Important Instructions:

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on side-1 and side-2 carefully with blue/black ball point pen only.

2. The test is of 3 hours duration and Test Booklet contains 180 questions. Each question carries 4 marks. For each correct response, the candidate will get 4 marks. For each incorrect response, one mark will be deducted from the total scores. The maximum marks are 720.

3. Use Blue/Black Ball Point Pen only for writing particulars on this page/marking responses.

4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.

5. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.

6. The CODE for this Booklet is X. Make sure that the CODE printed on Side-2 of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.

7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.

8. Use of white fluid for correction is NOT permissible on the Answer Sheet.

In case of any ambiguity in translation of any question, English version shall be treated as final.

Name of the Candidate (in Capitals): ____________________________

Roll Number: in figures: _______________________________________
            in words: ____________________________________________

Centre of Examination (in Capitals): ______________________________

Candidate’s Signature: ________________________________

Invigilator’s Signature: ________________________________
1. The addition of a catalyst during a chemical reaction alters which of the following quantities?
   (1) Internal energy
   (2) Enthalpy
   (3) Activation energy
   (4) Entropy

2. Predict the correct order among the following:
   (1) lone pair - lone pair > bond pair - bond pair > lone pair - bond pair
   (2) bond pair - bond pair > lone pair - bond pair > lone pair - lone pair
   (3) lone pair - bond pair > bond pair - bond pair > lone pair - lone pair
   (4) lone pair - lone pair > bond pair - bond pair > bond pair - bond pair

3. The correct statement regarding the basicity of arylamines is:
   (1) Arylamines are generally more basic than alkylamines because the nitrogen lone-pair electrons are not delocalized by interaction with the aromatic ring π electron system.
   (2) Arylamines are generally more basic than alkylamines because of aryl group.
   (3) Arylamines are generally more basic than alkylamines, because the nitrogen atom in arylamines is sp-hybridized.
   (4) Arylamines are generally less basic than alkylamines because the nitrogen lone-pair electrons are delocalized by interaction with the aromatic ring π electron system.

4. When copper is heated with conc. HNO₃ it produces:
   (1) Cu(NO₃)₂ and NO
   (2) Cu(NO₃)₂, NO and NO₂
   (3) Cu(NO₃)₂ and N₂O
   (4) Cu(NO₃)₂ and NO₂
5. For the following reactions:
   
   (a) \(\text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{KOH} \rightarrow \text{CH}_3\text{CH} = \text{CH}_2 + \text{KBr} + \text{H}_2\text{O}\)
   
   (b) \(\begin{align*}
   &\text{Br} \\
   \text{Br} &\text{Br}
   \end{align*}\) + \(\text{KOH} \rightarrow \begin{align*}
   &\text{Br} \\
   \text{Br} &\text{Br}
   \end{align*} + \text{KBr}
   
   Which of the following statements is correct?
   
   (1) (a) is elimination, (b) is substitution and (c) is addition reaction.
   
   (2) (a) is elimination, (b) and (c) are substitution reactions.
   
   (3) (a) is substitution, (b) and (c) are addition reactions.
   
   (4) (a) and (b) are elimination reactions and (c) is addition reaction.

6. Two electrons occupying the same orbital are distinguished by:
   
   (1) Magnetic quantum number
   
   (2) Azimuthal quantum number
   
   (3) Spin quantum number
   
   (4) Principal quantum number

7. The reaction
   
   \(\text{OH} \rightarrow \text{NaH} \rightarrow \begin{align*}
   &\text{O} \\
   \text{Na} &\text{Me-1} \\
   \text{O} &\text{Me}
   \end{align*}\)
   
   can be classified as:
   
   (1) Alcohol formation reaction
   
   (2) Dehydration reaction
   
   (3) Williamson alcohol synthesis reaction
   
   (4) Williamson ether synthesis reaction

8. The electronic configurations of Eu (Atomic No. 63), Gd (Atomic No. 64) and Tb (Atomic No. 65) are:
   
   (1) \([\text{Xe}]^4\text{f}^6\text{d}^1\text{e}^2, [\text{Xe}]^4\text{f}^7\text{d}^1\text{e}^2\) and \([\text{Xe}]^4\text{f}^9\text{e}^2\)
   
   (2) \([\text{Xe}]^4\text{f}^6\text{d}^1\text{e}^2, [\text{Xe}]^4\text{f}^7\text{d}^1\text{e}^2\) and \([\text{Xe}]^4\text{f}^8\text{d}^1\text{e}^2\)
   
   (3) \([\text{Xe}]^4\text{f}^7\text{e}^2, [\text{Xe}]^4\text{f}^8\text{d}^1\text{e}^2\) and \([\text{Xe}]^4\text{f}^9\text{e}^2\)
   
   (4) \([\text{Xe}]^4\text{f}^8\text{e}^2, [\text{Xe}]^4\text{f}^8\text{d}^2\) and \([\text{Xe}]^4\text{f}^8\text{d}^2\)

5. निम्न अभिक्रियाओं के लिए:
   
   (a) \(\text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{KOH} \rightarrow \text{CH}_3\text{CH} = \text{CH}_2 + \text{KBr} + \text{H}_2\text{O}\)
   
   (b) \(\begin{align*}
   &\text{Br} \\
   \text{Br} &\text{Br}
   \end{align*}\) + \(\text{KOH} \rightarrow \begin{align*}
   &\text{Br} \\
   \text{Br} &\text{Br}
   \end{align*} + \text{KBr}
   
   निम्न में से कौन सा क्रम सहायक है?
   
   (1) (a) विलोपन अभिक्रिया, (b) प्रतिस्थापन अभिक्रिया और (c) योगाई अभिक्रिया है।
   
   (2) (a) विलोपन अभिक्रिया, (b) और (c) प्रतिस्थापन अभिक्रियाएँ हैं।
   
   (3) (a) प्रतिस्थापन, (b) और (c) योगाई अभिक्रियाएँ हैं।
   
   (4) (a) और (b) विलोपन अभिक्रियाएँ हैं तथा (c) योगाई अभिक्रिया है।

6. दो इलेक्ट्रॉन जो कि एक ही क्षण में हैं। इनमें अर्थ किसके
   
   द्वारा किया जा सकता है?
   
   (1) चुंबकीय क्वांटम संख्या
   
   (2) विरोधी क्वांटम संख्या
   
   (3) विभाजन क्वांटम संख्या
   
   (4) पूर्वज क्वांटम संख्या

7. अभिक्रिया
   
   \(\text{OH} \rightarrow \text{NaH} \rightarrow \begin{align*}
   &\text{O} \\
   \text{Na} &\text{Me-1} \\
   \text{O} &\text{Me}
   \end{align*}\)
   
   को विकृत किया जा सकता है:
   
   (1) ऐल्कोहॉल विरचन अभिक्रिया
   
   (2) निर्माणक अभिक्रिया
   
   (3) विलियम्सन ऐल्कोहॉल संशोधन अभिक्रिया
   
   (4) विलियम्सन ऐल्कोहॉल संशोधन अभिक्रिया

8. Eu (प.स. 63), Gd (प.स. 64) और Tb (प.स. 65) के
   
   इलेक्ट्रॉनिक विभाजन हैं:
   
   (1) \([\text{Xe}]^6\text{f}^6\text{d}^1\text{e}^2, [\text{Xe}]^7\text{f}^6\text{d}^1\text{e}^2\) और \([\text{Xe}]^9\text{f}^6\text{d}^2\)
   
   (2) \([\text{Xe}]^6\text{f}^6\text{d}^1\text{e}^2, [\text{Xe}]^7\text{f}^6\text{d}^1\text{e}^2\) और \([\text{Xe}]^8\text{f}^6\text{d}^2\)
   
   (3) \([\text{Xe}]^7\text{e}^2, [\text{Xe}]^8\text{d}^1\text{e}^2\) और \([\text{Xe}]^9\text{e}^2\)
   
   (4) \([\text{Xe}]^7\text{e}^2, [\text{Xe}]^6\text{d}^2\) और \([\text{Xe}]^8\text{d}^2\)
9. At 100°C the vapour pressure of a solution of 6.5 g of a solute in 100 g water is 732 mm. If \( K_b = 0.52 \), the boiling point of this solution will be:

(1) 100°C  
(2) 102°C  
(3) 103°C  
(4) 101°C

10. The correct statement regarding the comparison of staggered and eclipsed conformations of ethane, is:

(1) The eclipsed conformation of ethane is more stable than staggered conformation, because eclipsed conformation has no torsional strain.

(2) The eclipsed conformation of ethane is more stable than staggered conformation even though the eclipsed conformation has torsional strain.

(3) The staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strain.

(4) The staggered conformation of ethane is less stable than eclipsed conformation, because staggered conformation has torsional strain.

11. Which one of the following characteristics is associated with adsorption?

(1) \( \Delta G, \Delta H \) and \( \Delta S \) all are negative

(2) \( \Delta G \) and \( \Delta H \) are negative but \( \Delta S \) is positive

(3) \( \Delta G \) and \( \Delta S \) are negative but \( \Delta H \) is positive

(4) \( \Delta G \) is negative but \( \Delta H \) and \( \Delta S \) are positive

12. Match the compounds given in column I with the hybridisation and shape given in column II and mark the correct option.

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) XeF(_6)</td>
<td>(i) distorted octahedral</td>
</tr>
<tr>
<td>(b) XeO(_3)</td>
<td>(ii) square planar</td>
</tr>
<tr>
<td>(c) XeOF(_4)</td>
<td>(iii) pyramidal</td>
</tr>
<tr>
<td>(d) XeF(_4)</td>
<td>(iv) square pyramidal</td>
</tr>
</tbody>
</table>

Code:

(a) (b) (c) (d)  
(1) (i) (ii) (iv) (iii)  
(2) (iv) (iii) (i) (ii)  
(3) (iv) (i) (ii) (iii)  
(4) (i) (iii) (iv) (ii)
13. The correct statement regarding a carbonyl compound with a hydrogen atom on its alpha-carbon, is:

(1) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as aldehyde-ketone equilibration.

(2) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as carbonylation.

(3) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as keto-enol tautomerism.

(4) a carbonyl compound with a hydrogen atom on its alpha-carbon never equilibrates with its corresponding enol.

14. In a protein molecule various amino acids are linked together by:

(1) β - glycosidic bond

(2) peptide bond

(3) dative bond

(4) α - glycosidic bond

15. Match items of Column I with the items of Column II and assign the correct code:

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>Cyanide process</td>
</tr>
<tr>
<td>(b)</td>
<td>Froth floatation process</td>
</tr>
<tr>
<td>(c)</td>
<td>Electrolytic reduction</td>
</tr>
<tr>
<td>(d)</td>
<td>Zone refining</td>
</tr>
<tr>
<td>(i)</td>
<td>Ultrapure Ge</td>
</tr>
<tr>
<td>(ii)</td>
<td>Dressing of ZnS</td>
</tr>
<tr>
<td>(iii)</td>
<td>Extraction of Al</td>
</tr>
<tr>
<td>(iv)</td>
<td>Extraction of Au</td>
</tr>
<tr>
<td>(v)</td>
<td>Purification of Ni</td>
</tr>
</tbody>
</table>

Code:

(a) (b) (c) (d) (e)

16. Which of the following is an analgesic?

(1) Penicillin

(2) Streptomycin

(3) Chloromycetin

(4) Novalgin
17. Which is the correct statement for the given acids?
(1) Phosphinic acid is a monoprotic acid while phosphonic acid is a diprotic acid.
(2) Phosphinic acid is a diprotic acid while phosphonic acid is a monoprotic acid.
(3) Both are triprotic acids.
(4) Both are diprotic acids.

18. The pair of electron in the given carbanion, \(\text{CH}_2\text{C}≡\text{C}^-\), is present in which of the following orbitals?
(1) \(sp^3\)
(2) \(sp^2\)
(3) \(sp\)
(4) \(2p\)

19. Consider the molecules \(\text{CH}_4\), \(\text{NH}_3\) and \(\text{H}_2\text{O}\). Which of the given statements is false?
(1) The \(\text{H}−\text{O}−\text{H}\) bond angle in \(\text{H}_2\text{O}\) is larger than the \(\text{H}−\text{C}−\text{H}\) bond angle in \(\text{CH}_4\).
(2) The \(\text{H}−\text{O}−\text{H}\) bond angle in \(\text{H}_2\text{O}\) is smaller than the \(\text{H}−\text{N}−\text{H}\) bond angle in \(\text{NH}_3\).
(3) The \(\text{H}−\text{C}−\text{H}\) bond angle in \(\text{CH}_4\) is larger than the \(\text{H}−\text{N}−\text{H}\) bond angle in \(\text{NH}_3\).
(4) The \(\text{H}−\text{C}−\text{H}\) bond angle in \(\text{CH}_4\), the \(\text{H}−\text{N}−\text{H}\) bond angle in \(\text{NH}_3\), and the \(\text{H}−\text{O}−\text{H}\) bond angle in \(\text{H}_2\text{O}\) are all greater than 90°.

20. Which one of the following statements is correct when \(\text{SO}_2\) is passed through acidified \(\text{K}_2\text{Cr}_2\text{O}_7\) solution?
(1) The solution is decolourized.
(2) \(\text{SO}_2\) is reduced.
(3) Green \(\text{Cr}_2(\text{SO}_4)_3\) is formed.
(4) The solution turns blue.

21. The correct thermodynamic conditions for the spontaneous reaction at all temperatures is:
(1) \(\Delta H > 0\) and \(\Delta S < 0\)
(2) \(\Delta H < 0\) and \(\Delta S > 0\)
(3) \(\Delta H < 0\) and \(\Delta S < 0\)
(4) \(\Delta H < 0\) and \(\Delta S = 0\)

22. Natural rubber has:
(1) All trans-configuration
(2) Alternate cis- and trans-configuration
(3) Random cis- and trans-configuration
(4) All cis-configuration
23. In which of the following options the order of arrangement does not agree with the variation of property indicated against it?

(1) B < C < N < O (increasing first ionisation enthalpy)
(2) I < Br < Cl < F (increasing electron gain enthalpy)
(3) Li < Na < K < Rb (increasing metallic radius)
(4) Al³⁺ < Mg²⁺ < Na⁺ < F⁻ (increasing ionic size)

24. Which of the following reagents would distinguish cis-cyclopenta-1,2-diol from the trans-isomer?

(1) Ozone
(2) MnO₂
(3) Aluminium isopropoxide
(4) Acetone

25. The product obtained as a result of a reaction of nitrogen with CaC₂ is:

(1) CaCN
(2) CaCN₃
(3) Ca₂CN
(4) Ca(CN)₂

26. Fog is a colloidal solution of:

(1) Gas in liquid
(2) Solid in gas
(3) Gas in gas
(4) Liquid in gas

27. Which one of the following orders is correct for the bond dissociation enthalpy of halogen molecules?

(1) Cl₂ > Br₂ > F₂ > I₂
(2) Br₂ > I₂ > F₂ > Cl₂
(3) F₂ > Cl₂ > Br₂ > I₂
(4) I₂ > Br₂ > Cl₂ > F₂

28. Equal moles of hydrogen and oxygen gases are placed in a container with a pin-hole through which both can escape. What fraction of the oxygen escapes in the time required for one-half of the hydrogen to escape?

(1) 1/4
(2) 3/8
(3) 1/2
(4) 1/8
29. Lithium has a bcc structure. Its density is 530 kg m\(^{-3}\) and its atomic mass is 6.94 g mol\(^{-1}\). Calculate the edge length of a unit cell of Lithium metal. \((N_A = 6.02 \times 10^{23} \text{ mol}^{-1})\)

(1) 352 pm
(2) 527 pm
(3) 264 pm
(4) 154 pm

30. Which of the following statements about the composition of the vapour over an ideal 1:1 molar mixture of benzene and toluene is correct? Assume that the temperature is constant at 25°C. (Given, Vapour Pressure Data at 25°C, benzene = 12.8 kPa, toluene = 3.85 kPa)

(1) The vapour will contain a higher percentage of toluene.
(2) The vapour will contain equal amounts of benzene and toluene.
(3) Not enough information is given to make a prediction.
(4) The vapour will contain a higher percentage of benzene.

31. Which of the following has longest \(\text{C} - \text{O}\) bond length? (Free \(\text{C} - \text{O}\) bond length in CO is 1.128 Å.)

(1) \([\text{Co(CO)}_4]^\ominus\)
(2) \([\text{Fe(CO)}_4]^{2-}\)
(3) \([\text{Mn(CO)}_5]^+\)
(4) \([\text{Ni(CO)}_4]^-\)

32. Among the following, the correct order of acidity is:

(1) \(\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4\)
(2) \(\text{HClO}_2 < \text{HClO} < \text{HClO}_3 < \text{HClO}_4\)
(3) \(\text{HClO}_4 < \text{HClO}_2 < \text{HClO} < \text{HClO}_3\)
(4) \(\text{HClO}_3 < \text{HClO}_4 < \text{HClO}_2 < \text{HClO}\)

33. In the reaction

\[\text{H} + \text{C} = \text{CH} \rightarrow (1) \text{NaNH}_2/\text{liq. NH}_3 \xrightarrow{(2) \text{CH}_3 \text{CH}_2 \text{Br}} Y,\]

\(X\) and \(Y\) are:

(1) \(X = 2\)-Butyne; \(Y = 3\)-Hexyne
(2) \(X = 2\)-Butyne; \(Y = 2\)-Hexyne
(3) \(X = 1\)-Butyne; \(Y = 2\)-Hexyne
(4) \(X = 1\)-Butyne; \(Y = 3\)-Hexyne
34. MY and NY₃, two nearly insoluble salts, have the same $K_{sp}$ values of $6.2 \times 10^{-13}$ at room temperature. Which statement would be true in regard to MY and NY₃?
(1) The molar solubility of MY in water is less than that of NY₃.
(2) The salts MY and NY₃ are more soluble in 0.5 M KY than in pure water.
(3) The addition of the salt of KY to solution of MY and NY₃ will have no effect on their solubilities.
(4) The molar solubilities of MY and NY₃ in water are identical.

