

MENIIT

NEET | IIT-JEE | FOUNDATION

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Maximum Marks: 720

Time : 3 Hours

Paper Code

P3

NEET (UG) – 2019

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/marketing 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 **P3**. 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.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. 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.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this Examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Section- I (CHEMISTRY)

- For the second period elements the correct increasing order of first ionisation enthalpy is:
 - $\text{Li} < \text{Be} < \text{B} < \text{C} < \text{N} < \text{O} < \text{F} < \text{Ne}$
 - $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{O} < \text{N} < \text{F} < \text{Ne}$
 - $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{N} < \text{O} < \text{F} < \text{Ne}$
 - $\text{Li} < \text{Be} < \text{B} < \text{C} < \text{O} < \text{N} < \text{F} < \text{Ne}$
- The method used to remove temporary hardness of water is:
 - Calgon's method
 - Clark's method
 - Ion-exchange method
 - Synthetic resins method
- Which of the following is an amphoteric hydroxide?
 - $\text{Sr}(\text{OH})_2$
 - $\text{Ca}(\text{OH})_2$
 - $\text{Mg}(\text{OH})_2$
 - $\text{Be}(\text{OH})_2$
- Among the following, the narrow spectrum antibiotic is:
 - penicillin G
 - ampicillin
 - amoxicillin
 - chloramphenicol
- Which mixture of the solutions will lead to the formation of negatively charged colloidal $[\text{AgI}]^-$ sol.?
 - 50 mL of 1 M AgNO_3 + 50 mL of 1.5 M KI
 - 50 mL of 1 M AgNO_3 + 50 mL of 2 M KI
 - 50 mL of 2 M AgNO_3 + 50 mL of 1.5 M KI
 - 50 mL of 0.1 M AgNO_3 + 50 mL of 0.1 M KI
- Conjugate base for Bronsted acids H_2O and HF are:
 - OH^- and H_2F^+ , respectively
 - H_3O^+ and F^- , respectively
 - OH^- and F^- , respectively
 - H_3O^+ and H_2F^+ , respectively
- The number of sigma (σ) and pi (π) bonds in pent-2-en-4-yne is:
 - 10 σ bonds and 3 π bonds
 - 8 σ bonds and 5 π bonds
 - 11 σ bonds and 2 π bonds
 - 13 σ bonds and no π bonds
- The correct structure of tribromooxide is:
 - $$\begin{array}{c} \text{O} & \text{O} & \text{O} \\ \parallel & \parallel & \parallel \\ \text{O}=\text{Br}-\text{Br}-\text{Br}=\text{O} \\ \parallel & \parallel & \parallel \\ \text{O} & \text{O} & \text{O} \end{array}$$
 - $$\begin{array}{c} \text{O} & \text{O} & \text{O} \\ \parallel & \parallel & \parallel \\ \text{O}=\text{Br}-\text{Br}-\text{Br}-\text{O}^- \\ \parallel & | & \parallel \\ \text{O} & \text{O}^- & \text{O}^- \end{array}$$
 - $$\begin{array}{c} \text{O} & \text{O} & \text{O}^- \\ \parallel & \parallel & \parallel \\ \text{O}^--\text{Br}-\text{Br}-\text{Br}=\text{O} \\ \parallel & \parallel & \parallel \\ \text{O} & \text{O} & \text{O}^- \end{array}$$
 - $$\begin{array}{c} \text{O} & \text{O} & \text{O} \\ \parallel & \parallel & \parallel \\ \text{O}=\text{Br}-\text{Br}-\text{Br}-\text{O}^- \\ \parallel & | & \parallel \\ \text{O} & \text{O}^- & \text{O} \end{array}$$
- pH of a saturated solution of $\text{Ca}(\text{OH})_2$ is 9. The solubility product (K_{sp}) of $\text{Ca}(\text{OH})_2$ is:
 - 0.5×10^{-15}
 - 0.25×10^{-10}
 - 0.125×10^{-15}
 - 0.5×10^{-10}
- The correct order of the basic strength of methyl substituted amines in aqueous solution is:
 - $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N}$
 - $(\text{CH}_3)_3\text{N} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH}$
 - $(\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2$
 - $\text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH} > (\text{CH}_3)_3\text{N}$

11. For a cell involving one electron $E_{\text{cell}}^{\ominus} = 0.59 \text{ V}$ at 298K, the equilibrium constant for the cell reaction is:

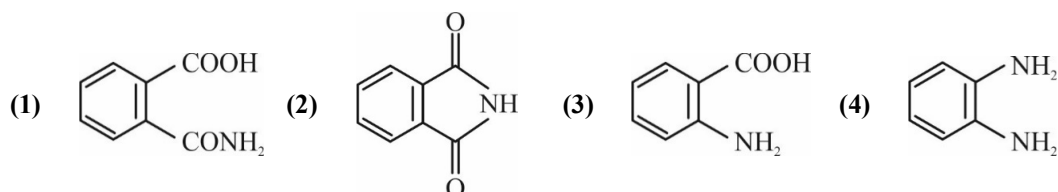
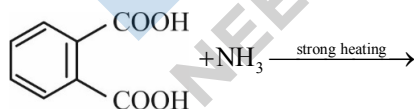
$$\left[\text{Given that } \frac{2.303RT}{F} = 0.059 \text{ V at } T = 298\text{K} \right]$$

- (1) 1.0×10^2 (2) 1.0×10^5 (3) 1.0×10^{10} (4) 1.0×10^{30}
12. Among the following, the one that is not green house gas is:
 (1) nitrous oxide (2) methane (3) ozone (4) Sulphur dioxide
13. The mixture that forms maximum boiling azeotrope is:
 (1) Water + Nitric acid (2) Ethanol + Water
 (3) Acetone + Carbon disulphide (4) Heptane + Octane
14. Which one is malachite from the following?
 (1) CuFeS_2 (2) $\text{Cu}(\text{OH})_2$ (3) Fe_3O_4 (4) $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
15. Match the following:

(a)	Pure nitrogen	(i)	Chlorine
(b)	Haber process	(ii)	Sulphuric acid
(c)	Contact process	(iii)	Ammonia
(d)	Deacon's process	(iv)	Sodium azide or Barium azide

Which of the following is the correct option?

- | | | | | |
|-----|-------|-------|-------|-------|
| | (a) | (b) | (c) | (d) |
| (1) | (i) | (ii) | (iii) | (iv) |
| (2) | (ii) | (iv) | (i) | (iii) |
| (3) | (iii) | (iv) | (ii) | (i) |
| (4) | (iv) | (iii) | (ii) | (i) |
16. Which is the correct thermal stability order for H_2E (E = O, S, Se, Te and Po)?
 (1) $\text{H}_2\text{S} < \text{H}_2\text{O} < \text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po}$ (2) $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po}$
 (3) $\text{H}_2\text{Po} < \text{H}_2\text{Te} < \text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{O}$ (4) $\text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po} < \text{H}_2\text{O} < \text{H}_2\text{S}$
17. Identify the incorrect statement related to PCl_5 from the following:
 (1) Three equatorial P—Cl bonds make an angle of 120° with each other
 (2) Two axial P—Cl bonds make an angle of 180° with each other
 (3) Axial P—Cl bonds are longer than equatorial P—Cl bonds
 (4) PCl_5 molecule is non-reactive
18. The major product of the following reaction is:



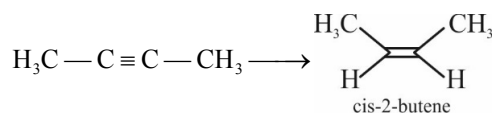
19. The compound that is most difficult to protonate is:



20. The manganate and permanganate ions are tetrahedral due to:

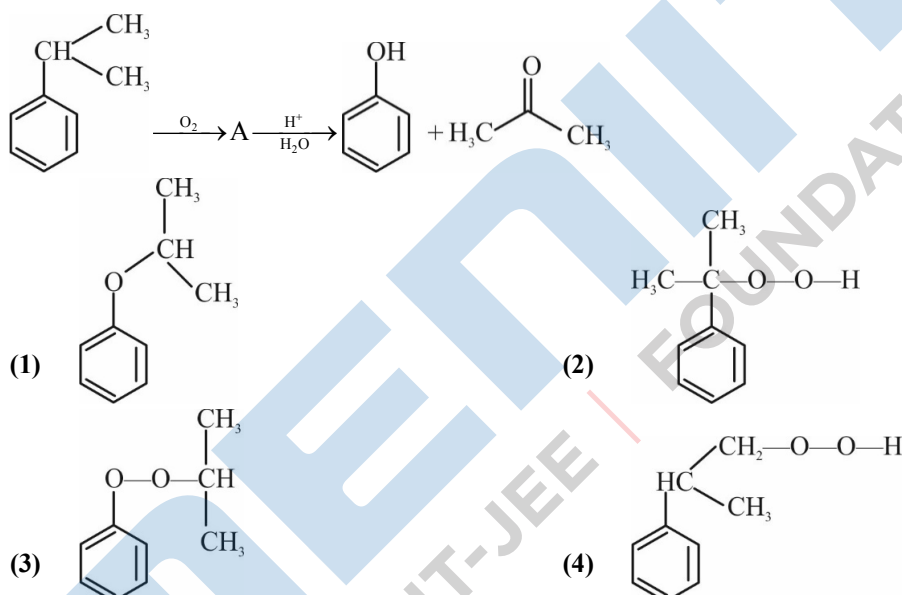
- (1) The π -bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese
 (2) There is no π -bonding
 (3) The π -bonding involves overlap of p-orbitals of oxygen with p-orbitals of manganese
 (4) The π -bonding involves overlap of d-orbitals of oxygen with d-orbitals of manganese

21. The most suitable reagent for the following conversion, is:



- (1) Na/liquid NH_3 (2) H_2 , Pd/C, quinoline
 (3) Zn/HCl (4) $\text{Hg}^{2+} / \text{H}^+, \text{H}_2\text{O}$

22. The structure of intermediate A in the following reaction, is:



23. If the rate constant for a first order reaction is k , the time (t) required for the completion of 99% of the reaction is given by:

- (1) $t = 0.693/k$ (2) $t = 6.909/k$ (3) $t = 4.606/k$ (4) $t = 2.303/k$

24. Which of the following reactions are disproportionation reaction?

- (a) $2\text{Cu}^+ \longrightarrow \text{Cu}^{2+} + \text{Cu}^0$ (b) $3\text{MnO}_4^{2-} + 4\text{H}^+ \longrightarrow 2\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2\text{O}$
 (c) $2\text{KMnO}_4 \xrightarrow{\Delta} \text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$ (d) $2\text{MnO}_4^- + 3\text{Mn}^{2+} + 2\text{H}_2\text{O} \longrightarrow 5\text{MnO}_2 + 4\text{H}^+$

Select the correct option from the following:

- (1) (a) and (b) only (2) (a), (b) and (c) (3) (a), (c) and (d) (4) (a) and (d) only

25. In which case change in entropy is negative?

- (1) Evaporation of water (2) Expansion of a gas at constant temperature
 (3) Sublimation of solid to gas (4) $2\text{H}(\text{g}) \longrightarrow \text{H}_2(\text{g})$

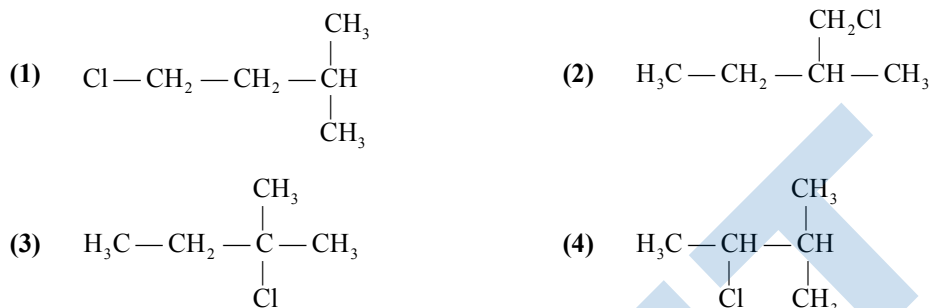
26. The biodegradable polymer is:
 (1) nylon-6, 6 (2) nylon 2-nylon 6 (3) nylon-6 (4) Buna-S
27. A gas at 350 K and 15 bar has molar volume 20 percent smaller than that for a ideal gas under the same conditions. The correct option about the gas and its compressibility factor (Z) is:
 (1) $Z > 1$ and attractive forces are dominant (2) $Z > 1$ and repulsive forces are dominant
 (3) $Z < 1$ and attractive forces are dominant (4) $Z < 1$ and repulsive forces are dominant
28. A compound is formed by cation C and anion A. The anions form hexagonal close packed (hcp) lattice and the cations occupy 75% of octahedral voids. The formula of the compound is:
 (1) C_2A_3 (2) C_3A_2 (3) C_3A_4 (4) C_4A_3
29. Enzymes that utilize ATP in phosphate transfer require an alkaline earth metal (M) as the cofactor. M is:
 (1) Be (2) Mg (3) Ca (4) Sr
30. 4d, 5p, 5f and 6p orbitals are arranged in the order of decreasing energy. The correct option is:
 (1) $5f > 6p > 5p > 4d$ (2) $6p > 5f > 5p > 4d$ (3) $6p > 5f > 4d > 5p$ (4) $5f > 6p > 4d > 5p$
31. For the cell reaction
 $2F^{3+}(aq) + 2I^{-}(aq) \longrightarrow 2Fe^{2+}(aq) + I_2(aq)$
 $E_{cell}^{\ominus} = 0.24 V$ at 298 K. The standard Gibbs energy ($\Delta_r G^{\ominus}$) of the cell reaction is:
 [Given that Faraday constant $F = 96500 C mol^{-1}$]
 (1) $-46.32 kJ mol^{-1}$ (2) $-23.16 kJ mol^{-1}$ (3) $46.32 kJ mol^{-1}$ (4) $23.16 kJ mol^{-1}$
32. For an ideal solution, the correct option is:
 (1) $\Delta_{mix} S = 0$ at constant T and P (2) $\Delta_{mix} V \neq 0$ at constant T and P
 (3) $\Delta_{mix} H = 0$ at constant T and P (4) $\Delta_{mix} G = 0$ at constant T and P
33. The non-essential amino acid among the following is:
 (1) valine (2) leucine (3) alanine (4) lysine
34. What is the correct electronic configuration of the central atom in $K_4[Fe(CN)_6]$ based on crystal field theory?
 (1) $t_{2g}^4 e_g^2$ (2) $t_{2g}^6 e_g^0$ (3) $e^3 t_2^3$ (4) $e^4 t_2^2$
35. Which of the following is incorrect statement?
 (1) PbF_4 is covalent in nature (2) $SiCl_4$ is easily hydrolysed
 (3) GeX_4 (X = f, Cl, Br, I) is GeX_2 (4) SnF_4 is ionic in nature
36. Match the Xenon compounds in Column – I with its structure in Column – II and assign the correct code:

