



NEET 2020

Answer Key & Solutions

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 Text 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/markings 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 the Booklet is **G5**. 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.

Sri Chaitanya
Educational Institutions
 NEET | IIT-JEE | Olympiad

BIOLOGY

01. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is 6.6×10^9 bp, then the length of the DNA is approximately:

- (1) 2.5 meters
- (2) 2.2 meters
- (3) 2.7 meters
- (4) 2.0 meters

Ans. (2)

Sol. The length of DNA can be calculated by following formula.

Distance between adjacent base pair x total number of base pair in diploid cell.

$$6.6 \times 10^9 \text{ (Bps)} \times 0.34 \times 10^{-9} \text{ (m)} = 2.2 \text{ m}$$

02. Bilaterally symmetrical and acoelomate animals are exemplified by :

- (1) Platyhelminthes
- (2) Aschelminthes
- (3) Annelida
- (4) Ctenophora

Ans. (1)

Sol. Platyhelminthes are bilaterally symmetrical and Acoelomate animals

Aschelminthes - Pseudocoelomate

Annelida - Eucoelomates

Ctenophora - Diploblastic acoelomate animals

03. Match the following columns and select the correct option.

Column I	Column II
(a) Gregarious, polyphagous pest	(i) <i>Asterias</i>
(b) Adult with radial symmetry and larva with bilateral symmetry	(ii) Scorpion
(c) Book lungs	(iii) <i>Ctenoplana</i>
(d) Bioluminescence	(iv) <i>Locusta</i>

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

Ans. (1)

Sol. Adult with radial symmetry and larva with bilateral symmetry - Echinodermata (*Asterias*)

Book lungs arthropoda respiratory structures - Scorpion
Bioluminescence - shown by Ctenophora example is *Ctenoplana*

04. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?

- (1) Peroxisomes
- (2) Golgi bodies
- (3) Polysomes
- (4) Endoplasmic reticulum

Ans. (2)

Sol. Glycoproteins and glycolipids are synthesized by Golgi apparatus.

05. The QRS complex in a standard ECG represents :

- (1) Depolarisation of auricles
- (2) Depolarisation of ventricles
- (3) Repolarisation of ventricles
- (4) Repolarisation of auricles

Ans. (2)

Sol. One QRS complex in a standard ECG represents depolarisation of ventricles. By counting the number of QRS complex we can calculate the heart rate

06. Match the following columns and select the correct option.

Column I	Column II
(a) Floating ribs	(i) Located between second and seventh ribs
(b) Acromion	(ii) Head of the Humerus
(c) Scapula	(iii) Clavicle
(d) Glenoid cavity	(iv) Do not connect with the sternum

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

Ans. (3)

Sol. Floating ribs (11 and 12 pairs) - Do not connect with the sternum.

Acromian process of scapula is connected with clavicle

Scapula - located between second and seventh ribs

Glenoid cavity - Head of the humerus attached with glenoid cavity of scapula

07. Experimental verification of the chromosomal theory of inheritance was done by :

- (A) Sutton
- (B) Boveri
- (C) Morgan
- (D) Mendel

Ans. (3)

Sol. Chromosomal theory was proposed by Sutton and Boveri but its experimental verification was done by T.H. Morgan.

08. Identify the **incorrect** statement.

- (1) Sapwood is involved in conduction of water and minerals from root to leaf.
- (2) Sapwood is the innermost secondary xylem and is lighter in colour.
- (3) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.
- (4) Heart wood does not conduct water but gives mechanical support

Ans. (2)

Sol. Sap wood is peripheral wood while heartwood is the innermost wood only sap wood is involved in conduction of water and minerals.

09. Match the following columns and select the **correct** option.

Column I	Column II
(a) Pituitary gland	(i) Grave's disease
(b) Thyroid gland	(ii) Diabetes mellitus
(c) Adrenal gland	(iii) Diabetes insipidus
(d) Pancreas	(iv) Addison's disease

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

Ans. (2)

Sol. Pituitary gland - diabetes insipidus is due to hyposecretion of ADH

Thyroid gland - Grave's disease is due to hyperthyroidism of thyroid

Adrenal gland - Addison's disease due to hyposecretion of adrenal cortex

Pancreas - Hyposecretion of Insulin leads to diabetes mellitus

10. Match the organism with its use in biotechnology.

- | | |
|--------------------------------------|--|
| (a) <i>Bacillus thuringiensis</i> | (i) Cloning vector |
| (b) <i>Thermus aquaticus</i> | (ii) Construction of first rDNA molecule |
| (c) <i>Agrobacterium tumefaciens</i> | (iii) DNA polymerase |
| (d) <i>Salmonella typhimurium</i> | (iv) Cry proteins |

Select the correct option from the following:

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

Ans. (1)

Sol. *Bacillus thuriengenesis* has a cry gene that codes for a toxic protein called Cry protein.

Thermus aquaticus is found in hot water spring. It has thermostable DNA polymerase named Taq polymerase, *Agrobacterium tumefaciens* has a ti plasmid that is modified to use as cloning vector. The construction of the first recombinant DNA emerged from the linking of a gene encoding antibiotic resistance with a native plasmid of *Salmonella typhimurium*.

11. Identify the substances having glycosidic bond and peptide bond, respectively in their structure :

- (1) Glycerol, trypsin
- (2) Cellulose, lecithin
- (3) Inulin, insulin
- (4) Chitin, cholesterol

Ans. (3)

Sol. Inulin is sugar polymer so it has glycosidic bond while insulin consists of polypeptides. So it has peptide bonds.

12. Name the enzyme that facilitates opening of DNA helix during transcription.

- (1) DNA helicase
- (2) DNA polymerase
- (3) RNA polymerase
- (4) DNA ligase

Ans. (3)

Sol. DNA dependent RNA polymerase somehow also facilitates opening of helix and continues elongation.

13. If the head of cockroach is removed, it may live for few days because :

- (1) the cockroach does not have nervous system.
- (2) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.
- (3) the head holds a $1/3^{\text{rd}}$ of a nervous system while the rest is situated along the dorsal part of its body.
- (4) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.

Ans. (2)

Sol. In Cockroach only a part of nervous system is present in the head region. Remaining is present in the thorax and abdomen. So, if the head is removed, it may live for few days

14. Select the **correct** events that occur during inspiration.

- (a) Contraction of diaphragm
 - (b) Contraction of external inter-costal muscles
 - (c) Pulmonary volume decreases
 - (d) Intra pulmonary pressure increases
- (1) (c) and (d)
 - (2) (a), (b) and (d)
 - (3) only (d)
 - (4) (a) and (b)

Ans. (4)

Sol. During inspiration contraction in the diaphragm and external intercostal muscles increasing the volume of pulmonary cavity. So, intra pulmonary pressure decreases.

15. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?

- (1) Mutational breeding
- (2) Cross breeding
- (3) Inbreeding
- (4) Out crossing

Ans. (2)

Sol. Hisardale is a breed of sheep formed by cross breeding between bikaneri ewes and marino rams.

