
c) Threatened
d) Vulnerable

128. Histone protein and RNA synthesis occur in: **[4]**

a) G_1 - phase
b) G_2 - phase
c) S - phase
d) Early anaphase

129. Match the Column I with Column II and choose correct option: **[4]**

Column I	Column II
(A) Pachytene	(i) Chromosomes are moved to spindle equator.
(B) Zygotene	(ii) Centromere splits and chromatids are separated.
(C) Anaphase	(iii) Pairing between homologous takes place.
(D) Metaphase	(iv) Crossing between homologous chromosomes,

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

130. The ATPase enzyme consists of: **[4]**

a) F_1- Protrudes on the outer surface of the thylakoid membrane on the
b) F_0- It embedded in the membrane and forms a transmembrane

side that faces the stroma

channel that carries out facilitated diffusion of protons across the membrane

c) F_1- It embedded in the membrane and forms a transmembrane channel that carries out facilitated diffusion of protons across the membrane

d) Both F_0- It embedded in the membrane and forms a transmembrane channel that carries out facilitated diffusion of protons across the membrane and F_1- Protrudes on the outer surface of the thylakoid membrane on the side that faces the stroma

131. Which one is incorrect? **[4]**

A. The C_3 and C_4 plants respond similarly to CO_2 concentration

B. At low light conditions, neither C_3 nor C_4 plants respond to high CO_2 concentration

C. C_4 plants attain saturation at much lower CO_2 concentration (about 360 pl/L) than C_3 plants (about 450 μ//L)

D. Current availability of CO_2 levels is limiting to the C_3 plants

a) A

b) D

c) B

d) C

132. Suppose di-chlorophenyl dimethyl urea (DCMU), a herbicide, is added to an illuminated suspension of Chlorella. Which of the following will be synthesised during photosynthesis? **[4]**

a) only ATP

b) Glucose

c) ATP and NADPH

d) O_2

133. Photorespiration is **[4]**

a) carboxylation of RuBP.

b) oxidation of PEP.

c) oxidation of chI a.

d) oxidation of RuBP.

134. What is the role of NAD^+ in cellular respiration? **[4]**

a) It functions as an electron carrier

b) It is a nucleotide source for ATP synthesis

c) It functions as an enzymes

d) It is the final electron acceptor for anaerobic respiration

135. The substances which have proved very effective to induce rooting from the cut end of the stem is: **[4]**

a) Indole acetic acid
b) Indole butyric acid
c) α-aphthalene acetic acid
d) Phenyl acetic acid

BOTANY (Section-B)

Attempt any 10 questions

136. Which one of the following aspects is an exclusive characteristic of living things? **[4]**

a) Isolated metabolic reactions occur in vitro
b) Perception of events happening in the environment and their memory
c) Increase in mass from inside only
d) Increase in mass by the accumulation of material both on the surface as well as internally

137. Viruses are non-cellular organisms but replicate themselves once they infect the host cell. To which of the following kingdom to viruses belong to? **[4]**

a) Fungi
b) None of these
c) Protista
d) Monera

138. What is the methods of reproduction in algae? **[4]**

a) Sexual
b) Asexual
c) All of these
d) Vegetative

139. Generally archesporium in an ovule is: **[4]**

A. Single celled and originates from nucellus at micropyler end
B. Single celled and lies in the centre of the ovule
C. Many celled and originates from nucellus at micropyler end
D. Single celled and originates from nucellus at chalazal end

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

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

A. Flower of tulip is a modified shoot

B. In tomato, fruit is a capsule

C. Seeds of orchids have oil-rich endosperm

D. Placentation in Primrose is basal

a) Seeds of orchids have oil-rich endosperm

b) Placentation in Primrose is basal

c) Flower of tulip is a modified shoot

d) In tomato, fruit is a capsule

141. Red colour (R) of fruits is dominant over white fruit (r); and tallness (7) is dominant over dwarfness (f). If a plant with genotype RRTt is crossed with a plant of genotypes rrtt, what will be the percentage of tall plants with red fruits in the next generation? **[4]**

a) 25%

b) 50%

c) 100%

d) 75%

142. The A + T/G + C ratio in E. coli is around: **[4]**

a) 0.97

b) 1.97

c) 0.52

d) 1.52

143. When the centromere is situated in the middle of two equal arms of chromosomes, the chromosome is referred as **[4]**

a) acrocentric

b) sub-metacentric

c) metacentric

d) telocentric

144. Milk is converted into curd (yoghurt) by the biological activity of: **[4]**

a) Lactobacillus cells

b) Fungal cells

c) Chloroplasts

d) Algal cells

145. The net gain of ATP molecules in glycolysis is: **[4]**

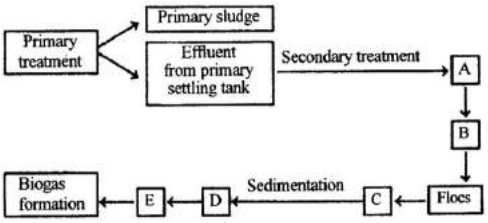
a) 36

b) 2

c) 4

d) 8

146. Given below is the flowchart of sewage treatment. Identify A, B, C, D and E and select the correct option. **[4]**



a) A-Small aeration tank, B-Microbial digestion, C-High BOD, D-Activated sludge, E-Aerobic sludge digesters

b) A-small aeration tank, B-Microbial digestion, C-Low BOD, D-Activated sludge, E-Anaerobic sludge digesters

c) A-Large aeration tank, B-Mechanical agitation, C-Increased BOD, D-Activated sludge, E-Aerobic sludge digesters

d) A-Large aeration tank, B-Mechanical agitation, C-Reduced BOD, D-Activated sludge, E-Anaerobic sludge digesters

147. The rate of biomass production per limit area over a time period by plants during photosynthesis is called **[4]**

a) gross primary productivity

b) secondary productivity

c) net primary productivity

d) decomposition

148. A hormone that promotes the growth of lateral buds has a negative effect on apical dominance is: **[4]**

a) Auxin

b) Cytokinin

c) Gibberellin

d) Gibberellin and Auxin

149. Monocarpic plants are those which: **[4]**

a) Bear flowers with one ovary

b) Flower once and die

c) Bear only one flower

d) All of these

150. Select the false statement: **[4]**

A. ATP or NADH is not formed during photorespiration

B. C_4-pathway of photosynthetic CO_2 fixation was first discovered by Hatch and Slack

C. Photorespiration results in maximum production of ATP

D. In C_4- plants, phosphoenol pyruvate (PEP) acts as CO_2 acceptor

a) D

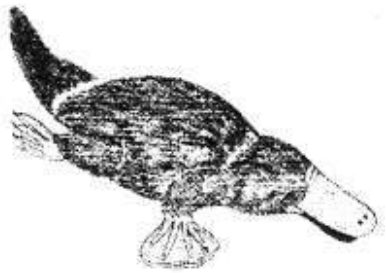
b) A

c) C

d) B

ZOOLOGY (Section-A)

151. Which of the following options is correct for the name of animal shown and its respective class and character? **[4]**



a) Ornithorhynchus - Chordates- Oviparous

b) Delphinus - Mammalia- Common dolphin

c) Ornithorhynchus - Mammalia- Oviparous

d) Ornithorhynchus - Mammalia- Viviparous

152. Turbellarians are: **[4]**

a) Independent roundworms

b) Parasitic worms

c) Independent flatworms

d) Parasitic tapeworms

153. Alimentary canal is complete with a well developed muscular pharynx in: **[4]**

a) Ascaris

b) All of these

c) Wuchereia

d) Ancylosyoma

154. This is not the cell of areolar tissue: **[4]**

a) Macrophages

b) Mast cells

c) Schwann cell

d) Fibroblasts

155. Haversian canal includes: **[4]**

a) One lymphatic vessel and few bone cell

b) One arteriole

c) Myelinated nerve fiber

d) One vein, one artery, lymph vessel, one nerve and few bone cells

156. Carbon dioxide is the excretory product in: **[4]**

a) Anaerobic respiration

b) Terrestrial animals and plants only

c) Both Aerobic and Anaerobic respiration

d) Aerobic respiration

157. The structure which prevents the entry of food into the respiratory tract is: **[4]**

a) Gullet

b) Epiglottis

c) Uvula

d) Glottis

158. Carbon monoxide can kill a person because of its extremely high affinity for: **[4]**

a) Cytochrome

b) Phytochrome

c) Hemoglobin

d) Both Phytochrome and Cytochrome

159. Lungs do not collapse between breaths and some air always remains in the lungs which can never be expelled because: **[4]**

a) Pressure in the lungs is higher than the atmospheric pressure

b) There is a negative pressure in the lungs

c) There is a positive intra pleural pressure

d) There is a negative intra pleural pressure pulling at the lung walls

160. Formation of carbamino-compounds is: **[4]**

a) Inhibited by cyanide

b) Regulated by enzyme carbonic anhydrase

c) Regulated by enzyme arginase

d) A non-enzymatic process

161. The stage of menstruation in which blood is released: **[4]**

a) Luteal

b) Menstrual

c) secretory phase

d) Follicular

162. If vasa efferentia in the human reproductive system gets blocked, the gametes will not be transported from **[4]**

a) testes to epididymis.

b) epididymis to vas deferens.

c) vas deferens to ejaculatory duct.

d) seminiferous tubules to rete testis.