35. Consider the nitration of benzene using mixed conc. H₂SO₄ and HNO₃. If a large amount of KHSO₄ is added to the mixture, the rate of nitration will be:
(1) slower
(2) unchanged
(3) doubled
(4) faster

36. The product formed by the reaction of an aldehyde with a primary amine is:
(1) Ketone
(2) Carboxylic acid
(3) Aromatic acid
(4) Schiff base

37. The pressure of H₂ required to make the potential of H₂-electrode zero in pure water at 298 K is:
(1) $10^{-12}$ atm
(2) $10^{-10}$ atm
(3) $10^{-4}$ atm
(4) $10^{-14}$ atm

38. The correct statement regarding RNA and DNA, respectively is:
(1) The sugar component in RNA is ribose and the sugar component in DNA is 2'-deoxyribose.
(2) The sugar component in RNA is arabinose and the sugar component in DNA is ribose.
(3) The sugar component in RNA is 2'-deoxyribose and the sugar component in DNA is arabinose.
(4) The sugar component in RNA is arabinose and the sugar component in DNA is 2'-deoxyribose.

39. Which one given below is a non-reducing sugar?
(1) Lactose
(2) Glucose
(3) Sucrose
(4) Maltose
40. Which of the following statements about hydrogen is incorrect?
   (1) Hydrogen never acts as cation in ionic salts.
   (2) Hydronium ion, \( H_3O^+ \) exists freely in solution.
   (3) Dihydrogen does not act as a reducing agent.
   (4) Hydrogen has three isotopes of which tritium is the most common.

41. Consider the following liquid - vapour equilibrium. Liquid \( \rightleftharpoons \) Vapour
   Which of the following relations is correct?
   (1) \( \frac{d\ln P}{dT} = \frac{-\Delta H_p}{RT} \)
   (2) \( \frac{d\ln P}{dT^2} = \frac{-\Delta H_p}{T^2} \)
   (3) \( \frac{d\ln P}{dT} = \frac{\Delta H_p}{RT^2} \)
   (4) \( \frac{d\ln G}{dT^2} = \frac{\Delta H_p}{RT^2} \)

42. Which of the following biphenyls is optically active?

   (1)
   \[
   \begin{array}{c}
   \text{Br} \\
   \text{Br} \\
   \text{I} \\
   \text{I} \\
   \text{I} \\
   \text{I} \\
   \end{array}
   \]

   (2)
   \[
   \begin{array}{c}
   \text{I} \\
   \text{I} \\
   \text{I} \\
   \text{I} \\
   \text{I} \\
   \text{I} \\
   \text{C}_6H_5 \\
   \end{array}
   \]

   (3)
   \[
   \begin{array}{c}
   \text{O}_2N \\
   \text{CH}_3 \\
   \text{CH}_3 \\
   \end{array}
   \]

   (4)
   \[
   \begin{array}{c}
   \text{O}_2N \\
   \text{CH}_3 \\
   \text{CH}_3 \\
   \end{array}
   \]

43. Which of the following statements is false?
   (1) \( Ca^{2+} \) ions are important in blood clotting.
   (2) \( Ca^{2+} \) ions are not important in maintaining the regular beating of the heart.
   (3) \( Mg^{2+} \) ions are important in the green parts of plants.
   (4) \( Mg^{2+} \) ions form a complex with ATP.
44. The ionic radii of A\(^+\) and B\(^-\) ions are \(0.98 \times 10^{-10} \text{ m}\) and \(1.81 \times 10^{-10} \text{ m}\). The coordination number of each ion in AB is:
   (1) 4
   (2) 8
   (3) 2
   (4) 6

45. The rate of a first-order reaction is 0.04 mol l\(^{-1}\) s\(^{-1}\) at 10 seconds and 0.03 mol l\(^{-1}\) s\(^{-1}\) at 20 seconds after initiation of the reaction. The half-life period of the reaction is:
   (1) 34.1 s
   (2) 44.1 s
   (3) 54.1 s
   (4) 24.1 s

46. The two polypeptides of human insulin are linked together by:
   (1) Phosphodiester bond
   (2) Covalent bond
   (3) Disulphide bridges
   (4) Hydrogen bonds

47. The coconut water from tender coconut represents:
   (1) Fleshy mesocarp
   (2) Free nuclear proembryo
   (3) Free nuclear endosperm
   (4) Endocarp

48. Which of the following is not a feature of the plasmids?
   (1) Circular structure
   (2) Transferable
   (3) Single-stranded
   (4) Independent replication

49. Which is the National Aquatic Animal of India?
   (1) River dolphin
   (2) Blue whale
   (3) Sea - horse
   (4) Gangetic shark

50. The Avena curvature is used for bioassay of:
   (1) GA\(_3\)
   (2) IAA
   (3) Ethylene
   (4) ABA
51. Which of the following is the most important cause of animals and plants being driven to extinction?

(1) Alien species invasion
(2) Habitat loss and fragmentation
(3) Co-extinctions
(4) Over-exploitation

52. Which of the following approaches does not give the defined action of contraceptive?

| (1) | Intra-uterine devices | increase phagocytosis of sperms, suppress sperm motility and fertilizing capacity of sperms |
| (2) | Hormonal contraceptives | Prevent/retard entry of sperms, prevent ovulation and fertilization |
| (3) | Vasectomy | prevents spermatogenesis |
| (4) | Barrier methods | prevent fertilization |

53. In a testcross involving F₁ dihybrid flies, more parental-type offspring were produced than the recombinant-type offspring. This indicates:

(1) Chromosomes failed to separate during meiosis.
(2) The two genes are linked and present on the same chromosome.
(3) Both of the characters are controlled by more than one gene.
(4) The two genes are located on two different chromosomes.

54. A typical fat molecule is made up of:

(1) One glycerol and three fatty acid molecules
(2) One glycerol and one fatty acid molecule
(3) Three glycerol and three fatty acid molecules
(4) Three glycerol molecules and one fatty acid molecule
55. Match the terms in Column I with their description in Column II and choose the correct option:

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Dominance</td>
<td>(i) Many genes govern a single character</td>
</tr>
<tr>
<td>(b) Codominance</td>
<td>(ii) In a heterozygous organism only one allele expresses itself</td>
</tr>
<tr>
<td>(c) Pleiotropy</td>
<td>(iii) In a heterozygous organism both alleles express themselves fully</td>
</tr>
<tr>
<td>(d) Polygenic inheritance</td>
<td>(iv) A single gene influences many characters</td>
</tr>
</tbody>
</table>

Code:

<table>
<thead>
<tr>
<th>(a)</th>
<th>(b)</th>
<th>(c)</th>
<th>(d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(ii)</td>
<td>(iii)</td>
<td>(iv)</td>
</tr>
<tr>
<td>(2)</td>
<td>(iv)</td>
<td>(i)</td>
<td>(ii)</td>
</tr>
<tr>
<td>(3)</td>
<td>(iv)</td>
<td>(iii)</td>
<td>(i)</td>
</tr>
<tr>
<td>(4)</td>
<td>(ii)</td>
<td>(i)</td>
<td>(iv)</td>
</tr>
</tbody>
</table>

56. Which of the following statements is not correct?

1. Insects that consume pollen or nectar without bringing about pollination are called pollen/nectar robbers.
2. Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil.
3. Some reptiles have also been reported as pollinators in some plant species.
4. Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of the same species grows into the style.

57. Which of the following features is not present in *Periplaneta americana*?

1. Indeterminate and radial cleavage during embryonic development
2. Exoskeleton composed of N-acetylglucosamine
3. Metamerically segmented body
4. Schizocoelom as body cavity

58. Water soluble pigments found in plant cell vacuoles are:

1. Chlorophylls
2. Carotenoids
3. Anthocyanins
4. Xanthophylls

55. कॉलम I की शब्दों को कॉलम II में दिए गए, उनके वर्णन से मैच कीजिए तथा सही विकल्प चुनिए:

<table>
<thead>
<tr>
<th>कॉलम I</th>
<th>कॉलम II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) प्रभावित *</td>
<td>(i) अनेक जीन एकल लक्षण का नियंत्रण करते हैं</td>
</tr>
<tr>
<td>(b) सहप्रभावित</td>
<td>(ii) विषयपूर्ण जीव में केवल एक ही ऐतिहासिक स्थाय को अभिव्यक्त करता है</td>
</tr>
<tr>
<td>(c) विभूप्रभावित</td>
<td>(iii) विषयपूर्ण जीव में दोनों ही ऐतिहासिक स्थाय को पूरी तरह अभिव्यक्त करता है</td>
</tr>
<tr>
<td>(d) बहुजीनी चंसायित (iv) एकल जीन अनेक लक्षणों का प्रभावित करता है</td>
<td></td>
</tr>
</tbody>
</table>

कोड:

<table>
<thead>
<tr>
<th>(a)</th>
<th>(b)</th>
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<tr>
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<tr>
<td>(2)</td>
<td>(iv)</td>
<td>(i)</td>
<td>(ii)</td>
</tr>
<tr>
<td>(3)</td>
<td>(iv)</td>
<td>(iii)</td>
<td>(i)</td>
</tr>
<tr>
<td>(4)</td>
<td>(ii)</td>
<td>(i)</td>
<td>(iv)</td>
</tr>
</tbody>
</table>

56. निम्नलिखित में से कौन सा कथन सत्य नहीं है?

1. कीट जो बिना परागण किये परागण या मकरण की ग्रहण करते हैं उन्हें पागा/मकरण गोर कहते हैं।
2. परागण अंकुरण तथा पार-नलिका बृद्धि परागण तथा उसके बीच का पारस्परिक संबंध के प्रक्रियाहृदय प्रकार रासायनिक प्रक्रम द्वारा नियंत्रित होता है।
3. कुछ सरसुपुरुः, कुछ पादप जातियों में परागण करते हुए बढ़ते गये हैं।
4. बहुत सारी जातियों के परागण एक पथ के वर्गों के अंतराल में होते हैं परंतु उसी जाति के परागण के केवल एक पथ-नलिका वर्तमान में आये बढ़ती है।

57. निम्नलिखित में से कौन-सा लक्षण *परिशिष्टेय* अमेरिकन में नहीं पाया जाता?

1. धूपीय परिवर्तन के दौरान अनियंत्रित और अलैट विकल्प
2. N - एसिटिलल्यूटिकासिमीन से नियंत्रित बांबुकाय
3. विशेषता: खड़े देखें
4. देशगुला के रूप में दोषपुष्प

58. पादप कोशिका की रसायनों में जल पुगील वर्णक कौन से होते हैं?

| प्राणिहरू | केतोटाइड | आधोसामियन | जैसार्कुल |
We molecules are both homosporous and heterosporous. The former are those of plants, and the latter are those of animals.

(4) Prokaryotic transport
(3) Prokaryotic replication and non-cyclic

(2) Prokaryotic transport and cyclic electron transport

(1) Two prokaryotes operating simultaneously

Expression of enhancement effect and Red drop have been eliminated in the discovery of a new immunodulatory molecule.

(4) In the absence of these two proteins, the immune system can

(5) Nifugen factor
(4) CAM
(1) C

Would you assign this plant? A plan in your garden along with photosynthesis.

(4) Aeropodity
(3) Polypody
(2) Somocional variation
(1) Polypodly

In contrast to other dandelion cells, this would result in a cell whose shape is observed by a student in a plant from the field, the cells are observed.

(5) C

(4) We molecules are both homosporous and heterosporous.

(3) The latter of the former are not well

(2) Selection of the latter three

(1) Selection, choice, and prints.
64. Which of the following is not a characteristic feature during mitosis in somatic cells?
(1) Disappearance of nucleolus
(2) Chromosome movement
(3) Synapsis
(4) Spindle fibres

65. Blood pressure in the pulmonary artery is:
(1) more than that in the carotid.
(2) more than that in the pulmonary vein.
(3) less than that in the venae cavae.
(4) same as that in the aorta.

66. Which of the following structures is homologous to the wing of a bird?
(1) Wing of a Moth
(2) Hind limb of Rabbit
(3) Flapper of Whale
(4) Dorsal fin of a Shark

67. Seed formation without fertilization in flowering plants involves the process of:
(1) Budding
(2) Somatic hybridization
(3) Apomixis
(4) Sporulation

68. Name the chronic respiratory disorder caused mainly by cigarette smoking:
(1) Asthma
(2) Respiratory acidosis
(3) Respiratory alkalosis
(4) Emphysema

69. Spindle fibres attach on to:
(1) Kinetochore of the chromosome
(2) Centromere of the chromosome
(3) Kinetosome of the chromosome
(4) Telomere of the chromosome
70. In context of Amniocentesis, which of the following statement is incorrect?

(1) It is used for prenatal sex determination.
(2) It can be used for detection of Down syndrome.
(3) It can be used for detection of Cleft palate.
(4) It is usually done when a woman is between 14 - 16 weeks pregnant.

71. Stems modified into flat green organs performing the functions of leaves are known as:

(1) Phyllodes
(2) Phylloclades
(3) Scales
(4) Cladodes

72. In a chloroplast the highest number of protons are found in:

(1) Lumen of thylakoids
(2) Inter membrane space
(3) Antennae complex
(4) Stroma

73. Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature?

(1) The first word in a biological name represents the genus name, and the second is a specific epithet
(2) The names are written in Latin and are italicised
(3) When written by hand, the names are to be underlined
(4) Biological names can be written in any language

74. In meiosis crossing over is initiated at:

(1) Leptotene
(2) Zygotene
(3) Diplotene
(4) Pachytene
75. Antivenom injection contains preformed antibodies while polio drops that are administered into the body contain:
   (1) Harvested antibodies
   (2) Gamma globulin
   (3) Attenuated pathogens
   (4) Activated pathogens

76. The Taq polymerase enzyme is obtained from:
   (1) *Thiobacillus ferrooxidans*
   (2) *Bacillus subtilis*
   (3) *Pseudomonas putida*
   (4) *Thermus aquaticus*

77. Which of the following most appropriately describes haemophilia?
   (1) X-linked recessive gene disorder
   (2) Chromosomal disorder
   (3) Dominant gene disorder
   (4) Recessive gene disorder

78. The standard petal of a papilionaceous corolla is also called:
   (1) Pappus
   (2) Vexillum
   (3) Corona
   (4) Carina

79. Which part of the tobacco plant is infected by *Meloidogyne incognita*?
   (1) Leaf
   (2) Stem
   (3) Root
   (4) Flower

80. Which of the following statements is wrong for viroids?
   (1) They are smaller than viruses
   (2) They cause infections
   (3) Their RNA is of high molecular weight
   (4) They lack a protein coat
81. Which of the following statements is not true for cancer cells in relation to mutations?

(1) Mutations destroy telomerase inhibitor.
(2) Mutations inactivate the cell control.
(3) Mutations inhibit production of telomerase.
(4) Mutations in proto-oncogenes accelerate the cell cycle.

82. Which type of tissue correctly matches with its location?

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areolar tissue</td>
<td>Tendons</td>
</tr>
<tr>
<td>Transitional epithelium</td>
<td>Tip of nose</td>
</tr>
<tr>
<td>Cuboidal epithelium</td>
<td>Lining of stomach</td>
</tr>
<tr>
<td>Smooth muscle</td>
<td>Wall of intestine</td>
</tr>
</tbody>
</table>

83. Which of the following pairs of hormones are not antagonistic (having opposite effects) to each other?

(1) Insulin - Glucagon
(2) Aldosterone - Atrial Natriuretic Factor
(3) Relaxin - Inhibin
(4) Parathormone - Calcitonin

84. Specialised epidermal cells surrounding the guard cells are called:

(1) Subsidiary cells
(2) Bulliform cells
(3) Lenticels
(4) Complementary cells

85. Fertilization in humans is practically feasible only if:

(1) the ovum and sperms are transported simultaneously to ampullary - isthmic junction of the fallopian tube.
(2) the ovum and sperms are transported simultaneously to ampullary - isthmic junction of the cervix.
(3) the sperms are transported into cervix within 48 hrs of release of ovum in uterus.
(4) the sperms are transported into vagina just after the release of ovum in fallopian tube.

86. Which one of the following is the starter codon?

(1) UGA
(2) UAA
(3) UAG
(4) AUG
87. A river with an inflow of domestic sewage rich in organic waste may result in:
   (1) Increased population of aquatic food web organisms.
   (2) An increased production of fish due to biodegradable nutrients.
   (3) Death of fish due to lack of oxygen.
   (4) Drying of the river very soon due to algal bloom.

88. Following are the two statements regarding the origin of life:
   (a) The earliest organisms that appeared on the earth were non-green and presumably anaerobes.
   (b) The first autotrophic organisms were the chemosynthetic that never released oxygen.
   Of the above statements which one of the following options is correct?
   (1) (b) is correct but (a) is false.
   (2) Both (a) and (b) are correct.
   (3) Both (a) and (b) are false.
   (4) (a) is correct but (b) is false.

89. A system of rotating crops with legume or grass pasture to improve soil structure and fertility is called:
   (1) Contour farming
   (2) Strip farming
   (3) Shifting agriculture
   (4) Ley farming

90. Gause's principle of competitive exclusion states that:
   (1) Competition for the same resources excludes species having different food preferences.
   (2) No two species can occupy the same niche indefinitely for the same limiting resources.
   (3) Larger organisms exclude smaller ones through competition.
   (4) More abundant species will exclude the less abundant species through competition.
91. Which of the following characteristic features always holds true for the corresponding group of animals?

<table>
<thead>
<tr>
<th>(1) Viviparous</th>
<th>Mammalia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possess a mouth with an upper and a lower jaw</td>
<td>Chordata</td>
</tr>
<tr>
<td>3-chambered heart with one incompletely divided ventricle</td>
<td>Reptilia</td>
</tr>
<tr>
<td>Cartilaginous endoskeleton</td>
<td>Chondrichthyes</td>
</tr>
</tbody>
</table>

92. Changes in GnRH pulse frequency in females is controlled by circulating levels of:

(1) estrogen and inhibin
(2) progesterone only
(3) progesterone and inhibin
(4) estrogen and progesterone

93. Microtubules are the constituents of:

(1) Spindle fibres, Centrioles and Cilia
(2) Centrioles, Spindle fibres and Chromatin
(3) Centrosome, Nucleosome and Centrioles
(4) Cilia, Flagella and Peroxisomes

94. Mitochondria and chloroplast are:

(a) semi-autonomous organelles.
(b) formed by division of pre-existing organelles and they contain DNA but lack protein synthesizing machinery.

Which one of the following options is correct?

(1) (b) is true but (a) is false.
(2) (a) is true but (b) is false.
(3) Both (a) and (b) are false.
(4) Both (a) and (b) are correct.