Column – I		Column – II	
(a)	XeF_4	(i)	Pyramidal
(b)	XeF_6	(ii)	Square planar
(c)	$XeOF_4$	(iii)	Distorted octahedral
(d)	XeO_3	(iv)	Square pyramidal

Codes:

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

37. An alkene "A" on reaction with O_3 and $Zn - H_2O$ gives propanone and ethanal in equimolar ratio. Addition of HCl to alkene "A" gives "B" as the major product. The structure of product "B" is:



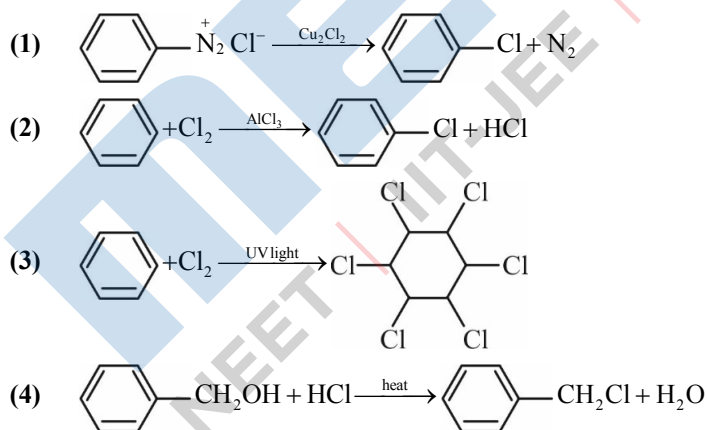
38. For the chemical reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ the correct option is:



39. Under isothermal condition, a gas at 300 K expands from 0.1 L to 0.25 L against a constant external pressure of 2 bar. The work done by the gas is: [Given that 1 L bar = 100 J]



40. Among the following, the reaction that proceed through an electrophilic substitution is:



41. Which of the following diatomic molecular species has only π bonds according to Molecular Orbital Theory?



42. Which of the following species is not stable?
(1) $[\text{SiF}_2]^{2-}$ (2) $[\text{GeCl}_6]^{2-}$ (3) $[\text{Sn}(\text{OH})_6]^{2-}$ (4) $[\text{SiCl}_6]^{2-}$
43. Which will make basic buffer?
(1) 50 mL of 0.1 M NaOH + 25 mL of 0.1 M CH_3COOH
(2) 100 mL of 0.1 M CH_3COOH + 100 mL of 0.1 M NaOH
(3) 100 mL of 0.1 M HCl + 200 mL of 0.1 M NH_4OH
(4) 100 mL of 0.1 M HCl + 100 mL of 0.1 M NaOH
44. Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region?
(1) Lyman series (2) Balmer series (3) Paschen series (4) Brackett series
45. The number of moles of hydrogen molecule required to produce 20 moles of ammonia through Haber's process is:
(1) 10 (2) 20 (3) 30 (4) 40

Section - II (BIOLOGY)

46. Conversion of glucose to glucose-6-phosphate, the first irreversible reaction of glycolysis, is catalyzed by:
(1) Aldolase (2) Hexokinase (3) Enolase (4) Phosphofructokinase
47. What is the site of perception of photoperiod necessary for induction of flowering in plants?
(1) Lateral buds (2) Pulvinus (3) Shoot apex (4) Leaves
48. Which of the following is **true** for Golden rice?
(1) It is Vitamin A enriched, with a gene from daffodil
(2) It is pest resistant, with a gene from *Bacillus thuringiensis*.
(3) It is drought tolerant, developed using *Agrobacterium* vector.
(4) It has yellow grains, because of a gene introduced from a primitive variety of rice.
49. Identify the **correct** pair representing the causative agent of typhoid fever and the confirmatory test for typhoid.
(1) *Plasmodium vivax*/UTI test (2) *Streptococcus pneumoniae*/Widal test
(3) *Salmonella typhi*/Anthrone test (4) *Salmonella typhi*/Widal test
50. Colostrum, the yellowish fluid, secreted by mother during the initial days of lactation is very essential to impart immunity to the newborn infants because it contains:
(1) Natural killer cells (2) Monocytes
(3) Macrophages (4) Immunoglobulin A
51. It takes very long time for pineapple plants to produce flowers. Which combination of hormones can be applied to artificially induce flowering in pineapple plants throughout the year to increase yield?
(1) Auxin and Ethylene (2) Gibberellin and Cytokinin
(3) Gibberellin and Abscisic acid (4) Cytokinin and Abscisic acid
52. DNA precipitation out of a mixture of biomolecules can be achieved by treatment with:
(1) Isopropanol (2) Chilled ethanol
(3) Methanol at room temperature (4) Chilled chloroform

53. What triggers activation of protoxin to active Bt toxin of *Bacillus thuringiensis* in boll worm?
 (1) Body temperature (2) Moist surface of midgut
 (3) Alkaline pH of gut (4) Acidic pH stomach
54. The frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes was explained by:
 (1) T.H. Morgan (2) Gregor J. Mendel (3) Alfred Sturtevant (4) Sutton Boveri
55. Which of the following is the most important cause for animals and plants being driven to extinction?
 (1) Habitat loss and fragmentation (2) Drought and floods
 (3) Economic exploitation (4) Alien species invasion
56. Identify the cells whose secretion protects the lining of gastro-intestinal tract from various enzymes.
 (1) Chief Cells (2) Goblet Cells (3) Oxyntic Cells (4) Duodenal Cells
57. Match the Column-I with Column-II:

	Column I		Column II
(a)	P-wave	(i)	Depolarisation of ventricles
(b)	QRS complex	(ii)	Repolarisation of ventricles
(c)	T-wave	(iii)	Coronary ischemia
(d)	Reduction in the size of T-wave	(iv)	Depolarisation of atria
		(v)	Repolarisation of atria

Select the **Correct** option.

- (1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii) (2) (a)-(iv), (b)-(i), (c)-(ii), (d)-(v)
 (3) (a)-(ii), (b)-(i), (c)-(v), (d)-(iii) (4) (a)-(ii), (b)-(iii), (c)-(v), (d)-(iv)
58. Match the following structures with their respective location in organs:
- | | | | |
|-----|----------------------|-------|-----------------|
| (a) | Crypts of Lieberkuhn | (i) | Pancreas |
| (b) | Glisson's Capsule | (ii) | Duodenum |
| (c) | Islets of Langerhans | (iii) | Small intestine |
| (d) | Brunner's Glands | (iv) | Liver |
- Select the correct option from the following:
- (1) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv) (2) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
 (3) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii) (4) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
59. Cells in G₀ phase:
 (1) exit the cell cycle (2) enter the cell cycle
 (3) suspend the cell cycle (4) terminate the cell cycle

60. The Earth Summit held in Rio de Janeiro in 1992 was called:
 (1) to reduce CO₂ emissions and global warming
 (2) for conservation of biodiversity and sustainable utilization of its benefits.
 (3) to assess threat posed to native species by invasive weed species.
 (4) for immediate steps to discontinue use of CFCs that were damaging the ozone layer.
61. Which of the following glucose transporters is insulin-dependent?
 (1) GLUT I (2) GLUT II (3) GLUT III (4) GLUT IV

62. Which of the statements given below is **not** true about formation of Annual Rings in trees?
- (1) Annual ring is a combination of spring wood and autumn wood produced in a year.
 - (2) Differential activity of cambium causes light and dark bands of tissue – early and late wood respectively
 - (3) Activity of cambium depends upon variation in climate
 - (4) Annual rings are not prominent in trees of temperate region.

63. Match the following hormones with the respective disease:

(a)	Insulin	(i)	Addison's disease
(b)	Thyroxin	(ii)	Diabetes insipidus
(c)	Corticoids	(iii)	Acromegaly
(d)	Growth Hormone	(iv)	Goitre
		(v)	Diabetes mellitus

Select the **correct** option.

- (1) (a)-(v), (b)-(i), (c)-(ii), (d)-(iii)
 - (2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
 - (3) (a)-(v), (b)-(iv), (c)-(i), (d)-(iii)
 - (4) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
64. In some plants, the female gamete develops into embryo without fertilization. This phenomenon is known as:
- (1) Autogamy
 - (2) Parthenocarpy
 - (3) Syngamy
 - (4) Parthenogenesis
65. Which of the following ecological pyramids is generally inverted?
- (1) Pyramid of numbers in grassland
 - (2) Pyramid of energy
 - (3) Pyramid of biomass in a forest
 - (4) Pyramid of biomass in a sea
66. Extrusion of second polar body from egg nucleus occurs:
- (1) after entry of sperm but before fertilization
 - (2) after fertilization
 - (3) before entry of sperm into ovum
 - (4) simultaneously with first cleavage
67. *Pinus* seed cannot germinate and establish without fungal association. This is because:
- (1) its embryo is immature
 - (2) it has obligate association with mycorrhizae
 - (3) it has very hard seed coat
 - (4) its seeds contain inhibitors that prevent germination
68. Which of the following factors is responsible for the formation of concentrated urine?
- (1) Low levels of antidiuretic hormone
 - (2) Maintaining hyperosmolarity towards inner medullary interstitium in the kidneys.
 - (3) Secretion of erythropoietin by Juxtaglomerular complex
 - (4) Hydrostatic pressure during glomerular filtration
69. In *Antirrhinum* (Snapdragon), a red flower was crossed with a white flower and in F₁ generation, pink flowers were obtained. When pink flowers were selfed, the F₂ generation showed white, red and pink flowers. Choose the **incorrect** statement from the following:
- (1) This experiment does not follow the Principle of Dominance
 - (2) Pink colour in F₁ is due to incomplete dominance.
 - (3) Ratio of F₂ is $\frac{1}{4}$ (Red) : $\frac{2}{4}$ (Pink) : $\frac{1}{4}$ (White)
 - (4) Law of Segregation does not apply in this experiment

70. Which part of the brain is responsible for thermoregulation?
 (1) Cerebrum (2) Hypothalamus (3) Corpus callosum (4) Medulla oblongata
71. Which of the following sexually transmitted diseases is **not** completely curable?
 (1) Gonorrhoea (2) Genital warts (3) Genital herpes (4) Chlamydia
72. Respiratory Quotient (RQ) value of tripalmitin is:
 (1) 0.9 (2) 0.7 (3) 0.07 (4) 0.09
73. Select the **correct** group of biocontrol agents
 (1) *Bacillus thuringiensis*, tobacco mosaic virus, Aphids
 (2) *Trichoderma*, *Baculovirus*, *Bacillus thuringiensis*
 (3) *Oscillatoria*, *Rhizobium*, *Trichoderma*
 (4) *Nostoc*, *Azospirillum*, *Nucleopolyhedrovirus*
74. Which one of the following statements regarding post-fertilization development in flowering plants is **incorrect**?
 (1) Ovary develops into fruit
 (2) Zygote develops into embryo
 (3) Central cell develops into endosperm
 (4) Ovules develop into embryo sac
75. Concanavalin A is:
 (1) an alkaloid (2) an essential oil (3) a lectin (4) a pigment
76. Match the following organisms with the products they produce:
- | | | | |
|-----|---------------------------------|-------|-------------|
| (a) | <i>Lactobacillus</i> | (i) | Cheese |
| (b) | <i>Saccharomyces cerevisiae</i> | (ii) | curd |
| (c) | <i>Aspergillus niger</i> | (iii) | Citric acid |
| (d) | <i>Acetobacter aceti</i> | (iv) | Bread |
| | | (v) | Acetic acid |
- Select the **correct** option.
 (1) (a)-(ii), (b)-(iv), (c)-(v), (d)-(iii)
 (2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(v)
 (3) (a)-(iii), (b)-(iv), (c)-(v), (d)-(i)
 (4) (a)-(ii), (b)-(i), (c)-(iii), (d)-(v)
77. Consider the following statements:
 (A) Coenzyme or metal ion that is tightly bound to enzyme protein is called prosthetic group
 (B) A complete catalytic active enzyme with its bound prosthetic group is called apoenzyme
 Select the **correct** option.
 (1) Both (A) and (B) are true (2) (A) is true but (B) is false
 (3) Both (A) and (B) are false (4) (A) is false but (B) is true
78. The **correct** sequence of phases of cell cycle is:
 (1) $M \rightarrow G_1 \rightarrow G_2 \rightarrow S$ (2) $G_1 \rightarrow G_2 \rightarrow S \rightarrow M$
 (3) $S \rightarrow G_1 \rightarrow G_2 \rightarrow M$ (4) $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$
79. *Thiobacillus* is a group of bacteria helpful in carrying out:
 (1) Nitrogen fixation (2) Chemoautotrophic fixation
 (3) Nitrification (4) Denitrification

