# CEE MODEL ENTRANCE EXAM
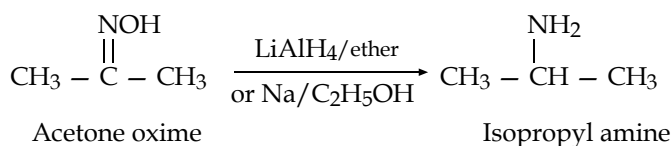
## (SET-7 Solutions)

**Instructions:**

- There are 200 multiple-choice questions, each having four choices of which only one choice is correct.
- Fill (●) the most appropriate one.

**Date** : 2081/10/12
(Jan 25)

**Duration** : 3 hours
**Time :** 7 A.M. – 10 A.M.

1.  (d)  $2KMnO_4 + 16\,HCl \rightarrow 2MnCl_2 + 2HCl + 5H_2O + Cl_2$
         i.e. 2 mole          16 mole
                 1 mole          8 mole
2.  (c)  $C + O_2 \qquad \rightarrow \qquad CO_2$
         1 mole                          1 mole
         12 g                            44 gm
         0.06 g                          0.22 gm
         % of C = $\dfrac{0.06}{0.24}$ × 100% = 25%
3.  (d)
4.  (a)  $XO_3^- + 6H_2O + 8e^- \rightarrow XH_3 + 9OH^-$
         So, 8 moles e⁻ are needed
5.  (c)  Hydrazoic acid = $N_3H$
         For conjugate base, remove $H^+$
         i.e., $N_3H \rightarrow N_3^- + H^+$
6.  (a)  $N_1V_1 = N_2V_2$
         or, 0.2 × 150 = 0.05 × (150 + x)
         ∴  x = 450 ml
7.  (d)  Glucose being crystalloid, pass through parchment paper leaving behind proteins (colloids)
8.  (b)
9.  (d)  Rate of diffusion $\propto \dfrac{1}{\sqrt{\text{molecular weight}}}$
         NO and $C_2H_6$ have same molecular weight i.e., 30. So, they have same rate of diffusion.
10. (d)
11. (c)  In $H_2O_2$, O–O bond is single bond
         In $O_3$, O–O bond has particle double bond
         In $O_2$, O–O bond is double bond
12. (d)  $N_2O_4 \xrightarrow{\hspace{1cm}} 2NO_2$
         Initial 1                       0
         Final 1 – ∝                  2∝
         Total no. of molecules = 1 – ∝ + 2∝ = 1 + ∝
13. (c)  Total $[H^+] = 10^{-8} + 10^{-7} = 1.1 \times 10^{-7}$
         So, p[H] = – log[H⁺] = 6.98
14. (d)  75% of reaction (2 half life) = 50 min
         50% of reaction (1 half life) = 25 min
15. (a)  Higher (positive value) the standard potential of a species, lesser will be reducing strength and higher will be its oxidising strength.
16. (a)  If   $H_R > H_P \rightarrow$ exothermic (–ve)
               $H_R < H_P \rightarrow$ endothermic (+ve)
17. (c)  Addition of 2nd electron to O⁻ is endothermic
18. (b)
19. (b)
20. (c)  Here auto reduction takes place i.e., the ore itself acts as reducing agent.
21. (a)  $CaO + H_2O \rightarrow Ca(OH)_2$ + Heat
22. (d)  This process is also called Down's process.
23. (d)  Solubility of sulphates, carbonates decreases from Be to Ba.
24. (c)  Boron nitride (Borazole) $\rightarrow B_3N_3H_6 \rightarrow$ Inorganic benzene
         BN $\rightarrow$ Inorganic graphite
25. (a)
26. (a)  Conc. $HNO_3$ is strong oxidising agent which oxidises the proteins of our skin into xanthoproteins.
27. (c)
28. (d)  $5F_2 + 5H_2O \rightarrow 10HF + O_2 + O_3$
29. (d)
30. (c)  Brass = Cu + Zn          Bronze = Cu + Sn
31. (c)  Matte = $Cu_2S + FeS$
         Fool's gold = $FeS_2$
         Blister copper = impure copper
32. (b)  $Cr^{3+} \rightarrow$ Green bead          $Mn^{2+} \rightarrow$ Pink bead
         $Co^{3+} \rightarrow$ Blue bead           $Fe^{2+} \rightarrow$ Yellow bead
         $Ni^{2+} \rightarrow$ Brown bead

33. (b)
34. (c)
35. (d) $2CH_3 - COOK + 2H_2O \xrightarrow{\text{electrolysis}} CH_3 - CH_3 + 2CO_2 + 2KOH + H_2$
This is Kolbe's electrolysis.
36. (d) $BP \propto \dfrac{\text{molecular weight}}{\text{No. of branches}}$
37. (c) $2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2$
38. (a)
39. (d)
40. (a) Rosenmund's reduction is free radical substitution reaction and used in preparation of aldehyde.
41. (b)
42. (b) $CO_2$ is the anhydride compound of Carbonic acid $H_2CO_3$
43. (b)

$$CH_3 - \underset{\underset{NOH}{\|}}{C} - CH_3 \xrightarrow[\text{or Na/C}_2\text{H}_5\text{OH}]{\text{LiAlH}_4/\text{ether}} CH_3 - \underset{\underset{NH_2}{|}}{CH} - CH_3$$