95. Photonsensitive compound in human eye is made up of:

(1) Opsin and Retinal
(2) Opsin and Retinol
(3) Transducin and Retinene
(4) Guanosine and Retinol

96. Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the kingdom:

(1) Protista
(2) Fungi
(3) Animalia
(4) Monera
97. The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the:

1. Thermoacidophiles
2. Methanogens
3. Eubacteria
4. Halophiles

98. Identify the correct statement on ‘inhibin’:

1. Is produced by granulose cells in ovary and inhibits the secretion of FSH.
2. Is produced by granulose cells in ovary and inhibits the secretion of LH.
3. Is produced by nurse cells in testes and inhibits the secretion of LH.
4. Inhibits the secretion of LH, FSH and Prolactin.

99. It is much easier for a small animal to run uphill than for a large animal, because:

1. Smaller animals have a higher metabolic rate.
2. Small animals have a lower O₂ requirement.
3. The efficiency of muscles in large animals is less than in the small animals.
4. It is easier to carry a small body weight.

100. A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the F₁ plants were selfed the resulting genotypes were in the ratio of:

1. 1:2:1::Tall heterozygous : Tall homozygous : Dwarf
2. 3:1::Tall : Dwarf
3. 3:1::Dwarf : Tall
4. 1:2:1::Tall homozygous : Tall heterozygous : Dwarf

101. Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers:

1. Ozone
2. Ammonia
3. Methane
4. Nitrous oxide
102. Which one of the following is a characteristic feature of cropland ecosystem?
   (1) Least genetic diversity
   (2) Absence of weeds
   (3) Ecological succession
   (4) Absence of soil organisms

103. Tricarpellary, syncarpous gynoecium is found in flowers of:
   (1) Solanaceae
   (2) Fabaceae
   (3) Poaceae
   (4) Liliaceae

104. In which of the following, all three are macronutrients?
   (1) Iron, copper, molybdenum
   (2) Molybdenum, magnesium, manganese
   (3) Nitrogen, nickel, phosphorus
   (4) Boron, zinc, manganese

105. Reduction in pH of blood will:
   (1) reduce the blood supply to the brain.
   (2) decrease the affinity of hemoglobin with oxygen.
   (3) release bicarbonate ions by the liver.
   (4) reduce the rate of heart beat.

106. Lack of relaxation between successive stimuli in sustained muscle contraction is known as:
   (1) Fatigue
   (2) Tetanus
   (3) Tonus
   (4) Spasm

107. Which one of the following statements is wrong?
   (1) Golden algae are also called desmids.
   (2) Eubacteria are also called false bacteria.
   (3) Phycomycetes are also called algal fungi.
   (4) Cyanobacteria are also called blue-green algae.

108. Which of the following is a restriction endonuclease?
   (1) Protease
   (2) DNase I
   (3) RNase
   (4) Hind II
109. Which of the following would appear as the pioneer organisms on bare rocks?
(1) Liverworts
(2) Mosses
(3) Green algae
(4) Lichens

110. Water vapour comes out from the plant leaf through the stomatal opening. Through the same stomatal opening carbon dioxide diffuses into the plant during photosynthesis. Reason out the above statements using one of following options:
(1) Both processes can happen together because the diffusion coefficient of water and CO₂ is different.
(2) The above processes happen only during night time.
(3) One process occurs during day time, and the other at night.
(4) Both processes cannot happen simultaneously.

111. Cotyledon of maize grain is called:
(1) coleorhiza
(2) coleoptile
(3) scutellum
(4) plumule

112. Which of the following guards the opening of hepatopancreatic duct into the duodenum?
(1) Ileocaecal valve
(2) Pyloric sphincter
(3) Sphincter of Oddi
(4) Semilunar valve

113. In the stomach, gastric acid is secreted by the:
(1) parietal cells
(2) peptic cells
(3) acidic cells
(4) gastrin secreting cells

114. In mammals, which blood vessel would normally carry largest amount of urea?
(1) Dorsal Aorta
(2) Hepatic Vein
(3) Hepatic Portal Vein
(4) Renal Vein

109. एक नन्हा चटन पर एक अग्रणी जीव के रूप में निभाते हैं?
(1) लिवरवर्टिस
(2) मॉस
(3) सीलीग्नाल्गी
(4) लिकेन

110. पादप पृथ्वी से जल वाष्प रचनाओं के द्वारा बाहर आता है। प्रकाशसंधियों के दौरान उसी रचने से कार्बन डाइऑक्साइड पादप में विस्तार होता है। उपरुपरु मुद्राओं में (कार्यों पर विचार कर) एक विकल्प चुनिए:
(1) दोनों प्रक्रियाएं हमेशा हो सकती हैं क्योंकि जल और CO₂ का विषय गुणधर्म है।
(2) उपरुपरु प्रक्रियाएं केवल रात में हो सकती हैं।
(3) एक प्रक्रिया दिन में तथा दूसरी प्रक्रिया रात में होती है।
(4) दोनों प्रक्रियाएं हमेशा हो सकती हैं।

111. बक्का के दाने के चोरियाँ को क्या कहा जाता है?
(1) मुकुर-चोल
(2) प्राकुर-चोल
(3) स्कुटेल्म
(4) प्राकुर

112. निम्नलिखित में से कौन-सी संरचना युक्तमुसाफ को जाहिर से प्राप्त होती में खुदने वाले रंग की देखभाल करती है?
(1) विकत्रक कपड़े
(2) जटरतिमर अवरोधी
(3) ओडाइ को अवरोधी
(4) अर्धचंताकार कपडे

113. आमाशय में जटररूप का लाभ होता है:
(1) भीतरी कोशिकाओं से
(2) पैक्टक कोशिकाओं से
(3) अंतर कोशिकाओं से
(4) गैरपूर्ण का साथ करने वाली कोशिकाओं से

114. स्तनपायों में, कौन-सी शरीर-चाहिए सामान्यतः सबसे अधिक यूरिया वहन करती है?
(1) पृथ्वी माहामानी
(2) बृहत-शिरा
(3) बृहत निमाहिका शिरा
(4) बृहत-शिरा
115. The term ecosystem was coined by:
(1) A.G. Tansley
(2) E. Haeckel
(3) E. Warming
(4) E.P. Odum

116. Which of the following is required as inducer(s) for the expression of Lac operon?
(1) galactose
(2) lactose
(3) lactose and galactose
(4) glucose

117. Which of the following is wrongly matched in the given table?

<table>
<thead>
<tr>
<th>Microbe</th>
<th>Product</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monascus purpureus</td>
<td>Statins</td>
<td>lowering of blood cholesterol</td>
</tr>
<tr>
<td>Streptococcus</td>
<td>Streptokinase</td>
<td>removal of clot from blood vessel</td>
</tr>
<tr>
<td>Clostridium butylicum</td>
<td>Lipase</td>
<td>removal of oil stains</td>
</tr>
<tr>
<td>Trichoderma polysporum</td>
<td>Cyclosporin A</td>
<td>immunosuppressive drug</td>
</tr>
</tbody>
</table>

118. When does the growth rate of a population following the logistic model equal zero? The logistic model is given as \( \frac{dN}{dt} = rN(1-N/K) \):
(1) when \( N \) nears the carrying capacity of the habitat.
(2) when \( N/K \) equals zero.
(3) when death rate is greater than birth rate.
(4) when \( N/K \) is exactly one.

119. Which one of the following statements is not true?
(1) Exine of pollen grains is made up of sporopollenin
(2) Pollen grains of many species cause severe allergies
(3) Stored pollen in liquid nitrogen can be used in the crop breeding programmes
(4) Tapetum helps in the dehiscence of anther
120. In bryophytes and pteridophytes, transport of male gametes requires:
(1) Insects
(2) Birds
(3) Water
(4) Wind

121. Which of the following is not a stem modification?
(1) Thorns of citrus
(2) Tendrils of cucumber
(3) Flattened structures of Opuntia
(4) Pitcher of Nepenthes

122. Which one of the following cell organelles is enclosed by a single membrane?
(1) Chloroplasts
(2) Lysosomes
(3) Nuclei
(4) Mitochondria

123. Analogous structures are a result of:
(1) Convergent evolution
(2) Shared ancestry
(3) Stabilizing selection
(4) Divergent evolution

124. Which one of the following statements is wrong?
(1) Cellulose is a polysaccharide.
(2) Uracil is a pyrimidine.
(3) Glycine is a sulphur containing amino acid.
(4) Sucrose is a disaccharide.

125. Proximal end of the filament of stamen is attached to the:
(1) Connective
(2) Placenta
(3) Thalamus or petal
(4) Anther

126. Which of the following is not required for any of the techniques of DNA fingerprinting available at present?
(1) Zinc finger analysis
(2) Restriction enzymes
(3) DNA - DNA hybridization
(4) Polymerase chain reaction
127. Which one of the following characteristics is not shared by birds and mammals?
(1) Breathing using lungs
(2) Viviparity
(3) Warm blooded nature
(4) Ossified endoskeleton

128. Select the incorrect statement:
(1) LH triggers ovulation in ovary.
(2) LH and FSH decrease gradually during the follicular phase.
(3) LH triggers secretion of androgens from the Leydig cells.
(4) FSH stimulates the sertoli cells which help in spermiogenesis.

129. The amino acid Tryptophan is the precursor for the synthesis of:
(1) Thyroxine and Triiodothyronine
(2) Estrogen and Progesterone
(3) Cortisol and Cortisone
(4) Melatonin and Serotonin

130. Joint Forest Management Concept was introduced in India during:
(1) 1970s
(2) 1980s
(3) 1990s
(4) 1960s

131. One of the major components of cell wall of most fungi is:
(1) Peptidoglycan
(2) Cellulose
(3) Hemicellulose
(4) Chitin

132. A complex of ribosomes attached to a single strand of RNA is known as:
(1) Polymer
(2) Polypeptide
(3) Okazaki fragment
(4) Polysome

133. Which of the following features is not present in the Phylum - Arthropoda?
(1) Metameric segmentation
(2) Parapodia
(3) Jointed appendages
(4) Chitinous exoskeleton

127. निम्नलिखित लक्षणों में से कौन-सा एक लक्षण पक्षीयों और स्तनधारियों दोनों में नहीं पाया जाता है?
(1) पीछे से घुड़स्वामि
(2) सशस्त्रप्रजातियाँ
(3) निर्दिशतापूर्व प्रकृति
(4) अशिष्ट्वृत्ति, अन्तःकरण

128. गलत कथन को चुनिए:
(1) LH अंडांश में अंडांशर्त को प्रेरित करता है।
(2) LH और FSH पुतलुक-अवस्था के दौरान धीरे-धीरे घटता जाता है।
(3) LH लीडिंग कोशिकाओं से एंडोजोन के स्तर को प्रेरित करता है।
(4) FSH सटोली कोशिकाओं को उत्पीड़ित करता है जो शुस्कासून में सहायता करता है।

129. अमीनो अम्ल ट्रिपोफैन किसके संस्तेलिशन के लिए पर्यावरणीय होता है?
(1) थायरोबजन और ट्राईथायोडोथ्रोजन
(2) इंटरेंज और प्रोोडक्सोएन
(3) कॉफिहेन्ट और कोफिटोयन
(4) मेलाफीडन्ट और सेटोडीमन

130. संग्रह वन प्रभाव की धारणा भारत में किस दौरान प्रस्तावित की गई थी?
(1) 1970
(2) 1980
(3) 1990
(4) 1960

131. अधिकांश कच्चे में कोशिका भित्ति का एक प्रमुख अंग शरीर सा है?
(1) पैपिडोलाइफन
(2) सेराफ़नुलॉज
(3) हेमीसेराफ़नुलॉज
(4) काइटन

132. राइयोमेज का एक संकुल जी RNA के एकल रनस्क के साथ जुड़ा होता है, बिना कहार्ला है?
(1) पीलिमूर (बहुलक)
(2) पीलिमूरेङ्ड
(3) आकाशावहार लालु
(4) पीलिमूरेज

133. निम्नलिखित लक्षणों में से कौन-सा लक्षण आरोग्य - आंशिक में नहीं पाया जाता?
(1) क्षितिज खादीवृक्ष
(2) पालसंपात
(3) सभी उपाय
(4) कार्यकारी बाह्यकर्मकार
134. Asthma may be attributed to:
(1) allergic reaction of the mast cells in the lungs
(2) inflammation of the trachea
(3) accumulation of fluid in the lungs
(4) bacterial infection of the lungs

135. Pick out the correct statements:
(a) Haemophilia is a sex-linked recessive disease.
(b) Down’s syndrome is due to aneuploidy.
(c) Phenylketonuria is an autosomal recessive gene disorder.
(d) Sickle cell anaemia is an X-linked recessive gene disorder.
(1) (b) and (d) are correct.
(2) (a), (c) and (d) are correct.
(3) (a), (b) and (c) are correct.
(4) (a) and (d) are correct.

136. A capacitor of 2 μF is charged as shown in the diagram. When the switch S is turned to position 2, the percentage of its stored energy dissipated is:
(1) 20%
(2) 75%
(3) 80%
(4) 0%

137. To get output 1 for the following circuit, the correct choice for the input is:
A
B
C
Y
(1) A = 1, B = 0, C = 0
(2) A = 1, B = 1, C = 0
(3) A = 1, B = 0, C = 1
(4) A = 0, B = 1, C = 0
A charge moving at constant velocity

An accelerating charge

A charged particle

A stationary charge

To produce a propagating electromagnetic wave?

\[ d(d(1 + u) + 1) \] (f)
\[ d(d(1 - u) + 1) \] (e)
\[ d(d(1 - u) + 2) \] (d)
\[ d(d(1 + u) + 2) \] (c)

Chapter 141

Two non-mixing liquids of densities and colors.

[Additional text not clearly legible due to image quality]
142. The charge flowing through a resistance $R$ varies with time $t$ as $Q = at - bt^2$, where $a$ and $b$ are positive constants. The total heat produced in $R$ is:

1. $\frac{a^3R}{3b}$
2. $\frac{a^3R}{2b}$
3. $\frac{a^3R}{b}$
4. $\frac{a^3R}{6b}$

143. At what height from the surface of the earth the gravitation potential and the value of $g$ are $-5.4 \times 10^7$ J kg$^{-2}$ and 6.0 ms$^{-2}$ respectively? Take the radius of the earth as 6400 km:

1. 1600 km
2. 1400 km
3. 2000 km
4. 2600 km

144. Coefficient of linear expansion of brass and steel rods are $\alpha_1$ and $\alpha_2$. Lengths of brass and steel rods are $l_1$ and $l_2$ respectively. If $(l_2 - l_1)$ is maintained same at all temperatures, which one of the following relations holds good?

1. $\alpha_1 l_2^2 = \alpha_2 l_1^2$
2. $\alpha_1 l_2 = \alpha_2 l_1$
3. $\alpha_1 l_1 = \alpha_2 l_2$
4. $\alpha_1 l_2 = \alpha_2 l_2$

145. The intensity at the maximum in a Young's double slit experiment is $I_0$. Distance between two slits is $d = 5\lambda$, where $\lambda$ is the wavelength of light used in the experiment. What will be the intensity in front of one of the slits on the screen placed at a distance $D = 10d$?

1. $\frac{I_0}{4}$
2. $\frac{3}{4} I_0$
3. $\frac{I_0}{2}$
4. $I_0$
146. The ratio of escape velocity at earth \((v_e)\) to the escape velocity at a planet \((v_p)\) whose radius and mean density are twice that of earth is:

(1) \(1:2\sqrt{2}\) 
(2) \(1:4\) 
(3) \(1:2\) 
(4) \(1:2\) 

147. A long solenoid has 1000 turns. When a current of 4A flows through it, the magnetic flux linked with each turn of the solenoid is \(4 \times 10^{-3}\) Wb. The self-inductance of the solenoid is:

(1) 3 H 
(2) 2 H 
(3) 1 H 
(4) 4 H 

148. A car is negotiating a curved road of radius R. The road is banked at an angle \(\theta\). The coefficient of friction between the tyres of the car and the road is \(\mu_s\). The maximum safe velocity on this road is:

(1) \(\sqrt{\frac{gR \mu_s + \tan \theta}{1 - \mu_s \tan \theta}}\) 
(2) \(\sqrt{\frac{g \mu_s + \tan \theta}{R (1 - \mu_s \tan \theta)}}\) 
(3) \(\sqrt{\frac{g \mu_s + \tan \theta}{R^2 (1 - \mu_s \tan \theta)}}\) 
(4) \(\sqrt{\frac{gR^2 \mu_s + \tan \theta}{1 - \mu_s \tan \theta}}\) 

150. The magnetic susceptibility is negative for:

(1) paramagnetic material only 
(2) ferromagnetic material only 
(3) paramagnetic and ferromagnetic materials 
(4) diamagnetic material only
151. A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at a speed of 15 ms\(^{-1}\). Then, the frequency of sound that the observer hears in the echo reflected from the cliff is:

(Take velocity of sound in air = 330 ms\(^{-1}\))

1. 800 Hz
2. 838 Hz
3. 885 Hz
4. 765 Hz

152. A body of mass 1 kg begins to move under the action of a time dependent force \( F = (2t^2 + 3t^3) \) newtons, where \( \hat{i} \) and \( \hat{j} \) are unit vectors along \( x \) and \( y \) axis. What power will be developed by the force at the time \( t \)?

1. \( (2t^2 + 4t^3) \) W
2. \( (2t^2 + 4t^3) \) W
3. \( (2t^2 + 3t^3) \) W
4. \( (2t^2 + 3t^3) \) W

153. From a disc of radius \( R \) and mass \( M \), a circular hole of diameter \( K \), whose rim passes through the centre is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis, passing through the centre?

1. \( 13 MR^2/32 \)
2. \( 11 MR^2/32 \)
3. \( 9 MR^2/32 \)
4. \( 15 MR^2/32 \)

154. In a diffraction pattern due to a single slit of width ‘a’, the first minimum is observed at an angle 30° when light of wavelength 5000 Å is incident on the slit. The first secondary maximum is observed at an angle of:

1. \( \sin^{-1} \left( \frac{2}{3} \right) \)
2. \( \sin^{-1} \left( \frac{1}{2} \right) \)
3. \( \sin^{-1} \left( \frac{3}{4} \right) \)
4. \( \sin^{-1} \left( \frac{1}{4} \right) \)
155. A square loop ABCD carrying a current $i$, is placed near and coplanar with a long straight conductor XY carrying a current $I$, the net force on the loop will be:

- $(1) \frac{\mu_0 ii L}{2\pi}$
- $(2) \frac{2\mu_0 ii L}{3\pi}$
- $(3) \frac{\mu_0 ii L}{2\pi}$
- $(4) \frac{2\mu_0 ii L}{3\pi}$

156. A black body is at a temperature of 5760 K. The energy of radiation emitted by the body at wavelength 250 nm is $U_1$, at wavelength 500 nm is $U_2$ and that at 1000 nm is $U_3$. Wien's constant, $b = 2.88 \times 10^6$ nmK. Which of the following is correct?