80. Select the **incorrect** statement
- (1) Inbreeding increases homozygosity
 - (2) Inbreeding is essential to evolve purelines in any animal
 - (3) Inbreeding selects harmful recessive genes that reduce fertility and productivity
 - (4) Inbreeding helps in accumulation of superior genes and elimination of undesirable genes.
81. Which map unit (Centimorgan) is adopted in the construction of genetic maps?
- (1) A unit of distance between two expressed genes, representing 10% cross over
 - (2) A unit of distance between two expressed genes, representing 100% cross over
 - (3) A unit of distance between genes on chromosomes, representing 1% cross over.
 - (4) A unit of distance between genes on chromosomes, representing 50% cross over.
82. Which one of the following is **not** a method of *in situ* conservation of biodiversity?
- (1) Biosphere Reserve
 - (2) Wildlife Sanctuary
 - (3) Botanical Garden
 - (4) Sacred Grove
83. Placentation, in which ovules develop on the inner wall of the ovary or in peripheral part, is:
- (1) Basal
 - (2) Axile
 - (3) Parietal
 - (4) Free central
84. Due to increasing air-borne allergens and pollutants, many people in urban areas are suffering from respiratory disorder causing wheezing due to:
- (1) benign growth on mucous lining of nasal cavity
 - (2) inflammation of bronchi and bronchioles
 - (3) proliferation of fibrous tissues and damage of the alveolar walls.
 - (4) reduction in the secretion of surfactants by pneumocytes
85. Which of the following statements is **correct**?
- (1) Cornea is an external, transparent and protective proteinacious covering of the eye-ball.
 - (2) Cornea consists of dense connective tissue of elastin and can repair itself.
 - (3) Cornea is convex, transparent layer which is highly vascularised
 - (4) Cornea consists of dense matrix of collagen and is the most sensitive portion of the eye
86. Purines found both in DNA and RNA are:
- (1) Adenine and thymine
 - (2) Adenine and guanine
 - (3) Guanine and cytosine
 - (4) Cytosine and thymine
87. Expressed Sequence Tags (ESTs) refers to:
- (1) Genes expressed as RNA
 - (2) Polypeptide expression
 - (3) DNA polymorphism
 - (4) Novel DNA sequences
88. Phloem in gymnosperms lacks:
- (1) Albuminous cells and sieve cells
 - (2) Sieve tubes only
 - (3) Companion cells only
 - (4) Both sieve tubes and companion cells
89. What is the genetic disorder in which an individual has an overall masculine development, gynaecomastia, and is sterile?
- (1) Turner's syndrome
 - (2) Klinefelter's syndrome
 - (3) Edward syndrome
 - (4) Down's syndrome
90. Grass leaves curl inwards during very dry weather. Select the most appropriate reason from the following:
- (1) Closure of stomata
 - (2) Flaccidity of bulliform cells
 - (3) Shrinkage of air spaces in spongy mesophyll
 - (4) Tyloses in vessels

91. Consider following features:
 (a) Organ system level of organisation (b) Bilateral symmetry
 (c) True coelomates with segmentation of body
 Select the **correct** option of animal groups which possess all the above characteristics
 (1) Annelida, Arthropoda and Chordata (2) Annelida, Arthropoda and Mollusca
 (3) Arthropoda, Mollusca and Chordata (4) Annelida, Mollusca and Chordata
92. Under which of the following conditions will there be no change in the reading frame of following mRNA?
 5' AACAGCGGUGCUAAU 3'
 (1) Insertion of G at 5th position (2) Deletion of G from 5th position
 (3) Insertion of A and G at 4th and 5th positions respectively
 (4) Deletion of GGU from 7th, 8th and 9th positions
93. Select the **correct** option.
 (1) 8th, 9th and 10th pairs of ribs articulate directly with the sternum
 (2) 11th and 12th pairs of ribs are connected to the sternum with the help of hyaline cartilage
 (3) Each rib is a flat thin bone and all the ribs are connected dorsally to the thoracic vertebrae and ventrally to the sternum
 (4) There are seven pairs of vertebrosteral, three pairs of vertebrochondral and two pairs of vertebral ribs
94. The shorter and longer arms of a submetacentric chromosome are referred to as:
 (1) s-arm and l-arm respectively (2) p-arm and q-arm respectively
 (3) q-arm and p-arm respectively (4) m-arm and n-arm respectively
95. Xylem translocates:
 (1) Water only (2) Water and mineral salts only
 (3) Water, mineral salts and some organic nitrogen only
 (4) Water, mineral salts, some organic nitrogen and hormones
96. Persistent nucellus in the seed is known as:
 (1) Chalaza (2) Perisperm (3) Hilum (4) Tegmen
97. Match column -I with Column II
- | | Column I | | Column II |
|-----|------------|-------|---|
| (a) | Saprophyte | (i) | Symbiotic association of fungi with plant roots |
| (b) | Parasite | (ii) | Decomposition of dead organic materials |
| (c) | Lichens | (iii) | Living on living plants or animals |
| (d) | Mycorrhiza | (iv) | Symbiotic association of algae and fungi |
- (1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv) (2) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
 (3) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv) (4) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
98. Which of the following can be used as a biocontrol agent in the treatment of plant disease?
 (1) *Trichoderma* (2) *Chlorella* (3) *Anabaena* (4) *Lactobacillus*
99. What would be the heart rate of a person if the cardiac output is 5L, blood volume in the ventricles at the end of diastole is 100 mL and at the end of ventricular systole is 50 mL?
 (1) 50 beats per minute (2) 75 beats per minute
 (3) 100 beats per minute (4) 125 beats per minute

100. Which of the following protocols did aim for reducing emission of chlorofluorocarbons into the atmosphere?
- (1) Montreal Protocol (2) Kyoto Protocol
(3) Gothenburg Protocol (4) Geneva Protocol
101. Polyblend, a fine powder of recycled modified plastic, has proved to be a good material for:
- (1) making plastic sacks (2) use as a fertilizer
(3) construction of roads (4) making tubes and pipes
102. Which of the following contraceptive methods do involve a role of hormone?
- (1) Lactational amenorrhea, Pills, Emergency contraceptives
(2) Barrier method, lactational amenorrhea, Pills
(3) CuT, Pills, Emergency contraceptives
(4) Pills, Emergency contraceptives, Barrier methods
103. Drug called 'Heroin' is synthesized by:
- (1) methylation of morphine (2) acetylation of morphine
(3) glycosylation of morphine (4) nitration of morphine
104. Which of the following pairs of gases is mainly responsible for green house effect?
- (1) Ozone and Ammonia (2) Oxygen and Nitrogen
(3) Nitrogen and Sulphur dioxide (4) Carbon dioxide and Methane
105. Which of the following muscular disorders is inherited?
- (1) Tetany (2) Muscular dystrophy
(3) Myasthenia gravis (4) Botulism
106. Which one of the following equipments is essentially required for growing microbes on a large scale, for industrial production of enzymes?
- (1) BOD incubator (2) Sludge digester (3) Industrial oven (4) Bioreactor
107. The concept of "*Omnia cellula-e cellula*" regarding cell division was first proposed by:
- (1) Rudolf Virchow (2) Theodore Schwann (3) Schleiden (4) Aristotle
108. What is the fate of the male gametes discharged in the synergid?
- (1) One fuses with the egg, other(s) degenerate(s) in the synergid
(2) All fuse with the egg
(3) One fuses with the egg, other(s) fuse(s) with synergid nucleus
(4) One fuses with the egg and other fuses with central cell nuclei
109. How does steroid hormone influence the cellular activities?
- (1) Changing the permeability of the cell membrane
(2) Binding to DNA and forming a gene-hormone complex
(3) Activating cyclic AMP located on the cell membrane
(4) Using aquaporin channels as second messenger.
110. Which of the following pair of organelles **does not** contain DNA?
- (1) Mitochondria and Lysosomes
(2) Chloroplast and Vacuoles
(3) Lysosomes and Vacuoles
(4) Nuclear envelope and Mitochondria

111. A gene locus has two alleles A, a. If the frequency of dominant allele A is 0.4; then what will be the frequency of homozygous dominant, heterozygous and homozygous recessive individuals in the population?

- (1) 0.36 (AA); 0.48 (Aa); 0.16 (aa)
- (2) 0.16 (AA); 0.24 (Aa); 0.36 (aa)
- (3) 0.16 (AA); 0.48 (Aa); 0.36 (aa)
- (4) 0.16 (AA); 0.36 (Aa); 0.48 (aa)

112. Match the following organisms with their respective characteristics:

(a)	<i>Pila</i>	(i)	Flame cells
(b)	<i>Bombyx</i>	(ii)	Comb plates
(c)	<i>Pleurobrachia</i>	(iii)	Radula
(d)	<i>Taenia</i>	(iv)	Malpighian tubules

Select the **correct** option from the following:

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

113. Which of the following is a commercial blood cholesterol lowering agent?

- (1) Cyclosporin A
- (2) Statin
- (3) Streptokinase
- (4) Lipases

114. Variations caused by mutation, as proposed by Hugo de Vries, are:

- (1) random and directional
- (2) random and directionless
- (3) small and directional
- (4) small and directionless

115. Select the **incorrect** statement

- (1) Male fruit fly is heterogametic
- (2) In male grasshoppers, 50% of sperms have no sex-chromosome
- (3) In domesticated fowls, sex of progeny depends on the type of sperm rather than egg
- (4) Human males have one of their sex-chromosome much shorter than the other

116. Which of the following immune responses is responsible for rejections of kidney graft?

- (1) Auto-immune response
- (2) Humoral immune response
- (3) Inflammatory immune response
- (4) Cell-mediated immune response

117. From evolutionary point of view, retention of the female gametophyte with developing young embryo on the parent sporophyte for some time, is first observed in:

- (1) Liverworts
- (2) Mosses
- (3) Pteridophytes
- (4) Gymnosperms

118. Select the **correct** sequence of organs in the alimentary canal of cockroach starting from mouth:

- (1) Pharynx → Oesophagus → Crop → Gizzard → Ileum → Colon → Rectum
- (2) Pharynx → Oesophagus → Gizzard → Crop → Ileum → Colon → Rectum
- (3) Pharynx → Oesophagus → Gizzard → Ileum → Crop → Colon → Rectum
- (4) Pharynx → Oesophagus → Ileum → Crop → Gizzard → Colon → Rectum

119. Which of the following statements regarding mitochondria is **incorrect**?

- (1) Outer membrane is permeable to monomers of carbohydrates, fats and proteins
- (2) Enzymes of electron transport are embedded in outer membrane
- (3) Inner membrane is convoluted with infoldings
- (4) Mitochondrial matrix contains single circular DNA molecule and ribosomes

120. Which of the following statements is **not** correct?

- (1) Lysosomes have numerous hydrolytic enzymes
 (2) The hydrolytic enzymes of lysosomes are active under acidic pH
 (3) Lysosomes are membrane bound structures
 (4) Lysosomes are formed by the process of packaging in the endoplasmic reticulum
121. Which of the following features of genetic code does allow bacteria to produce human insulin by recombinant DNA technology?
 (1) Genetic code is not ambiguous (2) Genetic code is redundant
 (3) Genetic code is nearly universal (4) Genetic code is specific
122. Tidal Volume and expiratory Reserve Volume of an athlete is 500 mL and 1000 mL respectively. What will be his Expiratory Capacity if the Residual Volume is 1200 mL?
 (1) 1500 mL (2) 1700 mL (3) 2200 mL (4) 2700 mL

123. Match the following genes of the lac operon with their respective products:

(a)	i gene	(i)	β -galactosidase
(b)	z gene	(ii)	Permease
(c)	a gene	(iii)	Repressor
(d)	y gene	(iv)	Transacetylase

Select the **correct** option

- (1) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
 (2) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
 (3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
 (4) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
124. Use of an artificial kidney during hemodialysis may result in:
 (a) Nitrogenous waste build-up in the body
 (b) Non-elimination of excess potassium ions
 (c) Reduced absorption of calcium ions from gastro-intestinal tract
 (d) Reduced RBC production

Which of the following options is the most **appropriate**?