163. Descending of little part of intestine into the scrotal sac due to: **[4]**

a) Hernia

b) Menopause

c) Azoospermia

d) aspermia

164. Select the measure that can be used to control over-population. **[4]**

a) Encouraging family planning programme.

b) All of these

c) Educating people about the advantages of a small family.

d) Raising the age of marriage

165. Match the STDs given in column I with their causal organisms given in column II and select the correct option. **[4]**

Column I (STDs)	**Column II (Causal organisms)**
(A) Syphilis	(i) Neisseria gonorrhoeae
(B) Gonorrhoea	(ii) Herpes simplex virus
(C) Genital warts	(iii) Treponema pallidum
(D) Genital herpes	(iv) Human papillomavirus

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

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

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

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

166. Match Column I with Column II. **[4]**

Column I	**Column II**
A. Francesco Redi	(i) Swan-necked flask experiment
B. L. Pasteur	(ii) Panspermia
C. Richter	(iii) Theory of chemical evolution of life
D. Oparin	(iv) Disproval of spontaneous generation

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

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

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

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

167. Industrial melanism is an example of : **[4]**

a) Natural selection

b) Neo Darwinism

c) Neo Lamarckism

d) Mutation

168. Which one of the following is the most soluble in water? **[4]**

a) Uric acid

b) Ammonia

c) Urea

d) Amino acid

169. Renal columns of Bertini are found in the kidney of man for the collection of **[4]**

a) emiction

b) Urine

c) Water

d) Glomerular filtrate

170. Urine output is reduced by: **[4]**

a) ACTH

b) LH

c) Vasopressin

d) Rennin

171. Knee joint and elbow joints are examples of: **[4]**

a) Pivot joint

b) Ball and socket joint

c) Hinge joint

d) Saddle joint

172. Coccygeal bone occurs in: **[4]**

a) Pelvic girdle

b) Pectoral girdle

c) Skull

d) Vertebral column

173. Lack of relaxation between successive stimuli in sustained muscle contraction is known as: **[4]**

a) Tonus

b) Spasm

c) Tetanus

d) Fatigue

174. The afferent nerve fibres transmit impulses **[4]**

a) from tissues/organs to the CNS.

b) from the CNS to the involuntary organs.

c) from the CNS to the concerned peripheral tissues/organs.

d) from the CNS to skeletal muscles.

175. Sympathetic nerves in mammals originate from: **[4]**

a) Cervical nerves

b) 3rd, 7th, 9th, and 10th, spinal nerves

c) Thoracico-lumbar nerves

d) Sacral nerves

176. When a nerve fibre is stimulated the inside of the membrane becomes? **[4]**

a) Filled with acetylcholine
b) Depolarised
c) Negatively charged
d) Positively charged

177. The mineralocorticoid hormone of the adrenal cortex which causes the Na retention and K excretion is: **[4]**

a) Cortisol
b) Progesterone
c) Cortisone
d) Aldosterone

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

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

179. Arteries are best defined as the vessels which: **[4]**

a) Break up into capillaries which reunite to form a vein.
b) Supply oxygenated blood to the different organs.
c) Carry blood away from the heart to different organs.
d) Carry blood from one visceral organ to another visceral organ.

180. What is the meaning of blood group A? **[4]**

a) The person can receive blood of group 'AB'
b) The person cannot give blood to 'O' group
c) The person can form antibody for 'A'
d) The person cannot form antibody for 'A'

181. Oxygenated blood to the lungs is carried by: **[4]**

a) Bronchial artery
b) Phrenic artery
c) Pulmonary artery
d) Pulmonary vein

182. Choose the correct statements for insertional inactivation of β-galactosidase enzyme: **[4]**

a) Colourless colonies in presence of insert and it is recombinant colonies
b) Blue colour colonies in presence of insert and it is recombinant colonies

c) Blue colour colonies in presence of insert and it is non-recombinant colonies

d) Colourless colonies in presence of insert and it is non-recombinant colonies

183. First discovered restriction endonuclease that always cuts DNA molecule at a particular point by recognising a specific sequence of six base pairs is **[4]**

a) thermostable DNA polymerase.

b) Hind II

c) adenosine deaminase

d) EcoRl

184. Sex hormone is a: **[4]**

a) Carbohydrate

b) Fat

c) Protein

d) Steroid

185. Continuous addition of sugars in **fed batch** fermentation is done to: **[4]**

a) produce methane

b) obtain antibiotics

c) degrade sewage

d) purify enzymes

ZOOLOGY (Section-B)

Attempt any 10 questions

186. On the basis of the symmetry _____ are mostly asymmetrical: **[4]**

a) Chlordates

b) Porifera

c) Platyhelminthes

d) Ctenophora

187. Frogs differ from humans in possessing: **[4]**

a) Hepatic portal system

b) Thyroid

c) Nucleated RBCs

d) Paired cerebral hemispheres

188. Myocardial infarction is caused by: **[4]**

a) Sudden interruption in blood flow towards a portion of heart

b) Clot may occur in the lumen of a coronary artery

c) Lumpy thickness develop in the inner walls of arteries

d) Hardening of arteries

189. Chloride shift for the transport of: **[4]**

a) Ozone

b) CO_2

c) CO

d) O_2

190. Select the correct statement regarding lactating female : **[4]**

A. First milk after parturition is called colostrums.

B. Colostrum provides active immunity to the neonate.

C. Menstrual cycle cannot be found during the intense lactation period.

D. Intense lactation is under the control of hormones secreted from anterior pituitary only.

a) Only (B) and (D)

b) Only (A) and (C)

c) Only (A), (C), (D)

d) Only (A), (B) and (C)

191. Saheli is an oral contraceptive pill that has very high contraceptive value with little side effects. It is because **[4]**

a) It decreases risk of cancer

b) It contains centchroman

c) It contains synthetic progesterone

d) It is taken once in a week

192. Earliest fossil form in phylogeny of horse is **[4]**

a) Merychippus

b) Equus

c) Eohippus

d) Mesohippus

193. Cortical nephrons are _____ in number to juxta-medullary nephrons: **[4]**

a) Equal

b) More

c) Depends on species to species

d) Less

194. Surface for attachment of tongue is: **[4]**

a) Hyoid apparatus

b) Sphenoid

c) Palatine

d) Pterygoid

195. Pacinian corpuscle present in skin detect: **[4]**

a) Temperature

b) Pain

c) Movement

d) Pressure contact

196. Endocrine glands: **[4]**

a) transport their secretion through blood ducts

b) always have ducts

c) do not possess ducts

d) sometimes do not have ducts

197. Polypeptide hormones are secreted by: **[4]**

a) Corpus luteum

b) Islets of Langerhans

c) Leydig cells

d) Adrenal cortex

198. When thromboplastin is released in humans? **[4]**

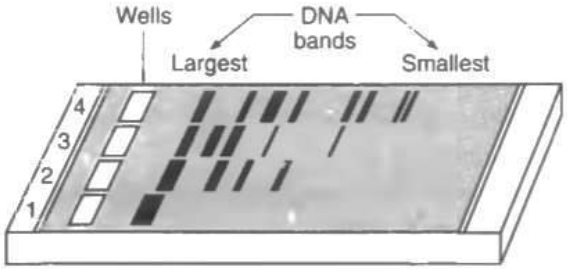
a) During hypertension.

b) In the condition of erythroblastosis foetalis.

c) By the traumatised cell at the place of injury.

d) During anaemia.

199. The given figure represents a typical agarose gel electrophoresis showing migration of an undigested and digested set of DNA fragments. Select the correct option for the migration of fragments? **[4]**



a) Lane 2 to 4-undigested and lane 1-digested set of DNA fragments

b) Lane 2 and 3-undigested and lane 1 and 4-digested set of DNA fragments

c) Lane 1 to 3-undigested and lane 4-digested set of DNA fragments

d) Lane 1-undigested and lane 2 to 4-digested set of DNA fragments

200. During the processing of proinsulin into the mature insulin **[4]**

a) C - peptide is added to proinsulin.

b) B - peptide is added to proinsulin.

c) B - peptide is removed from proinsulin.

d) C - peptide Is removed from proinsulin.

Solution

SAMPLE PAPER - 2

PHYSICS (Section-A)

1. **(d)** All of these

   Explanation: As strain = $\frac{I}{L}$; angle = $\frac{\text{arc}}{\text{radius}}$

   and specific gravity = $\frac{dm}{dw}$

   Hence, all the given quantities are dimensionless.

2. **(b)** [L]

   Explanation: Since the dimensions of distance are $[M^0L^1T^0]$ and a Light year is a unit of distance.

   Therefore, a light-year is dimensionally represented as $\mathbf{M^0L^1T^0}$.

3. **(c)** 10 cm/s

   Explanation: $200 = u \times 2 - (\frac{1}{2})\, a\, (2)^2$ or $u - a = 100$ ...(i)

   $200 + 220 = u(2 + 4) - (\frac{1}{2})\, (2 + 4)^2\, a$

   or $u - 3a = 70$ ...(ii)

   Solving eqns. (i) and (ii), we get; $a = 15$ cm/s^2 and $u = 115$ cm/s.
   Further, $v = u - at = 115 - 15 \times 7 = 10$ cm/sec

4. **(d)** 25 J

   Explanation: Work is the dot product of force and displacement

   $F = (3\hat{i} + 4\hat{j})$ N

   $S = (3\hat{i} + 4\hat{j})$ m

   $W = F \cdot S$

   $= (3i + 4j) \cdot (3i + 4\hat{j})$

   $= 9 + 16$ J

   $= 25$ J

5. **(a)** Zero

   Explanation: Considering triple product:

   $\vec{A} \cdot (\vec{B} \times \vec{A}) = \vec{A} \cdot \vec{C}$

   Here, $\vec{C} = \vec{B} \times \vec{A}$ that is perpendicular to both vector $\vec{A}$ and $\vec{B}$, so

   $\vec{A} \cdot \vec{C} = 0$

6. **(a)** they face less friction

Explanation: Tyres are made circular to reduce the frictional force because rolling friction < sliding friction.