- $(1) U_3 = 0$
- $(2) U_1 > U_2$
- $(3) U_2 > U_1$
- $(4) U_1 = 0$

157. An air column, closed at one end and open at the other, resonates with a tuning fork when the smallest length of the column is 50 cm. The next larger length of the column resonating with the same tuning fork is:

- $(1) 100$ cm
- $(2) 150$ cm
- $(3) 200$ cm
- $(4) 66.7$ cm
158. The molecules of a given mass of a gas have r.m.s. velocity of 200 ms⁻¹ at 27°C and 1.0 x 10⁵ Nm⁻² pressure. When the temperature and pressure of the gas are respectively, 127°C and 0.05 x 10⁵ Nm⁻², the r.m.s. velocity of its molecules in ms⁻¹ is:

(1) \( \frac{400}{\sqrt{3}} \)
(2) \( \frac{100\sqrt{2}}{3} \)
(3) \( \frac{100}{3} \)
(4) \( 100\sqrt{2} \)

159. Consider the junction diode as ideal. The value of current flowing through AB is:

\[ A + 4 \text{ V} \quad 1 \text{k}\Omega \quad B - 6 \text{ V} \]

(1) \( 10^{-2} \text{ A} \)
(2) \( 10^{-1} \text{ A} \)
(3) \( 10^{-3} \text{ A} \)
(4) 0 A

160. If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is:

(1) 90°
(2) 45°
(3) 180°
(4) 0°

161. A astronomical telescope has objective and eyepiece of focal lengths 40 cm and 4 cm respectively. To view an object 200 cm away from the objective, the lenses must be separated by a distance:

(1) 46.0 cm
(2) 50.0 cm
(3) 54.0 cm
(4) 37.3 cm

162. A npn transistor is connected in common emitter configuration in a given amplifier. A load resistance of 800 Ω is connected in the collector circuit and the voltage drop across it is 0.8 V. If the current amplification factor is 0.96 and the input resistance of the circuit is 192 Ω, the voltage gain and the power gain of the amplifier will respectively be:

(1) 3.69, 3.84
(2) 4, 4
(3) 4, 3.69
(4) 4, 3.84

158. ताप 27°C और दबाव 1.0 x 10⁵ Nm⁻² पर किसी दिए गए द्रव्यांक की गैस के आधुनिक का वर्तमान माध्य (r.m.s.) वेग 200 ms⁻¹ है। जब इस गैस के ताप और दबाव क्रमशः 127°C और 0.05 x 10⁵ Nm⁻² है, तो ms⁻¹ में इस गैस के आधुनिक का वर्तमान माध्य वेग है:

(1) \( \frac{400}{\sqrt{3}} \)
(2) \( \frac{100\sqrt{2}}{3} \)
(3) \( \frac{100}{3} \)
(4) \( 100\sqrt{2} \)

159. संधि डायोड को आदर्श मानकर विचार कीजिए। AB से प्रवाहित धारा का मान है:

\[ A + 4 \text{ V} \quad 1 \text{k}\Omega \quad B - 6 \text{ V} \]

(1) \( 10^{-2} \text{ A} \)
(2) \( 10^{-1} \text{ A} \)
(3) \( 10^{-3} \text{ A} \)
(4) 0 A

160. यदि दो सदिशों के योग का परिमाण न दो सदिशों के अन्तर के परिमाण के बराबर है, तो इन सदिशों के बीच कोण है:

(1) 90°
(2) 45°
(3) 180°
(4) 0°

161. किसी खंडोलीय दुर्बीज के अभियुक्त को और नेरिज्जा की फोकस दूरी का क्रमशः 40 से.मी. और 4 से.मी. है। अभियुक्त के से 200 से.मी. दूर स्थित किसी भिन्न को देखने के लिए, दोनों लेंस के बीच को दूरी होनी चाहिए:

(1) 46.0 से.मी.
(2) 50.0 से.मी.
(3) 54.0 से.मी.
(4) 37.3 से.मी.

162. A npn transistor is connected in common emitter configuration in a given amplifier. A load resistance of 800 Ω is connected in the collector circuit and the voltage drop across it is 0.8 V. If the current amplification factor is 0.96 and the input resistance of the circuit is 192 Ω, the voltage gain and the power gain of the amplifier will respectively be:

(1) 3.69, 3.84
(2) 4, 4
(3) 4, 3.69
(4) 4, 3.84
163. A gas is compressed isothermally to half its initial volume. The same gas is compressed separately through an adiabatic process until its volume is again reduced to half. Then:
(1) Compressing the gas through adiabatic process will require more work to be done.
(2) Compressing the gas isothermally or adiabatically will require the same amount of work.
(3) Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas.
(4) Compressing the gas isothermally will require more work to be done.

164. A long straight wire of radius a carries a steady current I. The current is uniformly distributed over its cross-section. The ratio of the magnetic fields B and B', at radial distances \( \frac{a}{2} \) and 2a respectively, from the axis of the wire is:

(1) \( \frac{1}{2} \)
(2) 1
(3) 4
(4) \( \frac{1}{4} \)

165. Match the corresponding entries of column 1 with column 2. [Where m is the magnification produced by the mirror]

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) ( m = -2 )</td>
<td>(a) Convex mirror</td>
</tr>
<tr>
<td>(B) ( m = -\frac{1}{2} )</td>
<td>(b) Concave mirror</td>
</tr>
<tr>
<td>(C) ( m = +2 )</td>
<td>(c) Real image</td>
</tr>
<tr>
<td>(D) ( m = +\frac{1}{2} )</td>
<td>(d) Virtual image</td>
</tr>
</tbody>
</table>

| (1) A→ a and c; B→ a and d; C→ a and b; D→ c and d |
| (2) A→ a and d; B→ b and c; C→ b and d; D→ b and c |
| (3) A→ c and d; B→ b and d; C→ b and c; D→ a and d |
| (4) A→ b and c; B→ b and c; C→ b and d; D→ a and d |

166. किसी गैस को समतापीय रूप से उसके आघे अवयवन र संपीडित किया जाता है। इसी गैस को पृथक रूप से स्वदो
प्रक्रिया द्वारा उसके आघे आवरण तक संपीडित किया जाता 
तब:
(1) गैस को स्वदोप्रक्रिया द्वारा संपीडित करने में अधी
कार्य करने को आवश्यकता होगी।
(2) गैस को समतापीय प्रक्रिया अवयव स्वदोप्रक्रिया द्वारा 
ही समान कार्य करने को आवश्यकता होगी।
(3) चाहे समतापीय प्रक्रिया द्वारा संपीडित करै अवयव स्वदो
प्रक्रिया द्वारा संपीडित करै, किस प्रक्रिया में अधी
कार्य करने की आवश्यकता होगी, इह गैस की पदमावत पर निर्भर करेगा।
(4) गैस को समतापीय प्रक्रिया द्वारा संपीडित करने में अधी
कार्य करने को आवश्यकता होगी।

166. किसी a के किसी लंबे संघर्ष तरा से कोई स्थायी धारा 
प्रवाहित हो रही है। इस तार को अनुसूचक कट पर ए
कस्मण रूप से वितरित है। तार के आघे से किरण पूर्वी 
\( \frac{a}{2} \) और 2a पर अनुसूचक: सुन्दरीक्षण तार और B का अनुपात 
(1) \( \frac{1}{2} \)
(2) 1
(3) 4
(4) \( \frac{1}{4} \)

165. कॉलं -1 को संगठ प्रतिक्षितों का मिलान कॉलं-2 
प्रतिक्षितों से काउँजिए। इह 'm' दर्पण्य द्वारा उपलब्ध आहे 
हातः कॉलं -1 कॉलं -2 
(A) \( m = -2 \) (a) उत्तर दर्पण
(B) \( m = -\frac{1}{2} \) (b) अवलंबित दर्पण
(C) \( m = +2 \) (c) वायतिक प्रतिक्षित
(D) \( m = +\frac{1}{2} \) (d) आभासी प्रतिक्षित
(1) A→ a व c; B→ a व d; C→ a व b; D→ c व d
(2) A→ a व d; B→ b व c; C→ b व d; D→ b व c
(3) A→ c व d; B→ b व d; C→ b व c; D→ a व d
(4) A→ b व c; B→ b व d; C→ b व d; D→ a व d
166. If the velocity of a particle is \( v = At + Bt^2 \), where \( A \) and \( B \) are constants, then the distance travelled by it between 1s and 2s is:

1. \( 3A + 7B \)
2. \( \frac{3}{2}A + \frac{7}{3}B \)
3. \( \frac{A}{2} + \frac{B}{3} \)
4. \( \frac{3}{2}A + 4B \)

167. A disk and a sphere of same radius but different masses roll off on two inclined planes of the same altitude and length. Which one of the two objects gets to the bottom of the plane first?

1. Sphere
2. Both reach at the same time
3. Depends on their masses
4. Disk

168. Two identical charged spheres suspended from a common point by two massless strings of lengths \( l \), are initially at a distance \( d (d < l) \) apart because of their mutual repulsion. The charges begin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity \( v \). Then \( v \) varies as a function of the distance \( x \) between the spheres, as:

1. \( v \propto x \)
2. \( v \propto x^{-1} \)
3. \( v \propto x^{-\frac{1}{2}} \)
4. \( v \propto x^2 \)

169. A particle moves so that its position vector is given by \( \mathbf{r} = \cos \omega t \mathbf{x} + \sin \omega t \mathbf{y} \). Where \( \omega \) is a constant.

Which of the following is true?

1. Velocity and acceleration both are parallel to \( \mathbf{r} \).
2. Velocity is perpendicular to \( \mathbf{r} \) and acceleration is directed towards the origin.
3. Velocity is perpendicular to \( \mathbf{r} \) and acceleration is directed away from the origin.
4. Velocity and acceleration both are perpendicular to \( \mathbf{r} \).
170. A piece of ice falls from a height $h$ so that it melts completely. Only one-quarter of the heat produced is absorbed by the ice and all energy of ice gets converted into heat during its fall. The value of $h$ is:

[Latent heat of ice is $3.4 \times 10^5$ J/kg and $g = 10$ N/kg]

(1) $544$ km
(2) $136$ km
(3) $68$ km
(4) $34$ km

171. A uniform circular disc of radius $50$ cm at rest is free to turn about an axis which is perpendicular to its plane and passes through its centre. It is subjected to a torque which produces a constant angular acceleration of $2.0$ rad s$^{-2}$. Its net acceleration in ms$^{-2}$ at the end of $2.0$ s is approximately:

(1) $7.0$
(2) $6.0$
(3) $3.0$
(4) $8.0$

172. What is the minimum velocity with which a body of mass $m$ must enter a vertical loop of radius $R$ so that it can complete the loop?

(1) $\sqrt{2gR}$
(2) $\sqrt{3gR}$
(3) $\sqrt{5gR}$
(4) $\sqrt{8gR}$

173. A small signal voltage $V(t) = V_0 \sin \omega t$ is applied across an ideal capacitor $C$:

(1) Over a full cycle the capacitor $C$ does not consume any energy from the voltage source.
(2) Current $I(t)$ is in phase with voltage $V(t)$.
(3) Current $I(t)$ leads voltage $V(t)$ by $180^\circ$.
(4) Current $I(t)$, lags voltage $V(t)$ by $90^\circ$.
174. A uniform rope of length L and mass $m_1$ hangs vertically from a rigid support. A block of mass $m_2$ is attached to the free end of the rope. A transverse pulse of wavelength $\lambda_1$ is produced at the lower end of the rope. The wavelength of the pulse when it reaches the top of the rope is $\lambda_2$. The ratio $\lambda_2/\lambda_1$ is:

1. $\sqrt{\frac{m_1 + m_2}{m_2}}$
2. $\sqrt{\frac{m_2}{m_1}}$
3. $\sqrt{\frac{m_1 + m_2}{m_1}}$
4. $\sqrt{\frac{m_1}{m_2}}$

175. An inductor $20 \, \text{mH}$, a capacitor $50 \, \mu\text{F}$ and a resistor $40 \, \Omega$ are connected in series across a source of emf $V=10 \sin 340 t$. The power loss in A.C. circuit is:

1. 0.67 W
2. 0.76 W
3. 0.89 W
4. 0.51 W

176. An electron of mass $m$ and a photon have same energy $E$. The ratio of de-Broglie wavelengths associated with them is:

1. $\left(\frac{E}{2m}\right)^{\frac{1}{2}}$
2. $c(2mE)^{\frac{1}{2}}$
3. $\frac{1}{c} \left(\frac{2m}{E}\right)^{\frac{1}{2}}$
4. $\frac{1}{c} \left(\frac{E}{2m}\right)^{\frac{1}{2}}$

($c$ being velocity of light)
177. When an $\alpha$-particle of mass $m$ moving with velocity $v$ bombards on a heavy nucleus of charge $Ze$, its distance of closest approach from the nucleus depends on $m$ as:

1. $\frac{1}{\sqrt{m}}$
2. $\frac{1}{m^2}$
3. $m$
4. $\frac{1}{m}$

178. A refrigerator works between 4°C and 30°C. It is required to remove 600 calories of heat every second in order to keep the temperature of the refrigerated space constant. The power required is:

(Take 1 cal = 4.2 Joules)

1. 23.65 W
2. 236.5 W
3. 2365 W
4. 2.365 W

179. A particle of mass 10 g moves along a circle of radius 6.4 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to $8 \times 10^{-4}$ J by the end of the second revolution after the beginning of the motion?

1. 0.15 m/s$^2$
2. 0.18 m/s$^2$
3. 0.2 m/s$^2$
4. 0.1 m/s$^2$

180. The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism is 60°. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are:

1. 30°; $\sqrt{2}$
2. 45°; $\sqrt{2}$
3. 30°; $\frac{1}{\sqrt{2}}$
4. 45°; $\frac{1}{\sqrt{2}}$
### Read carefully the following instructions:

| 1. Each candidate must show on demand his/her Admit Card to the Invigilator. |
| 2. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat. |
| 3. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case. |
| 4. Use of Electronic/Manual Calculator is prohibited. |
| 5. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board. |
| 6. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances. |
| 7. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet. |

### निम्नलिखित निर्देश ध्यान से पढ़ें:

| 1. पूछे जाने पर प्रश्नपत्र परीक्षार्थी, निरीक्षक को अपना प्रवेश-कार्ड दिखाएं। |
| 2. अधीश्क या निरीक्षक की विशेष अनुमति के बिना कोई परीक्षार्थी अपना स्थान न छोड़ें। |
| 3. कार्यक्रम निरीक्षक को अपना उत्तर पत्र दिए बिना एवं उपस्थित-पत्रक पर दुबारा हस्ताक्षर किए बिना कोई परीक्षार्थी परीक्षा हॉल नहीं छोड़ें। यदि किसी परीक्षार्थी ने दूसरी बार उपस्थित-पत्रक पर हस्ताक्षर नहीं किए तो यह माना जाएगा कि उसके उत्तर पत्र नहीं लीटाया है और यह अनुचित साधन का मामला माना जाएगा। |
| 4. इलेक्ट्रॉनिक/हस्तचारित परिकल्पना का उपयोग विराम है। |
| 5. परीक्षा-हॉल में आचरण के लिए परीक्षार्थी बोर्ड के नियमों एवं विनियमों द्वारा नियंत्रित हैं। अनुचित साधन के सभी मामलों के पैसला बोर्ड के नियमों एवं विनियमों के अनुसार होंगा। |
| 6. किसी हाल में परीक्षा पुस्तिका और उत्तर पत्र का कोई भाग अलग न करें। |
| 7. परीक्षा पुस्तिका/ उत्तर पत्र में दिए गए परीक्षा पुस्तिका संकेत को परीक्षार्थी सही तरीके से उपरिथित-पत्रक में लिखें। |
Important Instructions:

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on side-1 and side-2 carefully with blue/black ball point pen only.

2. The test is of 3 hours duration and Test Booklet contains 180 questions. Each question carries 4 marks. For each correct response, the candidate will get 4 marks. For each incorrect response, one mark will be deducted from the total scores. The maximum marks are 720.

3. Use Blue/Black Ball Point Pen only for writing particulars on this page/marking responses.

4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.

5. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.

6. The CODE for this booklet is Z. Make sure that the CODE printed on Side-2 of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.

7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.

8. Use of white fluid for correction is not permissible on the Answer Sheet.

In case of any ambiguity in translation of any question, English version shall be treated as final.
1. A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at a speed of 15 ms\(^{-1}\). Then, the frequency of sound that the observer hears in the echo reflected from the cliff is:

(Take velocity of sound in air = 330 ms\(^{-1}\))

(1) 838 Hz
(2) 885 Hz
(3) 765 Hz
(4) 800 Hz

2. Out of the following options which one can be used to produce a propagating electromagnetic wave?

(1) A chargeless particle
(2) An accelerating charge
(3) A charge moving at constant velocity
(4) A stationary charge

3. An inductor 20 mH, a capacitor 50 \(\mu\)F and a resistor 40 \(\Omega\) are connected in series across a source of emf \(V = 10 \sin 340t\). The power loss in A.C. circuit is:

(1) 0.76 W
(2) 0.89 W
(3) 0.51 W
(4) 0.67 W

4. Match the corresponding entries of column 1 with column 2. (Where \(m\) is the magnification produced by the mirror)

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) (m = -2)</td>
<td>(a) Convex mirror</td>
</tr>
<tr>
<td>(B) (m = -\frac{1}{2})</td>
<td>(b) Concave mirror</td>
</tr>
<tr>
<td>(C) (m = +2)</td>
<td>(c) Real image</td>
</tr>
<tr>
<td>(D) (m = +\frac{1}{2})</td>
<td>(d) Virtual image</td>
</tr>
</tbody>
</table>

1. 800 Hz आवृत्ति की ध्वनि उत्तर करने वाला कोई स्वरूप किसी प्रेषक से एक चट्टान को ओड़ा 15 ms\(^{-1}\) की गति से गति माना है। तब उस ध्वनि की आवृत्ति, जिसे चट्टान से पररंतित प्रतिक्रिया के रूप में वह प्रेषक सुनता है, क्या होगी?