16. Which one of the following is the most abundant protein in the animals ?

- (1) Collagen
- (2) Lectin
- (3) Insulin
- (4) Haemoglobin

Ans. (1)

Sol. Collagen is the most abundant protein in animals.

17. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits ?

- (1) 2
- (2) 14
- (3) 8
- (4) 4

Ans. (2)

Sol. Mendel selected 7 characters. For each character he selected 2 contrasting varieties. So total true breeding varieties selected by him were 14.

18. The body of the ovule is fused within the funicle at :

- (1) Micropyle
- (2) Nucellus
- (3) Chalaza
- (4) Hilum

Ans. (4)

Sol. The part of the ovule that fuses with funicle is hilum, that is seen in mature seed as a scar.

19. Which of the following is **correct** about viroids ?

- (1) They have free RNA without protein coat.
- (2) They have DNA with protein coat.
- (3) They have free DNA without protein coat.
- (4) They have RNA with protein coat.

Ans. (1)

Sol. Viroids are naked (without protein) circular, single stranded, infectious RNA of low molecular weight.

20. The number of substrate level phosphorylations in one turn of citric acid cycle is :

- (1) One
- (2) Two
- (3) Three
- (4) Zero

Ans. (1)

Sol. There is only one substrate level phosphorylation in one turn of citric acid cycle during conversion of succinyl CoA to succinic acid.

21. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :

- (1) Nitrate alone
- (2) Ammonia and oxygen
- (3) Ammonia and hydrogen
- (4) Ammonia alone

Ans. (3)

Sol.
$$\text{N}_2 + 8\text{e}^- + 8\text{H}^+ + 16\text{ATP} \xrightarrow{\text{Nitrogenase}} 2\text{NH}_3 + \text{H}_2 + 16\text{ADP} + 16\text{Pi}$$

22. Match the following diseases with the causative organism and select the **correct** option.

Column I	Column II
(a) Typhoid	(i) <i>Wuchereria</i>
(b) Pneumonia	(ii) <i>Plasmodium</i>
(c) Filariasis	(iii) <i>Salmonella</i>
(d) Malaria	(iv) <i>Haemophilus</i>

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

Ans. (1)

Sol. Typhoid caused by salmonella typhi.

Pneumonia - Haemophilus influenzae

Filariasis - Wuchereria bancrofti

Malaria - Plasmodium (Various species)

23. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :

- (1) CH_3 , H_2 , NH_4 and water vapor at 800°C
- (2) CH_4 , H_2 , NH_3 and water vapor at 600°C
- (3) CH_3 , H_2 , NH_3 and water vapor at 600°C
- (4) CH_4 , H_2 , NH_3 and water vapor at 800°C

Ans. (4)

Sol. Mixture of gases used H_2 - NH_3 - CH_4 and water vapour then electric discharge at 800°C

24. Which of the following statements is **correct** ?

- (1) Adenine pairs with thymine through one H-bond.
- (2) Adenine pairs with thymine through three H-bonds.
- (3) Adenine does not pair with thymine.
- (4) Adenine pairs with thymine through two H-bonds.

Ans. (4)

Sol. In a ds DNA adenine pair with thymine through 2H bonds while cytosine pairs with guanine through 3H bonds.

25. Match the following with respect to meiosis :

Column I	Column II
(a) Zygotene	(i) Terminalization
(b) Pachytene	(ii) Chiasmata
(c) Diplotene	(iii) Crossing over
(d) Diakinesis	(iv) Synapsis

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

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

Ans. (1)

Sol. In zygotene there is synapsis of homologous chromosomes; during pachytene crossing over takes place; during diplotene chiasmata become visible and during diakinesis there is terminalisation of homologous chromosomes.

26. Choose the **correct** pair from the following :

- | | |
|------------------|--|
| (1) Polymerases | - Break the DNA into fragments |
| (2) Nucleases | - Separate the two strands of DNA |
| (3) Exonucleases | - Make cuts at specific positions within DNA |
| (4) Ligases | - Join the two DNA molecules |

Ans. (4)

Sol. Polymerases catalyses synthesis of DNA/RNA. Nucleases digest nucleic acid. Exonuclease removes nucleotides from end of DNA and ligases join two DNA molecules.

27. Select the option including all sexually transmitted diseases.

- (1) Gonorrhoea, Malaria, Genital herpes
- (2) AIDS, Malaria, Filaria
- (3) Cancer, AIDS, Syphilis
- (4) Gonorrhoea, Syphilis, Genital herpes

Ans. (4)

Sol. Malaria is caused by *Plasmodium*
Filaria is caused by *Wuchereria* (Nematode)
Cancer is non-communicable disease

28. Embryological support for evolution was disapproved by :

- (1) Alfred Wallace
- (2) Charles Darwin
- (3) Oparin
- (4) Karl Ernst von Baer

Ans. (4)

Sol. Von Baer noted that embryos never pass through adult stages of ancestors.

29. The roots that originate from the base of the stem are:

- (1) Primary roots
- (2) Prop roots
- (3) Lateral roots
- (4) Fibrous roots

Ans. (4)

Sol. In plants like wheat the roots that originate from base of stem constitute the fibrous root system.

30. In gel electrophoresis, separated DNA fragments can be visualized with the help of :

- (1) Ethidium bromide in UV radiation
- (2) Acetocarmine in UV radiation
- (3) Ethidium bromide in infrared radiation
- (4) Acetocarmine in bright blue light

Ans. (1)

Sol. In gel electrophoresis, separated DNA fragments can be visualized under UV radiations after staining with ethidium bromide. These appear as bright orange bands.

31. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle?

- (1) High concentration of Progesterone
- (2) Low concentration of LH
- (3) Low concentration of FSH
- (4) High concentration of Estrogen

Ans. (4)

Sol. High concentration of estrogen causes LH surge, which induces ovulation

32. Goblet cells of alimentary canal are modified from :

- (1) Columnar epithelial cells
- (2) Chondrocytes
- (3) Compound epithelial cells
- (4) Squamous epithelial cells

Ans. (1)

Sol. Goblet cells are unicellular glands. They are modified columnar epithelial cells.

33. Snow-blindness in Antarctic region is due to :

- (1) Inflammation of cornea due to high dose of UV-B radiation
- (2) High reflection of light from snow
- (3) Damage to retina caused by infra-red rays
- (4) Freezing of fluids in the eye by low temperature

Ans. (1)

Sol. Snow blindness means inflammation of cornea due to high dose of UV-B Radiation.

34. Match the following concerning essential elements and their functions in plants :

- | | |
|---------------|---|
| (a) Iron | (i) Photolysis of water |
| (b) Zinc | (ii) Pollen germination |
| (c) Boron | (iii) Required for chlorophyll biosynthesis |
| (d) Manganese | (iv) IAA biosynthesis |

Select the **correct** option :

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

Ans. (2)

Sol. Iron is required for chlorophyll biosynthesis, Zn is required for IAA (auxin) biosynthesis, Boron helps in pollen germination and Mn is essential for photolysis of water.

35. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to :
- (1) Fungal diseases
 - (2) Plant nematodes
 - (3) Insect predators
 - (4) Insect pests
- Ans. (4)**
- Sol.** Bt cotton is a transgenic cotton plant that contains gene for synthesis of a crystal protein that is toxic to insects.
36. Ray florets have :
- (1) Superior ovary
 - (2) Hypogynous ovary
 - (3) Half inferior ovary
 - (4) Inferior ovary
- Ans. (4)**
- Sol.** Inferior ovary is found in flowers of guava, cucumber and ray florets of sunflower.
37. Montreal protocol was signed in 1987 for control of :
- (1) Emission of ozone depleting substances
 - (2) Release of Green House gases
 - (3) Disposal of e-wastes
 - (4) Transport of Genetically modified organisms from one country to another
- Ans. (1)**
- Sol.** Montreal protocol - 1987 related to control emission of ozone depleting substances
 Kyoto protocol - related to green house gases.
38. Identify the **wrong** statement with regard to Restriction Enzymes.
- (1) They cut the strand of DNA at palindromic sites.
 - (2) They are useful in genetic engineering.
 - (3) Sticky ends can be joined by using DNA ligases.
 - (4) Each restriction enzyme functions by inspecting the length of a DNA sequence.
- Ans. (3)**
- Sol.** For joining of sticky end DNA ligase is used while RE enzymes cut the DNA at specific locations.
39. The infectious stage of *Plasmodium* that enters the human body is :
- (1) Sporozoites
 - (2) Female gametocytes
 - (3) Male gametocytes
 - (4) Trophozoites
- Ans. (1)**
- Sol.** The infective stage of *Plasmodium* to the humans is sporozoite. Gametocytes are the infective stages to mosquito.
40. Meiotic division of the secondary oocyte is completed:
- (1) At the time of copulation
 - (2) After zygote formation
 - (3) At the time of fusion of a sperm with an ovum
 - (4) Prior to ovulation
- Ans. (3)**
- Sol.** The final maturation division in the secondary oocyte takes place just before the fertilization (at the time of fusion of a sperm with an ovum)
41. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of :
- (1) 1 molecule of 3-C compound
 - (2) 1 molecule of 6-C compound
 - (3) 1 molecule of 4-C compound and 1 molecule of 2-C compound
 - (4) 2 molecules of 3-C compound
- Ans. (1)**
- Sol.** Oxygenation activity of RuBISCO produces one molecule of 3C compound PGA, and one molecule of 2C compound phosphoglycolate.
42. Which of the following statements are **true** for the phylum Chordata?
- (a) In Urochordata notochord extends from head to tail and it is present throughout their life.
 - (b) In Vertebrata notochord is present during the embryonic period only.
 - (c) Central nervous system is dorsal and hollow.
 - (d) Chordata is divided into 3 subphyla: Hemichordata, Tunicata and Cephalochordata.
- (1) (c) and (a)
 - (2) (a) and (b)
 - (3) (b) and (c)
 - (4) (d) and (c)
- Ans. (3)**
- Sol.** In Urochordata, notochord is present only in the larval tail; absent in the adults. In vertebrata, notochord is present during the embryonic period only in adults; it is replaced by a vertebral column.

43. Match the following columns and select the correct option.

Column I		Column II	
(a) <i>Clostridium butylicum</i>	(i) Cyclosporin-A		
(b) <i>Trichoderma polysporum</i>	(ii) Butyric Acid		
(c) <i>Monascus purpureus</i>	(iii) Citric Acid		
(d) <i>Aspergillus niger</i>	(iv) Blood cholesterol lowering agent		
(a)	(b)	(c)	(d)
(1) (ii)	(i)	(iv)	(iii)
(2) (i)	(ii)	(iv)	(iii)
(3) (iv)	(iii)	(ii)	(i)
(4) (iii)	(iv)	(ii)	(i)

Ans. (1)

Sol. *Clostridium butylicum* gives butyric acid. *Trichoderma polysporum* yields cyclosporin-A. *Monascus purpureus* produces statin that are blood cholesterol lowering agent and *Aspergillus niger* is used for production of citric acid.

44. Which of the following pairs is of unicellular algae ?

- (1) *Gelidium* and *Gracilaria*
- (2) *Anabaena* and *Volvox*
- (3) *Chlorella* and *Spirulina*
- (4) *Laminaria* and *Sargassum*

Ans. (3)

Sol. *Chlorella* and *Spirulina* are unicellular.

45. In light reaction, plastoquinone facilitates the transfer of electrons from :

- (1) Cyt_b₆f complex to PS-I
- (2) PS-I to NADP⁺
- (3) PS-I to ATP synthase
- (4) PS-II to Cyt_b₆f complex

Ans. (4)

Sol. In light reaction, plastoquinone facilitates the transfer of electrons from PS II to cytb₆f complex.

46. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?

- (1) Uremia and Renal Calculi
- (2) Ketonuria and Glycosuria
- (3) Renal calculi and Hyperglycaemia
- (4) Uremia and Ketonuria

Ans. (2)

Sol. In diabetes mellitus, body cells are unable to utilize glucose for energy → blood glucose increases → glycosuria. In D.M., cells obtain energy from non-carbohydrate sources. Therefore, ketone bodies are formed in blood, which leads to ketonuria.

47. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their :

- (1) Growth response
- (2) Defence action
- (3) Effect on reproduction
- (4) Nutritive value

Ans. (2)

Sol. Strychnine & caffeine are produced by the plants as secondary metabolites to render plant parts unpalatable to the predators.

48. Which of the following would help in prevention of diuresis?

- (1) Reabsorption of Na⁺ and water from renal tubules due to aldosterone
- (2) Atrial natriuretic factor causes vasoconstriction
- (3) Decrease in secretion of renin by JG cells
- (4) More water reabsorption due to undersecretion of ADH

Ans. (1)

Sol. Diuresis is production of large amounts of dilute urine. Diuresis is prevented by decreasing the production of urine. This can be achieved by increasing sodium reabsorption and thereby water reabsorption with the help of aldosterone.

49. Select the **Correct** match.

- (1) Phenylketonuria - Autosomal dominant trait
 (2) Sickle cell anaemia - Autosomal recessive trait, Chromosome - 11
 (3) Thalassemia - X linked
 (4) Haemophilia - Y linked

Ans. (2)

Sol. Phenylketonuria - Autosomal recessive
 Thalassemia - Autosomal recessive
 Haemophilia - X-linked recessive

50. Which of the following is **not** an attribute of a population ?

- (1) Natality
 (2) Mortality
 (3) Species interaction
 (4) Sex ratio

Ans. (3)

Sol. Species interaction is not an attribute of population.