7.

(c) Kt

Explanation: Force, $F = \frac{k}{v} \Rightarrow m\frac{dv}{dt} = \frac{k}{v} \Rightarrow \int_u^v v\,dv = \frac{k}{m}\int_0^t dt$

$\Rightarrow \frac{m}{2}\left(v^2 - u^2\right) = kt$

As per work energy theorem, change in kinetic energy is work done by the force.

8.

(c) The helium has more kinetic energy than the thorium nucleus.

Explanation: According to conservation of linear momentum,

$p_f = p_i$

here, uranium decays at rest,

$\therefore\ p_f = p_i = 0$

i.e. $p_{He} - p_{Th} = 0$

or $p_{He} = p_{Th}$

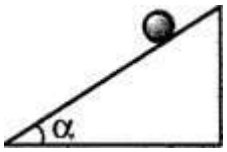
As, $K = \frac{p^2}{2m}$

$K \propto \frac{1}{m}$

$\therefore\ K_{He} > K_{Th}$ ...($\because\ m_{He} < m_{Th}$)

9.

(d) $\frac{2}{3}g\sin\alpha$

Explanation: 

We know that the acceleration of the body which rolling down an inclined plane of angle α is,

$a = \frac{g\sin\alpha}{1 + \frac{K^2}{R^2}}$

where K = Radius of gyration

and R = Radius of the body

Now, here the body is a uniform solid disc.

So, $\frac{K^2}{R^2} = \frac{1}{2}$

Hence, $a = \frac{g\sin\alpha}{1+\frac{1}{2}}$ or $a = \frac{g\sin\alpha}{\frac{3}{2}}$

or $a = \frac{2g\sin\alpha}{3}$

10. **(a)** zero

Explanation: Torque and rate of change of angular momentum,

or $\tau = \frac{d}{dt}$ (constant L)

or $\tau = 0$

11. **(d)** $\sqrt{\frac{2}{27}}$

Explanation: Here, $M' = \frac{1}{81}$, $g' = \frac{1}{6}$

$\therefore g' = \frac{M'}{\left(R'\right)^2}$

$\Rightarrow \left(R'\right)^2 = \frac{M'}{g'} = \frac{6}{81}$

$\therefore R' = \sqrt{\frac{3\times 2}{9\times 9}} = \sqrt{\frac{2}{27}}$

12. **(b)** 1 mm

Explanation: As we know that,

$T = \frac{2m_1m_2}{m_1+m_2}g$

$= \frac{2\times 2\times 3}{2+3} \times 10$ N

$= \frac{120}{5}$N

If r is the minimum radius, then

Breaking stress = $\frac{\frac{120}{5}}{\pi r^2}$

or $\frac{120}{5\pi} \times 10^\circ = \frac{120}{5\pi r^2}$

or $r^2 = \frac{1}{10^6}$

$\Rightarrow r = \frac{1}{10^3}$

= 1 mm

13.

(c) 2%

Explanation: $L = L_0\left[1 + \frac{1}{100}\right]$

Hence, $2L^2 = 2L_0^2\left(1 + \frac{1}{100}\right)^2$

or $2L^2 - 2L_0^2 \equiv 2L_0^2 \times \frac{2}{100}$

or $\frac{\Delta S}{2L_0^2} = \frac{2}{100} = 2\%$

14.

(c) does not circulate at all.

Explanation: When water is heated convection takes place at A but when hot water rises to the top, the pressure at D may not be higher than that C because the density of water is less. With the data available, one puts (d), i.e., water does not circulate.

15. **(a)** 375°C

Explanation: 375°C

16.

(c) $\frac{1}{3}\rho\bar{c}^2$

Explanation: Root-mean-square speed is the measure of the speed of particles in a gas which is most convenient for problem solving within the kinetic theory of gases

$v_{rms} = \sqrt{\frac{3RT}{M}}$

$\Rightarrow C = \sqrt{\frac{3RT}{M}}$

$\Rightarrow C = \sqrt{\frac{3PV}{M}}$

$\Rightarrow C = \sqrt{\frac{3P}{\rho}}$

$\Rightarrow P = \frac{\rho}{3}C^2 = \frac{1}{3}\rho C^2$

17.

(c) $y = a \sin 2\omega t + b \cos \omega t$

Explanation: Choice ($y = a \sin 2\omega t + b \cos \omega t$) is not a simple harmonic function because we have a sum of sin 2 ωt and cos ωt.

Also, sin ωt cos ωt = sin ωt

and $(1 - 2 \sin^2 \omega t) = \cos 2\omega t$

which are harmonic functions.

18.

(c) 6

Explanation: The human ear can hear frequencies up to 20,000 Hz. So, for closed pipe, overtone frequency,

$v = \frac{nv}{4L} = n \times$ fundamental frequency

$\therefore$ 20,000 = n × 1500

or n = 13

Maximum possible harmonics obtained

= 1, 3, 5, 9, 11, 13

Therefore, one can hear maximum upto 13th harmonic.

So, overtone = 7 - 1 = 6

19.

(d) 5

Explanation: We know that $v = v\lambda$

$\therefore \lambda = \frac{v}{v} = \frac{340}{606} = 0.561$ m = 56.1 cm

Since closed pipe allows only odd harmonics, so

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

or $l = \frac{(2n+1) \times 34000}{4 \times 606} = (2n + 1)$ 14 cm

$\therefore$ 1 = 14 cm, 42 cm, 70 cm, 98 cm, 126 cm, 154 cm ,. .....

Since / can not be greater than 150 cm, only five resonanced will be heard.

20.

(c) $\frac{1}{2}\left(\frac{q}{\varepsilon_0} - \phi\right)$

Explanation: Let ϕ_A, ϕ_B and ϕ_C are the electric flux linked with A, B, and C

According to Gauss theorem, $\phi_A + \phi_B + \phi_C = \frac{q}{\varepsilon_0}$

Since $\phi_A = \phi_C$

$\therefore 2\phi_A + \phi_B = \frac{q}{\varepsilon_0}$ or $2\phi_A = \frac{q}{\varepsilon_0} - \phi_B$

or $2\phi_A = \frac{q}{\varepsilon_0} - \phi$ (Given $\phi_B = \phi$)

$\therefore \phi_A = \frac{1}{2}\left(\frac{q}{\varepsilon_0} - \phi\right)$

21.

(d) there must be charges only on the surface

Explanation: If a conductor has a non-zero potential and there are no charges anywhere else outside, then there must be charges on the surface of the conductor or inside the conductor. There cannot be any charge in the body of the conductor.

22.

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

Explanation: Before adding, total resistance = 5 Ω

After adding, the central one is a Wheatstone network

$\therefore$ Total resistance = 1 + (2 and 2 in parallel) + 1 = 3 Ω

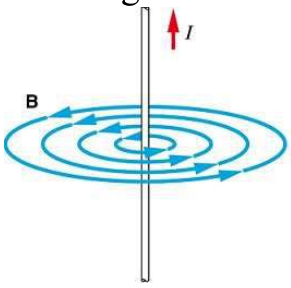
$\therefore$ Ratio of resistances = $(\frac{5}{3})$

23.

(d) only i

Explanation:

The magnetic field lines forms concentric circles around a current carrying wire as shown in the figure.



24.

(d) At points halfway between the wires in the horizontal plane

Explanation: When the current in the two wires are in same directions, then the field at P is in opposite direction and the needle is affected where field is zero. If the distance from P from a wire x, then

$$\frac{\mu_0 I}{2\pi x} = \frac{\mu_0 I}{2\pi(d-x)}$$

$x = \frac{d}{2}$ point which is middle of wires in horizontal plane.

25. **(a)** r^{-3}

Explanation: r^{-3}

26.

(b) -1.5 wbs^{-2}

Explanation: Given: $\phi = xt^2$

$$\therefore \quad \frac{d\phi}{dt} = 2 \text{ x t}$$

Induced emf: $e = -\frac{d\phi}{dt} = -2 \text{ x t}$

$$\therefore \quad x = -\frac{e}{2t}$$

At t = 3 sec, $x = -\frac{9}{2 \times 3} = -1.5 \text{ wbs}^{-2}$

27.

(d) $V_0\sqrt{\frac{C}{L}}$

Explanation: $V_0\sqrt{\frac{C}{L}}$

28.

(c) 20.8

Explanation: In transformer,

$$\frac{n_p}{n_s} = \frac{V_p}{V_s} = \frac{5000}{240} = 20.8$$

29.