(बायु में ध्वनि की गति = 330 ms\(^{-1}\) लिखिते हैं)

(1) 838 Hz
(2) 885 Hz
(3) 765 Hz
(4) 800 Hz

2. नीचे दिए गए विकल्पों में से किसका उपयोग एक संचालित विद्युत चुम्बकीय तरंग उत्पन्न करने में किया जा सकता है?

(1) आवेशशील कण
(2) कोई त्वरित आवेश
(3) निरस्त देख से गतिमान कोई आवेश
(4) स्थिर आवेश

3. किसी न्यूल जिसका emf, \(V = 10 \sin 340t\) है, से श्रेणी में 20 mH का प्रेषक, 50 \(\mu\)F का संयोजन तथा 40 \(\Omega\) का प्रतिरोधक संयोजित है। इस प्रतिरोधक धारा परिपथ में शक्ति श्रेणि है:

(1) 0.76 W
(2) 0.89 W
(3) 0.51 W
(4) 0.67 W

4. कॉलम-1 की संगत प्रतिविद्यमों का पिलाने कॉलम-2 की प्रतिविद्यमों से कीजिए। यहाँ ‘\(m\)’ दर्शाएं द्रव्य उत्पन्न आवर्धन हैं।

<table>
<thead>
<tr>
<th>कॉलम - 1</th>
<th>कॉलम - 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) (m = -2)</td>
<td>(a) उत्तर दर्शाएं</td>
</tr>
<tr>
<td>(B) (m = -\frac{1}{2})</td>
<td>(b) अवर्त दर्शाएं</td>
</tr>
<tr>
<td>(C) (m = +2)</td>
<td>(c) वास्तविक प्रतिरोधक</td>
</tr>
<tr>
<td>(D) (m = +\frac{1}{2})</td>
<td>(d) आभासी प्रतिरोधक</td>
</tr>
</tbody>
</table>

1. अवर्त दर्शाएं; \(C\) के बजाय \(D\) दर्शाएं

2. अवर्त दर्शाएं; \(A\) के बजाय \(B\) दर्शाएं

3. उत्तर दर्शाएं; \(D\) के बजाय \(A\) दर्शाएं

4. उत्तर दर्शाएं; \(B\) के बजाय \(C\) दर्शाएं
5. Coefficient of linear expansion of brass and steel rods are \( \alpha_1 \) and \( \alpha_2 \). Lengths of brass and steel rods are \( l_1 \) and \( l_2 \) respectively. If \( l_2 - l_1 \) is maintained same at all temperatures, which one of the following relations holds good?

\[
\begin{align*}
(1) & \quad \alpha_1 l_2 = \alpha_2 l_1 \\
(2) & \quad \alpha_1 l_1 = \alpha_2 l_2 \\
(3) & \quad \alpha_1 l_2 = \alpha_2 l_1 \\
(4) & \quad \alpha_1 l_1 = \alpha_2 l_2
\end{align*}
\]

6. At what height from the surface of the earth the gravitational potential and the value of \( g \) are \(-5.4 \times 10^7 \text{ J kg}^{-2}\) and \(6.0 \text{ ms}^{-2}\) respectively? Take the radius of the earth as 6400 km:

\[
\begin{align*}
(1) & \quad 1400 \text{ km} \\
(2) & \quad 2000 \text{ km} \\
(3) & \quad 2600 \text{ km} \\
(4) & \quad 1600 \text{ km}
\end{align*}
\]

7. A piece of ice falls from a height \( h \) so that it melts completely. Only one-quarter of the heat produced is absorbed by the ice and all energy of ice gets converted into heat during its fall. The value of \( h \) is:

[Latent heat of ice is \( 3.4 \times 10^5 \text{ J/kg} \) and \( g = 10 \text{ N/kg} \)]

\[
\begin{align*}
(1) & \quad 136 \text{ km} \\
(2) & \quad 68 \text{ km} \\
(3) & \quad 34 \text{ km} \\
(4) & \quad 544 \text{ km}
\end{align*}
\]

8. In a diffraction pattern due to a single slit of width \( a \), the first minimum is observed at an angle 30° when light of wavelength 5000 Å is incident on the slit. The first secondary maximum is observed at an angle of:

\[
\begin{align*}
(1) & \quad \sin^{-1} \left( \frac{1}{2} \right) \\
(2) & \quad \sin^{-1} \left( \frac{3}{4} \right) \\
(3) & \quad \sin^{-1} \left( \frac{1}{4} \right) \\
(4) & \quad \sin^{-1} \left( \frac{2}{3} \right)
\end{align*}
\]
9. A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50 cm and 10 cm from the positive end of the wire in the two cases. The ratio of emf’s is:

(1) 3 : 4
(2) 3 : 2
(3) 5 : 1
(4) 5 : 4

10. A particle of mass 10 g moves along a circle of radius 6.4 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to $8 \times 10^{-4}$ J by the end of the second revolution after the beginning of the motion?

(1) 0.18 m/s²
(2) 0.2 m/s²
(3) 0.1 m/s²
(4) 0.15 m/s²

11. An air column, closed at one end and open at the other, resonates with a tuning fork when the smallest length of the column is 50 cm. The next larger length of the column resonating with the same tuning fork is:

(1) 150 cm
(2) 200 cm
(3) 66.7 cm
(4) 100 cm

12. To get output 1 for the following circuit, the correct choice for the input is:

```
A
B
C
```

(1) A = 1, B = 1, C = 0
(2) A = 1, B = 0, C = 1
(3) A = 0, B = 1, C = 0
(4) A = 1, B = 0, C = 0
13. A gas is compressed isothermally to half its initial volume. The same gas is compressed separately through an adiabatic process until its volume is again reduced to half. Then:

(1) Compressing the gas isothermally or adiabatically will require the same amount of work.

(2) Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas.

(3) Compressing the gas isothermally will require more work to be done.

(4) Compressing the gas through adiabatic process will require more work to be done.

14. The intensity at the maximum in a Young’s double slit experiment is $I_0$. Distance between two slits is $d = 5\lambda$, where $\lambda$ is the wavelength of light used in the experiment. What will be the intensity in front of one of the slits on the screen placed at a distance $D = 10d$?

(1) $\frac{3}{4} I_0$

(2) $\frac{I_0}{2}$

(3) $I_0$

(4) $\frac{I_0}{4}$

15. A car is negotiating a curved road of radius $R$. The road is banked at an angle $\theta$. The coefficient of friction between the tyres of the car and the road is $\mu_s$. The maximum safe velocity on this road is:

(1) $\frac{g \mu_s + \tan \theta}{R \left( 1 - \mu_s \tan \theta \right)}$

(2) $\frac{g \mu_s + \tan \theta}{\sqrt{R^2 - 1 - \mu_s \tan \theta}}$

(3) $\frac{g \mu_s \tan \theta}{R \left( 1 - \mu_s \tan \theta \right)}$

(4) $\frac{g \mu_s + \tan \theta}{1 - \mu_s \tan \theta}$
16. An electron of mass $m$ and a photon have the same energy $E$. The ratio of de-Broglie wavelengths associated with them is:

\[
\frac{1}{c} \left( \frac{2mE}{c^2} \right)^{\frac{1}{2}}
\]

(1) \(c(2mE)^{\frac{1}{2}}\)

(2) \(\frac{1}{c} \left( \frac{2mE}{c^2} \right)^{\frac{1}{2}}\)

(3) \(\frac{1}{c} \left( \frac{E}{2m} \right)^{\frac{1}{2}}\)

(4) \(\left( \frac{E}{2m} \right)^{\frac{1}{2}}\)

($c$ being the velocity of light)

17. A black body is at a temperature of 5760 K. The energy of radiation emitted by the body at wavelength 250 nm is $U_1$, at wavelength 500 nm is $U_2$ and that at 1000 nm is $U_3$. Wien's constant, $b = 2.88 \times 10^6$ nmK. Which of the following is correct?

(1) $U_1 > U_2$

(2) $U_2 > U_1$

(3) $U_1 = 0$

(4) $U_3 = 0$

18. Given the value of Rydberg constant is $10^7$ m$^{-1}$, the wave number of the last line of the Balmer series in hydrogen spectrum will be:

(1) $0.25 \times 10^7$ m$^{-1}$

(2) $2.5 \times 10^7$ m$^{-1}$

(3) $0.025 \times 10^4$ m$^{-1}$

(4) $0.5 \times 10^7$ m$^{-1}$

19. A npn transistor is connected in common emitter configuration in a given amplifier. A load resistance of 800 $\Omega$ is connected in the collector circuit and the voltage drop across it is 0.8 V. If the current amplification factor is 0.96 and the input resistance of the circuit is 192 $\Omega$, the voltage gain and the power gain of the amplifier will respectively be:

(1) 4, 4

(2) 4, 3.69

(3) 4, 3.84

(4) 3.69, 3.84

16. द्रव्यमान $m$ के इलेक्ट्रॉन तथा किसी फोटोन की ऊर्जा एकसमान है। इनसे संबंध द्रव-ब्रह्मी तरंगदैर्घ्यों का अनुपात है:

(1) \(c(2mE)^{\frac{1}{2}}\)

(2) \(\frac{1}{c} \left( \frac{2mE}{c^2} \right)^{\frac{1}{2}}\)

(3) \(\frac{1}{c} \left( \frac{E}{2m} \right)^{\frac{1}{2}}\)

(4) \(\left( \frac{E}{2m} \right)^{\frac{1}{2}}\)

(यहाँ $c$ प्रकाश का वेग है।)

17. कोई क्षृष्णा 5760 K ताप पर है। इस पिण्ड द्वारा उत्सर्जित विकिरणों की ऊर्जा, तरंगदैर्घ्य 250 nm पर $U_1$, तरंगदैर्घ्य 500 nm पर $U_2$ तथा तरंगदैर्घ्य 1000 nm पर $U_3$ वीन-नियमांक, $b = 2.88 \times 10^6$ nmK है। नीचे दिया गया वीन-नियमांक को संबंध सदृश है?

(1) $U_1 > U_2$

(2) $U_2 > U_1$

(3) $U_1 = 0$

(4) $U_3 = 0$

18. रिडबर्ग नियमांक का मान 10$^7$ m$^{-1}$ दिया गया है, हालांकि स्पेक्ट्रम की बायर श्रेणी की अंतिम लाइन की तरंग दैर्घ्य होगी:

(1) $0.25 \times 10^7$ m$^{-1}$

(2) $2.5 \times 10^7$ m$^{-1}$

(3) $0.025 \times 10^4$ m$^{-1}$

(4) $0.5 \times 10^7$ m$^{-1}$

19. किसी दिए गए प्रवर्तक में कोई npn ट्रांजिस्टर उपयोगी उत्सर्जक विद्युत में संयोजित है। 800 $\Omega$ का कोई प्रतिरोध संयोजक परिपथ में संयोजित है और इसके लिए 0.8 V दिशावित है। यदि भार प्रवर्तक गुणांक 0.96 है परिपथ का निवेश प्रतिरोध 192 $\Omega$ है, तो इस प्रवर्तक की बोल्टज लघुत्व तथा शक्ति लघुत्व क्रमशः होगी:

(1) 4, 4

(2) 4, 3.69

(3) 4, 3.84

(4) 3.69, 3.84
20. Two non-mixing liquids of densities \( p \) and \( n_p \) \((n > 1)\) are put in a container. The height of each liquid is \( h \). A solid cylinder of length \( L \) and density \( d \) is put in this container. The cylinder floats with its axis vertical and length \( pL \) \((p < 1)\) in the denser liquid. The density \( d \) is equal to:

\[
\begin{align*}
(1) & \quad (2 + (n-1)p)p \\
(2) & \quad (1 + (n-1)p)p \\
(3) & \quad (1 + (n+1)p)p \\
(4) & \quad (2 + (n+1)p)p
\end{align*}
\]

21. If the velocity of a particle is \( v = At + Bt^2 \), where \( A \) and \( B \) are constants, then the distance travelled by it between \( 1s \) and \( 2s \) is:

\[
\begin{align*}
(1) & \quad \frac{3}{2}A + \frac{7}{3}B \\
(2) & \quad \frac{A}{2} + \frac{B}{3} \\
(3) & \quad \frac{3}{2}A + 4B \\
(4) & \quad 3A + 7B
\end{align*}
\]

22. A astronomical telescope has objective and eyepiece of focal lengths 40 cm and 4 cm respectively. To view an object 200 cm away from the objective, the lenses must be separated by a distance:

\[
\begin{align*}
(1) & \quad 50.0 \text{ cm} \\
(2) & \quad 54.0 \text{ cm} \\
(3) & \quad 37.3 \text{ cm} \\
(4) & \quad 46.0 \text{ cm}
\end{align*}
\]

23. The ratio of escape velocity at earth \( (v_e) \) to the escape velocity at a planet \( (v_p) \) whose radius and mean density are twice as that of earth is:

\[
\begin{align*}
(1) & \quad 1 : 4 \\
(2) & \quad 1 : \sqrt{2} \\
(3) & \quad 1 : 2 \\
(4) & \quad 1 : 2\sqrt{2}
\end{align*}
\]

24. A long straight wire of radius \( a \) carries a steady current \( I \). The current is uniformly distributed over its cross-section. The ratio of the magnetic fields \( B \) and \( B' \) at radial distances \( \frac{a}{2} \) and \( 2a \) respectively, from the axis of the wire is:

\[
\begin{align*}
(1) & \quad 1 \\
(2) & \quad 4 \\
(3) & \quad \frac{1}{4} \\
(4) & \quad \frac{1}{2}
\end{align*}
\]
25. A capacitor of 2 μF is charged as shown in the diagram. When the switch S is turned to position 2, the percentage of its stored energy dissipated is:

(1) 75%
(2) 80%
(3) 0%
(4) 20%

26. When a metallic surface is illuminated with radiation of wavelength λ, the stopping potential is V. If the same surface is illuminated with radiation of wavelength 2λ, the stopping potential is \( \frac{V}{4} \). The threshold wavelength for the metallic surface is:

(1) \( \frac{5}{2} \lambda \)
(2) 3 λ
(3) 4 λ
(4) 5 λ

27. If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is:

(1) 45°
(2) 180°
(3) 0°
(4) 90°

28. A body of mass 1 kg begins to move under the action of a time dependent force \( \vec{F} = (2t\hat{i} + 3t^2\hat{j})N \), where \( \hat{i} \) and \( \hat{j} \) are unit vectors along x and y axis.

What power will be developed by the force at the time t?

(1) \( (2t^3 + 3t^4) \) W
(2) \( (2t^3 + 3t^3) \) W
(3) \( (2t^2 + 3t^3) \) W
(4) \( (2t^2 + 4t^3) \) W
29. The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism is 60°. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are:

(1) 45°; \(\sqrt{2}\)
(2) 30°; \(\frac{1}{\sqrt{2}}\)
(3) 45°; \(\frac{1}{\sqrt{2}}\)
(4) 30°; \(\sqrt{2}\)

30. A particle moves so that its position vector is given by \(\vec{r} = \cos \omega t \hat{x} + \sin \omega t \hat{y}\). Where \(\omega\) is a constant. Which of the following is true?

(1) Velocity is perpendicular to \(\vec{r}\) and acceleration is directed towards the origin.
(2) Velocity is perpendicular to \(\vec{r}\) and acceleration is directed away from the origin.
(3) Velocity and acceleration both are perpendicular to \(\vec{r}\).
(4) Velocity and acceleration both are parallel to \(\vec{r}\).

31. Consider the junction diode as ideal. The value of current flowing through AB is:

\[\begin{array}{c}
\text{A} & \text{B} \\
+4\text{ V} & -6\text{ V} \\
1\text{ k}\Omega \\
\end{array}\]

(1) 10\(^{-1}\) A
(2) 10\(^{-3}\) A
(3) 0 A
(4) 10\(^{-2}\) A

32. Two identical charged spheres suspended from a common point by two massless strings of lengths \(l\), are initially at a distance \(d\) (\(d < l\)) apart because of their mutual repulsion. The charges begin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity \(v\). Then \(v\) varies as a function of the distance \(x\) between the spheres, as:

(1) \(v \propto x^{-\frac{1}{2}}\)
(2) \(v \propto x^{-1}\)
(3) \(v \propto x^1\)
(4) \(v \propto x\)
33. A small signal voltage \( V(t) = V_0 \sin \omega t \) is applied across an ideal capacitor \( C \):
   (1) Current \( I(t) \) is in phase with voltage \( V(t) \).
   (2) Current \( I(t) \) leads voltage \( V(t) \) by 180°.
   (3) Current \( I(t) \), lags voltage \( V(t) \) by 90°.
   (4) Over a full cycle the capacitor \( C \) does not consume any energy from the voltage source.

34. The magnetic susceptibility is negative for:
   (1) ferromagnetic material only
   (2) paramagnetic and ferromagnetic materials
   (3) diamagnetic material only
   (4) paramagnetic material only

35. A square loop ABCD carrying a current \( i \), is placed near and coplanar with a long straight conductor XY carrying a current \( I \), the net force on the loop will be:

   \[ \frac{2 \mu_0 i I L}{3 \pi} \]
   \[ \frac{\mu_0 i I L}{2 \pi} \]
   \[ \frac{2 \mu_0 i L}{3 \pi} \]
   \[ \frac{\mu_0 i L}{2 \pi} \]

36. A uniform rope of length \( L \) and mass \( m_1 \) hangs vertically from a rigid support. A block of mass \( m_2 \) is attached to the free end of the rope. A transverse pulse of wavelength \( \lambda_1 \) is produced at the lower end of the rope. The wavelength of the pulse when it reaches the top of the rope is \( \lambda_2 \). The ratio \( \lambda_2 / \lambda_1 \) is:

   \[ \sqrt{\frac{m_2}{m_1}} \]
   \[ \sqrt{\frac{m_1 + m_2}{m_1}} \]
   \[ \sqrt{\frac{m_1}{m_2}} \]
   \[ \sqrt{\frac{m_1 + m_2}{m_2}} \]
37. When an α-particle of mass ‘m’ moving with velocity ‘v’ bombards on a heavy nucleus of charge ‘Ze’, its distance of closest approach from the nucleus depends on m as:

(1) \( \frac{1}{m^2} \)
(2) \( m \)
(3) \( \frac{1}{m} \)
(4) \( \frac{1}{\sqrt{m}} \)

38. A disk and a sphere of same radius but different masses roll off on two inclined planes of the same altitude and length. Which one of the two objects gets to the bottom of the plane first?