   Acetone oxime                    Isopropyl amine

44. (d) Oil of winter green-Methyl salicylate
Oil of bitter almonds - Benzaldehyde
Artificial oil of bitter almond - Nitrobenzene
45. (a) Bakelite is a step growth polymer and co-polymer of phenol and formaldehyde.
46. (c)
47. (a) Alizarin + $Al^{3+} \rightarrow$ Rose red
Alizarin + $Fe^{3+} \rightarrow$ Violet
Alizarin + $Ba^{2+} \rightarrow$ Blue
48. (c) Coal tar $\xrightarrow[\text{of}]{\text{source}}$ Aromatic hydrocarbon

   Petroleum $\xrightarrow[\text{of}]{\text{source}}$ Aliphatic hydrocarbon

49. (b)
50. (b) $NO_2$ group is electron attracting or ring deactivating group and so increases acidic strength.
51. (c) As least count $= \dfrac{1}{2}$ s = 0.5 s $\therefore$ t = 2.5 s ± 0.5 s

   Permissible error $= \dfrac{\Delta t}{t} \times 100\%$

   $= \dfrac{0.5}{2.5} \times 100\% = 20\%$

52. (b) **Torque is an axial vector:** The other given quantities are polar vectors.
53. (b) Displacement in first eight steps = 5 – 3 = 2 m
Time taken for first eight steps = 8 s

   Time taken by drunkard to cover first six metres of journey $= \dfrac{8}{2} \times 6 = 24$ s.

   If the drunkard takes 5 steps more, he will fall into the pit so the time taken by the drunkard to cover last five steps = 5 s.
Total time = 24 + 5 = 29 s

54. (c) Vertical Retardation due to air friction $= \dfrac{10}{100} g = \dfrac{g}{10}$

   Therefore, during upward motion, total retardation

   $g' = g + \dfrac{g}{10} = \dfrac{11 g}{10}$

   Max. height $H = \dfrac{u^2 \sin^2 \theta}{2 g}$   and   $H' = \dfrac{u^2 \sin^2 \theta}{2g'} = \dfrac{u^2 \sin^2 \theta}{2 \times 11 \, g/10} = \dfrac{10}{11} H$

   % decrease in $H' = \dfrac{H - H'}{H} \times 100 = \left(1 - \dfrac{H'}{H}\right) \times 100$

   $= \left(1 - \dfrac{10}{100}\right) \times 100 = \mathbf{9\%}$

55. (d) The ball falls exactly in the hand which threw the ball. This is because initial velocity of ball in horizontal direction is same as velocity of car.
56. (d) Let x be the thickness of one plank and F be the resistive force offered by the plank.
As work done = loss in K.E.

$$\therefore \quad F x = \frac{1}{2} m \left[ v^2 - \left(\frac{19v}{20}\right)^2 \right] \quad \text{....... (i)}$$

$$F. n x = \frac{1}{2} m v^2 - 0 \quad \text{............. (ii)}$$

Divide (ii) by (i)

$$n = \frac{\frac{1}{2} mv^2}{\frac{1}{2} mv^2 \left(1 - \frac{361}{400}\right)} = \frac{400}{39} \simeq \mathbf{11}$$

Shortcut method:

No. of planks required to just stop the bullet = $n^2/(2n-1) = 20^2/(20*2-1) \sim 11$

57. (d) The angular momentum of a moving body remains constant if **net external torque is not applied.**

58. (d) If $K_s$ is the effective spring constant of two springs in series, then

$$\frac{1}{K_s} = \frac{1}{K_1} + \frac{1}{K_2} = \frac{k_2 + k_1}{k_1 \, k_2} \quad \text{or} \quad K_s = \frac{k_1 k_2}{k_1 + k_2}$$

59. (d) For water-glass interface, the angle of contact is less than 90°, so the shape of liquid meniscus is **concave on both faces.**

60. (d) $v \propto r^2$ ; so $\dfrac{v_2}{v_1} = \dfrac{r_2^2}{r_1^2} = \left(\dfrac{2 r_1}{r_1}\right)^2 = 4$ or $\dfrac{v_1}{v_2} = \dfrac{1}{4}$

$$\frac{m_1}{m_2} = \frac{\frac{4}{3} \pi r_1^2 \rho}{\frac{4}{3} \pi r_2^3 \rho} = \frac{r_1^3}{r_2^3} = \left(\frac{1}{2}\right)^3 = \frac{1}{8} \quad \therefore \quad \frac{P_1}{P_2} = \frac{m_1 v_2}{m_2 v_2} = \frac{1}{8} \times \frac{1}{4} = \mathbf{\frac{1}{32}}$$

61. (c) Ultrasonic waves are used in sonography.