- (1) (a) and (b) are correct (2) (b) and (c) are correct
 (3) (c) and (d) are correct (4) (a) and (d) are correct
125. Match the hominids with their **correct** brain size:

(a)	<i>Homo habilis</i>	(i)	900 cc
(b)	<i>Homo neanderthalensis</i>	(ii)	1350 cc
(c)	<i>Homo erectus</i>	(iii)	650-800 cc
(d)	<i>Homo sapiens</i>	(iv)	1400 cc

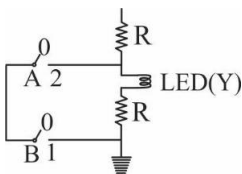
Select the **correct** option

- (1) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii) (2) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
 (3) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii) (4) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
126. Select the hormone-releasing Intra-Uterine Devices.
 (1) Vaults, LNG-20 (2) Multiload 375, Progestasert
 (3) Progestasert, LNG-20 (4) Lippes Loop, Multiload 375

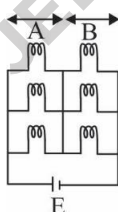
127. Select the correct sequence for transport of sperm cells in male reproductive system
- (1) Testis → Epididymis → Vasa efferentia → Rete testis → Inguinal canal → Urethra
 - (2) Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory duct → Urethra → Urethral meatus
 - (3) Seminiferous tubules → Vasa efferentia → Epididymis → Inguinal canal → Urethra
 - (4) Testis → Epididymis → Vasa efferentia → Vas deferens → Ejaculatory duct → Inguinal canal → Urethra → Urethral meatus
128. What is the direction of movement of sugars in phloem?
- (1) Non-multidirectional
 - (2) Upward
 - (3) Downward
 - (4) Bi-directional
129. Which of the following statements is **incorrect**?
- (1) Viroids lack a protein coat.
 - (2) Viruses are obligate parasites
 - (3) Infective constituent in viruses is the protein coat
 - (4) Prions consist of abnormally folded proteins
130. The ciliated epithelial cells are required to move particles or mucus in a specific direction. In humans, these cells are mainly present in:
- (1) Bile duct and Bronchioles
 - (2) Fallopian tubes and Pancreatic duct
 - (3) Eustachian tube and Salivary duct
 - (4) Bronchioles and Fallopian tubes
131. Which of the following statements is **incorrect**?
- (1) Morels and truffles are edible delicacies
 - (2) *Claviceps* is a source of many alkaloids and LSD
 - (3) Conidia are produced exogenously and ascospores endogenously
 - (4) Yeasts have filamentous bodies with long thread-like hyphae.
132. Which of these following methods is the most suitable for disposal of nuclear waste?
- (1) Shoot the waste into space
 - (2) Bury the waste under Antarctic ice-cover
 - (3) Dump the waste within rocks under deep ocean
 - (4) Bury the waste within rocks deep below the Earth's surface
133. Following statements describe the characteristics of the enzyme Restriction Endonuclease. Identify the **incorrect** statement
- (1) The enzyme cuts DNA molecule at identified position within the DNA
 - (2) The enzyme binds DNA at specific sites and cuts only one of the two strands
 - (3) The enzyme cuts the sugar-phosphate backbone at specific sites on each strand
 - (4) The enzyme recognizes a specific palindromic nucleotide sequence in the DNA
134. In a species, the weight of newborn ranges from 2 to 5 kg. 97% of the newborn with an average weight between 3 to 3.3 kg survive whereas 99% of the infants born with 2 to 2.5 kg or 4.5 to 5 kg die. Which type of selection process is taking place?
- (1) Directional Selection
 - (2) Stabilizing Selection
 - (3) Disruptive Selection
 - (4) Cyclical Selection
135. Select the **correctly** written scientific name of Mango which was first described by Carolus Linnaeus:
- (1) *Mangifera indica* Car. Linn.
 - (2) *Mangifera indica* Linn
 - (3) *Mangifera indica*
 - (4) *Mangifera Indica*

Section - III (PHYSICS)

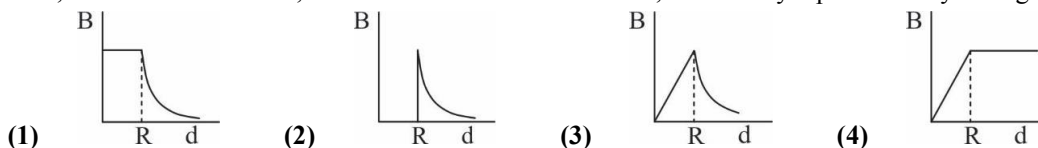
136. The correct Boolean operation represented by the circuit diagram drawn is:



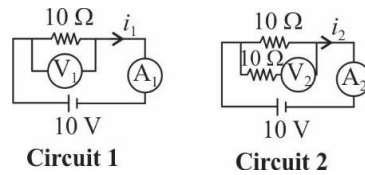
- (1) AND (2) OR (3) NAND (4) NOR
137. A hollow metal sphere of radius R is uniformly charged. The electric field due to the sphere at a distance r from the centre:
- (1) increases as r increases for $r < R$ and for $r > R$
 (2) zero as r increases for $r < R$, decreases as r increases for $r > R$.
 (3) zero as r increases for $r < R$, increases as r increases for $r > R$
 (4) decreases as r increases for $r < R$ and for $r > R$
138. At a point A on the earth's surface the angle of dip, $\delta = +25^\circ$. At a point B on the earth's surface the angle of dip, $\delta = -25^\circ$. We can interpret that:
- (1) A and B are both located in the northern hemisphere.
 (2) A is located in the southern hemisphere and B is located in the northern hemisphere.
 (3) A is located in the northern hemisphere and B is located in the southern hemisphere.
 (4) A and B are both located in the southern hemisphere.
139. In a double slit experiment, when light of wavelength 400 nm was used, the angular width of the first minima formed on a screen placed 1 m away, was found to be 0.2° . What will be the angular width of the first minima, if the entire experimental apparatus is immersed in water?
- (1) 0.266° (2) 0.15° (3) 0.05° (4) 0.1°
140. Six similar bulbs are connected as shown in the figure with a DC source of emf E , and zero internal resistance. The ratio of power consumption by the bulbs when (i) all are glowing and (ii) in the situation when two from section A and one from section B are glowing, will be:



- (1) 4 : 9 (2) 9 : 4 (3) 1 : 2 (4) 2 : 1
141. In which of the following processes, heat is neither absorbed nor released by a system?
- (1) isothermal (2) adiabatic (3) isobaric (4) isochoric
142. A cylindrical conductor of radius R is carrying a constant current. The plot of the magnitude of the magnetic field, B with the distance d , from the centre of the conductor, is correctly represented by the figure:



143. In the circuits shown below, the reading of the voltmeters and the ammeters will be:



- (1) $V_2 > V_1$ and $i_1 = i_2$ (2) $V_1 = V_2$ and $i_1 > i_2$ (3) $V_1 = V_2$ and $i_1 = i_2$ (4) $V_2 > V_1$ and $i_1 > i_2$

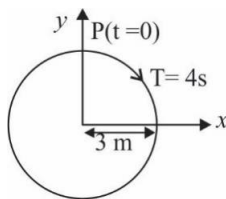
144. Which colour of the light has the longest wavelength?

- (1) red (2) blue (3) green (4) violet

145. Increase in temperature of a gas in a container would lead to:

- (1) increase in its mass (2) increase in its kinetic energy
(3) decrease in its pressure (4) decrease in intermolecular distance

146. The radius of circle, the period of revolution, initial position and sense of revolution are indicated in the fig.



y - projection of the radius vector of rotating particle P is:

- (1) $y(t) = -3 \cos 2\pi t$, where y in m (2) $y(t) = 4 \sin\left(\frac{\pi t}{2}\right)$, where y in m
(3) $y(t) = 3 \cos\left(\frac{3\pi t}{2}\right)$, where y in m (4) $y(t) = 3 \cos\left(\frac{\pi t}{2}\right)$, where y in m

147. Average velocity of a particle executing SHM in one complete vibration is:

- (1) $\frac{A\omega}{2}$ (2) $A\omega$ (3) $\frac{A\omega^2}{2}$ (4) zero

148. A solid cylinder of mass 2 kg and radius 4 cm is rotating about its axis at the rate of 3 rpm. The torque required to stop after 2π revolutions is:

- (1) $2 \times 10^{-6} Nm$ (2) $2 \times 10^{-3} Nm$ (3) $12 \times 10^{-4} Nm$ (4) $12 \times 10^6 Nm$

LOM

149. A block of mass 10 kg is in contact against the inner wall of a hollow cylindrical drum of radius 1 m. The coefficient of friction between the block and the inner wall of the cylinder is 0.1. The minimum angular velocity needed for the cylinder to keep the block stationary when the cylinder is vertical and rotating about its axis, will be: ($g = 10 \text{ m/s}^2$)

- (1) $\sqrt{10}$ rad/s (2) $\frac{10}{2\pi}$ rad/s (3) 10 rad/s (4) 10π rad/s

150. The speed of a swimmer in still water is 20 m/s. The speed of river water is 10 m/s and is flowing due east? If he is standing on the south bank and wishes to cross the river along the shortest path, the angle at which he should make his strokes w.r.t north is given by :

- (1) 30° west (2) 0° (3) 60° (4) 45° west

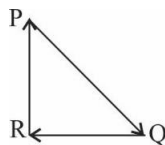
151. A 800 turn coil of effective area 0.05 m^2 is kept perpendicular to a magnetic field $5 \times 10^{-5} \text{ T}$. When the plane of the coil is rotated by 90° around any of its coplanar axis in 0.1 s , the emf induced in the coil will be :
- (1) 2V (2) 0.2 V (3) $2 \times 10^{-3} \text{ V}$ (4) 0.02 V
152. In an experiment, the percentage of error occurred in the measurement of physical quantities A, B,C and D are 1%, 2%, 3% and 4% respectively. Then the maximum percentage of error in the measurement X, where $X = \frac{A^2 B^{1/2}}{C^{1/3} D^3}$, will be:
- (1) $\left(\frac{3}{13}\right)\%$ (2) 16% (3) - 10% (4) 10%
153. The displacement of a particle executing simple harmonic motion is given by $y = A_0 + A \sin \omega t + B \cos \omega t$ Then the amplitude of its oscillation is given by:
- (1) $A_0 + \sqrt{A^2 + B^2}$ (2) $\sqrt{A^2 + B^2}$ (3) $\sqrt{A_0^2 + (A + B)^2}$ (4) A + B
154. An electron is accelerated through a potential difference of 10, 000 V. Its de Broglie wavelength is, (nearly) : ($m_e = 9 \times 10^{-31} \text{ kg}$)
- (1) $12.2 \times 10^{-13} \text{ m}$ (2) $12.2 \times 10^{-12} \text{ m}$ (3) $12.2 \times 10^{-14} \text{ m}$ (4) 12.2 nm

LOM

155. A mass m is attached to a thin wire and whirled in a vertical circle. The wire is most likely to break when:
- (1) the mass is at the highest point (2) the wire is horizontal
(3) the mass is at the lowest point (4) inclined at an angle of 60° from vertical
156. Two particle A and B are moving in uniform circular motion in concentric circles of Radii r_A and r_B with speed v_A and v_B respectively. Their time period of rotation is the same. The ratio of angular speed of A to that of B will be:
- (1) $r_A : r_B$ (2) $v_A : v_B$ (3) $r_B : r_A$ (4) 1 : 1
157. A copper rod of 88 cm and an aluminium rod of unknown length have their increase in length independent of increase in temperature. The length of aluminium rod is : ($\alpha_{Cu} = 1.7 \times 10^{-5} \text{ K}^{-1}$ and $\alpha_{Al} = 2.2 \times 10^{-5} \text{ K}^{-1}$)
- (1) 6.8 cm (2) 113.9 cm (3) 88 cm (4) 68 cm
158. Ionized hydrogen atoms and α -particles with same momenta enters perpendicular to a constant magnetic field, B. The ratio of their radii of their paths $r_H : r_\alpha$ will be:
- (1) 2 : 1 (2) 1:2 (3) 4:1 (4) 1:4
159. When a block of mass M is suspended by a long wire of length L, the length of the wire becomes (L+ l). The elastic potential energy stored in the extended wire is:
- (1) Mgl (2) MgL (3) $\frac{1}{2} Mgl$ (4) $\frac{1}{2} MgL$
160. For a p-type semiconductor, which of the following statements is true?
- (1) Electrons are the majority carries and trivalent atoms are the dopants
(2) Holes are the majority carriers and trivalent atoms are the dopants
(3) Holes are the majority carriers and pentavalent atoms are the dopants
(4) Electrons are the majority carries and pentavalent atoms are the dopants

161. The work done to raise a mass m from the surface of the earth to a height h , which is equal to the radius of the earth is:
- (1) mgR (2) $2mgR$ (3) $\frac{1}{2}mgR$ (4) $\frac{3}{2}mgR$
162. In total internal reflection when the angle of incidence is equal to the critical angle for the pair of media in contact, what will be angle of refraction?
- (1) 180° (2) 0° (3) equal to angle of incidence
(4) 90°
163. Two point charge A and B, having charges $+Q$ and $-Q$ respectively are placed at certain distance apart and force acting between them is F . If 25% charge of A is transferred to B, then force between the charges becomes:
- (1) F (2) $\frac{9F}{16}$ (3) $\frac{16F}{9}$ (4) $\frac{4F}{3}$
164. α -particle consists of:
- (1) 2 protons and 2 neutrons only (2) 2 electrons, 2 protons and 2 neutrons
(3) 2 electrons and 4 protons only (4) 2 protons only
165. Body A of mass $4m$ moving with speed u collides with another body B of mass $2m$, at rest. The collision is head on and elastic in nature. After the collision the fraction of energy lost by the colliding body A is:
- (1) $\frac{1}{9}$ (2) $\frac{8}{9}$ (3) $\frac{4}{9}$ (4) $\frac{5}{9}$
166. A body weighs 200 N on the surface of the earth. How much will it weigh halfway down to the centre of the earth?
- (1) 150 N (2) 200 N (3) 250 N (4) 100 N
167. Pick the wrong answer in the context with rainbow.
- (1) When the light rays undergo two internal reflections in a water drop, a secondary rainbow is formed
(2) The order of colours is reversed in the secondary rainbow.
(3) An observer can see a rainbow when his front is towards the sun
(4) Rainbow is a combined effect of dispersion, refraction and reflection of sunlight
168. A force $F = 20 + 10y$ acts on a particle in y -direction where F is in newton and y in meter. Work done by this force to move the particle from $y = 0$ to $y = 1$ m is:
- (1) 30 J (2) 5 J (3) 25 J (4) 20 J
169. A disc of radius 2 m and mass 100 kg rolls on a horizontal floor. Its centre of mass has speed of 20 cm/s. How much work is needed to stop it?
- (1) 3 J (2) 30 kJ (3) 2 J (4) 1 J
170. A small hole of area of cross-section 2 mm^2 is present near the bottom of a fully filled open tank of height 2 m. Taking $g = 10 \text{ m/s}^2$, the rate of flow of water through the open hole would be nearly:
- (1) $12.6 \times 10^{-6} \text{ m}^3/\text{s}$ (2) $8.9 \times 10^{-6} \text{ m}^3/\text{s}$ (3) $2.23 \times 10^{-6} \text{ m}^3/\text{s}$ (4) $6.4 \times 10^{-6} \text{ m}^3/\text{s}$
171. When an object is shot from the bottom of a long smooth inclined plane kept at an angle 60° with horizontal, it can travel a distance x_1 along the plane. But when the inclination is decreased to 30° and the same object is shot with the same velocity, it can travel x_2 distance. Then $x_1 : x_2$ will be:
- (1) $1 : \sqrt{2}$ (2) $\sqrt{2} : 1$ (3) $1 : \sqrt{3}$ (4) $1 : 2\sqrt{3}$