51. Which of the following statements about inclusion bodies is **incorrect** ?

- (1) These are involved in ingestion of food particles.
 (2) They lie free in the cytoplasm.
 (3) These represent reserve material in cytoplasm.
 (4) They are not bound by any membrane.

Ans. (1)

Sol. Inclusion bodies are non-membranous storage structures like phosphate, sulphur and glycogen granules in prokaryotes.

52. The transverse section of a plant shows following anatomical features :

- (a) Large number of scattered vascular bundles surrounded by bundle sheath.
 (b) Large conspicuous parenchymatous ground tissue.
 (c) Vascular bundles conjoint and closed.
 (d) Phloem parenchyma absent.

Identify the category of plant and its part :

- (1) Monocotyledonous root
 (2) Dicotyledonous stem
 (3) Dicotyledonous root
 (4) Monocotyledonous stem

Ans. (4)

Sol. Characteristic features of monocot stem are large number of scattered, closed vascular bundles.

53. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is **correct** ?

- (1) Gross primary productivity is always more than net primary productivity.
 (2) Gross primary productivity and Net primary productivity are one and same.
 (3) There is no relationship between Gross primary productivity and Net primary productivity.
 (4) Gross primary productivity is always less than net primary productivity.

Ans. (1)

Sol. $NPP = GPP - R$

54. In water hyacinth and water lily, pollination takes place by:

- (1) water currents only
 (2) wind and water
 (3) insects and water
 (4) insects or wind

Ans. (4)

Sol. In water hyacinth and water lily pollination is done by insects or wind although these are hydrophytes.

55. Which of the following is put into Anaerobic sludge digester for further sewage treatment ?

- (1) Floating debris
 (2) Effluents of primary treatment
 (3) Activated sludge
 (4) Primary sludge

Ans. (3)

Sol. In sewage treatment plant, the activated sludge is put into an anaerobic sludge digester for further digestion. During this process biogas is produced.

56. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is :

- (1) Root pressure
 (2) Imbibition
 (3) Plasmolysis
 (4) Transpiration

Ans. (1)

Sol. The process of guttation is caused due to root pressure. In this process water is lost from the tip of grass blade at night and in early morning.

57. Cuboidal epithelium with brush border of microvilli is found in :

- (1) ducts of salivary glands
- (2) proximal convoluted tubule of nephron
- (3) eustachian tube
- (4) lining of intestine

Ans. (2)

Sol. PCT is lined by simple cuboidal epithelium with microvilli (brush border)

58. Select the **correct** statement

- (1) Glucagon is associated with hypoglycemia.
- (2) Insulin acts on pancreatic cells and adipocytes.
- (3) Insulin is associated with hyperglycemia.
- (4) Glucocorticoids stimulate gluconeogenesis.

Ans. (4)

Sol. Glucocorticoids increase blood sugar by stimulation of gluconeogenesis

59. Which of the following is **not** an inhibitory substance governing seed dormancy ?

- (1) Abscisic acid
- (2) Phenolic acid
- (3) Para-ascorbic acid
- (4) Gibberellic acid

Ans. (4)

Sol. Gibberellic acid breaks seed dormancy and promotes seed germination.

60. According to Robert May, the global species diversity is about :

- (1) 20 million
- (2) 70 million
- (3) 7 million
- (4) 1.5 million

Ans. (3)

Sol. Robert May estimated that total species on earth to be 7 million.

61. Match the trophic levels with their **correct** species examples in grassland ecosystem.

- | | |
|--------------------------|--------------|
| (a) Fourth trophic level | (i) Crow |
| (b) Second trophic level | (ii) Vulture |
| (c) First trophic level | (iii) Rabbit |
| (d) Third trophic level | (iv) Grass |

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

- | | | | | |
|-----|-------|-------|-------|------|
| (1) | (iii) | (ii) | (i) | (iv) |
| (2) | (iv) | (iii) | (ii) | (i) |
| (3) | (i) | (ii) | (iii) | (iv) |
| (4) | (ii) | (iii) | (iv) | (i) |

Ans. (4)

Sol. Grass (I) → Rabbit (II) → Crow (III) → Vulture (IV)
(Vulture is a top carnivore)

62. The first phase of translation is :

- (1) Recognition of DNA molecule
- (2) Aminoacylation of tRNA
- (3) Recognition of an anti-codon
- (4) Binding of mRNA to ribosome

Ans. (2)

Sol. In the first phase of translation, amino acids are activated in presence of ATP and linked to their cognate tRNA, a process commonly called as charging of tRNA.

63. Strobili or cones are found in :

- (1) *Pteris*
- (2) *Marchantia*
- (3) *Equisetum*
- (4) *Salvinia*

Ans. (3)

Sol. Strobili or cones are found in some pteridophytes like *Equisetum*, *Selaginella*, *Lycopodium* etc.

64. Match the following columns and select the **correct** option

Column - I

Column - II

- | | |
|------------------------------|----------------------|
| (a) 6-15 pairs of gill slits | (i) <i>Trygon</i> |
| (b) Heterocercal caudal fin | (ii) Cyclostomes |
| (c) Air Bladder | (iii) Chondrichthyes |
| (d) Poison sting | (iv) Osteichthyes |

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

- | | | | | |
|-----|-------|-------|-------|------|
| (1) | (iii) | (iv) | (i) | (ii) |
| (2) | (iv) | (ii) | (iii) | (i) |
| (3) | (i) | (iv) | (iii) | (ii) |
| (4) | (ii) | (iii) | (iv) | (i) |

Ans. (4)

Sol. Cyclostomes have 6-15 pairs of gill slits
Chondrichthyes have heterocercal tail
Bony fishes have air bladder
Trygon (sting-ray) has poison sting

65. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G_0). This process occurs at the end of :

- (1) G_1 phase
- (2) S phase
- (3) G_2 phase
- (4) M phase

Ans. (1)

Sol. Cell enter into G_0 Phase from G_1 Phase

66. Identify the **correct** statement with reference to human digestive system.

- (1) Serosa is the innermost layer of the alimentary canal.
- (2) Ileum is a highly coiled part.
- (3) Vermiform appendix arises from duodenum.
- (4) Ileum opens into small intestine.

Ans. (2)

Sol. Serosa is the outermost layer not the inner. Vermiform appendix arises from ileocaecal junction Ileum opens into caecum.

67. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?

- (1) GIFT and ZIFT
- (2) ICSI and ZIFT
- (3) GIFT and ICSI
- (4) ZIFT and IUT

Ans. (4)

Sol. ZIFT & IUT are embryo transfer techniques for women who cannot conceive.

68. The plant parts which consist of two generations - one within the other :

- (a) Pollen grains inside the anther
- (b) Germinated pollen grain with two male gametes
- (c) Seed inside the fruit
- (d) Embryo sac inside the ovule

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

Ans. (3)

Sol. Pollen grain - Gametophytic generation.
 Anther - Sporophytic generation
 Embryo sac - Female gametophyte
 Ovule - Sporophytic generation

69. Dissolution of the synaptonemal complex occurs during :

- (1) Zygotene
- (2) Diplotene
- (3) Leptotene
- (4) Pachytene

Ans. (2)

Sol. Dissolution of synaptonemal complex occurs in diplotene.