(1) Both reach at the same time
(2) Depends on their masses
(3) Disk
(4) Sphere

39. From a disc of radius R and mass M, a circular hole of diameter R, whose rim passes through the centre is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis, passing through the centre?

(1) \( 11 MR^2/32 \)
(2) \( 9 MR^2/32 \)
(3) \( 15 MR^2/32 \)
(4) \( 13 MR^2/32 \)

40. A long solenoid has 1000 turns. When a current of 4A flows through it, the magnetic flux linked with each turn of the solenoid is \( 4 \times 10^{-3} \) Wb. The self-inductance of the solenoid is:

(1) 2 H
(2) 1 H
(3) 4 H
(4) 3 H

41. What is the minimum velocity with which a body of mass m must enter a vertical loop of radius R so that it can complete the loop?

(1) \( \sqrt{3gR} \)
(2) \( \sqrt{5gR} \)
(3) \( \sqrt{gR} \)
(4) \( \sqrt{2gR} \)
42. The molecules of a given mass of a gas have r.m.s. velocity of 200 ms\(^{-1}\) at 27°C and 1.0 \(\times 10^5\) Nm\(^{-2}\) pressure. When the temperature and pressure of the gas are respectively, 127°C and 0.05 \(\times 10^5\) Nm\(^{-2}\), the r.m.s. velocity of its molecules in ms\(^{-1}\) is:

1. \(\frac{100\sqrt{2}}{3}\)
2. \(\frac{100}{3}\)
3. \(100\sqrt{2}\)
4. \(\frac{400}{\sqrt{3}}\)

43. The charge flowing through a resistance R varies with time t as \(Q = at - bt^2\), where a and b are positive constants. The total heat produced in R is:

1. \(\frac{a^3R}{2b}\)
2. \(\frac{a^3R}{b}\)
3. \(\frac{a^3R}{6b}\)
4. \(\frac{a^3R}{3b}\)

44. A refrigerator works between 4°C and 30°C. It is required to remove 600 calories of heat every second in order to keep the temperature of the refrigerated space constant. The power required is:

(Take 1 cal = 4.2 Joules)

1. 236.5 W
2. 2365 W
3. 2.365 W
4. 23.65 W

45. A uniform circular disc of radius 50 cm at rest is free to turn about an axis which is perpendicular to its plane and passes through its centre. It is subjected to a torque which produces a constant angular acceleration of 2.0 rad s\(^{-2}\). Its net acceleration in ms\(^{-2}\) at the end of 2.0 s is approximately:

1. 6.0
2. 3.0
3. 8.0
4. 7.0
46. Which of the following would appear as the pioneer organisms on bare rocks?
   (1) Mosses
   (2) Green algae
   (3) Lichens
   (4) Liverworts

47. Water vapour comes out from the plant leaf through the stomatal opening. Through the same stomatal opening carbon dioxide diffuses into the plant during photosynthesis. Reason out the above statements using one of the following options:
   (1) The above processes happen only during night time.
   (2) One process occurs during the day, and the other at night.
   (3) Both processes cannot happen simultaneously.
   (4) Both processes can happen together because the diffusion coefficient of water and CO₂ is different.

48. Lack of relaxation between successive stimuli in sustained muscle contraction is known as:
   (1) Tetanus
   (2) Tonus
   (3) Spasm
   (4) Fatigue

49. Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers?
   (1) Ammonia
   (2) Methane
   (3) Nitrous oxide
   (4) Ozone

50. Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature?
   (1) The names are written in Latin and are italicised
   (2) When written by hand, the names are to be underlined
   (3) Biological names can be written in any language
   (4) The first word in a biological name represents the genus name, and the second is a specific epithet
51. A cell at telophase stage is observed by a student in a plant brought from the field. He tells his teacher that this cell is not like other cells at telophase stage. There is no formation of cell plate and thus the cell is containing more number of chromosomes as compared to other dividing cells. This would result in:

(1) Somaclonal variation
(2) Polyteny
(3) Aneuploidy
(4) Polyploidy

52. The two polypeptides of human insulin are linked together by:

(1) Covalent bond
(2) Disulphide bridges
(3) Hydrogen bonds
(4) Phosphodiester bond

53. Reduction in pH of blood will:

(1) decrease the affinity of hemoglobin with oxygen.
(2) release bicarbonate ions by the liver.
(3) reduce the rate of heart beat.
(4) reduce the blood supply to the brain.

54. In a chloroplast the highest number of protons are found in:

(1) Inter membrane space
(2) Antennae complex
(3) Stroma
(4) Lumen of thylakoids

55. Which type of tissue correctly matches with its location?

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transitional epithelium</td>
<td>Tip of nose</td>
</tr>
<tr>
<td>Cuboidal epithelium</td>
<td>Lining of stomach</td>
</tr>
<tr>
<td>Smooth muscle</td>
<td>Wall of intestine</td>
</tr>
<tr>
<td>Areolar tissue</td>
<td>Tendons</td>
</tr>
</tbody>
</table>

56. Which of the following pairs of hormones are not antagonistic (having opposite effects) to each other?

(1) Aldosterone - Atrial Natriuretic Factor
(2) Relaxin - Inhibin
(3) Parathormone - Calcitonin
(4) Insulin - Glucagon
57. In mammals, which blood vessel would normally carry largest amount of urea?

(1) Hepatic Vein
(2) Hepatic Portal Vein
(3) Renal Vein
(4) Dorsal Aorta

58. Pick out the correct statements:

(a) Haemophilia is a sex-linked recessive disease.
(b) Down’s syndrome is due to aneuploidy.
(c) Phenylketonuria is an autosomal recessive gene disorder.
(d) Sickle cell anaemia is an X-linked recessive gene disorder.

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

59. Which of the following approaches does not give the defined action of contraceptive?

| (1) Hormonal contraceptives | Prevent/retard entry of sperms, prevent ovulation and fertilization |
| (2) Vasectomy | Prevents spermatogenesis |
| (3) Barrier methods | Prevent fertilization |
| (4) Intra uterine devices | Increase phagocytosis of sperms, suppress sperm motility and fertilizing capacity of sperms |

60. Which one of the following characteristics is not shared by birds and mammals?

(1) Viviparity
(2) Warm blooded nature
(3) Ossified endoskeleton
(4) Breathing using lungs

61. Which of the following actions does not give the defined action of contraceptive?

(1) Hormonal contraceptives
(2) Vasectomy
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(4) Intra uterine devices

62. Which one of the following characteristics is not shared by birds and mammals?

(1) Viviparity
(2) Warm blooded nature
(3) Ossified endoskeleton
(4) Breathing using lungs
61. Emerson’s enhancement effect and Red drop have been instrumental in the discovery of:
(1) Photophosphorylation and cyclic electron transport
(2) Oxidative phosphorylation
(3) Photophosphorylation and non-cyclic electron transport
(4) Two photosystems operating simultaneously

62. In which of the following, all three are macronutrients?
(1) Molybdenum, magnesium, manganese
(2) Nitrogen, nickel, phosphorus
(3) Boron, zinc, manganese
(4) Iron, copper, molybdenum

63. Changes in GnRH pulse frequency in females is controlled by circulating levels of:
(1) progesterone only
(2) progesterone and inhibin
(3) estrogen and progesterone
(4) estrogen and inhibin

64. The coconut water from tender coconut represents:
(1) Free nuclear proembryo
(2) Free nuclear endosperm
(3) Endocarp
(4) Fleshy mesocarp

65. Which of the following guards the opening of hepatopancreatic duct into the duodenum?
(1) Pyloric sphincter
(2) Sphincter of Oddi
(3) Semilunar valve
(4) Ileocaecal valve

66. Which one of the following is the starter codon?
(1) UAA
(2) UAG
(3) AUG
(4) UGA

67. Spindle fibres attach on to:
(1) Centromere of the chromosome
(2) Kinetosome of the chromosome
(3) Telomere of the chromosome
(4) Kinetochore of the chromosome
68. A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the \( F_1 \) plants were selfed the resulting genotypes were in the ratio of:

1. \( 3:1:1 \) : Tall : Dwarf
2. \( 3:1 \) : Tall
3. \( 1:2:1 \) : Tall homozygous : Tall heterozygous : Dwarf
4. \( 1:2:1 \) : Tall heterozygous : Tall homozygous : Dwarf

69. A typical fat molecule is made up of:

1. One glycerol and one fatty acid molecule
2. Three glycerol and three fatty acid molecules
3. Three glycerol molecules and one fatty acid molecule
4. One glycerol and three fatty acid molecules

70. A system of rotating crops with legume or grass pasture to improve soil structure and fertility is called:

1. Strip farming
2. Shifting agriculture
3. Ley farming
4. Contour farming

71. Which of the following is not a stem modification?

1. Tendrils of cucumber
2. Flattened structures of \( Opuntia \)
3. Pitcher of \( Nepenthes \)
4. Thorns of citrus

72. Which of the following features is not present in \( Periplaneta americana \)?

1. Exoskeleton composed of \( N \)-acetylg glucosamine
2. Metamerically segmented body
3. Schizocoelom as body cavity
4. Indeterminate and radial cleavage during embryonic development

73. Name the chronic respiratory disorder caused mainly by cigarette smoking:

1. Respiratory acidosis
2. Respiratory alkalosis
3. Emphysema
4. Asthma

74. Which of the following features is not present in \( Periplaneta americana \)?

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4. Indeterminate and radial cleavage during embryonic development

77. Name the chronic respiratory disorder caused mainly by cigarette smoking:

1. Respiratory acidosis
2. Respiratory alkalosis
3. Emphysema
4. Asthma
74. Which one of the following statements is not true?
(1) Pollen grains of many species cause severe allergies.
(2) Stored pollen in liquid nitrogen can be used in the crop breeding programmes.
(3) Tapetum helps in the dehiscence of anther.
(4) Exine of pollen grains is made up of sporopollenin.

75. Which of the following is required as inducer(s) for the expression of Lac operon?
(1) lactose
(2) lactose and galactose
(3) glucose
(4) galactose

76. Mitochondria and chloroplast are:
(a) semi-autonomous organelles.
(b) formed by division of pre-existing organelles and they contain DNA but lack protein synthesizing machinery.

Which one of the following options is correct?
(1) (a) is true but (b) is false.
(2) Both (a) and (b) are false.
(3) Both (a) and (b) are correct.
(4) (b) is true but (a) is false.

77. It is much easier for a small animal to run uphill than for a large animal, because:
(1) Small animals have a lower O_2 requirement.
(2) The efficiency of muscles in large animals is less than in the small animals.
(3) It is easier to carry a small body weight.
(4) Smaller animals have a higher metabolic rate.

78. Seed formation without fertilization in flowering plants involves the process of:
(1) Somatic hybridization
(2) Apomixis
(3) Sporulation
(4) Budding

74. निम्नलिखित में से कौन सा कथन सत्य नहीं है?
(1) बहुत सी जातियों के परागकण गर्भीर प्रत्यूपरंता पैदा करते हैं
(2) डिविक नाटकों में भूमिकार परागकण, फलम तथा खोजना में प्रयुक्त किये जा सकते हैं
(3) परागकणों के स्पून्ट में टेपिटम सहयोग करता है
(4) परागकणों को बाह्य उत्पाद स्पोरोपॉलेनिन की बनी होती है

75. लैक प्रचालक की अभिव्यक्ति के लिए निम्नलिखित में से कौन सा प्रदर्शक के रूप में कार्य करने के लिए आवश्यक होगा?
(1) लैकटोज
(2) लैकटोज और गैलक्टोज
(3) गैलक्टोज
(4) गैलक्टोज

76. माइटोकोडिया और क्लोरोप्लास्ट (हरितलक्ष) हैं:
(a) अर्थात अल्कान हैं
(b) पूर्ववर्ती अंतर्गत के भूमिका से बनते हैं और उनके DNA होता है, लेकिन प्रोटीन-संबंधित प्राणी का आवश्यक होता है

निम्नलिखित विकल्पों में से कौन-सा सही है?
(1) (a) सही है लेकिन (b) गलत है
(2) (a) और (b) दोनों सही है
(3) (a) और (b) दोनों गलत है
(4) (b) सही है लेकिन (a) गलत है

77. बड़े आकार के जंतुओं के मुकाबले में छोटे आकार के जंतुओं के लिए पहाड़ों पर चढ़ना आसान होता है क्योंकी:
(1) होटे आकार के जंतुओं की O_2 आवश्यकता अपेक्षकता कम होती है
(2) होटे जंतुओं के मुकाबले में बड़े जंतुओं की पेशियों की कार्यक्षमता कम होती है
(3) होटे शरीर के धर को ऊपर ले जाने अपेक्षकता आसान होता है
(4) होटे आकार वाले जंतुओं की उपारच्यों दर अपेक्षकता अधिक होती है

78. पुष्प पादियों में विना निपेचन के बोध बनना निम्नलिखित में से कौन सी विषय है?
(1) काल्पिक संकरण
(2) असंग्राम
(3) बोधकसुक्लन
(4) मुकुलन
The Avena curvature is used for bioassay of:

1. IAA
2. Ethylene
3. ABA
4. GA₃

A plant in your garden avoids photorespiratory losses, has improved water use efficiency, shows high rates of photosynthesis at high temperatures and has improved efficiency of nitrogen utilisation. In which of the following physiological groups would you assign this plant?

1. CAM
2. Nitrogen fixer
3. C₃
4. C₄

Which is the National Aquatic Animal of India?

1. Blue whale
2. Sea horse
3. Gangetic shark
4. River dolphin

Which of the following is not a feature of the plasmids?

1. Transferable
2. Single-stranded
3. Independent replication
4. Circular structure

The amino acid Tryptophan is the precursor for the synthesis of:

1. Estrogen and Progesterone
2. Cortisol and Cortisone
3. Melatonin and Serotonin
4. Thyroxine and Triiodothyronine

Joint Forest Management Concept was introduced in India during:

1. 1980s
2. 1990s
3. 1960s
4. 1970s
85. Water soluble pigments found in plant cell vacuoles are:
   (1) Carotenoids
   (2) Anthocyanins
   (3) Xanthophylls
   (4) Chlorophylls

86. Which one of the following is a characteristic feature of cropland ecosystem?
   (1) Absence of weeds
   (2) Ecological succession
   (3) Absence of soil organisms
   (4) Least genetic diversity

87. Which of the following characteristic features always holds true for the corresponding group of animals?

<table>
<thead>
<tr>
<th>Possess a mouth with an upper and a lower jaw</th>
<th>Chordata</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-chambered heart with one incompletely divided ventricle</td>
<td>Reptilia</td>
</tr>
<tr>
<td>Cartilaginous endoskeleton</td>
<td>Chondrichthyes</td>
</tr>
<tr>
<td>Viviparous</td>
<td>Mammalia</td>
</tr>
</tbody>
</table>

88. The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the:
   (1) Methanogens
   (2) Eubacteria
   (3) Halophiles
   (4) Thermoacidophiles

89. Antivenom injection contains preformed antibodies while polio drops that are administered into the body contain:
   (1) Gamma globulin
   (2) Attenuated pathogens
   (3) Activated pathogens
   (4) Harvested antibodies
90. When does the growth rate of a population following the logistic model equal zero? The logistic model is given as \( \frac{dN}{dt} = rN(1-N/K) \):

1. when \( N/K \) equals zero.
2. when death rate is greater than birth rate.
3. when \( N/K \) is exactly one.
4. when \( N \) nears the carrying capacity of the habitat.

91. Which one of the following statements is wrong?

1. Uracil is a pyrimidine.
2. Glycine is a sulphur containing amino acid.
3. Sucrose is a disaccharide.
4. Cellulose is a polysaccharide.

92. The Taq polymerase enzyme is obtained from:

1. Bacillus subtilis
2. Pseudomonas putida
3. Thermus aquaticus
4. Thiobacillus ferrooxidans

93. Gause's principle of competitive exclusion states that:

1. No two species can occupy the same niche indefinitely for the same limiting resources.
2. Larger organisms exclude smaller ones through competition.
3. More abundant species will exclude the less abundant species through competition.
4. Competition for the same resources excludes species having different food preferences.
94. Stems modified into flat green organs performing the functions of leaves are known as:
   (1) Phylloclades
   (2) Scales
   (3) Cladodes
   (4) Phyllodes

95. Which part of the tobacco plant is infected by *Meloidogyne incognita*?
   (1) Stem
   (2) Root
   (3) Flower
   (4) Leaf

96. Fertilization in humans is practically feasible only if:
   (1) the ovum and sperms are transported simultaneously to ampullary - isthmic junction of the cervix.
   (2) the sperms are transported into cervix within 48 hrs of release of ovum in uterus.
   (3) the sperms are transported into vagina just after the release of ovum in fallopian tube.
   (4) the ovum and sperms are transported simultaneously to ampullary - isthmic junction of the fallopian tube.

97. Which of the following statements is not true for cancer cells in relation to mutations?
   (1) Mutations inactivate the cell control.
   (2) Mutations inhibit production of telomerase.
   (3) Mutations in proto-oncogenes accelerate the cell cycle.
   (4) Mutations destroy telomerase inhibitor.