(b) i and iii

Explanation: Given, $E = 10 \cos(10^7 t + kx)$ V/m

Comparing it with standard equation of electromagnetic wave;

$E = E_0 \cos(\omega t + kx)$

We get,

E_0 = 10 V/m and

$\omega = 10^7$ rad/s

$c = v\lambda = \frac{\omega\lambda}{2\pi}$

$\lambda = \frac{2\pi c}{\omega} = \frac{2\pi \times 3 \times 10^8}{10^7} = 188.4$ m

$c = \frac{\omega}{k}$

$k = \frac{\omega}{c} = \frac{10^7}{3 \times 10^8} = 0.033$ rad/m

The wave is propagating along x-direction.

30.

(b) +2.5 D

Explanation: Hypermetropia is corrected by using a convex lens.

Focal length of lens used = +(defected near point)

f = +d = +40 cm

Power of lens = $\frac{100}{f(\text{ cm})}$

$= \frac{100}{+40} = +2.5$ D

31.

(d) 1.9 mm

Explanation: We know that

$\theta = \frac{\lambda}{d}, \therefore \frac{\theta_1}{\theta_2} = \frac{d_2}{d_1}$

$\frac{0.20}{0.21} = \frac{d_2}{2} \Rightarrow d_2 = \frac{0.20}{0.21} \times 2 = 1.9$ mm

32. **(a)** 4×10^{-15} V-s

Explanation: In emission of electron, Potential Energy

$eV = \frac{hc}{\lambda} - W_0$

When light of wavelength λ = 0.6mm and stopping potential 0.5V

$0.5e = \frac{hc}{6 \times 10^{-7}} - W_0$ ...(i)

When light of wavelength λ = 0.4mm and stopping potential 1.5V

$1.5e = \frac{hc}{4 \times 10^{-7}} - W_0$ ...(ii)

subtract equation (1) from (2) $e = \frac{hc}{10^{-7}}\left[\frac{1}{4} - \frac{1}{6}\right]$

$\Rightarrow \frac{h}{e} = \frac{12 \times 10^{-7}}{3 \times 10^{8}} = 4 \times 10^{-15}$ V-s

33. **(a)** intensity of incident beam

Explanation: According to Planck's quantum concept, the intensity of the incident beam (electromagnetic wave) means, the number of photons in the beam. If the intensity of the beam increases, the number of photons increases, hence the number of photo-electrons emitting will increase, in accordance with the laws of photoelectric emission. One of those laws says, that one photon emits one electron from a metal surface. Therefore, the number of photo-electrons emitted is proportional to the intensity of the incident beam.

34.

(c) ten times ionised sodium atom

Explanation: $\frac{1}{\lambda} = Z^2 R\left(\frac{1}{1^2} - \frac{1}{5^2}\right)$

Hence, λ is minimum when Z is maximum.

35.

(d) 4.37×10^9 yr

Explanation: 4.37×10^9 yr

PHYSICS (Section-B)

36.

(d) 3.33

Explanation: Power $= \left(\frac{mgh + \frac{1}{2}mV^2}{t}\right)$

$= \frac{1000 \times 10 \times 10 + \frac{1}{2} \times 1000 \times 10 \times 10}{60} = \frac{15,000}{6}$ wat

But 1 watt $= \frac{1}{746}$HP

$\therefore$ Power $= \frac{15000}{6 \times 746} = 3.33$ HP

37. **(a)** $5\sqrt{2}ms^{-1}$

Explanation: $5\sqrt{2}ms^{-1}$

38.

(b) d^{-2}

Explanation: According to Newton's law of gravitation

$F \propto \frac{1}{d^2}$

or, $F \propto d^{-2}$

39.

(d) Radius to the hole starts to increase

Explanation: When the plate is heated, it expands. During heating, in fact, interatomic separation increases. Hence, due to heating, radius of the circular hole also increases.

40.

(c) 2:1

Explanation: 2:1

41.

(c) $x = \frac{n\lambda}{2}$, n = 0, 1, 2, 3, ...

Explanation: The standing wave is represented by the equation,

y(x, t) = 2a sin kx cos ωt

= A(x) cos ωt ...(i)

Nodes are points where amplitude is zero.

For nodes: A (x) = 0

or 2a sin kx = 0

or $kx = n\pi$, n = 0, 1, 2, ...

or $\frac{2\pi}{\lambda}x = n\pi$

or $x = \frac{n\lambda}{2}$, n = 0, 1, 2 .....

42. **(a)** 0.014 J

Explanation: Work done in reversing dipole is

W = 2 MB

where, M = magnetic dipole moment = 10^{-2} A-m^2

and B = external field = $B\cos\omega t$ = 1 × cos(0.125 × 1)

$= \cos\left(7°\right) = 0.992$

Substituting these values, we get,

$W = 2 \times 10^{-2} \times 0.992$

= 0.0198 J

which is nearest to 0.014 J

43.

(d) 20

Explanation: l = 1 m, B = 5 $\times$ 10^{-5} T, = $\frac{22}{7}$mV

= $\frac{22}{7} \times 10^{-3}$ Volt

Induced emf, V = Blv

or v = $\frac{V}{Bl} = \frac{\frac{22}{7} \times 10^{-3}}{5 \times 10^{-5} \times 1} = 20\pi$

v = $r\omega$

$\therefore \quad \omega = \frac{20\pi}{r} = 20\pi$ rotation/sec

or ω = 20 rad/sec

44.

(d) 60 μWb

Explanation: Magnetic flux,

$\phi = \vec{B} \cdot \vec{A}$

= $(0.02\hat{i}) \cdot (30\hat{i} + 16\hat{i} + 23\hat{k}) \times 10^{-4}$

= 0.6 $\times$ 10^{-4} Wb

= 60 μWb

45. **(a)** either purely inductive or purely capacitive

Explanation: The average power dissipated in an AC circuit is given by, $P = E_V I_V \cos\phi$ where E_V and I_V are rms values of voltage and current respectively. cos ϕ is the power factor. For both inductor and capacitor, $\phi = 90^o$ i.e., cos ϕ = 0. Hence, the average power dissipated per cycle is zero for them.

46.

(d) two points propagating in two different parallel directions

Explanation: We know that in any medium except vacuum or air, the velocities of different colours are different. Therefore, both red and green colours are refracted at different, angles of refraction. So, after emerging from glass slab through opposite parallel faces, they appear at two different points an move in two different parallel directions.

47.

(c) $\frac{100}{79}$cm

Explanation: When the telescope is focussed to the moon, the objective forms the image at a distance of 100 cm from it, When the telescope is focussed at an object at u_0 = 8000 cm, then

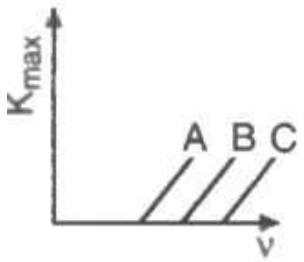
$$\frac{1}{f_o} = -\frac{1}{u_e} + \frac{1}{v_a} \text{ or } \frac{1}{100} = \frac{1}{v_o} - \frac{1}{-8000}$$

$\therefore$ $v_0 = \frac{8000}{79}$ cm

The shift in the image = $\frac{8000}{79}$ - 100 = $\frac{100}{79}$ cm

As the image is shifted $\frac{100}{79}$ cm towards the eye-piece, it should be pulled back through $\frac{100}{79}$ cm to focus the image in normal adjustment.

48. **(a)**



Explanation: Variation of KE of photoelectrons after threshold frequency is the same as the variation of stopping potential versus frequency.

49. **(a)** $E_n \propto \frac{1}{J_n^2}$

Explanation: $J_n = 1 = n\frac{h}{2R} = mvr$ ...(1) (in Bohr's model)

And from Coulomb force:

$$F = \frac{Ze^2}{4nE_0r^2}$$

And from centripetal force:

$$\frac{Ze^2}{4nE_0r^2} = \frac{mV^2}{r}$$

$$r = \frac{Ze^2}{4nE_0mV^2} \text{ ...(2)}$$

Eliminating r from (1) and (2)

$$V = \frac{Ze^2}{2E_0hn}$$

$$r = \frac{E_0h^2n^2}{RmZe^2}$$

Now, Kinetic energy = $\frac{1}{2}mv^2 = \frac{mz^2e^4}{8E_0^2h^2n^2}$

Potential energy = $\frac{-Ze^2}{4RE_0r} = \frac{-mZ^2e^4}{4E_0^2h^2n^2}$

So, total energy = K + V = $\frac{-mZ^2e^4}{8E_0^2h^2n^2} = \frac{-mZ^2e^4 4R^2}{8E_0^2\left(4R^2\right)h^2n^2} = \frac{-mZ^2e^4}{32E_0^2R^2} \times \frac{1}{l^2}$

So, $E_n \propto \frac{1}{J_n^2}$

50. **(a)** 20 days and 5 days

Explanation: Activity of a radioactive material is given as $R = \lambda N$

where, λ is the decay constant and N is the number of nuclei in the radioactive material.

For substance A,

$R_A = \lambda_A N_A = 10$ mCi

For substance B,

$R_B = \lambda_B N_B = 20$ mCi ...(i)

As given in the question,

$N_A = 2N_B$

$\Rightarrow R_A = \lambda_A (2N_B) = 10$ mCi ...(ii)

$\therefore$ Dividing Eq. (ii) and Eq.(i), we get

$$\frac{R_A}{R_B} = \frac{\lambda_A\left(2N_B\right)}{\lambda_B\left(N_B\right)} = \frac{10}{20}$$

or $\frac{\lambda_A}{\lambda_B} = \frac{1}{4}$ ....(iii)

As, half-life of a radioactive material is given as

$T_{1/2} = \frac{0.693}{\lambda}$

$\therefore$ For material A and B, we can write

$$\frac{\left(T_{1/2}\right)_A}{\left(T_{1/2}\right)_B} = \frac{\frac{0.693}{\lambda_A}}{\frac{0.693}{\lambda_B}} = \frac{\lambda_B}{\lambda_A}$$

Using Eq. (iii), we get

$$\frac{\left(T_{1/2}\right)_A}{\left(T_{1/2}\right)_B} = \frac{4}{1}$$

Hence, from the given options, only option (d) satisfies this ratio.