70. Match the following columns and select the **correct** option.

Column - I

Column - II

- | | |
|---------------------|--------------------------------------|
| (a) Organ of Corti | (i) Connects middle ear and pharynx |
| (b) Cochlea | (ii) Coiled part of the labyrinth |
| (c) Eustachian tube | (iii) Attached to the oval window |
| (d) Stapes | (iv) Located on the basilar membrane |

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

Ans. (2)

Sol. Organ of Corti is located on the basilar membrane
 Cochlea is the coiled part of labyrinth
 Eustachian tube connects middle ear cavity with pharynx to equalize air pressure on both the sides of eardrum .
 Stapes is the smallest ear ossicle and the footplate of stapes is attached to the oval window.

71. The ovary is half inferior in :

- (1) Mustard
- (2) Sunflower
- (3) Plum
- (4) Brinjal

Ans. (3)

Sol. Ovary is half inferior in plum, rose, peach.

72. Identify the basic amino acid from the following.

- (1) Glutamic Acid
- (2) Lysine
- (3) Valine
- (4) Tyrosine

Ans. (2)

Sol. Lysine and arginine are basic amino acids.

73. Match the following columns and select the **correct** option.

Column - I	Column - II
(a) Eosinophils	(i) Immune response
(b) Basophils	(ii) Phagocytosis
(c) Neutrophils	(iii) Release histaminase, destructive enzymes
(d) Lymphocytes	(iv) Release granules containing histamine

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

Ans. (4)

Sol. Eosinophils - Release histaminase destructive enzymes
 Basophils - Release granules containing histamine
 Neutrophils - Phagocytosis
 Lymphocytes - B and T related with immune system

74. Match the following :

Column - I	Column - II
(a) Inhibitor of catalytic activity	(i) Ricin
(b) Possess peptide bonds	(ii) Malonate
(c) Cell wall material in fungi	(iii) Chitin
(d) Secondary metabolite	(iv) Collagen

Choose the **correct** option from the following :

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

Ans. (4)

Sol. Malonate is competitive inhibitor of succinic dehydrogenase, collagen is a protein, so it has peptide bond. In fungi cell wall is made up of chitin, ricin is in secondary metabolite, toxin.

75. Identify the correct statement with regard to G_1 phase (Gap 1) of interphase.

- (1) Reorganisation of all cell components takes place.
- (2) Cell is metabolically active, grows but does not replicate its DNA
- (3) Nuclear Division takes place.
- (4) DNA synthesis or replication takes place.

Ans. (2)

Sol. In G_1 phase cell is metabolically active, it grows, it synthesises RNA and protein but DNA replication takes place in S-phase.

76. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.

- (1) Gibberellin
- (2) Ethylene
- (3) Abscisic acid
- (4) Cytokinin

Ans. (1)

Sol. Gibberellin is used for spraying on sugarcane crop to increase the length of stem.

77. Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups.
- (1) A person will have only two of the three alleles.
 - (2) When I^A and I^B are present together, they express same type of sugar.
 - (3) Allele 'i' does not produce any sugar.
 - (4) The gene (I) has three alleles.

Ans. (2)

Sol. A person with genotype I^AI^B will have both antigens A and antigen B. That are slightly different forms of sugar.

78. Identify the **wrong** statement with reference to immunity.
- (1) When ready-made antibodies are directly given, it is called "Passive immunity".
 - (2) Active immunity is quick and gives full response.
 - (3) Foetus receives some antibodies from mother, it is an example for passive immunity.
 - (4) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".

Ans. (2)

Sol. Unlike Passive immunity, active Immunity is slow and takes times to become fully effective.

79. The enzyme enterokinase helps in conversion of :
- (1) trypsinogen into trypsin
 - (2) caseinogen into casein
 - (3) pepsinogen into pepsin
 - (4) protein into polypeptides

Ans. (1)

Sol. Enterokinase is present in intestinal juice converting inactive trypsinogen into active trypsin.

80. The specific palindromic sequence which is recognized by EcoRI is :
- (1) 5'-GGAACC-3'
3'-CCTTGG-5'
 - (2) 5'-CTTAAG-3'
3'-GAATTC-5'
 - (3) 5'-GGATCC-3'
3'-CCTAGG-5'
 - (4) 5'-GAATTC-3'
3'-CTTAAG-5'

Ans. (4)

Sol. Recognition sequence of RE EcoRI is
 5'GAATTC3'
 3'CTTAAG5'

81. Match the following columns and select the **correct** option.

Column - I	Column - II
(a) Bt cotton	(i) Gene therapy
(b) Adenosine deaminase deficiency	(ii) Cellular defence
(c) RNAi	(iii) Detection of HIV infection
(d) PCR	(iv) <i>Bacillus thuringiensis</i>
(a)	(b)
(c)	(d)
(1) (iii)	(ii) (i) (iv)
(2) (ii)	(iii) (iv) (i)
(3) (i)	(ii) (iii) (iv)
(4) (iv)	(i) (ii) (iii)

Ans. (4)

Sol. Bt cotton contain genes from *Bacillus thuringiensis*, RNAi is a method of cellular defense in eukaryotes.

82. Floridean starch has structure similar to :
- (1) Amylopectin and glycogen
 - (2) Mannitol and algin
 - (3) Laminarin and cellulose
 - (4) Starch and cellulose

Ans. (1)

Sol. Floridean starch is the storage food in red algae, structurally it is similar to amylopectin and glycogen.

83. Which of the following statements is **not correct** ?
- (1) The proinsulin has an extra peptide called C-peptide.
 - (2) The functional insulin has A and B chains linked together by hydrogen bonds.
 - (3) Genetically engineered insulin is produced in *E-Coli*.
 - (4) In man insulin is synthesised as a proinsulin.

Ans. (2)

Sol. Chain A and chain B of insulin are linked together by disulphide bonds.

84. Flippers of Penguins and Dolphins are examples of :

- (1) Convergent evolution
- (2) Industrial melanism
- (3) Natural selection
- (4) Adaptive radiation

Ans. (1)

Sol. Same in functions example flippers of penguins (Aves) and Dolphins (Mammals).

85. Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action ?

- (a) Darwin's Finches of Galapagos islands.
 - (b) Herbicide resistant weeds.
 - (c) Drug resistant eukaryotes.
 - (d) Man-created breeds of domesticated animals like dogs.
- (1) (a) and (c)
 - (2) (b), (c) and (d)
 - (3) only (d)
 - (4) only (a)

Ans. (2)

Sol. Darwin's finches of Galapagos islands is an example of natural selection .

86. Identify the **wrong** statement with reference to transport of oxygen.

- (1) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.
- (2) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.
- (3) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.
- (4) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2 .

Ans. (2)

Sol. Higher H^+ conc. favours dissociation of oxyhaemoglobin.