172. A parallel plate capacitor of capacitance $20 \mu\text{F}$ is being charged by a voltage source whose potential is changing at the rate of 3 V/s . The conduction current through the connecting wires, and the displacement current through the plates of the capacitor, would be, respectively:
 (1) zero, $60 \mu\text{A}$ (2) $60 \mu\text{A}$, $60 \mu\text{A}$ (3) $60 \mu\text{A}$, zero (4) zero, zero
173. The unit of the thermal conductivity is:
 (1) J m K^{-1} (2) $\text{J m}^{-1} \text{K}^{-1}$ (3) W m K^{-1} (4) $\text{W m}^{-1} \text{K}^{-1}$
174. Which of the following acts as a circuit protection device?
 (1) conductor (2) inductor (3) switch (4) fuse
175. The soap bubble, having radius of 1 mm , is blown from a detergent solution having a surface tension of $2.5 \times 10^{-2} \text{ N/m}$. The pressure inside the bubble equals at a point Z_0 below the free surface of water in a container. Taking $g = 10 \text{ m/s}^2$, density of water $= 10^3 \text{ kg/m}^3$, the value of Z_0 is:
 (1) 100 cm (2) 10 cm (3) 1 cm (4) 0.5 cm
176. The total energy of an electron in an atom in an orbit is -3.4 eV . Its kinetic and potential energies are, respectively:
 (1) -3.4 eV , -3.4 eV (2) -3.4 eV , -6.8 eV (3) 3.4 eV , -6.8 eV (4) 3.4 eV , 3.4 eV
177. Two similar thin equi-convex lenses, of focal length f each, are kept coaxially in contact with each other such that the focal length of the combination is F_1 . When the space between the two lenses is filled with glycerin (which has the same refractive index ($\mu=1.5$) as that of glass) then the equivalent focal length is F_2 . The ratio $F_1:F_2$ will be:
 (1) $2:1$ (2) $1:2$ (3) $2:3$ (4) $3:4$
178. Two parallel infinite line charges with linear charge densities $+\lambda \text{ C/m}$ and $-\lambda \text{ C/m}$ are placed at a distance of $2R$ in free space. What is the electric field mid-way between the two line charges:
 (1) zero (2) $\frac{2\lambda}{\pi\epsilon_0 R} \text{ N/C}$ (3) $\frac{\lambda}{\pi\epsilon_0 R} \text{ N/C}$ (4) $\frac{\lambda}{2\pi\epsilon_0 R} \text{ N/C}$
179. In which of the following devices, the eddy current effect is not used?
 (1) induction furnace (2) magnetic braking in train
 (3) electromagnet (4) electric heater
180. A particle moving with velocity \vec{V} is acted by three forces shown by the vector triangle PQR. The velocity of the particle will:



- (1) increase (2) decrease
 (3) remains constant (4) change according to the smallest force \overline{QR}

NEET : 2019 - Paper Code

P3**ANSWER KEY**

CHEMISTRY		BIOLOGY			PHYSICS		
Q 1	2	Q 46	2	Q 91	1	Q 136	3
Q 2	2	Q 47	4	Q 92	4	Q 137	2
Q 3	4	Q 48	1	Q 93	4	Q 138	3
Q 4	1	Q 49	4	Q 94	2	Q 139	2
Q 5	1, 2	Q 50	4	Q 95	4	Q 140	2
Q 6	3	Q 51	1	Q 96	2	Q 141	2
Q 7	1	Q 52	2	Q 97	4	Q 142	3
Q 8	1	Q 53	3	Q 98	1	Q 143	3
Q 9	1	Q 54	3	Q 99	3	Q 144	1
Q 10	1	Q 55	1	Q 100	1	Q 145	2
Q 11	3	Q 56	2	Q 101	3	Q 146	4
Q 12	4	Q 57	1	Q 102	1	Q 147	4
Q 13	1	Q 58	3	Q 103	2	Q 148	1
Q 14	4	Q 59	1	Q 104	4	Q 149	3
Q 15	4	Q 60	2	Q 105	2	Q 150	1
Q 16	3	Q 61	4	Q 106	4	Q 151	4
Q 17	4	Q 62	4	Q 107	1	Q 152	2
Q 18	2	Q 63	3	Q 108	4	Q 153	2
Q 19	4	Q 64	4	Q 109	2	Q 154	2
Q 20	1	Q 65	4	Q 110	3	Q 155	3
Q 21	2	Q 66	1	Q 111	3	Q 156	4
Q 22	2	Q 67	2	Q 112	2	Q 157	4
Q 23	3	Q 68	2	Q 113	2	Q 158	1
Q 24	1	Q 69	4	Q 114	2	Q 159	3
Q 25	4	Q 70	2	Q 115	3	Q 160	2
Q 26	2	Q 71	3	Q 116	4	Q 161	3
Q 27	3	Q 72	2	Q 117	3	Q 162	4
Q 28	3	Q 73	2	Q 118	1	Q 163	2
Q 29	2	Q 74	4	Q 119	2	Q 164	1
Q 30	1	Q 75	3	Q 120	4	Q 165	2
Q 31	1	Q 76	2	Q 121	3	Q 166	4
Q 32	3	Q 77	2	Q 122	1	Q 167	3
Q 33	3	Q 78	4	Q 123	3	Q 168	3
Q 34	2	Q 79	4	Q 124	3	Q 169	1
Q 35	1	Q 80	3	Q 125	3	Q 170	1
Q 36	2	Q 81	3	Q 126	3	Q 171	3
Q 37	3	Q 82	3	Q 127	2	Q 172	2
Q 38	3	Q 83	3	Q 128	4	Q 173	4
Q 39	1	Q 84	2	Q 129	3	Q 174	4
Q 40	2	Q 85	1	Q 130	4	Q 175	3
Q 41	3	Q 86	2	Q 131	4	Q 176	3
Q 42	4	Q 87	1	Q 132	4	Q 177	2
Q 43	3	Q 88	4	Q 133	2	Q 178	3
Q 44	2	Q 89	2	Q 134	2	Q 179	4
Q 45	3	Q 90	2	Q 135	2	Q 180	3

HINTS AND SOLUTION

Section- I (CHEMISTRY)

1. (2)

${}_4\text{Be} \longrightarrow 1s^2 2s^2$ fully filled

${}_5\text{B} \longrightarrow 1s^2 2s^2 2p^1$

${}_7\text{N} \longrightarrow 1s^2 2s^2 2p^3$ Half filled.

${}_8\text{O} \longrightarrow 1s^2 2s^2 2p^4$

'Be' and 'N' have comparatively more stable valence subshell configuration than 'B' and 'O'.
2. (2)

Ca(OH)_2 is used to remove temporary hardness, in Clarke's Method.

$\text{Ca(HCO}_3)_2 + \text{Ca(OH)}_2 \longrightarrow 2\text{CaCO}_3 \downarrow + 2\text{H}_2\text{O}$

$\text{Mg(HCO}_3)_2 + 2\text{Ca(OH)}_2 \longrightarrow 2\text{CaCO}_3 \downarrow + \text{Mg(OH)}_2 + 2\text{H}_2\text{O}$
3. (4)

Be(OH)_2 Beryllium Hydroxide can react with both strong acids and bases, as shown.

$\text{Be(OH)}_2 + 2\text{HCl} \longrightarrow \text{BeCl}_2 + 2\text{H}_2\text{O}$

$\text{Be(OH)}_2 + 2\text{NaOH} \longrightarrow \text{Na}_2[\text{Be(OH)}_4]$
4. (1)

Penicillin G or benzyl penicillin is a narrow spectrum antibiotic to treat different infections.
5. (1, 2)

50 mL of 1 M AgNO_3 + 50 mL of 2 M KI

0.05 mol AgNO_3 + 0.10 mol KI

Excess of I^- are available. Same way excess KI is also present in Choice (1)
6. (3)

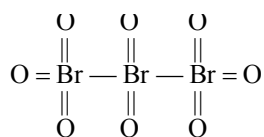
$\text{H}_2\text{O} \longrightarrow \text{H}^{+1} + \underset{\text{Conjugate Base}}{\text{OH}^{-1}}$

$\text{HF} \longrightarrow \text{H}^{+1} + \underset{\text{Conjugate Base}}{\text{F}^{-1}}$
7. (1)

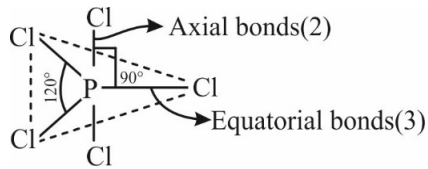
$$\begin{array}{ccccccc} & \text{H} & & & & & \\ & | & & & & & \\ & \sigma & & & & & \\ \text{H} & - \sigma & - \text{C} & - \sigma & - \text{C} & - \sigma & - \text{C} & - \sigma & - \text{H} \\ & | & & | & & | & & | & \\ & \sigma & & \sigma & & \sigma & & \sigma & \\ & \text{H} & & \text{H} & & \text{H} & & & \end{array}$$

(10 σ and 3 π)
8. (1)

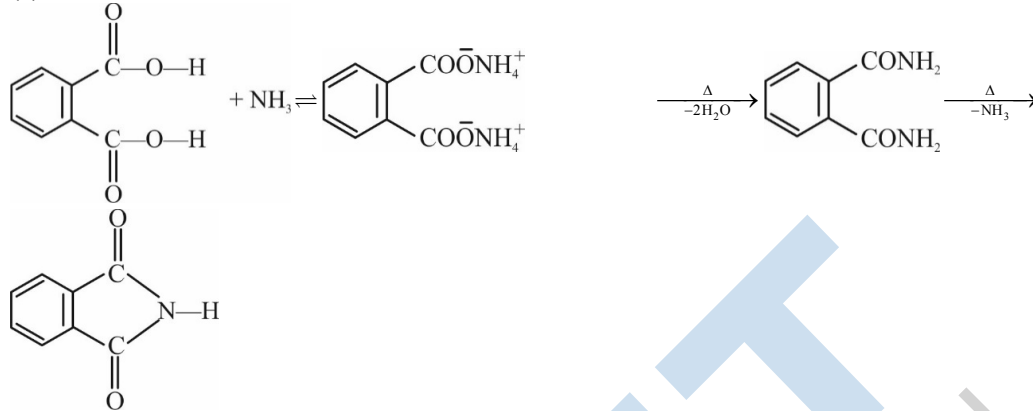
Br_3O_8



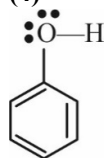
9. (1)
 $\text{pH} = 14 - \text{pH} = 14 - 9 = 5 \Rightarrow [\text{OH}^-] = 10^{-5} \text{ mol/l}$
 $\text{Ca}(\text{OH})_2 \rightleftharpoons \text{Ca}^{+2} + 2\text{OH}^-$
 $\frac{1}{2} \times 10^{-5} \quad 10^{-5}$
 $K_{\text{sp}} = [\text{Ca}^{+2}][\text{OH}^-]^2 = \frac{1}{2} \times 10^{-5} (10^{-5})^2 = 0.5 \times 10^{-15}$
10. (1)
 Combined effect of inductive effect, hydrogen bonding and steric hindrance decide the basic strength of methylamines in aqueous state to be $2^\circ > 1^\circ > 3^\circ$.
11. (3)
 At equilibrium $E_{\text{cell}} = 0$
 So, $\log k = \frac{n \times E_{\text{cell}}^0}{0.059}$; $k = \text{antilog} \left[\frac{n \times E_{\text{cell}}^0}{0.059} \right]$; $k = \text{antilog} \left[\frac{1 \times 0.59}{0.059} \right]$; $k = \text{antilog} [10]$
 $k = 1.0 \times 10^{10}$
12. (4)
 SO_2 is not a green house gas.
13. (1)
 Water + Nitric acid
 Those solutions which show negative deviation from Raoult's Law can form maximum boiling azeotropes.
14. (4)
 Malachite is basic copper carbonate i.e. $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
15. (4)
 Pure $\text{N}_2 \longrightarrow$ Sodium azide or Barium azide by the Brin's method ($\text{Ba}(\text{N}_3)_2 \xrightarrow{\Delta} \text{Ba} + 3\text{N}_2$)
 $\text{N}_2 + 3\text{H}_2 \xrightarrow[\text{Mo, } 500^\circ\text{C}]{\text{Fe}} 2\text{NH}_3$ Haber's process
 $\text{H}_2\text{SO}_4 \longrightarrow$ contact process ($2\text{SO}_2 + \text{O}_2 \xrightarrow[500^\circ\text{C}]{\text{V}_2\text{O}_5} 2\text{SO}_3$ and $\text{SO}_3 + \text{H}_2\text{O} \longrightarrow \text{H}_2\text{SO}_4$)
 Chlorine \longrightarrow Deacon's Process $\left(2\text{HCl} + \frac{1}{2}\text{O}_2 \xrightarrow[500\text{K}]{\text{CuCl}_2} \text{Cl}_2 + \text{H}_2\text{O} \right)$
16. (3)
 Thermal stability decreases down the group due to decreasing bond strength.
17. (4)
 PCl_5 is a reactive molecule as it has a central $\delta+$ phosphorous due to e^- withdrawal of five chlorine atoms.