98. Which of the following structures is homologous to the wing of a bird?
   (1) Hind limb of Rabbit
   (2) Flipper of Whale
   (3) Dorsal fin of a Shark
   (4) Wing of a Moth
99. Match the terms in Column I with their description in Column II and choose the correct option:

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Dominance</td>
<td>(i) Many genes govern a single character</td>
</tr>
<tr>
<td>(b) Codominance</td>
<td>(ii) In a heterozygous organism only one allele expresses itself</td>
</tr>
<tr>
<td>(c) Pleiotropy</td>
<td>(iii) In a heterozygous organism both alleles express themselves fully</td>
</tr>
<tr>
<td>(d) Polygenic inheritance</td>
<td>(iv) A single gene influences many characters</td>
</tr>
</tbody>
</table>

Code:

<table>
<thead>
<tr>
<th>(a)</th>
<th>(b)</th>
<th>(c)</th>
<th>(d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(iv)</td>
<td>(i)</td>
<td>(ii)</td>
</tr>
<tr>
<td>(2)</td>
<td>(iv)</td>
<td>(iii)</td>
<td>(i)</td>
</tr>
<tr>
<td>(3)</td>
<td>(ii)</td>
<td>(i)</td>
<td>(iv)</td>
</tr>
<tr>
<td>(4)</td>
<td>(ii)</td>
<td>(iii)</td>
<td>(iv)</td>
</tr>
</tbody>
</table>

100. Which of the following is wrongly matched in the given table?

<table>
<thead>
<tr>
<th>Microbe</th>
<th>Product</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Streptococcus</td>
<td>Streptokinase</td>
<td>removal of clot from blood vessel</td>
</tr>
<tr>
<td>(2) Clostridium butylicum</td>
<td>Lipase</td>
<td>removal of oil stains</td>
</tr>
<tr>
<td>(3) Trichoderma polysporum</td>
<td>Cyclosporin A</td>
<td>immunosuppressive drug</td>
</tr>
<tr>
<td>(4) Monascus purpureus</td>
<td>Statins</td>
<td>lowering of blood cholesterol</td>
</tr>
</tbody>
</table>

101. Select the incorrect statement:

(1) LH and FSH decrease gradually during the follicular phase.

(2) LH triggers secretion of androgens from the Leydig cells.

(3) FSH stimulates the sertoli cells which help in spermiogenesis.

(4) LH triggers ovulation in ovary.
102. Which of the following is a restriction endonuclease?
(1) DNase I
(2) RNase
(3) Hind II
(4) Protease

103. Microtubules are the constituents of:
(1) Centrioles, Spindle fibres and Chromatin
(2) Centrosome, Nucleosome and Centrioles
(3) Cilia, Flagella and Peroxisomes
(4) Spindle fibres, Centrioles and Cilia

104. Select the correct statement:
(1) *Sequioia* is one of the tallest trees
(2) The leaves of gymnosperms are not well adapted to extremes of climate
(3) Gymnosperms are both homosporous and heterosporous
(4) *Salvinia, Ginkgo* and *Pinus* all are gymnosperms

105. In higher vertebrates, the immune system can distinguish self-cells and non-self. If this property is lost due to genetic abnormality and it attacks self-cells, then it leads to:
(1) Auto-immune disease
(2) Active immunity
(3) Allergic response
(4) Graft rejection

106. In a testcross involving *F₁* dihybrid flies, more parental-type offspring were produced than the recombinant-type offspring. This indicates:
(1) The two genes are linked and present on the same chromosome.
(2) Both of the characters are controlled by more than one gene.
(3) The two genes are located on two different chromosomes.
(4) Chromosomes failed to separate during meiosis.
107. Which of the following statements is not correct?

(1) Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil.

(2) Some reptiles have also been reported as pollinators in some plant species.

(3) Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of the same species grows into the style.

(4) Insects that consume pollen or nectar without bringing about pollination are called pollen/nectar robbers.

108. Asthma may be attributed to:

(1) inflammation of the trachea

(2) accumulation of fluid in the lungs

(3) bacterial infection of the lungs

(4) allergic reaction of the mast cells in the lungs

109. In context of Amniocentesis, which of the following statements is incorrect?

(1) It can be used for detection of Down syndrome.

(2) It can be used for detection of Cleft palate.

(3) It is usually done when a woman is between 14 - 16 weeks pregnant.

(4) It is used for prenatal sex determination.

110. Specialised epidermal cells surrounding the guard cells are called:

(1) Buliform cells

(2) Lenticels

(3) Complementary cells

(4) Subsidiary cells

111. Which of the following is the most important cause of animals and plants being driven to extinction?

(1) Habitat loss and fragmentation

(2) Co-extinctions

(3) Over-exploitation

(4) Alien species invasion
112. Analogous structures are a result of:
   (1) Shared ancestry
   (2) Stabilizing selection
   (3) Divergent evolution
   (4) Convergent evolution

113. Which of the following most appropriately describes haemophilia?
   (1) Chromosomal disorder
   (2) Dominant gene disorder
   (3) Recessive gene disorder
   (4) X-linked recessive gene disorder

114. Cotyledon of maize grain is called:
   (1) coleoptile
   (2) scutellum
   (3) plumule
   (4) coleorhiza

115. The term ecosystem was coined by:
   (1) E. Haeckel
   (2) E. Warming
   (3) E.P. Odum
   (4) A.G. Tansley

116. Which of the following features is not present in the Phylum - Arthropoda?
   (1) Parapodia
   (2) Jointed appendages
   (3) Chitinous exoskeleton
   (4) Metameric segmentation

117. Which one of the following cell organelles is enclosed by a single membrane?
   (1) Lysosomes
   (2) Nuclei
   (3) Mitochondria
   (4) Chloroplasts

118. Which of the following is not a characteristic feature during mitosis in somatic cells?
   (1) Chromosome movement
   (2) Synapsis
   (3) Spindle fibres
   (4) Disappearance of nucleolus

112. सम्पूर्ण संरचनाएं किस कारण उत्पन्न होती हैं?
   (1) साझा वंशापरंपरा
   (2) स्थिरकारी दर्पण
   (3) अपर्स्त्री विकास के
   (4) अभिव्यक्ति विकास के

113. निम्नलिखित में से कीौन-सा रूढ़िवाद का सबसे अधिक उपयुक्त वर्णन प्रस्तुत करता है?
   (1) गुणसूत्री विकास
   (2) प्रभावी जीन का विकास
   (3) अपर्स्त्री जीन का विकास
   (4) X-सहलन अपर्स्त्री जीन का विकास

114. मक्का के दाने के बीजपत्र को क्या कहा जाता है?
   (1) प्रांकुर-चोल
   (2) स्कुटेलम
   (3) प्रांकुर
   (4) मूलाकुर-चोल

115. इकोसिस्टम (पारिस्थितिक) शब्द सबसे पहले किसने बनाया था?
   (1) ई. हिल्कल
   (2) ई. वार्मिंग
   (3) ई.पी. ओडम
   (4) प.जी. टांसले

116. निम्नलिखित लक्षणों में से कौन-सा लक्षण फाइलम - अनिमाएडा में नहीं पाया जाता?
   (1) पांसोपाद
   (2) संभित उपांग
   (3) काइटिनी बाह्यकंकाल
   (4) विखंडी खींचीभवन

117. निम्नलिखित में से कौन सा कोशिकांक केवल एकल कला से बिखरा होता है?
   (1) लघुकाय
   (2) केन्द्र
   (3) सूक्ष्मकणिका
   (4) हरलोकत

118. वायुक कोशिकाओं में समस्तरण के दौरान निम्नलिखित में से कौन-सा लक्षण नहीं पाया जाता?
   (1) गुणसूत्र गति
   (2) स्पिनडल
   (3) तरुणुपीता संघ
   (4) केन्द्रका विलुप्त
119. A river with an inflow of domestic sewage rich in organic waste may result in:

1. An increased production of fish due to biodegradable nutrients.
2. Death of fish due to lack of oxygen.
3. Drying of the river very soon due to algal bloom.
4. Increased population of aquatic food web organisms.

120. Which of the following is not required for any of the techniques of DNA fingerprinting available at present?

1. Restriction enzymes
2. DNA - DNA hybridization
3. Polymerase chain reaction
4. Zinc finger analysis

121. In meiosis crossing over is initiated at:

1. Zygotene
2. Diplotene
3. Pachytene
4. Leptotene

122. Which one of the following statements is wrong?

1. Eubacteria are also called false bacteria.
2. Phycomycetes are also called algal fungi.
3. Cyanobacteria are also called blue-green algae.
4. Golden algae are also called desmids.

123. Blood pressure in the pulmonary artery is:

1. more than that in the pulmonary vein.
2. less than that in the venae cavae.
3. same as that in the aorta.
4. more than that in the carotid.

124. Which of the following statements is wrong for viroids?

1. They cause infections
2. Their RNA is of high molecular weight
3. They lack a protein coat
4. They are smaller than viruses
125. Photosensitive compound in human eye is made up of:
   (1) Opsin and Retinol
   (2) Transducin and Retinene
   (3) Guanosine and Retinol
   (4) Opsin and Retinal

126. One of the major components of cell wall of most fungi is:
   (1) Cellulose
   (2) Hemicellulose
   (3) Chitin
   (4) Peptidoglycan

127. Following are the two statements regarding the origin of life:
   (a) The earliest organisms that appeared on the earth were non-green and presumably anaerobes.
   (b) The first autotrophic organisms were the chemoautotrophs that never released oxygen.
   Of the above statements which one of the following options is correct?
   (1) Both (a) and (b) are correct.
   (2) Both (a) and (b) are false.
   (3) (a) is correct but (b) is false.
   (4) (b) is correct but (a) is false.

128. Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the kingdom:
   (1) Fungi
   (2) Animalia
   (3) Monera
   (4) Protista

129. Tricarpellary, syncarpous gynoecium is found in flowers of:
   (1) Fabaceae
   (2) Poaceae
   (3) Liliaceae
   (4) Solanaceae

130. A complex of ribosomes attached to a single strand of RNA is known as:
   (1) Polypeptide
   (2) Okazaki fragment
   (3) Polysome
   (4) Polymer
131. In the stomach, gastric acid is secreted by the:

(1) peptic cells
(2) acidic cells
(3) gastrin secreting cells
(4) parietal cells

132. Identify the correct statement on ‘inhibin’:

(1) Is produced by granulose cells in ovary and inhibits the secretion of LH.
(2) Is produced by nurse cells in testes and inhibits the secretion of LH.
(3) Inhibits the secretion of LH, FSH and Prolactin.
(4) Is produced by granulose cells in ovary and inhibits the secretion of FSH.

133. The standard petal of a papilionaceous corolla is also called:

(1) Vexillum
(2) Corona
(3) Carina
(4) Pappus

134. In bryophytes and pteridophytes, transport of male gametes requires:

(1) Birds
(2) Water
(3) Wind
(4) Insects

135. Proximal end of the filament of stamen is attached to the:

(1) Placenta
(2) Thalamus or petal
(3) Anther
(4) Connective

136. Which of the following statements about the composition of the vapour over an ideal 1:1 molar mixture of benzene and toluene is correct? Assume that the temperature is constant at 25°C. (Given, Vapour Pressure Data at 25°C, benzene = 12.8 kPa, toluene = 3.85 kPa)

(1) The vapour will contain equal amounts of benzene and toluene.
(2) Not enough information is given to make a prediction.
(3) The vapour will contain a higher percentage of benzene.
(4) The vapour will contain a higher percentage of toluene.
137. Match the compounds given in column I with the hybridisation and shape given in column II and mark the correct option.

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) XeF₆</td>
<td>(i) distorted octahedral</td>
</tr>
<tr>
<td>(b) XeO₃</td>
<td>(ii) square planar</td>
</tr>
<tr>
<td>(c) XeOF₄</td>
<td>(iii) pyramidal</td>
</tr>
<tr>
<td>(d) XeF₄</td>
<td>(iv) square pyramidal</td>
</tr>
</tbody>
</table>

Code:

(a) (b) (c) (d)

(1) (iv) (iii) (i) (ii)

(2) (iv) (i) (ii) (iii)

(3) (i) (iii) (iv) (ii)

(4) (i) (ii) (iv) (iii)

138. The correct statement regarding the comparison of staggered and eclipsed conformations of ethane, is:

(1) The eclipsed conformation of ethane is more stable than staggered conformation even though the eclipsed conformation has torsional strain.

(2) The staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strain.

(3) The staggered conformation of ethane is less stable than eclipsed conformation, because staggered conformation has torsional strain.

(4) The eclipsed conformation of ethane is more stable than staggered conformation, because eclipsed conformation has no torsional strain.

139. Fog is a colloidal solution of:

(1) Solid in gas
(2) Gas in gas
(3) Liquid in gas
(4) Gas in liquid
140. Match items of Column I with the items of Column II and assign the correct code:

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Cyanide process</td>
<td>(i) Ultrapure Ge</td>
</tr>
<tr>
<td>(b) Froth floatation process</td>
<td>(ii) Dressing of ZnS</td>
</tr>
<tr>
<td>(c) Electrolytic reduction</td>
<td>(iii) Extraction of Al</td>
</tr>
<tr>
<td>(d) Zone refining</td>
<td>(iv) Extraction of Au</td>
</tr>
</tbody>
</table>

Code:

(a) (b) (c) (d)
1 (i) (ii) (iii) (iv)
2 (iii) (iv) (v) (i)
3 (iv) (i) (iii) (i)
4 (ii) (iii) (i) (v)

141. Which is the correct statement for the given acids?

(1) Phosphinic acid is a monoprotic acid while phosphonic acid is a diprotic acid.
(2) Phosphinic acid is a diprotic acid while phosphonic acid is a monoprotic acid.
(3) Both are diprotic acids.
(4) Both are triprotic acids.

142. The correct thermodynamic conditions for the spontaneous reaction at all temperatures is:

(1) $\Delta H < 0$ and $\Delta S > 0$
(2) $\Delta H < 0$ and $\Delta S < 0$
(3) $\Delta H > 0$ and $\Delta S = 0$
(4) $\Delta H > 0$ and $\Delta S < 0$

143. Which one of the following statements is correct when $SO_2$ is passed through acidified $K_2Cr_2O_7$ solution?

(1) $SO_2$ is reduced.
(2) Green $Cr_2(SO_4)_3$ is formed.
(3) The solution turns blue.
(4) The solution is decolourized.

144. The correct statement regarding RNA and DNA, respectively is:

(1) The sugar component in RNA is arabinose and the sugar component in DNA is ribose.
(2) The sugar component in RNA is 2'-deoxyribose and the sugar component in DNA is arabinose.
(3) The sugar component in RNA is arabinose and the sugar component in DNA is 2'-deoxyribose.
(4) The sugar component in RNA is ribose and the sugar component in DNA is 2'-deoxyribose.
145. Which of the following reagents would distinguish cis-cyclopenta-1,2-diol from the trans-isomer?
(1) MnO₂
(2) Aluminium isopropoxide
(3) Acetone
(4) Ozone

146. The correct statement regarding a carbonyl compound with a hydrogen atom on its alpha-carbon, is:
(1) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as carbonylation.
(2) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as keto-enol tautomerism.
(3) a carbonyl compound with a hydrogen atom on its alpha-carbon never equilibrates with its corresponding enol.
(4) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as aldehyde-ketone equilibration.

147. At 100°C the vapour pressure of a solution of 6.5 g of a solute in 100 g water is 732 mm. If K_b = 0.52, the boiling point of this solution will be:
(1) 102°C
(2) 103°C
(3) 101°C
(4) 100°C

148. Consider the nitration of benzene using mixed conc. H₂SO₄ and HNO₃. If a large amount of KHSO₄ is added to the mixture, the rate of nitration will be:
(1) unchanged
(2) doubled
(3) faster
(4) slower

149. The pressure of H₂ required to make the potential of H₂⁻ electrode zero in pure water at 298 K is:
(1) 10⁻¹⁰ atm
(2) 10⁻⁴ atm
(3) 10⁻¹⁴ atm
(4) 10⁻¹² atm
150. The correct statement regarding the basicity of arylamines is:

(1) Arylamines are generally more basic than alkylamines because of aryl group.
(2) Arylamines are generally more basic than alkylamines, because the nitrogen atom in arylamines is sp-hybridized.
(3) Arylamines are generally less basic than alkylamines because the nitrogen lone-pair electrons are delocalized by interaction with the aromatic ring π electron system.
(4) Arylamines are generally more basic than alkylamines because the nitrogen lone-pair electrons are not delocalized by interaction with the aromatic ring π electron system.

151. In a protein molecule various amino acids are linked together by:

(1) peptide bond
(2) dative bond
(3) α - glycosidic bond
(4) β - glycosidic bond

152. Consider the molecules CH₄, NH₃ and H₂O. Which of the given statements is false?

(1) The H – O – H bond angle in H₂O is smaller than the H – N – H bond angle in NH₃.
(2) The H – C – H bond angle in CH₄ is larger than the H – N – H bond angle in NH₃.
(3) The H – C – H bond angle in CH₄, the H – N – H bond angle in NH₃, and the H – O – H bond angle in H₂O are all greater than 90°.
(4) The H – O – H bond angle in H₂O is larger than the H – C – H bond angle in CH₄.

153. Which of the following statements is false?

(1) Ca²⁺ ions are not important in maintaining the regular beating of the heart.
(2) Mg²⁺ ions are important in the green parts of plants.
(3) Mg²⁺ ions form a complex with ATP.
(4) Ca²⁺ ions are important in blood clotting.

154. Which one of the following orders is correct for the bond dissociation enthalpy of halogen molecules?

(1) Br₂ > I₂ > F₂ > Cl₂
(2) F₂ > Cl₂ > Br₂ > I₂
(3) I₂ > Br₂ > Cl₂ > F₂
(4) Cl₂ > Br₂ > F₂ > I₂

155. ऐलाॉग्रमे के शासक के लिए सच्ची कथन हैं:

(1) ऐनिल समूह के कारण ऐलाग्रामे सामान्यता: ऐलाग्रामे से ज्यादा धार्मिक है।
(2) ऐलाग्रामे सामान्यता: ऐलाग्रामे से ज्यादा धार्मिक है क्योंकि ऐलाग्रामे में नाइट्रोजन परमाणु sp-संकेतित है।
(3) ऐलाग्रामे सामान्यता: ऐलाग्रामे से कम धार्मिक होती है क्योंकि नाइट्रोजन के एकांकी - गुम हीलेक्ट्रॉन एरोमेटिक वर्ग के π - हेर्लेक्ट्रॉन के साथ विवस्थापित होते हैं।
(4) ऐलाग्रामे सामान्यता: ऐलाग्रामे से ज्यादा धार्मिक होती है क्योंकि नाइट्रोजन के एकांकी - गुम हीलेक्ट्रॉन एरोमेटिक वर्ग के π - हेर्लेक्ट्रॉन के साथ विवस्थापित नहीं होते हैं।

156. त्रीटन अम में विभिन्न ऐमीन अम एक दूसरे से जुड़े रहते हैं:

(1) पेप्टाइड आवंध के द्वारा
(2) दाता आवंध के द्वारा
(3) α - ग्लाइकोसिलिक आवंध के द्वारा
(4) β - ग्लाइकोसिलिक आवंध के द्वारा

157. CH₄, NH₃ और H₂O अमोनिया के लिए नीचे दिये गये कथनों में से कौन सा सच्चा है?

(1) H₂O में H–O–H आवंध-कोण, NH₃ में H–N–H आवंध-कोण से कम है।
(2) CH₄ में H–C–H आवंध-कोण, NH₃ में H–N–H आवंध-कोण से अधिक है।
(3) CH₄ में H–C–H आवंध-कोण, NH₃ में H–N–H आवंध-कोण तथा H₂O में H–O–H आवंध-कोण, सभी में 90° से अधिक है।
(4) H₂O में H–O–H आवंध-कोण, CH₄ में H–C–H आवंध-कोण से अधिक है।

158. निम्नलिखित में से कौन सा कथन सच्चा है?