87. The process of growth is maximum during :

- (1) Lag phase
- (2) Senescence
- (3) Dormancy
- (4) Log phase

Ans. (4)

Sol. The process of growth is maximum during log phase.

88. Which of the following regions of the globe exhibits highest species diversity?

- (1) Madagascar
- (2) Himalayas
- (3) Amazon forests
- (4) Western Ghats of India

Ans. (3)

Sol. Amazon forest highest species diversity

89. The sequence that controls the copy number of the linked DNA in the vector, is termed :

- (1) Ori site
- (2) Palindromic sequence
- (3) Recognition site
- (4) Selectable marker

Ans. (1)

Sol. The sequence that controls the copy number of linked DNA in the vector is the ori site. It is also required for initiation of DNA replication.

90. Match the following columns and select the **correct** option.

Column I	Column II
(a) Placenta	(i) Androgens
(b) Zona pellucida	(ii) Human Chorionic Gonadotropic (hCG)
(c) Bulbo-urethral glands	(iii) Layer of the ovum
(d) Leydig cells	(iv) Lubrication of the Penis
(a) (b) (c) (d)	
(1) (i) (iv) (ii) (iii)	
(2) (iii) (ii) (iv) (i)	
(3) (ii) (iii) (iv) (i)	
(4) (iv) (iii) (i) (ii)	

Ans. (3)

Sol. Placenta secretes hCG

Zona pellucida is the inner noncellular layer surround ovum

Bulbourethral glands or Cowper's glands - lubrication of the penis

Leydig cells or interstitial cells of the testis secrete androgens.

CHEMISTRY

91. Sucrose on hydrolysis gives :

- (1) α -D-Glucose + β -D-Glucose
- (2) α -D-Glucose + β -D-Fructose
- (3) α -D-Fructose + β -D-Fructose
- (4) β -D-Glucose + α -D-Fructose

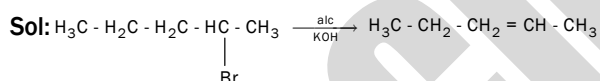
Ans. (2)

Sol: Sucrose on hydrolysis gives α -D glucose and β -D fructose

92. Elimination reaction of 2-Bromo-pentane to form pen-2-ene is :

- (a) β -Elimination reaction
 - (b) Follows Zaitsev rule
 - (c) Dehydrohalogenation reaction
 - (d) Dehydration reaction
- (1) (a), (c), (d)
 - (2) (b), (c), (d)
 - (3) (a), (b), (d)
 - (4) (a), (b), (c)

Ans. (4)

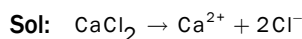


Follows saytzeff's rule and it is an example of β -Elimination reaction where halogen atom is removed from β -carbon leading to dehydrohalogenation

93. The number of Faradays (F) required to produce 20g of calcium from molten CaCl_2 (Atomic mass of Ca = 40g mol^{-1}) is :

- (1) 2
- (2) 3
- (3) 4
- (4) 1

Ans. (1)



$$\text{Eq. weight} = \frac{\text{At. Wt}}{\text{Valency}} = \frac{40}{2} = 20 \text{ gm}$$

$$1 \text{ equivalent} = 1 \times 96500 \text{C} = 1\text{F}$$

94. An element has a body centered cubic (bcc) structure with a cell edge of 288pm. The atomic radius is :

- (1) $\frac{\sqrt{2}}{4} \times 288 \text{ pm}$
- (2) $\frac{4}{\sqrt{3}} \times 288 \text{ pm}$
- (3) $\frac{4}{\sqrt{2}} \times 288 \text{ pm}$
- (4) $\frac{\sqrt{3}}{4} \times 288 \text{ pm}$

Ans. (4)

Sol: For bcc $4r = \sqrt{3}a$

$$r = \frac{\sqrt{3}a}{4} = \frac{\sqrt{3}}{4} \times 288 \text{ pm}$$

95. HCl was passed through a solution of CaCl_2 , MgCl_2 and NaCl. Which of the following compound(s) crystallise(s) ?

- (1) Only NaCl
- (2) Only MgCl_2
- (3) NaCl, MgCl_2 and CaCl_2
- (4) Both MgCl_2 and CaCl_2

Ans. (1)

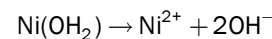
Sol: Solubility of NaCl is less than CaCl_2 and MgCl_2 , on passing HCl through the saturated solution of NaCl containing CaCl_2 and MgCl_2 , NaCl only precipitates, because its ionic product (Q_{SP}) exceeds solubility product.

96. Find out the solubility of $\text{Ni}(\text{OH})_2$ in 0.1M NaOH. Given that the ionic product of $\text{Ni}(\text{OH})_2$ is 2×10^{-15}

- (1) $2 \times 10^{-8} \text{ M}$
- (2) $1 \times 10^{-13} \text{ M}$
- (3) $1 \times 10^8 \text{ M}$
- (4) $2 \times 10^{-13} \text{ M}$

Ans. (4)

Sol: 0.1 M NaOH = 0.1 M OH^- ions



$$K_{\text{SP}} = S \times (10^{-1})^2$$

$$S = \frac{2 \times 10^{-15}}{10^{-2}} = 2 \times 10^{-13} \text{ M}$$

97. For the reaction, $2\text{Cl}(\text{g}) \rightarrow \text{Cl}_2(\text{g})$, the correct option is :

- (1) $\Delta_r H > 0$ and $\Delta_r S < 0$
- (2) $\Delta_r H < 0$ and $\Delta_r S > 0$
- (3) $\Delta_r H < 0$ and $\Delta_r S < 0$
- (4) $\Delta_r H > 0$ and $\Delta_r S > 0$

Ans. (3)

Sol: $2\text{Cl}(\text{g}) \rightarrow \text{Cl}_2(\text{g})$

As it involves bond formation, reaction is an Exothermic reaction ($\Delta H = -ve$) and $\Delta n = -1$, Entropy decreases.

$$\Delta S < 0$$

98. Which of the following is the correct order of increasing field strength of ligands to form coordination compounds ?

- (1) $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$
- (2) $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
- (3) $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$
- (4) $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$

Ans. (4)

Sol: $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$ (spectrochemical series)

99. The calculated spin only magnetic moment of Cr^{2+} ion is :

- (1) 4.90 BM
- (2) 5.92 BM
- (3) 2.84 BM
- (4) 3.87 BM

Ans. (1)

Sol: $\text{Cr} = [\text{Ar}] 4s^1 3d^5$

$\text{Cr}^{+2} = 4s^0 3d^4$

$$\sqrt{n(n+2)} = \sqrt{4(4+2)} = \sqrt{24} = 4.9 \text{ BM}$$

100. Which of the following set of molecules will have zero dipole moment ?

- (1) Boron trifluoride, hydrogen fluoride, carbondioxide, 1, 3-dichlorobenzene
- (2) Nitrogen trifluoride, beryllium difluoride, water, 1, 3-dichlorobenzene
- (3) Boron trifluoride, beryllium difluoride, carbon dioxide, 1, 4-dichlorobenzene
- (4) Ammonia, beryllium difluoride, water, 1, 4-dichlorobenzene