62. (d) Beats are the result of superposition of two waves of nearly equal frequencies.

63. (b) If the star starts accelerating towards the earth, frequency of light reaching the earth increases or wavelength decreases. Hence the star will turn gradually blue.

64. (d) As $\alpha_{Al} > \alpha_{steel}$ therefore, on heating, aluminium strip will expand more than steel. Therefore, aluminium strip will bend more and be on convex side is shown in Fig. Aluminium is on convex side and steel on concave side.

Aluminium



Steel
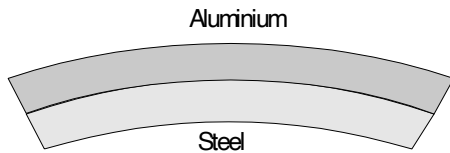
65. (a) Freezing point of water decreases when pressure increases, because water expands on solidification while "except water" for other liquid, freezing point increase with increase in pressure.

66. (b) $C = \sqrt{\dfrac{3RT}{M}}$ i.e., $C \propto \dfrac{1}{\sqrt{M}}$

As $M_H < M_N < M_O$     So, $C_H > C_N > C_O$

67. (a) For every gas, $C_p - C_v = R \therefore x = y$

68. (b) $\eta = 1 - \dfrac{T_2}{T_1} = \dfrac{T_1 - T_2}{T_1}$

In all the four cases, $T_1 - T_2 = 20$ K; Therefore, $\eta$ is highest, when $T_1$ is lowest. Choice (b) is correct.

69. (c) Newton's Law of cooling is used for the determination of the specific heat of liquids.

70. (b) In convex mirror alone, the image formed is always smaller than the size of the object.

71. (c) $\dfrac{\lambda_a}{\lambda_g} = \mu$

$\therefore$   The required ratio is $\mu : 1$

72. (d) Starts are not visible in the day time because atmosphere scatters sunlight into a blanket of extreme brightness through which faint stars cannot be seen.

73. (a) $P = \dfrac{1}{F} = \left(\dfrac{\mu_g}{\mu_a} - 1\right) \left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right)$

$P' = \dfrac{1}{F'} = \left(\dfrac{\mu_g}{\mu_l} - 1\right) \left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right)$

$$\frac{P'}{P} = \frac{\left(\frac{\mu_g}{\mu_l} - 1\right)}{\left(\frac{\mu_g}{\mu_a} - 1\right)} = \frac{\left(\frac{1.5}{1.6} - 1\right)}{\left(\frac{1.5}{1} - 1\right)} = \frac{-0.1/1.6}{0.5}$$

$$P' = \frac{1 \times 2}{16 \times 1} P = -\frac{1}{8}(-8) = 1 \text{ dioptre}$$

74. (a) As it is known, in case of astronomical telescope,

$$\text{R.P.} = \frac{D}{1.22\lambda} \text{ and } M = \frac{f_0}{f_e}$$

To increase both, R.P. and M; D and $f_0$ must be increased respectively, i.e., both, the focal length of objective lens and aperture of objective lens must be increased.
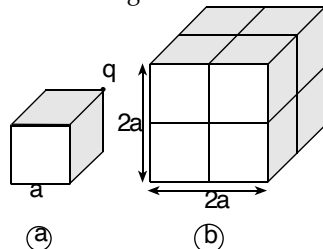
75. (d) The dual nature of light is exhibited by diffraction (wave nature) and by photoelectric effect (crepuscular nature)

76. (d) $F = \dfrac{q_1 q_2}{4\pi\in_0 r^2}$

$$F' = \frac{q_1 q_2}{4\pi\in (r/2)^2} = \frac{4q_1 q_2}{4\pi\in r^2} \quad ; \qquad \frac{F'}{F} = 4\frac{\in_0}{\in} = 4\left(\frac{1}{K}\right) = 4\left(\frac{1}{4}\right) = 1$$

∴    $F' = F$

77. (b) In fig. we have shown a point change q at one corner of a cube of side a. This charge can be imagined at the centre of eight identical cubes as shown in fig.



According to Gauss's theorem in electrostatics, electric flux through the given cube,

$$\phi = \frac{1}{8}\left(\frac{q}{\in_0}\right) = \frac{q}{8\in_0}$$

78. (c) The arrangement is equivalent to three capacitors joined in parallel.
∴    $C = 3\in_0 A/d$

79. (d) $R = \dfrac{\rho l}{\pi r^2} = \dfrac{\rho V/\pi r^2}{\pi r^2} = \dfrac{\rho V}{\pi^2 r^4}$     $\begin{bmatrix} \text{volume } V = Al \\ \text{or } l = \dfrac{V}{A} = \dfrac{V}{\pi r^2} \end{bmatrix}$

$\therefore R \propto \dfrac{1}{r^4}$  Hence, $\dfrac{R'}{R} = \dfrac{r^4}{(r/n)^4} = n^4$  or,  $R' = n^4 R$

80. (a) Current in the external resistance is maximum if the value of external resistance is equal to total internal resistance of cell.