18. (2)

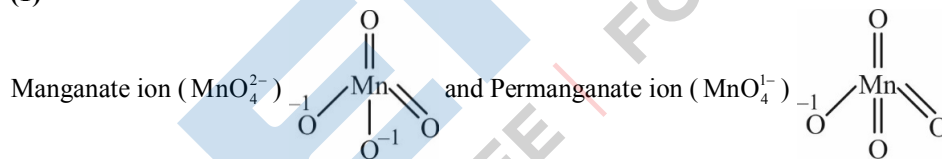


19. (4)



Lone-pair on oxygen is involved in resonance. There is partial positive charge on oxygen. Due to this incoming proton will not be able to bind to the oxygen site.

20. (1)

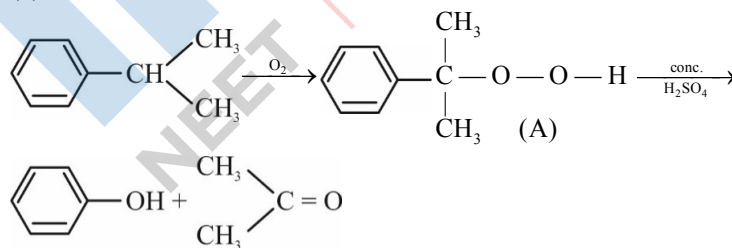


Form $d\pi - p\pi$ bonds.

21. (2)

Partly poisoned Lindlar's catalyst converts Alkyne to cis Alkenes by catalytic hydrogenation.

22. (2)



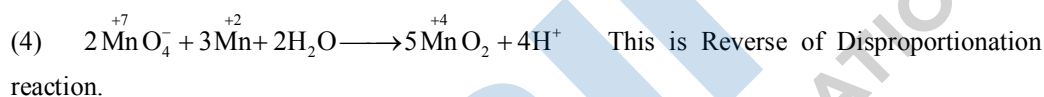
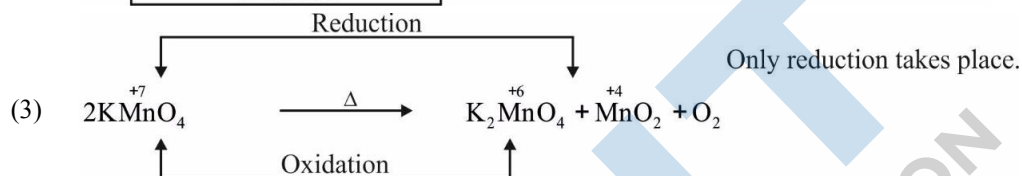
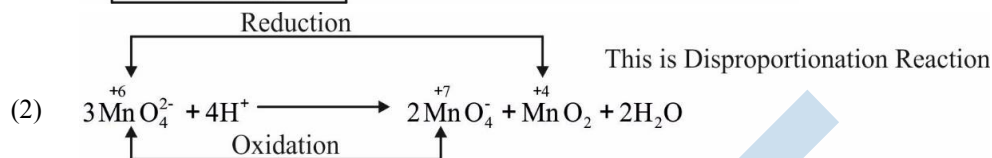
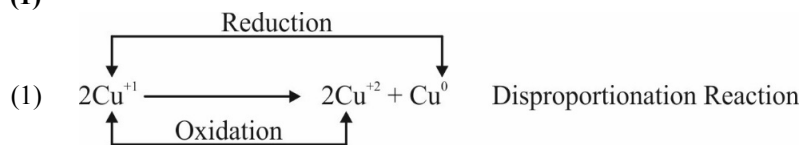
23. (3)

$$t = \frac{2.303}{k} \log \frac{100}{100 - 99}$$

$$t = \frac{2.303}{k} \log 10^2$$

$$t = \frac{4.606}{k}$$

24. (1)



25. (4)



$$\therefore \Delta S < 0$$

26. (2)

Nylon 2-nylon 6 is biodegradable.

27. (3)

Molar volume decreases, means attractive forces between the molecules dominate and $Z < 1$

$$\therefore Z < 1 \text{ (gases are easily liquefiable)}$$

28. (3)

A at HCP means the unit cell will have 6 atoms effectively.

$$\text{C at 75\% octahedral void} = \frac{75}{100} \times 6 = \frac{9}{2}$$

$$\left(\text{C}_9\text{A}_6\right) \times 2 = \text{C}_9\text{A}_{12} = \text{C}_3\text{A}_4$$

29. (2)

All enzymes that utilizes ATP in phosphate transfer require Mg as cofactor.

30. (1)

$$5f > 6p > 5p > 4d$$

As per $(n + l)$ rule,

$$5f = n + l = 5 + 3 = 8$$

$$6p = n + l = 6 + 1 = 7$$

$$5p = n + l = 5 + 1 = 6$$

$$4d = n + l = 4 + 2 = 6$$

31. (1)

$$\Delta_r G^\ominus = -nFE_{\text{cell}}^0$$

$$\Delta_r G^\ominus = \frac{-2 \times 96500 \times 0.24}{1000} \text{ kJ mol}^{-1} = -46.32 \text{ kJ mol}^{-1}$$

32. (3)

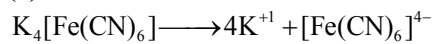
For an ideal solution.

$$\Delta_{\text{mix}} V = 0; \Delta_{\text{mix}} H = 0; \Delta_{\text{mix}} S > 0; \Delta_{\text{mix}} G < 0$$

33. (3)

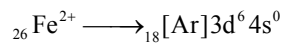
Alanine is the non-essential amino acid out of these.

34. (2)

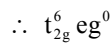


$$x - 6 = -4$$

$$x = +2$$



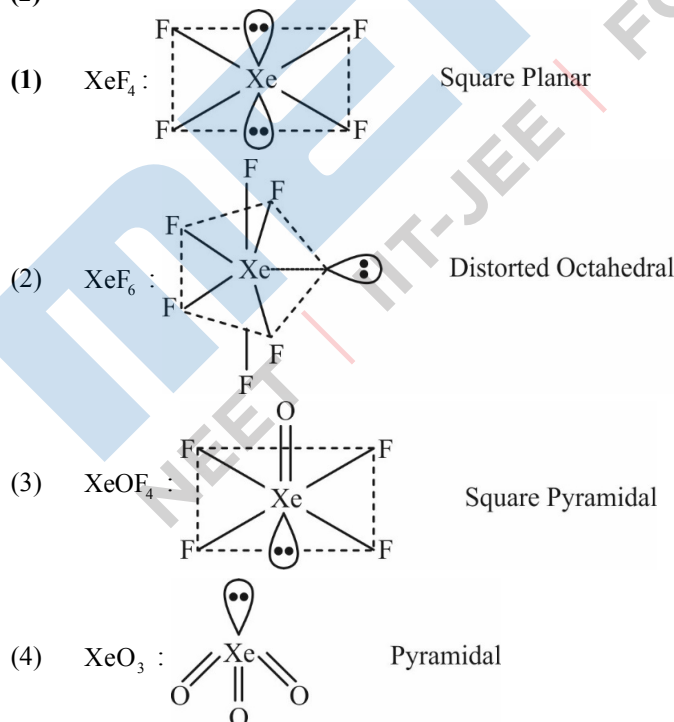
CN^- is a strong field ligand.



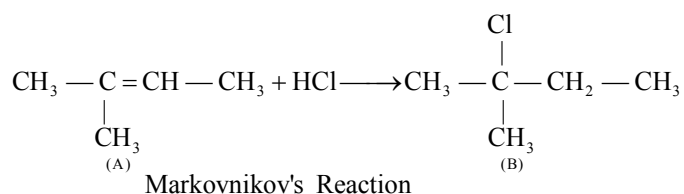
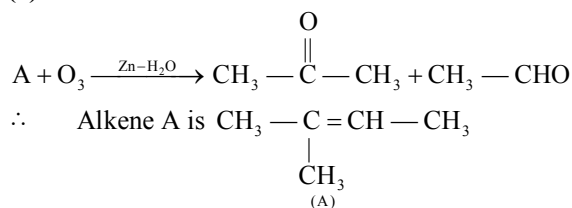
35. (1)

PbF_4 is ionic in nature.

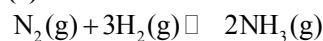
36. (2)



37. (3)



38. (3)



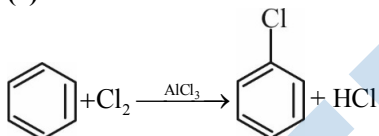
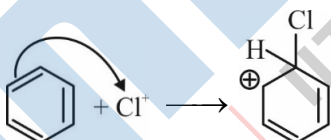
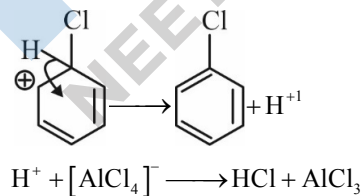
Rate of reaction is given below:

$$-\frac{d[N_2]}{dt} = -\frac{1}{3} \frac{d[H_2]}{dt} = \frac{1}{2} \frac{d[NH_3]}{dt}$$

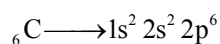
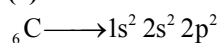
39. (1)

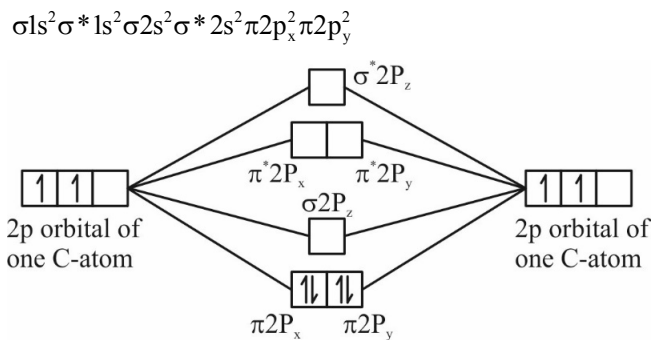
$$W = -P_{\text{ext}}[V_f - V_i] = -2[0.25 - 0.10] = -0.3 \text{ L bar} = -0.3 \times 100 = -30 \text{ J}$$

40. (2)

Step 1 \longrightarrow Generation of electrophile.Step 2 \longrightarrow Attack of ElectrophileStep 3 \longrightarrow Cleavage of C — H bond.

41. (3)





∴ There is any overlapping of P_x and P_y .

42. (4)
 $[\text{SiCl}_6]^{2-}$ it is highly unstable because 6 larger chloride ions can't accommodate around Si^{4+} due to steric constraints.
43. (3)
 meq of $\text{NH}_4\text{OH} = 20$ and meq of $\text{HCl} = 10$. Final solution has 10 meq of NH_4Cl and 10 meq of NH_4OH that makes a basic buffer.
44. (2)
 Balmer series of wavelengths fall in visible region of hydrogen spectrum.
45. (3)
 $\text{N}_2 + 3\text{H}_2 \longrightarrow 2\text{NH}_3$
 2 mol NH_3 need = 3 mol H_2
 20 mol NH_3 will need = 30 mol H_2

Section- II (BIOLOGY)

46. (2)
 $\text{Glucose} + \text{ATP} \xrightarrow[\text{Mg}^{2+}]{\text{Hexokinase}} \text{glucose 6 PO}_4 + \text{ADP} + \text{Pi}$ (irreversible reactions are catalyzed by enzymes with suffix Kinase)
47. (4)
 Leaves receive light and synthesise a hormonal substance florigen which migrates from leaves to shoot apices to induce flowering only after necessary inductive photoperiod.
48. (1)
 Golden rice is enriched with vit A and lysine, a gene taken from daffodil.
49. (4)
 Causative agent of typhoid fever is *Salmonella typhi*. Typhoid fever is confirmed by widal test.
50. (4)
 Colostrum, the yellowish fluid secreted by mother during initial days of lactation imparts natural passive immunity to the new born infant as it contains IgA.
51. (1)
 In pineapple, flowers are stimulated by spraying auxin and ethylene.
52. (2)
 DNA precipitation out of mixture of biomolecules can be achieved by chilled ethanol
53. (3)

- Protoxin to Bt. active toxin of *Bacillus thuringiensis* takes place in alkaline PH of gut
54. (3)
Alfred Sturtevant has worked on gene mapping the distance b/w genes of same chromosome
55. (1)
It is proved by Amazon rain forest where animals and plants were destroyed due to cultivation of soybean and grass land for raising beef cattle.
56. (2)
Goblet cells in the gastro-intestinal tract secrete mucus which covers the mucosal surface and protects it from action of various enzymes.
57. (1)
(a) P-wave – (iv) Depolarisation of atria
(b) QRS complex – (i) Depolarisation of ventricles
(c) T-wave – (ii) Repolarisation of ventricles
(d) Reduction in the size of T-wave – (iii) Coronary ischemia.
58. (3)
(a) Crypts of Leiberkuhn – (iii) Small intestine
(b) Glisson's capsule – (iv) Liver
(c) Islets of Langerhans – (i) Pancreas
(d) Brunner's glands – (ii) Duodenum
59. (1)
The cells that do not divide further exit G1 phase to enter an inactive stage called quiescent stage (G0) of the cell cycle.
60. (2)
Earth summit held in Reo de Janeiro in 1992 was called for conservation of biodiversity and sustainable utilization of its benefits.
61. (4)
GLUT – IV is insulin – dependent glucose transporter found primarily in adipose tissues and striated muscles and enables glucose transport into cells.
62. (4)
Annual rings are prominent in trees of temperate region where there is seasonal variation
63. (3)
(a) Insulin – (v) Diabetes mellitus
(b) Thyroxine –(iv) Goitre
(c) Corticoids – (i) Addison's disease
(d) Growth Hormone – (iii) Acromegaly
- Insulin deficiency caused diabetes mellitus.
- Thyroxin is linked with enlargement of gland known as goiter.
- Corticoids deficiency cause Addison's disease.
- Growth hormone hypersecretion cause acromegaly.
64. (4)
The female gamete develops into embryo without fertilization - Parthenogenesis
65. (4)
In sea, biomass of fishes exceeds to that of phytoplanktons
66. (1)
As the sperm enters the secondary oocyte, meiosis II is completed with release of second polar body, the fertilisation occurs.