Therefore, $(T_{1/2})_A$ = 20 days and $(T_{1/2})_B$ = 5 days

CHEMISTRY (Section-A)

51.

(d) 0.2 M

Explanation:

$FeCl_3(aq)limiting\ reagent + NaOH(aq)(Excess\ amount)\ Not\ behave\ as\ limiting\ reagent$

$\rightarrow Fe(OH)_3(s) + 3NaCl(aq)$

$$\text{Moles of } Fe(OH)_3 = \frac{\text{weight in g}}{\text{Mol. mass of } Fe(OH)_3}$$

$$= \frac{2.14\text{ g}}{107\text{ g/mol}} = 0.02\text{ mol}$$

1.0 mole of $Fe(OH)_3$ is obtained from = 1.0 mole of $FeCl_3$

0.02 mole of $Fe(OH)_3$ will be obtained from = 0.02 mole of $FeCl_3$

$$\text{Molarity} = \frac{\text{No. of moles}}{\text{Volume in L}} = \frac{0.02\text{ mole}}{0.1\text{ L}} = 0.2\text{M}$$

52.

(d) 4%

Explanation: $\lambda \propto \sqrt{\frac{1}{KE}}$

$$\therefore \quad \frac{\lambda_1}{\lambda_2} = \sqrt{\frac{KE_2}{KE_1}}$$

$$\text{or } \frac{KE_2}{KE_1} = \frac{\lambda_1^2}{\lambda_2^2} = \frac{\lambda_1^2}{\left(0.98\lambda_1\right)^2}$$

$$\left[\because \quad \lambda_2 = \left[\lambda_1 - \frac{2}{100}\lambda_2\right]\right]$$

$KE_2 = KE_1 \times 1.04$

Change in K.E. $= \left[\frac{KE_2 - KE_1}{KE_1}\right] \times 100$

$= 0.04 \times 100 = 4\%$

53.

(b) $Br^- > S^{2-} > Cl^- > N^{3-}$

Explanation: Br^- $> S^{2-} > Cl^-$ $> N^{3-}$

4th period 3rd period 2nd period

(isoelectronic)

54.

(b) σ bond only

Explanation: σ bond only

55.

(c) NaBr, NaCl, NaF

Explanation: NaBr, NaCl, NaF

56.

(c) Thermal stability and ionic character of alkali metal carbonates.

Explanation: For polyatomic anions, thermal stability $\propto$ ionic character.

57. **(a)** It introduces the concept of the entropy

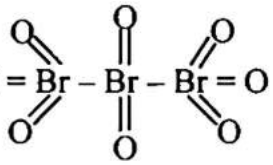
Explanation: It introduces the concept of the entropy

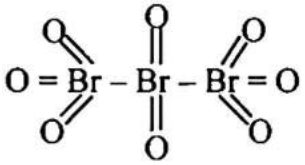
58.

(c) 8.0

Explanation: $K_p = \frac{\left(p_{CO}\right)^2}{p_{CO_2}} = \frac{4 \times 4}{2} = 8$

59.

(b) 

Explanation: 

60.

(c) MnO_2

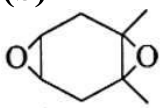
Explanation: $Mn^{2+} \rightarrow Mn^{4+} + 2e$ ($MnSO_4$ to MnO_2)

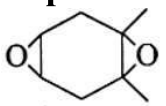
$E_{MnSO_4} = \frac{M}{2}$

61. **(a)** Option (iv)
Explanation: Option (iv)

62.
(c) $CH_4 < NF_3 < NH_3 < H_2O$
Explanation: The correct order of dipole moment is $CH_4 < NF_3 < NH_3 < H_2O$.
Methane has zero dipole moment as it is tetrahedral molecule in which C − H bond dipoles cancel each other.
In NF_3, the bond dipole of the lone pair and the resultant dipole of three N − F bonds are in opposite direction wheres in ammonia, they are in same direction. Hence, the dipole moment of NF_3 is smaller than that of methane.
The dipole moment of water is greater than the dipole moment of ammonia as oxygen is more electronegative than nitrogen.

63. **(a)** Optical isomerism and geometrical isomerism
Explanation: Stereoisomers are isomeric molecules that have the same molecular formula and sequence of bonded atoms but differ in the three-dimensional orientations of their atoms in space.
Pair of optical isomerism and geometrical isomerism are able to exhibit the phenomenon of stereoisomerism because both types of isomers differ only in their orientation in space.

64.
(b)


Explanation:


65. **(a)** Carbocation B is more stable and formed relatively at faster rate
Explanation: Carbocation B is more stable as it is secondary carbocation having more number of a-hydrogens and having greater +1 effect.
∴ Carbocation B formed at a faster rate than carbocation A.

66.
(c) Decimolar $Al_2(SO_4)_3$
Explanation: As we know, osmotic pressure will be high if no. of ions are more and $Al_2(SO_4)_3$ furnishes maximum number of ions so it shows maximum pressure.

67.
(d) 0.16 N
Explanation: 0.16 N

68.
(c) $E_1 > E_2$
Explanation: The cell reaction is $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$

$$E_{cell} = E^{\circ}_{cell} - \frac{0.059}{2}\log\frac{\left[Zn^{2+}\right]}{\left[Cu^{2+}\right]}$$

When $[Zn^{2+}]$ is increased and $[Cu^{2+}]$ is decreased, the term $\log \frac{\left[Zn^{2+}\right]}{\left[Cu^{2+}\right]}$ increases.

Thus, $E_1 > E_2$

69.

(d) 1.08×10^{-5}

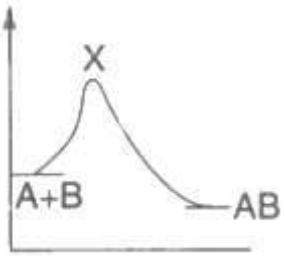
Explanation: Formation constant of $[Ag(NH_3)_2]^+$:

$Ag^+ + 2NH_3 \longrightarrow [Ag(NH_3)_2]^+ = K$

$\therefore K = K_1 \times K_2 = 6.8 \times 10^{-3} \times 1.6 \times 10^{-3} = 1.08 \times 10^{-5}$

70.

(d)



Explanation: Note that after formation of X (a slow process) the decomposition of X is fast; The energy of activation for formation of X is high.

71.

(d) 3

Explanation: The common stable oxidation state of all the lanthanoids is +3. The oxidation state of +2 and +4 are also exhibited by some of the elements. These oxidation states are only stable in those cases where stable $4f^0$, $4f^7$ or $4f^{14}$ configurations are achieved.

72.

(d) SnO_2

Explanation: Oxides of Sn and Pb are amphoteric in nature.

CO_2, SiO_2	Acidic
K_2O	Basic
SnO_2	Amphoteric

73.

(c) Mn^{2+}

Explanation:

Ions	E^0(V)
Ti^{2+}	-0.37
V^{2+}	-0.26
Cr^{2+}	-0.41
Mn^{2+}	+1.57

Negative value of E^0 means these metals librate hydrogen from dilute acid.

($M^{2+} + 2H^+ - e^- \longrightarrow M^{3+} + H_2$)

74.

(c) Option (ii)

Explanation: According to Irving and Williams, the stability of the complexes of the divalent metal ions of the first transition series is in the following order:

Mn(II) < Fe(II) < Co(II) < Ni(II) < Cu(II)

75.

(c) Na

Explanation: Na has an unchanged oxidation number. Its oxidation number is +1 and is not variable. All alkali metals are always univalent.

76.

(d) Q > S > P > R

Explanation: Rate of S_N1 reaction depends on the following factors:

i. As the stability of cation increases the rate of reaction increases
ii. Rate of reaction increases with better-leaving groups
iii. Electron donating groups increases rate of reaction

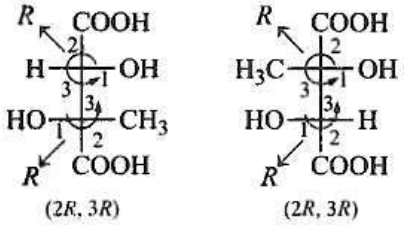
77. **(a)** partial double bond character of C - O bond

Explanation: partial double bond character of C - O bond

78.

(d) homomers

Explanation:



If 4th group is on horizontal line then, we take reverse configuration.

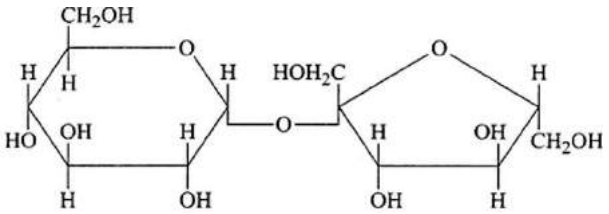
79.