81. (c) The material of wire of potentiometer is manganin as its temperature coefficient of resistance is least and it shows negligible small variation of resistance on heating.

82. (b) $F = q v B \sin\theta$. It is independent of mass m of the particle.

83. (b) For a point inside the pipe, current I = 0

$$\therefore \oint \vec{B} \cdot d\vec{l} = \mu_0 \times 0 = 0 \text{ or } B = 0$$

84. (c) According to Gauss's theorem in magnetism, net magnetic flux through any closed surface is always zero.

85. (b) As it is known from theory, energy stored in inductor $= \dfrac{1}{2} Li^2$.

86. (a) Here, $I_0 = 5\sqrt{2}$ A, $I_{rms} = \dfrac{I_0}{\sqrt{2}} = \dfrac{5\sqrt{2}}{\sqrt{2}} = 5A$

87. (a) For an ideal transformer, voltage per turn of secondary coil = voltage per turn of primary coil.

i.e., $V_s = V_P$ or $\dfrac{V_s}{V_P} = 1$

88. (c) The important conclusion given by Millikan's experiment is that the charge is quantised, i.e., charge on oil drop is always integral multiple of charge of an electron.

89. (d) If f is the frequency of the emitted photon when electron in an atom jumps form excited state (n = 3)

to ground state (n = 1) is

$$E = hf = E_2 - E_1 = \frac{-13.6}{3^2} - \left(\frac{-13.4}{1^2}\right)$$

$$= \frac{-13.6}{9} + 13.6 = 12.1 \text{ eV}$$
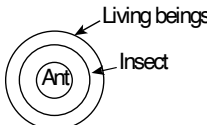
If $V_0$ is the stopping potential, then

$eV_0 = hf - \phi_0 = 12.1 - 5.1 = 7.0$ eV

or     $V_0 = 7.0$ V

90.   (b)   $\lambda \propto \dfrac{1}{Z^2} \Rightarrow \dfrac{c}{f} \propto \dfrac{1}{Z^2} \Rightarrow f \propto Z^2$.

91.   (c)   Energy required to remove an electron from n = 2 is equal to B.E. of electron in 2nd orbit = $\dfrac{13.6}{2^2}$ eV = 3.4 eV.

92.   (b)   In Bohr's orbit of hydrogen atom, we know,

K.E. = – (total energy)

$\therefore \quad \dfrac{\text{K.E.}}{\text{total energy}} = \dfrac{1}{-1} = 1 : -1$

93.   (d)   Total mass before fusion = 2 m

Mass converted into energy in this process = $E/c^2$

Mass of helium formed = $(2m - E/c^2)$

94.   (d)   $_{48}Cd^{107} + _{-1}e^0 \rightarrow _{47}Ag^{107}$

or     $_{48}Cd^{107} \rightarrow _{47}Ag^{107} + _{+1}e^0$

Therefore, choice (d) is correct.

95.   (b)   1 curie = $3.7 \times 10^{10}$ disintegrations/sec.

96.   (b)   Photon is exchanged in electromagnetic interaction.

97.   (a)   $\mu_e > \mu_h$ because mobility of electron is more than that of hole.

98.   (d)   Barrier potential of a p-n junction diode does not depend upon diode design.

99.   (b)   As the output is low when either of the input is high, the gate must be negative of OR gate, i.e., the gate should be NOR gate.

100.   (d)   Stars derives energy from either proton-proton cycle or carbon-nitrogen cycle.

101.  c)   The frequency of dominate allele can be calculated by $p + q = 1$

102.  b)

     a.   Reptiles and  birds - *Archaeopteryx*

     c.   Fishes and amphibians - *Diponi*

     d.   Amphibians and reptiles- *Seymaouria.*

103.  c)

     a. Pliocene – Age of bird, mammal and Angiosperms.

     b. Pleistocene- Origin of man.

     c. Holocene - Age of human being and herbs

     d. Miocene- Origin of Pre-man

104.  b) Cave, Picture, dweller, 1st hunting, 1st speech centre etc develop in Neaderthal man.

105.  b)

     a. 0.2 – 3μm/sec.-  Pseudopodial  movement

     b. 0.4 – 2m/sec.-  ciliary movement

     c.15 – 300 μm/sec.-  flagellar  movement

     d. 8.1 m/sec- Earthworm

106.  a)

     **Lobopodia** – These are the commonly found pseudopods among parasitic amoeba. They are long and blunt finger-like structures composed of ectoplasm only or both ectoplasm and endoplasm. It forms slowly with gradual flow of ectoplasm into them. However, *Entamoeba histolytica* is an exception.