(1) Ca²⁺ आयन हदय गति को नियंत्रित रखने में महत्वपूर्ण नहीं है।
(2) Mg²⁺ आयन पौधों के हदय गति के लिये महत्वपूर्ण है।
(3) Mg²⁺ आयन एटीपी. के साथ संबंधित बनते हैं।
(4) Ca²⁺ आयन रक्त को जमाने के लिये महत्वपूर्ण है।

159. निम्नलिखित में से कौन से हलोजन अमोनिया की आवंध वियोजन एन्जाइम के लिए सच्चा है?

(1) Br₂ > I₂ > F₂ > Cl₂
(2) F₂ > Cl₂ > Br₂ > I₂
(3) I₂ > Br₂ > Cl₂ > F₂
(4) Cl₂ > Br₂ > F₂ > I₂
155. The rate of a first-order reaction is 0.04 mol l\(^{-1}\) s\(^{-1}\) at 10 seconds and 0.03 mol l\(^{-1}\) s\(^{-1}\) at 20 seconds after initiation of the reaction. The half-life period of the reaction is:

- (1) 44.1 s
- (2) 54.1 s
- (3) 24.1 s
- (4) 34.1 s

156. Which one given below is a non-reducing sugar?

- (1) Glucose
- (2) Sucrose
- (3) Maltose
- (4) Lactose

157. Which one of the following characteristics is associated with adsorption?

- (1) \(\Delta G\) and \(\Delta H\) are negative but \(\Delta S\) is positive
- (2) \(\Delta G\) and \(\Delta S\) are negative but \(\Delta H\) is positive
- (3) \(\Delta G\) is negative but \(\Delta H\) and \(\Delta S\) are positive
- (4) \(\Delta G, \Delta H\) and \(\Delta S\) all are negative

158. Two electrons occupying the same orbital are distinguished by:

- (1) Azimuthal quantum number
- (2) Spin quantum number
- (3) Principal quantum number
- (4) Magnetic quantum number

159. Lithium has a bcc structure. Its density is 530 kg m\(^{-3}\) and its atomic mass is 6.94 g mol\(^{-1}\). Calculate the edge length of a unit cell of Lithium metal. (\(N_A = 6.02 \times 10^{23}\) mol\(^{-1}\))

- (1) 527 pm
- (2) 264 pm
- (3) 154 pm
- (4) 352 pm

160. The pair of electron in the given carbanion, \(\text{CH}_3\text{C} ≈ \text{C}^\ominus\), is present in which of the following orbitals?

- (1) \(sp^2\)
- (2) \(sp\)
- (3) \(2p\)
- (4) \(sp^3\)

161. The product obtained as a result of a reaction of nitrogen with CaC\(_2\) is:

- (1) CaCN\(_3\)
- (2) Ca\(_2\)CN
- (3) Ca(CN)\(_2\)
- (4) CaCN

---

155. एक प्रथम कोटि की अभिक्रिया का वेग अभिक्रिया प्रारंभ होने पर 10 से 20 सेकों तक रहता है। यदि अभिक्रिया की अवधि आयु काल है:

- (1) 44.1 s
- (2) 54.1 s
- (3) 24.1 s
- (4) 34.1 s

156. निम्न में से कौनसी एक गैर-अपचारक शुगर है?

- (1) ग्लुकोज़
- (2) सुक्रोज़
- (3) मालटोज़
- (4) लेक्टोज़

157. निम्नलिखित तंत्रों में से कौन सा अभिशोषण से सम्बन्धित है?

- (1) \(\Delta G\) तथा \(\Delta H\) आणुमात्रक लेखन \(\Delta S\) भाग्यतम होता है
- (2) \(\Delta G\) तथा \(\Delta S\) आणुमात्रक लेखन \(\Delta H\) भाग्यतम होता है
- (3) \(\Delta G\) आणुमात्रक लेखन \(\Delta H\) एवं \(\Delta S\) भाग्यतम होते हैं
- (4) \(\Delta G, \Delta H\) एवं \(\Delta S\) सभी आणुमात्रक होते हैं

158. दो इलेक्ट्रॉन जो कि एक ही कक्ष में हैं, इनमें अन्तर किसी द्वारा किया जा सकता है?

- (1) दिग्गजीय क्वांटम संख्या
- (2) प्रथम क्वांटम संख्या
- (3) मुख्य क्वांटम संख्या
- (4) चुम्बकीय क्वांटम संख्या

159. लिथियम की bcc संरचना है। इसका भार 530 kg m\(^{-3}\) तथा परमाणु द्रव्यमान 6.94 g mol\(^{-1}\) है। लिथियम शाखा ओं एक कोणिका के कोण की लंबाई है:

\(N_A = 6.02 \times 10^{23}\) mol\(^{-1}\)

- (1) 527 pm
- (2) 264 pm
- (3) 154 pm
- (4) 352 pm

160. दीये गये कार्बनार्गात्मक, \(\text{CH}_3\text{C} ≈ \text{C}^\ominus\) के गुणपत्र इलेक्ट्रोन निम्न में से किस कक्ष में उपस्थित है?

- (1) \(sp^2\)
- (2) \(sp\)
- (3) \(2p\)
- (4) \(sp^3\)

161. नाईट्रोजन की CaC\(_2\) के साथ अभिक्रिया से प्रभाव उत्पन्न है:

- (1) CaCN\(_3\)
- (2) Ca\(_2\)CN
- (3) Ca(CN)\(_2\)
- (4) CaCN
162. In the reaction

\[ H - C = CH \quad (1) \text{NaNH}_2/\text{liq.NH}_3 \rightarrow X \quad (1) \text{NaNH}_2/\text{liq.NH}_3 \rightarrow Y, \]

\[ X \text{ and } Y \text{ are:} \]

(1) \( X = 2\)-Butyne; \( Y = 2\)-Hexyne
(2) \( X = 1\)-Butyne; \( Y = 2\)-Hexyne
(3) \( X = 1\)-Butyne; \( Y = 3\)-Hexyne
(4) \( X = 2\)-Butyne; \( Y = 3\)-Hexyne

163. MY and NY3, two nearly insoluble salts, have the same \( K_{sp} \) values of \( 6.2 \times 10^{-13} \) at room temperature. Which statement would be true in regard to MY and NY3?

(1) The salts MY and NY3 are more soluble in 0.5 M KY than in pure water.
(2) The addition of the salt of KY to solution of MY and NY3 will have no effect on their solubilities.
(3) The molar solubilities of MY and NY3 in water are identical.
(4) The molar solubility of MY in water is less than that of NY3.

164. When copper is heated with conc. HNO3 it produces:

(1) Cu(NO3)2, NO and NO2
(2) Cu(NO3)2 and N2O
(3) Cu(NO3)2 and NO2
(4) Cu(NO3)2 and NO

165. The product formed by the reaction of an aldehyde with a primary amine is:

(1) Carboxylic acid
(2) Aromatic acid
(3) Schiff base
(4) Ketone

166. The addition of a catalyst during a chemical reaction alters which of the following quantities?

(1) Enthalpy
(2) Activation energy
(3) Entropy
(4) Internal energy

167. Predict the correct order among the following:

(1) bond pair - bond pair > lone pair - bond pair > lone pair - lone pair
(2) lone pair - bond pair - bond pair - lone pair - bond pair
(3) lone pair - lone pair - bond pair - bond pair - bond pair
(4) lone pair - lone pair - bond pair - bond pair - bond pair - bond pair

168. \( H - C = CH \quad (1) \text{NaNH}_2/\text{liq.NH}_3 \rightarrow X \quad (1) \text{NaNH}_2/\text{liq.NH}_3 \rightarrow Y, \)

\[ X \text{ and } Y \text{ are:} \]

(1) \( X = 2\)-Butyne; \( Y = 2\)-Hexyne
(2) \( X = 1\)-Butyne; \( Y = 2\)-Hexyne
(3) \( X = 1\)-Butyne; \( Y = 3\)-Hexyne
(4) \( X = 2\)-Butyne; \( Y = 3\)-Hexyne

163. MY and NY3 दो लगभग अभावित लवणों का कमरे के ताप पर \( K_{sp} \) का मान, \( 6.2 \times 10^{-13} \) एकसामान है। निम्न में से कौन सा कथन MY एवं NY3 के संदर्भ में सत्य है?

(1) MY एवं NY3 के लवण सुदृढ़ जल की तुलना में 0.5 M KY में ज्यादा विलेय है।
(2) KY लवण की MY एवं NY3 के विलेय में डालने पर इनकी विलेयत पर कोई प्रभाव नहीं पड़ता है।
(3) MY एवं NY3 की जल में मोलर विलेयत समान है।
(4) MY की जल में मोलर विलेयत NY3 से कम है।

164. कॉपर को सांत HNO3 के साथ गम करते पर बनता है:

(1) Cu(NO3)2, NO और NO2
(2) Cu(NO3)2 और N2O
(3) Cu(NO3)2 और NO2
(4) Cu(NO3)2 और NO

165. ऐल्डहाइड एवं प्राथमिक ऐमीन की अभिग्रामण की समाप्ति के बाद उपयोग है:

(1) कार्बोक्सिलिक अम्ल
(2) एरोमेटिक अम्ल
(3) शिफ्ट बेस
(4) किटान

166. किसी उसायनिक अभिग्रामण में उद्देश्य के योग से निम्नलिखित में से कौन सा मात्रा बदलता है?

(1) ऐल्डहाइड
(2) सक्षमकरण उठाता
(3) ऐल्डहाइड
(4) अतीतिक उठाता

167. निम्न में से सही क्रम होगा:

(1) आबंधी युग्म - आबंधी युग्म > एकाकी युग्म - आबंधी युग्म > एकाकी युग्म - एकाकी युग्म
(2) एकाकी युग्म - आबंधी युग्म > आबंधी युग्म - आबंधी युग्म > एकाकी युग्म - एकाकी युग्म
(3) एकाकी युग्म-एकाकी युग्म > एकाकी युग्म-आबंधी युग्म > आबंधी युग्म - आबंधी युग्म
(4) एकाकी युग्म - एकाकी युग्म > आबंधी युग्म - आबंधी युग्म > एकाकी युग्म - आबंधी युग्म
168. Consider the following liquid - vapour equilibrium.

Liquid $\rightleftharpoons$ Vapour

Which of the following relations is correct?

(1) \[ \frac{d\ln P}{dT^2} = \frac{-\Delta H_v}{T^2} \]

(2) \[ \frac{d\ln P}{dT} = \frac{\Delta H_v}{RT^2} \]

(3) \[ \frac{d\ln G}{dT^2} = \frac{\Delta H_v}{RT^2} \]

(4) \[ \frac{d\ln P}{dT} = \frac{-\Delta H_v}{RT} \]

169. Which of the following biphenyls is optically active?

(1) \[
\begin{array}{c}
\text{I} \\
\text{CH}_3 \\
\text{O}_2\text{N} \\
\text{Br} \text{ Br}
\end{array}
\]

(2) \[
\begin{array}{c}
\text{I} \\
\text{CH}_3 \\
\text{Br} \text{ Br}
\end{array}
\]

(3) \[
\begin{array}{c}
\text{I} \\
\text{O}_2\text{N} \\
\text{Br} \text{ Br}
\end{array}
\]

(4) \[
\begin{array}{c}
\text{I} \\
\text{CH}_3 \\
\text{O}_2\text{N}
\end{array}
\]

170. Which of the following statements about hydrogen is incorrect?

(1) Hydronium ion, $\text{H}_3\text{O}^+$ exists freely in solution.

(2) Dihydrogen does not act as a reducing agent.

(3) Hydrogen has three isotopes of which tritium is the most common.

(4) Hydrogen never acts as cation in ionic salts.
171. The electronic configurations of Eu (Atomic No. 63), Gd (Atomic No. 64) and Tb (Atomic No. 65) are:
   (1) \([\text{Xe}]^4f^65d^16s^2\), \([\text{Xe}]^4f^75d^16s^2\) and \([\text{Xe}]^4f^86s^2\)
   (2) \([\text{Xe}]^4f^86s^2, [\text{Xe}]^4f^75d^16s^2\) and \([\text{Xe}]^4f^96s^2\)
   (3) \([\text{Xe}]^4f^76s^2, [\text{Xe}]^4f^86s^2\) and \([\text{Xe}]^4f^85d^16s^2\)
   (4) \([\text{Xe}]^4f^85d^16s^2, [\text{Xe}]^4f^75d^16s^2\) and \([\text{Xe}]^4f^96s^2\)

172. The reaction

\[
\begin{align*}
\text{OH}^- + \text{Na}^+ &\rightarrow \quad \text{O}^- \quad \text{Na}^+ \quad \text{Me}^- \quad \text{O}^- \\
&\rightarrow \quad \text{Me}^+ \quad \text{O}^- \\
\end{align*}
\]

can be classified as:
   (1) Dehydration reaction
   (2) Williamson alcohol synthesis reaction
   (3) Williamson ether synthesis reaction
   (4) Alcohol formation reaction

173. For the following reactions:
   (a) \(\text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{KOH} \rightarrow \text{CH}_3\text{CH} = \text{CH}_2 + \text{KBr} + \text{H}_2\text{O}\)
   (b) \(\text{Br}^- + \text{KOH} \rightarrow \text{H}_2\text{O} + \text{KBr}\)
   (c) \(\bigcirc + \text{Br}_2 \rightarrow \text{Br}^-\)

Which of the following statements is correct?
   (1) (a) is elimination, (b) and (c) are substitution reactions.
   (2) (a) is substitution, (b) and (c) are addition reactions.
   (3) (a) and (b) are elimination reactions and (c) is addition reaction.
   (4) (a) is elimination, (b) is substitution and (c) is addition reaction.

174. In which of the following options the order of arrangement does not agree with the variation of property indicated against it?
   (1) I < Br < Cl < F (increasing electron gain enthalpy)
   (2) Li < Na < K < Rb (increasing metallic radius)
   (3) Al\(^{3+}\) < Mg\(^{2+}\) < Na\(^+\) < F\(^-\) (increasing ionic size)
   (4) B < C < N < O (increasing first ionisation enthalpy)
175. Equal moles of hydrogen and oxygen gases are placed in a container with a pin-hole through which both can escape. What fraction of the oxygen escapes in the time required for one-half of the hydrogen to escape?
   (1) 3/8  
   (2) 1/2  
   (3) 1/8  
   (4) 1/4

176. Among the following, the correct order of acidity is:
   (1) $\text{HClO}_2 < \text{HClO} < \text{HClO}_3 < \text{HClO}_4$
   (2) $\text{HClO}_4 < \text{HClO}_2 < \text{HClO} < \text{HClO}_3$
   (3) $\text{HClO}_3 < \text{HClO}_4 < \text{HClO}_2 < \text{HClO}$
   (4) $\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$

177. Which of the following is an analgesic?
   (1) Streptomycin  
   (2) Chloromycetin  
   (3) Novalgin  
   (4) Penicillin

178. Natural rubber has:
   (1) Alternate cis- and trans-configuration  
   (2) Random cis- and trans-configuration  
   (3) All cis-configuration  
   (4) All trans-configuration

179. The ionic radii of $A^+$ and $B^-$ ions are $0.98 \times 10^{-10}$ m and $1.81 \times 10^{-10}$ m. The coordination number of each ion in $AB$ is:
   (1) 8  
   (2) 2  
   (3) 6  
   (4) 4

180. Which of the following has longest $C-O$ bond length? (Free $C-O$ bond length in CO is 1.128 Å)
   (1) $[\text{Fe(CO)}_4]^{2-}$  
   (2) $[\text{Mn(CO)}_3]^+$  
   (3) $\text{Ni(CO)}_4$  
   (4) $[\text{Co(CO)}_4]^{2-}$
Read carefully the following instructions:

1. Each candidate must show on demand his/her Admit Card to the Invigilator.

2. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.

3. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.

4. Use of Electronic/Manual Calculator is prohibited.

5. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.

6. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.

7. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

निम्नलिखित निर्देश ध्यान से पढ़ें:

1. पूछे जाने पर प्रत्येक परीक्षार्थी, निरीक्षक को अपना प्रवेश-कार्ड दिखाएं।

2. अधिशक्त या निरीक्षक को विवेचन अनुमति के बिना कोई परीक्षार्थी अपना स्थान न छोड़ें।

3. कार्यरत निरीक्षक को अपना उत्तर पत्र दिए बिना एवं उपस्थित-पत्र पर दुबारा हस्ताक्षर किए बिना कोई परीक्षार्थी परीक्षा ही नहीं छोड़ें। यदि किसी परीक्षार्थी ने दूसरी बार उपस्थित-पत्र पर हस्ताक्षर नहीं किए तो यह माना जाएगा कि उसने उत्तर पत्र नहीं लीया है और यह अनुचित साधन का मामला माना जाएगा।

4. इलेक्ट्रॉनिक/हस्ताक्षर परिकल्पक का उपयोग बंद रखें।

5. परीक्षा-हॉल में आचरण के लिए परीक्षार्थी बोर्ड के नियम एवं विनियमों द्वारा निर्धारित है। अनुचित साधन के सभी मामले कक्षा/भौला बोर्ड के नियम एवं विनियमों के अनुसार होगा।

6. किसी हल्त में परीक्षा पुस्तिका और उत्तर पत्र को कोई भाग अलग न करें।

7. परीक्षा पुस्तिका/उत्तर पत्र में दिए गए परीक्षा पुस्तिका संकेत को परीक्षार्थी सभी तरीकों से उपस्थित-पत्र में लिखें।