The entry of sperm into the Ovum induces completion of the meiotic division of the secondary oocyte.

So, extrusion of second polar body from egg nucleus occurs after entry of sperm but before fertilization.

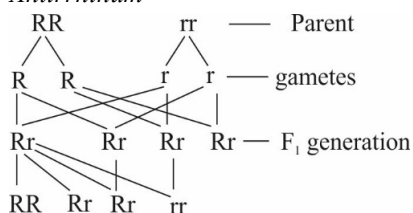
67. (2)

68. (2)

The counter current mechanism between loop of Henle and vasa recta help in maintaining an increasing osmolarity in the inner medullary interstitium which is responsible for the formation of concentrated urine. For formation of concentrated urine the inner medullary interstitium has hypersomolarity i.e., maintained at 1200 mOsmol/L.

69. (4)

Antirrhinum



segregation takes place during formation of F₁ and F₂ gametes.

70. (2)

The hypothalamus contains a number of centres which control **body temperature**, urge for eating and drinking.

71. (3)

Genital Herpes is caused by type II Herpes simplex virus

Except for hepatitis-B, genital herpes and HIV infections, other diseases are completely curable if detected early and treated properly.

72. (2)

Tripalmitin is a lipid, R.Q. = 0.7

73. (2)

1. *Trichoderma* a fungi that controls several plant pathogens
2. *Baculovirus* – attacks insects and other arthropods, used as narrow spectrum insecticide
3. *Bacillus thuringiensis* controls cotton and corn borer.

74. (4)

Embryo sac is formed before fertilization

75. (3)

Concanavalin A is a lectin extracted for jack bean *Canavalia ensiformes*

76. (2)

- Lactobacillus* – Curd
- Saccharomyces* – Bread
- Aspergillus niger* – Citric acid
- Acetobacter aceti* – Acetic acid

77. (2)

With reference to the book Lehninger's Principles of Biochemistry, Pg 184, A coenzyme or metal ion that is very tightly or even covalently bound to the enzyme protein is called a prosthetic group. A complete, catalytically active enzyme together with its bound coenzyme and/or metal

- ions is called a holoenzyme. The protein part of such an enzyme is called the apoenzyme or apoprotein.
- With reference to NCERT, the protein portion of the enzymes is called the apoenzyme. Three kinds of cofactors may be identified: prosthetic groups, co-enzymes and metal ions. Prosthetic groups are organic compounds and are distinguished from other cofactors in that they are tightly bound to the apoenzyme. Co-enzymes are also organic compounds but their association with the apoenzyme is only transient, usually occurring during the course of catalysis.
78. (4)
The correct sequence of phases of cell cycle is $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$
79. (4)
Thiobacillus denitrificans does denitrification, which loses soil fertility.
80. (3)
Inbreeding selects harmful recessive genes that reduce fertility and productivity.
Inbreeding expose harmful recessive genes that are eliminated by selection. It also helps in accumulation of superior genes and elimination of less desirable genes. Close and continued inbreeding usually reduces fertility and even productivity.
81. (3)
Centimorgan is a map unit used to express the distance between two gene loci on a chromosome. 1 cM indicates one percent chance that two genes will be separated by crossing over.
82. (3)
Insitu conservation strategy is conservation of biodiversity in its natural habitat.
Eg: Biosphere reserves, wildlife sanctuary, sacred groves.
Botanical garden is exsitu conservation strategy to conserve plants outside their natural habitat.
83. (3)
Axile placentation – Placenta is axial and the ovules are attached to it in a multilocular ovary.
Parietal placentation – Ovules develop on the inner wall of the ovary or on peripheral part.
Basal placentation – Placenta develops at the base of ovary and a single ovule is attached to it.
Free central placentation – Ovules are borne on central axis and septa are absent.
84. (2)
All these symptoms are matching with the disorder Asthma, which occurs due to inflammation of bronchi and bronchioles.
85. (1)
Cornea is an external, transparent and protective proteinaceous covering of the eye-ball.
86. (2)
Purines – Adenine (A)
 – Guanine (G)
Pyrimidine – Cytosine, Thymine, Uracil
 (C) (T) (U)
DNA → AGTC
RNA → AUGC
So common purines are Adenine, Guanine
87. (1)
ESTs (Expressed sequence tag are short subsequence of a c-DNA. It is used to identify gene transcripts. They are expressed as mRNA for protein synthesis.
88. (4)

Gymnosperms	Angiosperms
Sieve cells, albuminous cells	Sieve tubes, companion cells

89. (2)
 Klinefelter's syndrome → 44A + XXY
 → Gynaecomastia
 → Masculine development
 → sterile
 Turner Syndrome → AA + XO
 → Females sterile
 → Rudimentary ovaries
 → Lack secondary sexual characters.
90. (2)
 Bulliform cells are large, bubble shaped epidermal cells that occur in upper surface of monocots (grasses). They help in rolling/curling of leaves to prevent water loss. They become flaccid due to water loss.
91. (1)
92. (4)
 5' AAC AGC GGU GCU AUU 3'
 ↓
 deletion
 5' AAC AGC GCU AUU 3'
 (No change in reading frame of m RNA)
 Due to triplet nature of gene expression by codons, addition or deletion of three bases doesnot change the reading frame.
93. (4)
 Vertebrosteral ribs are true ribs, dorsally attached to thoracic vertebrae and ventrally to sternum. These are first 7 pairs. There are 3 pairs (8th, 9th and 10th pair) of vertebrochondral ribs which do not articulate directly with sternum but join the 7th ribs with the help of hyaline cartilage. These ribs are known as false ribs.
 These are 2 pairs (11th and 12th pair) of Vertebral ribs are not connected ventrally and are known as floating ribs.
94. (2)
 The "p" comes from the French "petit" meaning small. Chromosomes have 2 arms - the p (short) arm and the q (long) arm - that are separated from each other only by a primary constriction, the centromere, the point at which the chromosome is attached to the spindle during cell division.
95. (4)
 Xylem translocates water, mineral salts, some nitrogen and some hormones.
96. (2)
 Persistent nucellus – Perisperm
 Chalaza – Represent basal part of ovule
 Hilum – In this region, body of the ovule fuses with funicle.
 Tegmen – Delicate inner protective layer of a seed.
97. (4)
Mycorrhiza – Symbiotic association of fungi with roots of higher plants.
Parasite – Organisms that lives on or in a host organism (plants and animals)

Lichens – Mutual symbiotic association of algae and fungi.

Saprophyte – Organism that lives on dead/decaying organic matter

98. (1)
Trichoderma is a free living fungus that is very common in root ecosystem and effective against many plant pathogens.
99. (3)
Cardiac output = stroke volume \times heart rate
Stroke volume = blood volume in ventricles at the end of diastole – blood volume in ventricles at the end of systole = 100 – 50 = 50 ml
Therefore, 5000 ml = 50 ml \times heart rate
heartrate = $\frac{5000\text{ml}}{50\text{ml}}$ = 100 beats/minute
100. (1) Recognising the deleterious affects of ozone depletion, an international treaty, known as the Montreal Protocol, was signed at Montreal (Canada) in 1987 (effective in 1989) to control the emission of ozone depleting substances i.e. for reducing the emission of CFCs and other ozone depleting chemicals.
101. (3)
Polyblend, a fine powder of recycled modified plastic, which is mixed with the bitumen that is used to lay roads.
102. (1)
In lactational ammenorrhea, due to high prolactin level, gonadotropin level decreases. Oral pills are either progesterone or progesterone – estrogen combination. Emergency contraceptives also include progesterone or progesterone – estrogen combination.
103. (2)
Heroin is synthesized by acetylation of morphine. It is also known as Diacetyl morphine.
104. (4)
CH₄ (Methane), CO₂, N₂O, CFCs - greenhouse gases.
- Contribution**
- | | |
|--------------------|-----|
| • CO ₂ | 60% |
| • CH ₄ | 20% |
| • CFCs | 14% |
| • N ₂ O | 6% |
- So major greenhouse gases are CO₂ and CH₄.
105. (2)
Muscular dystrophy – Autosomal dominant disorder in which there is progressive degeneration of skeletal muscles.
106. (4)
To produce in large quantities, the development of bioreactors, where large volumes (100-1000 litres) of culture can be processed, was required. Thus, bioreactors can be thought of as vessels in which raw materials are biologically converted into specific products, individual enzymes, etc., using microbial plant, animal or human cells.
107. (1)
Rudolf Virchow (1855) first explained that cells divided and new cells are formed from pre-existing cells (*Omnis cellula-e cellula*).
108. (4)

- When 2 male gametes enter the female gametophyte (embryo-sac)
One fuses with egg cell to form zygote and other fuses with secondary nucleus to form primary endosperm nucleus.
109. (2)
Steroid hormones directly enter into the cell and bind with intracellular receptors in nucleus to form hormone receptor complex. These hormones can also bind to DNA and form a gene hormone complex.
110. (3)
There are 3 organelles in the cells which contain DNA namely, Mitochondria, Chloroplast and Nucleus.
So, the pair lysosomes and vacuoles both do not contain, DNA.
111. (3)
(A) Frequency of dominant allele: $f(p) = 0.4$ (As, $p + q = 1$)
(a) Frequency of recessive allele: $f(q) = 0.6$
 $As, p^2 + 2pq + q^2 = 1$
 $AA + 2Aa + aa = 1$
Frequency of homozygous dominant individuals (AA) = $0.4 \times 0.4 = 0.16$
Frequency of heterozygous individuals (2Aa) = $2 \times 0.4 \times 0.6 = 0.48$
Frequency of recessive individuals. (aa) = $0.6 \times 0.6 = 0.36$
112. (2)
- *Pila* is mollusc having feeding organ known as radula.
- *Bombyx* is an Arthropod so excretion occurs through Malpighian tubules.
- *Pleurobrachia* is a Ctenophore, so has comb plates.
- *Taenia* is a platyhelminth, so has flame cells for osmoregulation and excretion.
113. (2)
Cyclosporin A – Used as an immunosuppressive agent in organ transplant patients.
Streptokinase – Clot buster for removing clots from blood vessels of patients
Statins are blood cholesterol lowering agents. Statins acts by competitively inhibiting the enzyme responsible for synthesis of cholesterol. It is obtained from a fungus called *Monascus purpureus*.
114. (2)
According to Hugo De Vries, Variations caused by mutations are random and directionless, while Darwinian variations are small and directional.
115. (3)
In domesticated fowls or birds – type of egg determines the sex of the progeny.
116. (4)
Cell mediated immune response is responsible for rejection of kidney graft. As body is able to differentiate between self and non-self and immune response mediated T cell is able to reject the graft.
117. (3)
Retention of female gametophyte with developing young embryo on parent sporophyte for some time is observed in Pteridophytes
118. (1)
The correct sequence of organs in the alimentary canal of cockroach is
Pharynx → Oesophagus → crop → Gizzard → Ileum → Colon → Rectum.

119. (2)
Enzymes of electron transport are embedded in inner membrane.
120. (4)
Lysosomes are membrane bound vesicular structures formed by the process of packaging in the Golgi apparatus.
121. (3)
Genetic code is nearly universal that means it is common for all organisms. (except protozoans and mitochondria)
122. (1)
Expiratory capacity = Tidal volume + Expiratory Reserve volume
= 500 mL + 1000 mL = 1500 mL
123. (3)
(a) *i* gene → repressor (b) *z* gene → β galactosidase
(c) *a* gene → transacetylase (d) *y* gene → Permease
124. (3)
During Hemodialysis, nitrogenous wastes (Urea, creatinine) and Potassium ions are eliminated, so (a) and (b) options are incorrect.
Parathyroid hormone stimulates calcitriol production in the kidney by increasing the synthesis of 1-α hydroxylase. Calcitriol has several important functions in the body. It maintains serum calcium levels by increasing calcium absorption in the gastrointestinal tract. In deficiency of calcitriol, there is reduced absorption of calcium ions from gastrointestinal tract. RBC production is also reduced, due to reduced erythropoietin hormone.
125. (3)
The correct brain size of hominids are:
(a) *Homo habilis* → 650-800 cc
(b) *Homo neanderthalensis* → 1400 cc
(c) *Homo erectus* → 900 cc
(d) *Homo sapiens* → 1350 cc
126. (3)
Progestasert and LNG-20 are hormone releasing IUDs which effect on uterus and cervix.
127. (2)
The correct sequence for transport of sperm cells is → seminiferous tubule → Rete testis → Vasa efferentia → Epididymis → vas deferens → Ejaculatory duct → Urethra → Urethral meatus.
128. (4)
Translocation of sugar is bidirectional from leaves to root and during spring from root to apical parts
129. (3)
Infective constituent in virus is nucleic acid (DNA or RNA).
130. (4)
In Bronchioles and fallopian tubes there is requirement of moving particles or mucus in a specific direction, so these are lined with ciliated epithelial cells.
131. (4)
Yeasts are unicellular fungi belonging to class Ascomycetes. Shape of yeast is spherical, ellipsoid or globose not filamentous hyphae.
132. (4)

The containers of radioactive wastes or nuclear wastes should be buried within rocks deep 500 m below the earth's surface.

134. (2)

Restriction endonuclease recognises specific sequence and binds to DNA and cuts each of the two strands of the double helix at specific points in their sugar – phosphate backbones.