     **Axopodia** – This is a semi-permanent structure, which is a characteristic feature of actinopods. They are made of an array of microtubules along with a fine needle like radiating pseudopods enclosed by cytoplasm. Axopodia are vital for phagocytosis as they act rapidly. Example: Radiolaria, Heliozoa.

     **Filopodia** – Also known as filose pseudopods, they are composed of microfilaments and protein bundles like fimbres and fascias, held together loosely by crosslinking. They are filiform (thread like) with pointed ends occasionally forming branched networks.

     **Reticulopodia** - They are the type of pseudopodia characterized by a reticular network formation of cytoplasmic projections. The pseudopodia forms reticulating nets. Examples of organisms forming reticulopodia are the reticulose amoebae (of subphylum Endomyxa) and foraminiferans.

**107. c)**   Toxoplasmosis, Neosporosis, Sarcosporidiosis (sarcocystosis) and Trypanosomiasis are the common zoonotic protozoal diseases causing abortion which caused by single-celled protozoan parasites; *Toxoplasma gondii, Neospora caninum, Sarcocystis spp and* **Trypanosoma evansi**, respectively.

**108. b)** There is no known cyst stage for *Entamoeba gingivalis*; trophozoites live in the oral cavity of humans, residing in the gingival pockets near the base of the teeth. They are not considered pathogenic, and feed on bacteria and other debris. Trophozoites are transmitted person-to-person orally by kissing or fomites (such as eating utensils) .

109. c)
   - a.   Myocytes – Act as valve
   - b.   Thesocytes – Storage of food occurs in it.
   - c.   Archaeocytes – It is totipotent cell and is also associated for gemmule formation in sponge.
   - d.   Chromocytes- It provides pigment to sponge.

110. b)   *Hydra* has many testis and single ovary. At the time of sexual reproduction *Hydra* produces one ovary in proximal or lower half and few testes in distal or upper half. Ovary produces a single ovum. And testis produces many sperms.

111. a)   In *Hydra*, after fertilization, the zygote undergoes complete cleavage and a hollow blastula is formed which changes into a solid stereogastrula whose ectodermal cells acquire cilia. This stereogastrula changes into free-swimming planula (larva). Planula attaches itself to the hard substrata and transforms into the young *Hydra* through metamorphosis.

112. a)   a. Liver fluke – Miracidium,sporocyst, redia, cercaria and metacercaria
   b. Tapeworm - Cysticerous
   c. *Ascaris* - Rhabditoid

**113. c)**   *Plasmodium falciparum* causes cerebral malaria and malignant malaria. It causes black water fever (urine becomes black) and clots blood in brain.

114. b)   Sporozoite produces proteolytic enzyme that digests liver cell.  The spleen of a malaria victim becomes enlarged, it has been postulated that a lytic substance, lysolecithin, which destroys erythrocytes, is released by the spleen.

**115. b)**   In earthworm haemoglobin dissolves in plasma and combines with oxygen to form oxyhaemoglobin. Heamoblobin is produced by blood gland cell in earthworm.

116. c)   **Basal cell:** They are shorter, conical cells, wedged in between and narrower basal parts of other cells, situated at the base. It is also known as **replacement cell as it replaces the destroyed cells of epidermis.  Supporting cell produces cuticle.**

117. b)   Parthenogenesis (Apomixis): The process of changing egg into adult without fertilization.
   There is two types of parthenogenesis. They are
   - a)   Natural Parthenogenesis:  It can be classified into complete and incomplete
      Complete (Obligatory):  Male is absent. Female develop parthenogenetically. E.g. Rotifers, Typhilina, Brahmina (small lizard 15 cm long), Lacerta saxicola Americana (rock lizard), Cnemidophorus (whiptail lizard of America)
      Incomplete (cyclic):- Both sexual and individuals occur. In Aphids and Termites, several generations of parthenogenetic females develop followed by formation of both male and female to perform sexual reproduction. In Turkey 40 % of male develop parthenogenetically. In honey bee, drone (male) develops.
   - b)   Artificial (Induced) Parthenogenesis-
      Pincus (1936) was able to induce artificial parthenogenesis in rabbit egg by temperature and chemical stimuli. But, generally not survive.

118. c)   Cell movements i.e. morphogenetic movement is the most important characteristic of gastrulation. As a result of which (a) and (b) takes place.

119. c)   Portal system carries blood from different part of body and gives to either kidney or liver by forming blood capillaries. Renal portal system is absent in human.

120. c)
   - a.   Innominate vein          - is formed by union of internal jugular and subscapular vein.
   - b.   External jugular vein – is formed by union of lingual and mandibular vein.
   - c.   Sub-clavian vein – is formed by union of brachial and musculo cutaneous vein.

121. a)
   **Vitamin $B_{15}$** - It is used for formation of Anti-venum.
   **Vitamin $B_{17}$** - It is recent Anti-cancer vitamin.
   **Vitamin Q -** It helps in blood clotting.
   **Vitamin C** - It is Anti scurvy vitamin.