(d) CH_3 - NH - CH_3

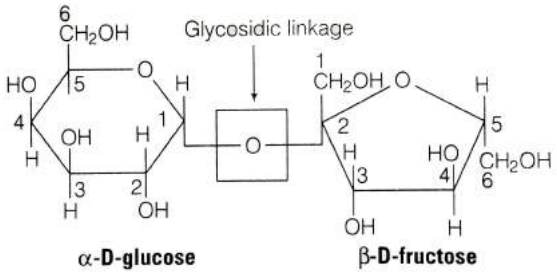
Explanation: 2^o amine give this reaction.

80.

(c)



Explanation:

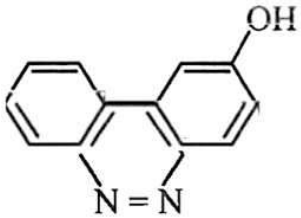


This structure represents sucrose in which α−D glucose and β−D fructose is attached to each other by C_1−C_2 glycosidic linkage. Since reducing groups of glucose and fructose are involved in glycosidic bond formation, this is considered as a non-reducing sugar.

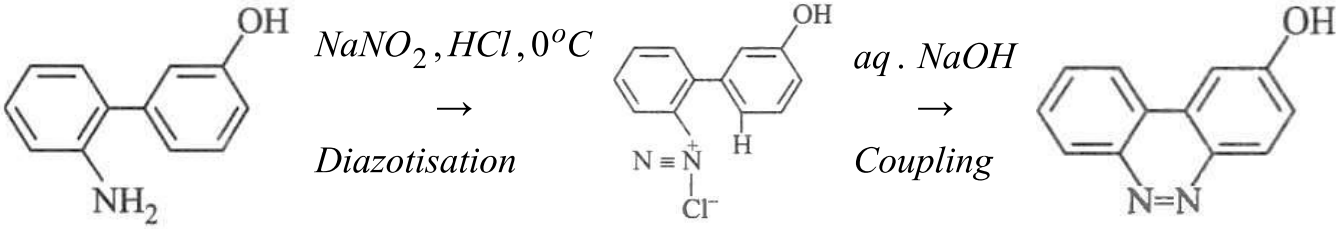
81. **(a)** Vitamin D

Explanation: Deficiency of vitamin D causes rickets.

82. **(a)**



Explanation:



83. **(a)** It gains electrons.

Explanation: It gains electrons.

84.

(d) Solid and liquid is stationary phase and gas is the mobile phase.

Explanation: Solid and liquid is stationary phase and gas is the mobile phase.

85.

(c) Co

Explanation: The blue borax bead is obtained with cobalt.

CHEMISTRY (Section-B)

86.

(d) CCl_4

Explanation: $\mu_{CCl_4} = 0$

87.

(c) 63.5 g

Explanation: Given, Q = 2F

Atomic mass of Cu = 63.5u

Valency of the metal Z = 2

We have, $CuSO_4 \longrightarrow Cu^{2+} + SO_4^{2-}$

$Cu^{2+}\ 1mol + 2e^{-}\ 2mol\ 2F \longrightarrow Cu\ 1mol = 63.5g$

Alternatively

$W = ZQ = \frac{E}{F} \cdot 2F = 2E = \frac{2 \times 63.5}{2} = 63.5$

88.

(b) (D) only

Explanation: If the AG $\rightarrow$ Negative, reaction proceed in the forward direction.

i. $\left[Co\left(NH_3\right)_6\right]^{3+} + 3en \rightleftharpoons \left[Co(en)_3\right]^{3+} + 6NH_3$

Stability of $[Co(en)_3]^{3+} > [Co(NH_3)_6]^{3+}$

ii. $2Na[Al(OH)_4] + CO_2 \longrightarrow > 2Al(OH)_3 + Na_2CO_3 + H_2O$

Precipitation reaction

iii. $AIN + H_2O \rightarrow Al(OH)_3 + NH_3$ Evolved gas.

89. **(a)** a, b, c, f

Explanation:

- Most of the 3rd-period elements have higher E.A. as compared to corresponding 2nd-period elements.
- Elements that have s^2 or p^3-configuration in the outermost shell have low E.A. as compared to its next and previous element in the periodic table.

90. **(a)** by absorption of electromagnetic radiation of a particular frequency

Explanation: by absorption of electromagnetic radiation of a particular frequency

91.

(d) iii only

Explanation: Al_2O_3 is ionic and SiO_2 is a network solid.

92.

(d) 25 min

Explanation: 25 min

93.

(b) Ag > Au > Zn > Al

Explanation: According to Faraday's second law of electrolysis,

mass of product deposited $\propto$ equivalent weight

$E_{eq}(Al^{3+}) = \frac{27}{3} = 9, E_{eq}(Ag^{+}) = \frac{108}{1} = 108$

$E_{eq}(Zn^{2+}) = \frac{65.4}{2} = 32.7$, $E_{eq}(Au^{+}) = \frac{197}{3} = 65.6$

Hence, the correct decreasing order of amount of different metals deposited is:
Ag > Au > Zn > Al

94.

(b) Hydrochloric acid, HCl

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

95. **(a)** 467s

Explanation: For 1st order reaction

$$K = \frac{2.303}{t}\log\frac{a_o}{0.2a_o}$$

also $t\frac{1}{2} = \frac{0.693}{k}$

$$K = \frac{0.693}{200} \Rightarrow \frac{0.693}{200} = \frac{2.303}{t}\log\frac{1}{0.2}$$

$$t = \frac{2.303}{0.693} \times 200\log\frac{1}{0.2} = 466.675 \approx 467 \text{ sec}$$

96.

(c) NeF_2

Explanation: NeF_2

97. **(a)** Option (iv)

Explanation: Ozone oxidizes moist iodine to iodic acid, HIO_3.

98.

(d) Co (Z = 27)

Explanation: SRP value normally increases from left to right in the period of d-block elements. Some SRP value are exceptionally higher due to stability of product ion. e.g.

$E^{\circ}_{Mn^{3+}/Mn^{2+}} = +1.57V$; $E^{\circ}_{Co^{3+}/Co^{2+}} = +1.97V$

Thus, $E^{0}_{M^{3+}/M^{2+}}$ is highest for Co.

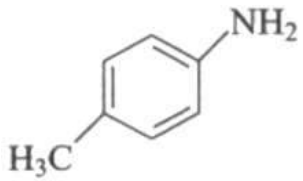
99.

(b) $\left[CrCl\left(H_2O\right)_5\right]Cl_2 \cdot H_2O$

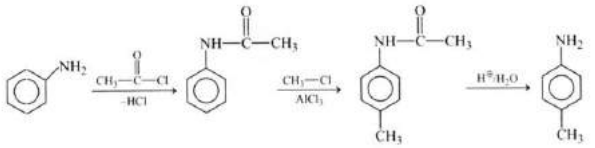
Explanation: $\left[CrCl\left(H_2O\right)_5\right]Cl_2 \cdot H_2O$

100.

(d)



Explanation:



BOTANY (Section-A)

101. **(a)** (A) - (v), (B) - (iv), (C) - (i), (D) - (ii), (E) - (iii)
Explanation: (A) - (v), (B) - (iv), (C) - (i), (D) - (ii), (E) - (iii)

102.
(c) Biological names can be written in any language
Explanation: The universal rules of nomenclature are as follows:
- Biological names are in Latin and are written in italics.
- The first word in the name indicates the genus, while the second word denotes its specific epithet.
- When the name is handwritten, both the words are separately underlined. When printed, the name is in italics.
- The first letter of the first word is always written in capital, while the first letter of the specific epithet, i.e. the second word, is a small letter.

Examples: *Homo sapiens*, *Mangifera indica*

103.
(c) Blue green algae
Explanation: During rainy seasons, the ground becomes slippery due to the dense growth of cyanobacteria (Blue-green algae). Cyanobacteria are bacteria that obtain energy through photosynthesis. Cyanobacteria synthesize a gelatinous mass around themselves, enclosing multiple filaments. This causes the surface area on which they thrive to be slippery.

104.
(c) All of these
Explanation: Some of the bacteria are autotrophic, i.e., they synthesize their own food from inorganic substrates. They may be photosynthetic autotrophic or chemosynthetic autotrophic. The vast majority of bacteria are heterotrophs, i.e., they depend on other organisms or on dead organic matter for food.

105.
(b) Generative cell
Explanation: Generative cell divides mitotically to form two male gametes during the growth of pollen tube through style in 2-celled pollen grains and before their dispersal in 3-celled pollen grains.

106.
(b) Multicellular
Explanation: The sex organs in bryophytes are multicellular. The male sex organ is called

the antheridium. They produce biflagellate antherozoids. The female sex organ called archegonium is flask-shaped and produces a single egg.

107. **(a)** Haplodiplontic, Diplontic
Explanation: Interestingly, while most algal genera are haplontic, some of them such as Ectocarpus, Polysiphonia, Kelps are haplodiplontic. Fucus, an alga is diplontic.

108. **(d)** Megaspore mother cell
Explanation: Megaspore mother cell

109. **(a)** 250
Explanation: 200 pea seeds will be produced from the fusion of 200 pollen grains and 200 eggs. Since one microspore mother produces four microspores from one meiotic division, 200 pollen grains will be formed from 50 microspore mother cells by 50 meiotic divisions while one functional mother cell resulting from one meiotic division of megaspore mother cell forms one egg, 200 eggs will be formed by 200 megaspore mother cells so total 250 meiotic divisions will be required to produce 200 pea seeds.