Ans. (3)

Sol: $\text{BF}_3 \rightarrow$ Trigonal Planar $\mu = 0$

$\text{BeF}_2 \rightarrow$ Linear $\mu = 0$

$\text{CO}_2 \rightarrow$ linear, $\mu = 0$

\rightarrow Para dichloro benzene $\mu = 0$

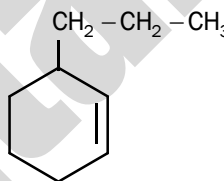
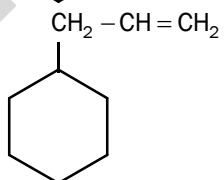
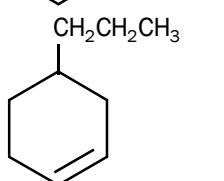
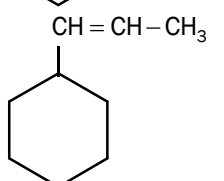
101. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals

- (1) Copper
- (2) Calcium
- (3) Potassium
- (4) Iron

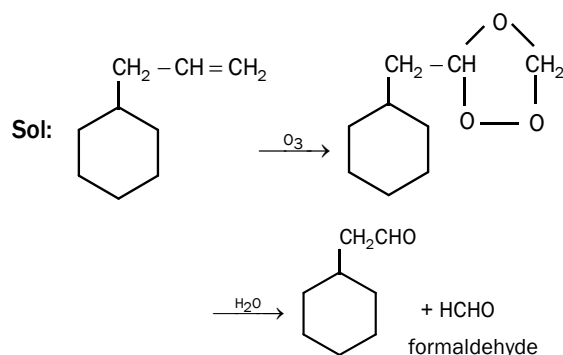
Ans. (3)

Sol: Potassium ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals

102. Al alkene on ozonolysis gives methanal as one of the product. Its structure is

- (1) 
- (2) 
- (3) 
- (4) 

Ans. (2)



103. The rate constant for a first order reaction is $4.606 \times 10^{-3} \text{ s}^{-1}$. The time required to reduce 2.0 g of the reactant to 0.2 g is

- (1) 200 s
- (2) 500 s
- (3) 1000 s
- (4) 100 s

Ans. (2)

Sol:
$$K = \frac{2.303}{t} \log \frac{a}{(a-x)}$$

$$4.606 \times 10^{-3} = \frac{2.303}{t} \log \frac{2}{0.2}$$

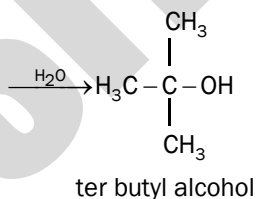
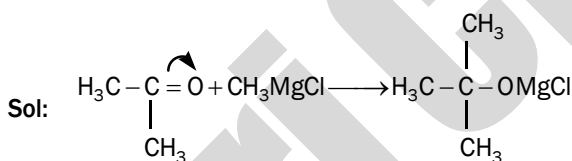
$$t = \frac{2.303}{4.606 \times 10^{-3}} \times \log 10$$

$$= \frac{2.303}{4.606 \times 10^{-3}} \times 1 = 500 \text{ S}$$

104. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :

- (1) Sec. butyl alcohol
- (2) Tert. butyl alcohol
- (3) Isobutyl alcohol
- (4) Isopropyl alcohol

Ans. (2)



105. Which of the following is a natural polymer ?

- (1) poly (Butadiene - styrene)
- (2) polybutadiene
- (3) poly (Butadiene - acrylonitrile)
- (4) cis - 1, 4 - polyisoprene

Ans. (4)

Sol: cis - 1, 4 polyisoprene is natural rubber

106. Identify the correct statements from the following :

- (a) CO_2 (g) is used as refrigerant for ice-cream and frozen food
- (b) The structure of C_{60} contains twelve six carbon rings and twenty five carbon rings
- (c) ZSM - 5, a type of zeolite, is used to convert alcohols into gasoline
- (d) CO is colourless and odourless gas

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

Ans. (3)

Sol: c and d correct, solid CO_2 is a refrigerant, fullerene contains 20 six membered rings and 12 five membered rings

107. The correct option for free expansion of an ideal gas under adiabatic condition is :

- (1) $q = 0, \Delta T = 0$ and $w > 0$
- (2) $q < 0, \Delta T = 0$ and $w = 0$
- (3) $q > 0, \Delta T > 0$ and $w > 0$
- (4) $q = 0, \Delta T = 0$ and $w = 0$

Ans. (4)

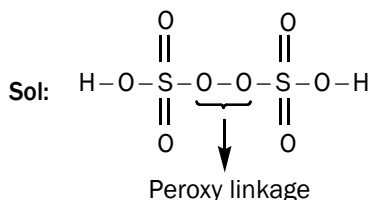
Sol: For adiabatic system $q = 0$

For free expansion of an ideal gas $w = 0$. Therefore $\Delta E = 0$ and $\Delta T = 0$

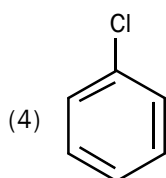
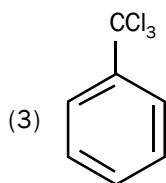
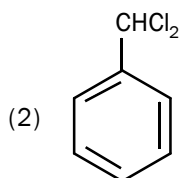
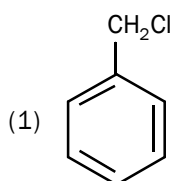
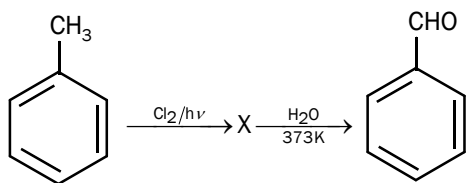
108. Which of the following oxoacid of sulphur has O - O - linkage?

- (1) H_2SO_4 , sulphuric acid
- (2) $\text{H}_2\text{S}_2\text{O}_8$, peroxodisulphuric acid
- (3) $\text{H}_2\text{S}_2\text{O}_7$, pyrosulphuric acid
- (4) H_2SO_3 , sulphurous acid

Ans. (2)



109. Identify compound X in the following sequence of reactions:



Ans. (2)

110. The number of protons, neutrons and electrons in ${}_{71}^{175}\text{Lu}$, respectively, are:

- (1) 104, 71 and 71
- (2) 71, 71 and 104
- (3) 175, 104 and 71
- (4) 71, 104 and 71

Ans. (4)

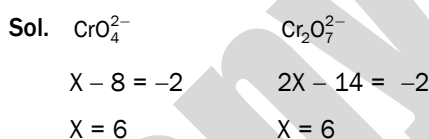
Sol: ${}_{71}^{175}\text{Lu}$

Since atomic number is 71, number of protons = 71, electrons = 71, neutrons = 175 - 71 = 104

111. Identify the incorrect statement

- (1) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes
- (2) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattice of metals
- (3) The oxidation states of chromium in CrO_4^{2-} and $\text{Cr}_2\text{O}_7^{2-}$ are not the same
- (4) $\text{Cr}^{2+}(\text{d}^4)$ is a stronger reducing agent than $\text{Fe}^{2+}(\text{d}^6)$ in water.