122. a)
   1.   **Filiform**: Elongated; thread like, more in number; taste buds are absent.
   2.   **Fungiform**: Taste buds are present; Present on tip and laterally, have taste buds for salt and sour, mushroom head like structure.
   3.   **Foliate**: Taste buds are present, smallest papillae; absent in man.
   4.   **Circumvallate**: Largest papillae, Inverted V shaped, present at the base, less in number. Taste buds for bitter taste present. (Chilies don't have any taste-They cause burning sensation)

**123. a)** Purpose of Tracheostomy is to allow air to pass into upper airway helping with speech. There are four main reasons why someone would receive a tracheotomy. They are Emergency airway access, Airway access for prolonged mechanical ventilation and functional or mechanical upper airway obstruction.

124. d)

125. c)  The brush border and the extensive length of the proximal tubule dramatically increase the surface area available for reabsorption of substances into the blood enabling around 80% of the glomerular filtrate to be reabsorbed in this segment. Another notable feature of these cells is that they are densely packed with mitochondria (the cell's energy generators). The mitochondria ensure a good supply of energy is available to fuel the active transport systems needed for efficient reabsorption.

126. d)  Acute decompression syndrome (Caisson's disease/ air embolism) is an acute neurological emergency in divers. It is caused due to release of nitrogen gas bubbles that impinge the blood vessels of the spinal cord and brain and result in severe neurodeficit.

127. a)  The most prominent signs and symptoms of Parkinson's disease occur when nerve cells in the basal ganglia, an area of the brain that controls movement, become impaired and/or die. Normally, these nerve cells, or neurons, produce an important brain chemical known as dopamine. When the neurons die or become impaired, they produce less dopamine, which causes the movement problems associated with the disease.

128. a)  Humans contain three types, resulting in trichromatic color vision. Each individual cone contains pigments composed of opsin  apoprotein covalently linked to a light-absorbing prosthetic group: either 11-cis-hydroretinal or, more rarely, 11-cis-dehydroretinal.

129. b)  Overlying the hair cells and their hair bundles is a gelatinous layer, and above this is a fibrous structure, the otolithic membrane, in which are embedded crystals of calcium carbonate called otoconia. Otoliths, commonly known as "earstones," are hard, calcium carbonate structures located directly behind the brain of bony fishes.

130. a)  Each testicular lobule contains one to three highly coiled seminiferous tubules in which sperms are produced. Each seminiferous tubule is lined on its inside by two types of cells, called as male germ cells (spermatogonia) and Sertoli cells.
The male germ cells undergo meiotic divisions finally leading to sperm formation, while Sertoli cells provide nutrition to the germ cells. Spermatogenesis starts at the age of puberty due to significant increase in the secretion of gonadotropin releasing hormone (GnRH). This is a hypothalamic hormone. The increased levels of GnRH then acts at the anterior pituitary gland and stimulates secretion of two gonadotropins luteinising hormone (LH) and follicle stimulating hormone (FSH). LH acts at the Leydig cells and stimulates synthesis and secretion of androgens. Androgens, in turn, stimulate the process of spermatogenesis. FSH acts on the Sertoli cells and stimulates secretion of some factors, which help in the process of spermiogenesis.

131. b)  Vulva or urinogenital opening is the opening of vestibule which inturn consists jointly the opening of vagina. (i.e. vaginal orifice), urethra (urethral orifice) and hymen.

132. d)  Diabetes insipidus is caused by problems with a chemical called vasopressin (AVP), which is also known as antidiuretic hormone (ADH). AVP is produced by the hypothalamus and stored in the pituitary gland until needed. The hypothalamus is an area of the brain that controls mood and appetite.

133. a)  Acromegaly is a syndrome that results when the anterior pituitary gland produces excess growth hormone (GH) or somatotropin (STH) after epiphyseal plate closure at puberty. Acromegaly most commonly affects adults in middle age. Enlargement of the hands and feet is one of the most common signs of the disease. Other effects include enlargement of the jaw and other facial bones; overgrowth of bone and cartilage in the joints, curvature of the spine (kyphosis), swelling of the face, lips, and tongue; breathing problems during sleep (sleep apnea); thickening of the skin; carpal tunnel and other nerve entrapment syndromes.

134. b)  DOTS (directly-observed therapy, short-course) means that the patient taking the medicine should be observed by a nominated person and the taking of the medicine should be recorded. This ensures that the patient takes the medication regularly, which is essential for the medicines to be effective  and to prevent the bacteria from becoming resistant and the drug from becoming ineffective.

135. c)  Most breast cancers are carcinomas. The most common breast cancers such as ductal carcinoma in situ (DCIS) and invasive carcinoma are adenocarcinomas, since the cancers start in the gland cells in the milk ducts or the lobules (milk-producing glands).

136. c)  Tendon is made by white collagen fibres and ligament is made by yellow elastin fibres. Tendon connects bone to muscle while ligament connects bone to bone.