110. **(c)** The seeds cannot be stored under normal conditions.
Explanation: Because seeds cannot be stored under normal condition.

111. **(a)** Primary meristems
Explanation: The meristem that originates from the embryonic meristems is Primary meristems. They gave the power of division throughout the life of the plant. They build the primary body of the plant. They are located at the tip of the root and stem.

112. **(b)** Maize
Explanation: The stem of Maize (Zea mays) has water containing cavities in the vascular bundle.

113. **(a)** recessive and autosomal
Explanation: Given pedigree analysis indicates the transmission of autosomal recessive trait from parents to their offspring.

114. **(d)** Law of independent assortment
Explanation: Law of independent assortment

115. **(c)** Lagging strand
Explanation: The new strand synthesized in small pieces, called Okazaki fragments and then joined together by the enzyme ligase, during DNA replication, is called a lagging strand or a discontinuous strand.

116. **(c)** (i) → (iii) → (ii) → (v) → (iv)
Explanation: Helicase unwinds the dsDNA, SSBPs or single-stranded binding proteins maintain single stranded position, primase synthesises the. RNA primer, DNA polymerase catalyses the polymerisation of DNA, and ligase joins the fragments.

117. **(c)** Slime layer

Explanation: The cell envelope of prokaryotes consists of a tightly bound three-layered structure, i.e. the outermost glycocalyx followed by the cell wall and then the plasma membrane. Glycocalyx differs in composition and thickness among different bacteria. It could be a loose sheath called the **slime layer** in some, while in others it may be thick and tough, called the **capsule.**

118. **(a)** All of these
Explanation: Modern cell theory has been modified. It includes:
- All living organisms are made up of cells and product of cells.
- New cells develop from the division of pre-existing cells.
- The function of organisms is an integrated effort of cells.

119. **(b)** Diphtheria, pertussis, tetanus
Explanation: Diphtheria, pertussis, tetanus

120. **(a)** T-lymphocytes
Explanation: T-lymphocytes

121. **(a)** the contraction of the contractile ring of microfilament.
Explanation: In animal cell cytokinesis involves the contraction of the contractile ring of microfilament. Contractile ring of microfilaments develops peripherally below die cell membrane in the equatorial region.

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

123. **(d)** Grass
Explanation: Grass

124. **(d)** Dwarf gene of wheat
Explanation: Dwarf gene of wheat

125. **(b)** Zoo
Explanation: Zoo

126. **(a)** No human activity is allowed
Explanation: No human activity is allowed

127. **(a)** Endangered
Explanation: Endangered

128. **(c)** S - phase
Explanation: The first step of chromatin structure duplication is the synthesis of histone proteins: H1, H2A, H2B, H3, H4. These proteins are synthesized during the S phase of the cell cycle.

129. **(b)** A - (iv), B - (iii), C - (ii), D - (i)
Explanation:

Pachytene	Crossing between homologous chromosomes,

Zygotene	Pairing between homologous takes place.
Anaphase	Centromere splits and chromatids are separated.
Metaphase	Chromosomes are moved to spindle equator.

130.

(d) Both F_0- It embedded in the membrane and forms a transmembrane channel that carries out facilitated diffusion of protons across the membrane and F_1- Protrudes on the outer surface of the thylakoid membrane on the side that faces the stroma

Explanation: The ATPase enzyme consists of two parts: one called the F0 is embedded in the membrane and forms a transmembrane channel that carries out facilitated diffusion of protons across the membrane. The other portion is called Fj and protrudes on the outer surface of the thylakoid membrane on the side that faces the stroma.

131. **(a)** A

Explanation: The C_3 and C_4 plants respond differently to CO_2 concentrations. At low light conditions neither group responds to high CO_2 conditions. At high light intensities, both C_3 and C_4 plants show increase in the rates of photosynthesis. C_4 plants show saturation at about 360 μL^{-1} while C_3 responds to increased CO_2 concentration and saturation is seen only beyond 450 μL^{-1}. Thus, current availability of CO_2 levels is limiting to the C_3 plants.

132. **(a)** only ATP

Explanation: DCMU inhibits the flow of electrons from PS II to cytochrome b6-f by competing for the binding site of plastoquinone. Only ATP synthesis will occur through cyclic photophosphorylation. Since no NADPH is synthesised, no glucose will be formed.

133.

(d) oxidation of RuBP.

Explanation: The enzyme RuBisCO is a key enzyme in photosynthesis. It combines O_2 with RuBP as the first step of the photorespiration under high temperature and higher ratio of O_2 to CO_2.

134. **(a)** It functions as an electron carrier

Explanation: It functions as an electron carrier

135.

(b) Indole butyric acid

Explanation: Indole butyric acid

BOTANY (Section-B)

136.

(b) Perception of events happening in the environment and their memory

Explanation: All living organisms show growth which is an irreversible increase in the mass of individuals from inside. However, some nonliving things like mountains, crystals also grow, but their growth is due to the addition of matter from outside. Metabolism is the process by which all living things assimilate energy and use it for various purposes such as growth, movement, locomotion, etc. This mechanism of metabolism is not shown by

nonliving objects. However, some of the metabolic reactions can be carried out in a cell-free system or outside the cells. Isolated metabolic reactions in vitro are not living things but are living reactions.
All organisms respond to external stimuli which can be physical, chemical, or biological. Stimuli are perceived by sense organs in animals but plants can respond to external factors like water, temperature, light, etc. All organisms from prokaryote to the most complex eukaryotes can sense and respond to environmental events. Hence, the perception of events happening in the environment and their memory is an exclusive characteristic of all living things.

137.

(b) None of these
Explanation: Viruses did not find a place in classification since they are not considered truly 'living' if we understand living as those organisms that have a cell structure. The viruses are non-cellular organisms that are characterized by having an inert crystalline structure outside the living cell.

138.

(c) All of these
Explanation: The algae reproduce by vegetative, asexual, and sexual methods. Vegetative reproduction is by fragmentation. Asexual reproduction is by the production of different types of spores, the most common being the zoospores. They are flagellated (motile) and germination gives rise to new plants. Sexual reproduction takes place through the fusion of two gametes. These gametes can be flagellated and similar in size (as in Ulothrix) or non-flagellated (non-motile) but similar in size (as in Spirogyra).

139.

(b) Only A
Explanation: Single celled and originates from nucellus at micropyler end

140.

(c) Flower of tulip is a modified shoot
Explanation: Flower is a modified shoot where shoot apical meristem gets transformed into floral meristem. In tomato, fruit is a berry. Seeds of orchids are non-endospermic. In primrose, the placentation is free-central.

141.

(b) 50%
Explanation: 50%

142. **(a)** 0.97
Explanation: 0.97

143.

(c) metacentric
Explanation: A chromosome consists of two chromatids held together by a centromere. Depending on the position of the centromere, the chromosomes are classified into four types. They are metacentric, sub-metacentric, acrocentric, and telocentric. In the metacentric chromosome, the centromere is located at the centre and forms two equal arms of chromatids.

144. **(a)** Lactobacillus cells
Explanation: Lactobacillus cells

145.
(d) 8
Explanation: Glucose is the first cycle of aerobic respiration. It produces two pyruvate molecules, a net gain of two ATP molecules and two $NADH_2$ molecules at the end of the cycle. In glycolysis, 2 molecules of ATP are produced during the conversion of 1, 3-biphosphoglyceric acid to 3-phosphoglyceric acid and 2-phosphoenol pyruvic acid to pyruvic acid each. However, out of these 4 molecules of ATP, 2 molecules are utilized during the conversion of glucose to glucose-6-phosphate and fructose-6-phosphate to fructose-1,6-diphosphate. During the conversion of 2 molecules of 1, 3-diphosphoglyceraldehyde into 2 molecules of 1, 3-diphosphoglyceric acid, 2 molecules of $NADH_2$ are formed. During aerobic respiration, each $NADH_2$ forms 3 ATP and water. Hence, net gain of ATP molecules in glycolysis is 2 ATP + 6 ATP = 8 ATP.

146.
(d) A-Large aeration tank, B-Mechanical agitation, C-Reduced BOD, D-Activated sludge, E-Anaerobic sludge digesters
Explanation: A-Large aeration tank, B-Mechanical agitation, C-Reduced BOD, D-Activated sludge, E-Anaerobic sludge digesters.

147. **(a)** gross primary productivity
Explanation: The rate of synthesis of organic matter or biomass produced by green plants during a given period of time is called gross primary productivity. It is measured as weight gm/m2/ year or energy ($kcal/m^2/yr$).

148.
(b) Cytokinin
Explanation: Cytokinin promotes growth of lateral buds and has negative effect on apical dominance.

149.
(b) Flower once and die
Explanation: Monocarpic plants are those plants that flower once during their life time, set seeds, and then die, e.g., bamboos.

150.
(c) C
Explanation: In the photorespiratory pathway, there is neither synthesis of sugars, nor of ATP. Rather it results in the release of CO_2 with the utilisation of ATP. Therefore, photorespiration is a wasteful process.

ZOOLOGY (Section-A)

151.
(c) Ornithorhynchus - Mammalia- Oviparous
Explanation: The given image represents Ornithorhynchus (Platypus) which is oviparous and belongs to Class Mammalia.

152.
(c) Independent flatworms

Explanation: Turbellarians are independent flatworms that are not parasitic in nature.

153.