134. (2)

Stabilising selection is the selection which favors mean/average value. The data show stabilising selection as most of the newborn (97%) have an average weight between 3 to 3.3 kg survive and infants with weights from 2 → 2.5 kg or 4.5 to 5 kg die.

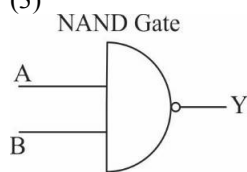
135. (2)

Name of the author appears after specific epithet. In indicates that this species was first described by Linnaeus, full name is not written.

MENIIT
NEET | IIT-JEE | FOUNDATION

Section- III (PHYSICS)

136. (3)



Output of the circuit

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

A	B	Y'	Y
0	0	1	1
0	1	1	1
1	0	1	1
1	1	0	0

137. (2)

For hollow sphere, inside it no charge distribution so electric field inside sphere is zero and outside sphere electric field is given by

$$E = \frac{kQ}{r^2} \Rightarrow E \propto \frac{1}{r^2}$$

138. (3)

From sign convention, Positive sign is chosen if magnetic needle points towards surface of earth.

139. (2)

$$\frac{\beta}{D} = \frac{\lambda}{D}$$

$$0.2^\circ = \frac{\lambda}{D} \quad \dots(i)$$

Now immersed in water

$$\lambda' = \frac{\lambda}{\mu}$$

$$= \frac{3}{4}\lambda$$

$$\therefore d = 1m$$

$$= 0.2^\circ \times \frac{3}{4}$$

$$= 0.2^\circ \times 0.75 = 0.15^\circ$$

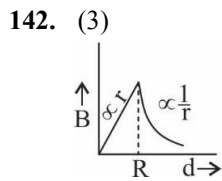
140. (2)

$$P_1 = \frac{E^2}{\left(\frac{2R}{3}\right)}$$

$$P_2 = \frac{E^2}{\left(\frac{3}{2}R\right)}$$

$$\frac{P_1}{P_2} = \frac{\frac{3}{2}}{\frac{2}{3}} = \frac{9}{4}$$

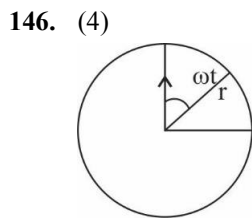
141. (2)
For adiabatic process, heat is neither absorbed nor released



143. (3)
Considering ideal voltmeter and ammeter
 $\therefore V_1 = V_2$
 $i_1 = i_2$

144. (1)
Factual information

145. (2)
 $PV = nRT$
 $P \propto T$
and increase in K.E.



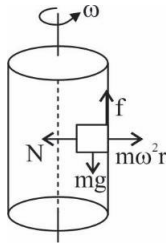
$$y = r \cos \omega t = 3 \cos \left(\frac{2\pi}{4} \right) t$$

$$y = 3 \cos \left(\frac{\pi}{2} \right) t$$

147. (4)
Average velocity in one complete vibration = $\frac{\text{Net displacement}}{\text{Total time}} = 0$

148. (1)
 $\omega_i = \frac{6\pi}{60} = \frac{\pi}{10} \text{ rad/s}$
 $i = \frac{mr^2}{2} = 2 \times \frac{\left(\frac{4}{100} \right)^2}{2}$
 $= 16 \times 10^{-4} \text{ kg.m}^2$
And $0 = \omega_i^2 - 2\alpha\theta$
 $\alpha = \frac{\omega_i^2}{2\theta} = \frac{\pi^2 / 100}{2.4\pi^2} = \frac{100}{800} \text{ rad/s}$
 $\tau = I\alpha = 16 \times 10^{-4} \times \frac{100}{800}$
 $= 2 \times 10^{-6} \text{ N.m}$

149. (3)



$$m = 10 \text{ kg}$$

$$\mu = 0.1$$

$$r = 1 \text{ m}$$

$$f = mg$$

$$\mu N = mg$$

$$\mu m \omega^2 r = mg$$

$$\omega = \sqrt{\frac{g}{\mu r}} = \sqrt{\frac{10}{0.1 \times 1}} = 10 \text{ rad/s}$$

150. (1)

$$V_{BR} = 20 \text{ m/s}$$



$$V_R = 10 \text{ m/s}$$

$$\sin \theta = \frac{V_r}{V_{BR}} = \frac{10}{20} = \frac{1}{2}$$

$$\Rightarrow \theta = 30^\circ$$

$\therefore 30^\circ$ west

151. (4)

$$N = 800$$

$$A = 0.05 \text{ m}^2$$

$$B = 5 \times 10^{-5} \text{ T}$$

$$\phi_{\max} = NBA$$

$$= 800 \times 0.05 \times 5 \times 10^{-5}$$

$$= 200 \times 10^{-5} \text{ Wb}$$

$$\therefore e = \frac{d\phi}{dt} = \frac{200 \times 10^{-5}}{0.1}$$

$$= 0.02 \text{ v}$$

152. (2)

$$\% \text{ error in } x = \left(\pm \frac{\Delta A}{A} \times 100 \right) + \frac{1}{2} \left(\pm \frac{\Delta B}{B} \times 100 \right) + \frac{1}{3} \left(\pm \frac{\Delta C}{C} \times 100 \right) + 3 \left(\pm \frac{\Delta D}{D} \times 100 \right)$$

$$\Rightarrow 2 \times 1 + \frac{1}{2}(2) + \frac{1}{3}(3) + 3 \times 4$$

$$\Rightarrow 2 + 1 + 1 + 1 + 12 = 16\%$$

153. (2)

$$\text{Given: } y = A_0 + A \sin \omega t + B \cos \omega t$$

$$(y - A_0) = A \sin \omega t + B \cos \omega t$$

So resultant Amplitude

$$\Rightarrow \sqrt{A^2 + B^2 + 2AB \cos \frac{\pi}{2}} \left(\because \Delta\phi = \frac{\pi}{2} \right)$$

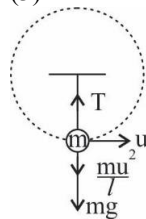
$$\Rightarrow \sqrt{A^2 + B^2}$$

154. (2)

$$\lambda = \frac{\sqrt{150}}{\sqrt{v}}$$

$$= \frac{12.27}{\sqrt{10000}} = 12.2 \times 10^{-12} \text{ m}$$

155. (3)



At lowest point

$$T_{\max} = \frac{mu^2}{l} + mg$$

156. (4)

$$T_A = T_B$$

$$\therefore \omega_A = \omega_B = 1:1$$

157. (4)

Cu rod 88 cm

Al Rod l

$$\alpha_1(88) = \alpha_2(l)$$

$$(1.7 \times 10^{-5})(88) = (2.2 \times 10^{-5})l$$

$$l = \frac{1.7(88)}{(2.2)} = 68 \text{ cm}$$

158. (1)

$$r = \frac{mv}{qB}$$

$$r \propto \frac{1}{q}$$

$$\therefore r_H = \frac{k}{e} \left(k \text{ is } \frac{mv}{B} \right)$$

$$r_\infty = \frac{k}{2e}$$

$$\therefore \frac{r_H}{r_\infty} = \frac{2e}{e} = 2:1$$

159. (3)

$$kl = mg \text{ and } U = \frac{1}{2} kx^2$$

$$U = \frac{1}{2} \left(\frac{mg}{l} \right) l^2$$

$$U = \frac{mgl^2}{2l} = \frac{mgl}{2}$$

160. (2) Factual information

161. (3)

$$\Delta = \frac{mgh}{1 + \frac{h}{R}} = \frac{mgR}{2} \quad (\because h = R)$$

162. (4)

$$\angle i = \angle C \text{ so } \angle r = 90^\circ$$

163. (2)

$$\begin{array}{c} +Q \quad \quad \quad -Q \\ \hline d \end{array}$$

$$F = \frac{kQ^2}{d^2}$$

$$\text{And } \frac{3}{4}Q \quad \quad \quad \frac{-3}{4}Q$$

$$F' = \frac{k \cdot \left(\frac{9}{16} Q^2 \right)}{d^2} = \frac{9}{16} F$$

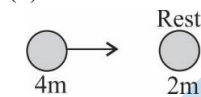
164. (1)

$$\alpha \text{ particle} \equiv {}_2\text{He}^4$$

$$\text{No. of protons} = 2$$

$$\text{No. of neutrons} = 4 - 2 = 2$$

165. (2)



$$E_i = \frac{1}{2}(4m)u^2 = 2mu^2$$

$$p_i = p_f$$

$$4mu = 4mv_1 + 2mv_2$$

$$e = \frac{v_2 - v_1}{u_1 - u_2} = 1$$

$$\Rightarrow v_2 - v_1 = u$$

$$\Rightarrow v_2 = u + v_1$$

$$\therefore 4mu = 4mv_1 = 2mu + 2mv_1$$

$$\Rightarrow 2mu = 6mv_1$$

$$\Rightarrow v_1 = \frac{1}{3}u$$

$$\therefore E_f = \frac{1}{2} \times 4m \times \frac{u^2}{9}$$

$$= \frac{2mu^2}{9}$$

$$\begin{aligned} \therefore \text{Energy lost} &= \frac{E_i - E_f}{E_i} = \frac{2mu^2 - \frac{2}{9}mu^2}{2mu^2} \\ &= \frac{8}{9} \end{aligned}$$

166. (4)

As we know

$$g_d = g \left(1 - \frac{d}{R} \right)$$

Given: For half depth $d = \frac{R}{2}$

$$g_d = g \left(1 - \frac{R}{2R} \right)$$

$$g_d = \frac{g}{2}$$

Weight = mg_d

$$\Rightarrow \frac{mg}{2}$$

So final weight at half depth = $\frac{200}{2}$

$$= 100 \text{ N}$$

167. (3)

Rainbow is formed on the opposite side of sun's position

168. (3)

$$w = \int F_y \cdot dy$$

$$w = \int_0^1 (20 + 10y) dy$$

$$w = 20[y]_0^1 + \frac{10}{2}[y^2]_0^1$$

$$\Rightarrow 20(1 - 0) + 5(1 - 0)$$

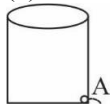
$$\Rightarrow 20 + 5 = 25 \text{ Joule}$$

169. (1)

$$K_i = \frac{1}{2}mv^2 \left(1 + \frac{K^2}{R^2} \right) = \frac{1}{2}(100)(0.2)^2 \left(1 + \frac{1}{2} \right)$$

$$K_i = \frac{3}{4}(100) \left(\frac{4}{100} \right) = 3 \text{ J}$$

170. (1)

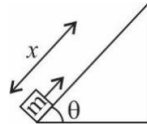


Speed of efflux = $v = \sqrt{2gh}$

Volume flow rate = $A \times v$

$$= 2 \times (10^{-3})^2 \times \sqrt{2 \times 10 \times 2} = 12.6 \times 10^{-6} \text{ m}^3/\text{sec}$$

171. (3)



$$a = g \sin \theta$$

$$0 = u^2 - 2g \sin \theta \times X$$

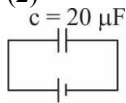
$$x = \frac{u^2}{2g \sin \theta}$$

$$x \propto \frac{1}{\sin \theta}$$

$$\frac{x_1}{x_2} = \frac{\sin \theta_2}{\sin \theta_1} = \frac{\sin 30^\circ}{\sin 60^\circ}$$

$$\frac{x_1}{x_2} = \frac{1}{\sqrt{3}}$$

172. (2)



$$\frac{dV}{dt} = 3v/s$$

$$q = CV$$

$$\frac{dq}{dt} = C \frac{dv}{dt}$$

$$= (20\mu F) \cdot (3)$$

$$= 60\mu A$$

$$i_C = i_D = 60\mu A$$

173. (4)

$$\text{As we know } \frac{dH}{dt} = \frac{KA(T_2 - T_1)}{l}$$

$$K = \frac{\frac{dH}{dt} \times \Delta l}{A \times \Delta T} \Rightarrow \frac{\text{Watt}}{m \times K}$$

$$K = \text{watt } m^{-1} k^{-1}$$

174. (4) Factual information

175. (3)

$$r = 1 \text{ mm}$$

$$T = 2.5 \times 10^{-2}$$

$$Z_0 \rho g = \frac{4T}{r} \text{ (Bubble is in air)}$$

$$Z_0 = \frac{4T}{r \rho g} = \frac{4(2.5 \times 10^{-2})}{(10^{-3})(10^3)(10)}$$

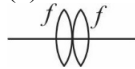
$$Z_0 = \frac{10}{10} \times 10^{-2} = \frac{1}{100} m = 1 \text{ cm}$$

176. (3)

$$\text{T.E.} = U/2 = -\text{K.E.} = -3.4$$

$$\text{K.E.} = 3.4 \text{ eV and } U = -6.8 \text{ eV}$$

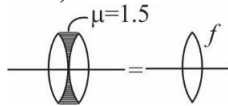
177. (2)



$$\therefore f_{eq} = \frac{f}{2}$$

$$\therefore F_1 = \frac{f}{2}$$

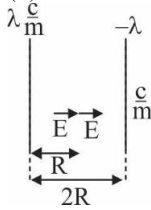
Now,



$$\therefore F_2 = f$$

$$\therefore F_1 : F_2 = \frac{f/2}{f} = \frac{1}{2}$$

178. (3)

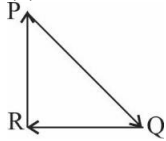


$$E_{net} = 2E = 2 \cdot \frac{\lambda}{2\pi\epsilon_0 R} = \frac{\lambda}{\pi\epsilon_0 R}$$

179. (4)

Electric heater is a device in which eddy current effect is not used

180. (3)



Closed triangle means net force = 0

$$\therefore F_{net} = 0$$

Hence v = constant