137. c)  Ends of long bones are covered with a layer of connective tissue called hyaline cartilage.

138. a)  A sarcomere is defined as the distance between the Z-lines. The Z-lines are pulled closer together during contraction and move further apart during relaxation. The Z-lines are closer during contraction because actin and myosin interaction generates cross-bridges, which slide the myofilaments over each other.

139. b)  a. Columnar epithelium  -Stomach, Intestine, mammary gland, bronchioles etc.
b. Cuboidal epithelium - Salivary gland, pancreas, tubules of nephron, all glandular duct etc.
c. Ciliated columnar epithelium - Oviduct, retina of **eye and bucco-pharyngeal cavity of frog.**
d. Transitional epithelium – Ureter, urinary bladder etc.

140. c)  During the last 3 months of pregnancy, antibodies from mothers are passed to their unborn babies through the placenta. This type of immunity is called passive immunity because the baby has been given antibodies rather than making them itself.

141. b)  Anaerobic chemoheterotrophs like bacteria belong to kingdom Monera.

142. b)  Virus has no metabolism, so they cannot produce any chemical like antibiotics.
143. a)  Cellulose is usually absent in cell wall of fungi and bacteria.
144. c)  Chlorophyll a and carotenes are universal pigment found in all group of algae.
145. b)  Zoospores and aplansospores are asexual spores. The Zygospores are diploid spores and formed by conjugation. The azygospores are sexual unsuccessful sporë, hence haploid nuclei are found.
146. b)  Protonema is juvenile gametophyte which produce mature gametophyte.
147. c)  Indusium is kidney shaped saprophytic structure found in several ferns.
148. b)  Gymnosperms have seeds but not enclosed inside fruit. It has no true flower and flower is represented by cones of aggregation of sporophylls.
149. b)  Cuscuta is complete stem parasite.
150. b)  The spike, catkin and spadix can produce sorosis and hypanthodium can produce syconus.
151. c)  *Tagetes erecta* (marigold) is common member of family Asteraceae.
152. d)  Single seeded fruits (caryopsis, cypsela) are found in members of grasses family and sunflower family.
153. b)  Ozone is useful gas in stratosphere and harmful gas when present in earth surface.
154. a)  *Nardostachys grandiflora* (Jatamansi) is endangered plant species in Nepal.
155. d)  Rainfall is the main determining factor for nature of vegetation.
156. c)  Nitrogen fixation is the conversion of atmospheric nitrogen into soil nitrogen.
157. c)  Ribosome is the smallest organelle found in cell.
158. d)  Nucleoprotein (RNA and DNA) are synthesised in cytoplasm of bacterial cell. They are produced in nucleoplasm in eukaryotic cells.
159. c)  A V Leeuwenhoek (1675) discovered first living cell as bacteria, protozoans and sperms.
160. c)  Amitosis is direct division of cell which does not involve successive steps of karyokinesis and cytokinesis.
161. c)  Sphaerosomes are also called plant lysosome due to presence of hydrolytic enzymes.
162. b)  Lignin is only present on secondary and tertiary cell wall.
163. c)  Polygenic inheritance due to two genes produce 5 phenotypes (1:4:6:4:1) with 2 parental type
164. a)  Holandric genes are found in Y chromosomes.
165  c)  DNA polymerase I and DNA polymerase III are involved in DNA repairing
166. d)  Colour blindness is sex linked character inherited through X chromosomes. It is expressed in male and may be expressed or become carrier in female. Male become colourblind if his mother is carrier or colourblind.
167. b)  Root has sub terminal apical meristem
168. b)  Mesophyll cell, spongy parenchyma and palisade tissues are related with photosynthesis and found in leaves.
169. b)  Imbibition is exothermic process that produces heat of hydration.
170. b)  Maximum osmotic pressure and DPD are found in xerophytes (If halophyte not given)
171. c)  During photosynthesis 18ATP and 30ATP molecules are required for the of glucose in $C_3$ and $C_4$ cycle.
172. a)  During photolysis of water molybdenum and chloride (Mn and Cl) are involved.
173. b)  Every respiration produces ATP molecule for cellular activities.
174. d)  Respiratory quotient for lipid, fat, and protein is less than one.
175. c)  Dormancy of seed is related with growth inhibitory hormone like abscisic acid (ABA).
176. b)  During mitosis, chromosome divides during Anaphase I.
177. a)  Tryptophan is an amino acid which is required for the formation of proteins Cellulose, chitin and glycogens are polysaccharide.
178. c)  Due to fusion between diploid secondary cell and male gamete (n), the primary endosperm nucleus (PEN) is triploid and process is called vegetative fertilization.
179. c)  Callus is an undifferentiated mass of cells produced during cell division.
180.  a).   Agar-agar is polysaccharide obtained from several red algae like *Gracillaria* and *Gelidium.*
181. (d)  The word is divided into 3 groups of H letters each and the letters of each group are written in reverse order to obtain
the code.
MATHEMATICAL $\rightarrow$ MATH / EMAT/ ICAL $\rightarrow$ HTAM / TAME / LACI
182. (a)  bcaa | bcaa | bcaa | bcaa
183. (d)  $(2 \times 2 - 1) = 3$
and $(5 \times 4 - 5) = 15$
$(5 \times 5 - 3) = 22$
184. (d)  All ants are insects. All insects are living beings.