(b) All of these

Explanation: Ascaris (Round Worm), Wuchereria (Filaria worm), Ancylostoma (Hookworm) are aschelminthes in which the alimentary canal is complete with a well developed muscular pharynx.

154.

(c) Schwann cell

Explanation: Schwann cells are the cells of neurons. In myelinated axons, Schwann cells form the myelin sheath.

155.

(d) One vein, one artery, lymph vessel, one nerve and few bone cells

Explanation: A Haversian canal is a central canal within the Haversian system, which is a network of canals inside the compact bone. It constitutes one vein, one artery, lymph vessel, one nerve, and few bone cells.

156.

(c) Both Aerobic and Anaerobic respiration

Explanation: Both Aerobic and Anaerobic respiration

157.

(b) Epiglottis

Explanation: The epiglottis is a flexible flap at the superior end of the larynx in the throat. It acts as a switch between the larynx and the esophagus to permit air to enter the airway to the lungs and food to pass into the gastrointestinal tract. The epiglottis also protects the body from choking on food that would normally obstruct the airway.

158.

(c) Hemoglobin

Explanation: Carbon monoxide combines with Hb far more readily than O_2 (CO has about 200 times greater affinity for Hb as compared to O_2) forming a relatively stable compound carboxy-haemoglobin. This causes low supply of O_2 to the body cells leading to headache, nausea, dizziness, paralysis and even death.

159.

(d) There is a negative intra pleural pressure pulling at the lung walls

Explanation: Intrapleural pressure is the pressure of air within the pleural cavity. Intrapleural pressure is always negative, which acts like a suction to keep the lungs inflated and prevent them from collapsing. The negative intrapleural pressure is due to three main factors: Surface tension of the alveolar fluid; elasticity of lungs; elasticity of thoracic wall.

160.

(d) A non-enzymatic process

Explanation: A non-enzymatic process

161.

(b) Menstrual

Explanation: Menstrual

162. **(a)** testes to epididymis.
Explanation: Rete testis carries sperms from the seminiferous tubules (where sperms are produced) of the testes into the vasa efferentia which in turn, opens into epididymis located along the posterior surface of each testis. Thus, if vasa efferentia get blocked, sperms will not be transported from testes to epididymis.
163. **(a)** Hernia
Explanation: Hernia
164.
(b) All of these
Explanation: The most important step to control the problem of the over-population is to motivate smaller families by using various contraceptive methods. Statutory raising of marriage able age of the female to 18 years and that of males to 21 years, and incentives given to couples with small families are two of the other measures taken to tackle this problem.
165.
(c) A-(iii), B-(i), C-(iv), D-(ii)
Explanation: Syphilis is caused by a bacterium, Treponema pallidum, gonorrhoea is caused by the bacterium, Neisseria gonorrhoeae, genital warts are caused by human papillomavirus, and genital herpes is caused by herpes simplex virus.
166.
(b) A-(iv), B-(i), C-(ii), D-(iii)
Explanation: Theory of panspermia was proposed by Richter. The theory of spontaneous generation was disproved by experimentally challenged by Francesco Redi (1626-1697), Lazzaro Spallanzani (1729-1799), and Louis Pasteur (1822-1895). In his famous experiment, Louis Pasteur used a special flask whose neck was shaped like an S or the neck of a swan, hence the name Swan Neck Flask. Oparin put forward his influential theory that life on Earth developed through gradual chemical evolution of carbon-based molecules in a primordial soup.
167. **(a)** Natural selection
Explanation: Natural selection
168.
(b) Ammonia
Explanation: Ammonia
169.
(b) Urine
Explanation: Renal columns of Bertini are found in the kidney of man for the collection of urine.
170.
(c) Vasopressin
Explanation: The distal convoluted tubule (DCT) reacts to the amount of anti-diuretic hormone (ADH) or vasopressin in the blood. The more ADH is present in the blood, the more water is reabsorbed into it. This happens because the presence of ADH in the blood causes the cells in the DCT to become more permeable to water, therefore they allow more

water to pass from the tubular fluid back into the blood. This results in more concentrated urine.

171. **(c)** Hinge joint
Explanation: In hinge joint movement is possible in one direction only. Joint of malleus and incus, knee joint, elbow joint, articulation joint of the lower jaw.

172. **(d)** Vertebral column
Explanation: In humans, the vertebral column is formed by 26 serially arranged units called vertebrae and is dorsally placed. Each vertebra has a central hollow portion (neural canal) through which the spinal cord passes. The vertebral column is differentiated into cervical (7), thoracic (12), lumbar (5), sacral (1-fused) and coccygeal (1-fused) regions starting from the skull. Hence coccygeal bone occurs in the vertebral column. So, the correct answer is 'Vertebral column'.

173. **(c)** Tetanus
Explanation: Tetanus toxin can lead to muscle spasms, nursing loss, and seizures in neonates. Usually, this happens during the first two weeks of birth and may be associated with inadequate measures of hygiene of care for the neonate's umbilical cord stump.

174. **(a)** from tissues/organs to the CNS.
Explanation: The afferent nerve fibres transmit impulses from tissues/organs to the. CNS and it is the efferent nerve fibres that transmits regulatory impulses from the CNS to the concerned peripheral tissue/organs.

175. **(c)** Thoracico-lumbar nerves
Explanation: Thoracico-lumbar nerves

176. **(d)** Positively charged
Explanation: Positively charged

177. **(d)** Aldosterone
Explanation: Aldosterone

178. **(d)** Adrenal
Explanation: Adrenal

179. **(c)** Carry blood away from the heart to different organs.
Explanation: Arteries are blood vessels that carry blood away from heart to diferent body organs. The blood is usually oxygenated.

180. **(d)** The person cannot form antibody for ‘A’
Explanation: The person with blood group A cannot form antibody ‘A’ but can form antibody 'B' and have antigen A on the RBCs.

181. **(a)** Bronchial artery
Explanation: The bronchial arteries carry oxygenated blood to the lungs as part of the general systemic circulatory system.
182. **(a)** Colourless colonies in presence of insert and it is recombinant colonies
Explanation: Alternative selectable markers have been developed which differentiate recombinants from non-recombinants on the basis of their ability to produce colour in the presence of a chromogenic substrate. In this, recombinant DNA is inserted within the coding sequence of an enzyme, β-galactosidase. This results in the inactivation of the enzyme, which is referred to as **insertional inactivation**. The presence of a chromogenic substrate gives blue coloured colonies if the plasmid in the bacteria does not have an insert. The presence of insert results into insertional inactivation of the 3-galactosidase and the colonies do not produce any colour, these are identified as recombinant colonies.
183.
(b) Hind II
Explanation: Hind II was the first restriction enzyme to be isolated. This enzyme was first isolated from Haemophilus influenzae Ry13 strain II. So, the enzyme was shortly labelled as Hind II.
184.
(d) Steroid
Explanation: Steroid
185.
(b) obtain antibiotics
Explanation: Continuous addition of sugars in 'fed batch' fermentation is done to obtain antibiotics.

ZOOLOGY (Section-B)

186.
(b) Porifera
Explanation: The animals belonging to Phylum Porifera like sponges are mostly asymmetrical, that is, any plane that passes through the centre does not divide them into equal halves.
187.
(c) Nucleated RBCs
Explanation: The blood cells in frog are RBC (red blood cells) or erythrocytes, WBC (white blood cells) or leucocytes and platelets. RBC's are nucleated and contain red coloured pigment namely haemoglobin.
188. **(a)** Sudden interruption in blood flow towards a portion of heart
Explanation: A myocardial infarction (MI), also known as a heart attack, occurs when blood flow decreases or stops to a part of the heart, causing damage to the heart muscle.
189.
(b) CO_2
Explanation: CO_2
190.
(b) Only (A) and (C)

Explanation: First milk after parturition is called colostrums. and Menstrual cycle cannot be found during the intense lactation period.

191. **(b)** It contains centchroman
Explanation: Saheli is a non-hormonal contraceptive pill that contains ormeloxifene, also known as centchroman.

192. **(c)** Eohippus
Explanation: The earliest fossil form in the phylogeny of the horse is Eohippus.

193. **(b)** More
Explanation: More

194. **(a)** Hyoid apparatus
Explanation: A single U-shaped bone that is present at the base of the buccal cavity is called as Hyoid. Hyoid bone occurs in the skull. The hyoid bone is also called lingual or tongue bone. The term hyoid apparatus refers to the bones of the tongue. The primary function of the hyoid bone is to serve as an anchoring structure for the tongue. Hence surface for attachment of the tongue is the Hyoid apparatus. So, the correct answer is 'Hyoid apparatus'.

195. **(d)** Pressure contact
Explanation: Pressure contact

196. **(c)** do not possess ducts
Explanation: do not possess ducts

197. **(b)** Islets of Langerhans
Explanation: Islets of Langerhans

198. **(c)** By the traumatised cell at the place of injury.
Explanation: Thromboplastin is a complex enzyme that is found in brain, lung, and other tissues and especially in blood platelets. It is released by damaged blood vessels and surrounding tissues at the place of injury. In the presence of other plasma proteins (clotting factors) and calcium ions, this leads to the activation of a protein called factor X.

199. **(d)** Lane 1-undigested and lane 2 to 4-digested set of DNA fragments
Explanation: Lane 1-undigested and lane 2 to 4-digested set of DNA fragments

200. **(d)** C - peptide Is removed from proinsulin.
Explanation: During the processing of proinsulin into the mature insulin C-peptide is removed from proinsulin.