185. (a)
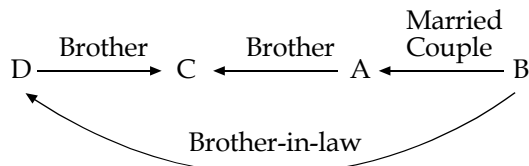
186. (d)  According to the question, after interchanging the position of the first and third digits, new numbers are
         $519 \Rightarrow 915$, $364 \Rightarrow 463$, $287 \Rightarrow 782$, $158 \Rightarrow 851$, $835 \Rightarrow 538$, so second lowest number = 538.
         Hence, third digit of the second lowest number is 8.

187. (c)  Given year is divided by 4, and the quotient gives the number of leap years.
         Here, $\dfrac{300}{4} = 75$
         But, as 100, 200 and 300 are not leap years.
         So, 75 – 3 = 72 leap years.

188. (d)  Since it was morning and Nandita's shadow fell exactly to her left side, Nandita was facing north and hence Ravi
         should be facing south.

189. (d)  According to the question,
         Clearly, six friends A, B, C, D, E and F are sitting in a row facing east.

         West $\boxed{F}$  A  C  E  B  D East
         Left                        Right
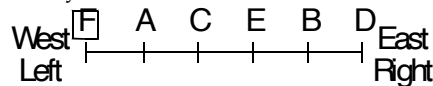
         $\therefore$ F is to the left of A.

190. (d)  Clearly, with so many people around in a joint family, there is more security. Also, work is shared. So, the
         argument I holds. In nuclear families, there are less number of people and so less responsibilities and more
         freedom. Thus, II also holds.

191. (c)  C.P. of 6 toffees = Re. 1
         C.P. of 6 toffees = 120% of Re. 1 = Rs. $\dfrac{6}{5}$
         For Rs. $\dfrac{6}{5}$, toffees sold = 6
         For Re. 1, toffees sold = $\left(6 \times \dfrac{5}{6}\right)$ = 5.

192. (d)  1. The difference of age b/w R and Q = The difference of age b/w Q and T.
         2. Sum of age or R and T is 50 i.e. (R + T) = 50
         Question: R – Q = ?
         Explanation
         R – Q = Q – T
         (R + T) = 2Q
         Now given that, (R + T) = 50
         So, 50 = 2Q and therefore Q = 25.
         The question is (R – Q) = ?
         Here we know the value (age) of Q(25), but we don't know the age of R.
         Therefore, (R – Q) cannot be determined.

193. (d)  Average of 20 numbers = 0
         $\therefore$ Sum of 20 numbers $(0 \times 20) = 0$
         It is quite possible that 19 of these numbers may be positive and if their sum is a then 20th number is (–a).

194. (c)  A= 40 days          B = 50 days
         Taking LCM of 40 and 50 we get 200 which is total work i.e., Work = 200 unit
         A can do $\dfrac{200}{40}$ = 5 unit work in 1 day
         B can do $\dfrac{200}{50}$ = 4 unit work in 1 day
         So, A + B can do 5 + 4 = 9 unit work in 2 days since they are working alternately.
         Thus, A + B can do 9 × 22 = 198 unit work in 2 × 22 = 44 days. (Choosing the nearest multiple of 9 less than 200)
         The remaining 2 unit works will be done by A on 45th day.
         A can do 5 unit of work in 1 day
         A can do 2 unit of work in $\dfrac{2}{5}$ day. (Using unitary method)

So, total time = 44 + $\frac{2}{5}$ days = $44\frac{2}{5}$ days

195. (a)
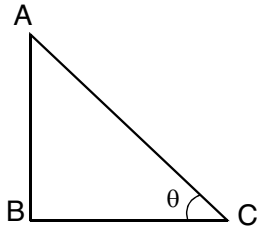


AB = 30 meter
AB = 15 meter
∠ACB = θ

∴ sin θ = $\frac{AB}{AC}$ = $\frac{15}{30}$ = $\frac{1}{2}$

=> sin θ = sin 30°
=> θ = 30°

196. (c)    In each step, an element at the upper-right position gets enlarged, inverts vertically and reaches the lower-left corner; the existing element at the lower-left position is lost and a new small element appears at the upper-right position.

197. (b)    The figure rotates 90°CW and gets laterally inverted.

198. (d)



199. (a)    The letters of the adjacent faces to the face with letter A, are B, F, C and E. Hence D is the letter of the face opposite to the face with letters (A).

200. (a)