Ans. (3)



112. Which of the following is a cationic detergent?

- (1) Sodium stearate
- (2) Cetyltrimethyl ammonium bromide
- (3) Sodium dodecylbenzene sulphonate
- (4) Sodium lauryl sulphate

Ans. (2)

Sol: Cetyltrimethyl ammonium bromide is a cationic detergent

113. The freezing point depression constant (K_f) of benzene is $5.12 \text{ K kg mol}^{-1}$. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places):

- (1) 0.80 K
- (2) 0.40 K
- (3) 0.60 K
- (4) 0.20 K

Ans. (2)

Sol: $K_f = 5.12 \text{ K kg mol}^{-1}$

$$\Delta T_f = ? \quad m = 0.078 \text{ m}$$

$$\Delta T_f = K_f \times m$$

$$= 5.12 \times 0.078$$

$$= 0.399 = 0.40 \text{ K}$$

114. Identify the incorrect match

Name	IUPAC Official Name
(a) Unnilunium	(i) Mendeleevium
(b) Unniltrium	(ii) Lawrencium
(c) Unnilhexium	(iii) Seaborgium
(d) Unununnium	(iv) Darmstadtium

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

Ans. (3)

Sol: Unnilunium 101 → Mendeleevium

Unniltrium 103 → Lawrencium

Unnilhexium 106 → Seaborgium

Unununnium 111 → Roentgenium

115. The mixture which shows positive deviation from Raoult's law is:

- (1) Benzene + Toulene
 (2) Acetone + Chloroform
 (3) Chloroethane + Bromoethane
 (4) Ethanol + Acetone

Ans. (4)

Sol: thanol + Acetone shows positive deviation because hydrogen bonds in ethanol are weakened by the addition of acetone

116. Match the following:

Oxide	Nature
(a) CO	(i) Basic
(b) BaO	(ii) Neutral
(c) Al ₂ O ₃	(iii) Acidic
(d) Cl ₂ O ₇	(iv) Amphoteric

Which of the following is correct option?

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

Ans. (1)

Sol: (a) CO - (ii) Neutral

(b) BaO - (i) Basic

(c) Al₂O₃ - (iv) amphoteric

(d) Cl₂O₇ - (iii) acidic

117. Which one of the following has maximum number of atoms?

- (1) 1 g of Mg(s) [Atomic mass of Mg = 24]
 (2) 1g of O₂ (g) [Atomic mass of O = 16]
 (3) 1 g of Li(s) [Atomic mass of Li = 7]
 (4) 1 g of Ag(s) [Atomic mass of Ag = 108]

Ans. (3)

Sol: Least atomic weight more number of atom

$$\text{Li} = \frac{1}{7} \times N_0$$

$$\text{Mg} = \frac{1}{24} \times N_0$$

$$\text{O} = \frac{1}{16} \times N_0$$

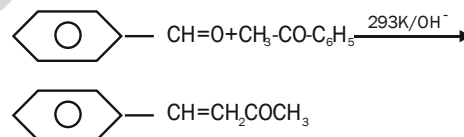
$$\text{Ag} = \frac{1}{108} \times N_0$$

118. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as:

- (1) Cannizzaro's reaction
 (2) Cross Cannizzaro's rection
 (3) Cross Aldol condensation
 (4) Aldol condensation

Ans. (3)

Sol:

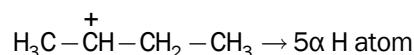
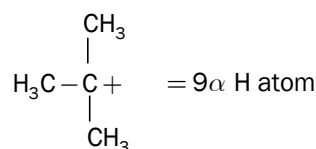


119. A tertiary butyl carbocation is most stable than a secondary butyl carbocation because of which of the following?

- (1) + Reflect of - CH₃ groups
 (2) - Reflect of - CH₃ groups
 (3) Hyperconjugation
 (4) - I effect of -CH₃ groups

Ans. (3)

Sol: 3^o butyl carbocation is more stable than 2^o butyl carbocation due to more hyperconjugated structures.



120. Which of the following is not correct about carbon monoxide?

- (1) It reduces oxygen carrying ability of blood
- (2) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
- (3) It is produced due to incomplete combustion
- (4) It forms carboxyhaemoglobin

Ans. (2)

Sol: CO is a strong ligand. CO combines with haemoglobin to form more stable carboxyhaemoglobin

121. Which of the following is a basic amino acid?

- (1) Alanine
- (2) Tyrosine
- (3) Lysine
- (4) Serine

Ans. (3)

Sol: Lysine - basic amino acid

122. Urea reacts with water to form A which will decompose to form B. B when passed through Cu^{2+} (aq), deep blue colour solution C is formed. What is formula of C from the following?

- (1) $[\text{Cu}(\text{NH}_3)_4]^{2+}$
- (2) $\text{Cu}(\text{OH})_2$
- (3) $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
- (4) CuSO_4

Ans. (1)

Sol: $\text{NH}_2\text{CONH}_2 \xrightarrow{\text{H}_2\text{O}/\Delta} \text{NH}_3 \xrightarrow{\text{Cu}^{2+}(\text{aq})} [\text{Cu}(\text{NH}_3)_4]^{2+}$
 deep blue colour solution

123. A mixture of N_2 and Ar gases in a cylinder contains 7g of N_2 and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of N_2 is

[Use of atomic masses (in g mol^{-1}): N = 14, Ar = 40]

- (1) 12 bar
- (2) 15 bar
- (3) 18 bar
- (4) 9 bar

Ans. (2)

Sol: 7 gm of $\text{N}_2 = \frac{7}{28} = 0.25$ mole

8 gm of Ar = $\frac{8}{40} = 0.2$ mole

$P_{\text{N}_2} = \frac{0.25}{0.45} \times 27 = 15$ bar

124. Identify the correct statement from the following:

- (1) Blister copper has blistered appearance due to evolution of CO_2
- (2) Vapour phase refining is carried out for Nickel by Van Arkel method
- (3) Pig iron can be moulded into a variety of shapes
- (4) Wrought iron is impure iron with 4% carbon

Ans. (3)

Sol: Pig iron (molten iron) can be moulded into a variety of shapes.

125. Hydrolysis of sucrose is given by the following reaction



If the equilibrium constant (K_c) is 2×10^{13} at 300 K, the value $\Delta_r G^\ominus$ of at the same temperature will be

- (1) $8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
- (2) $8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(3 \times 10^{13})$
- (3) $-8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(4 \times 10^{13})$
- (4) $-8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$

Ans. (4)

Sol:

$$\Delta G^\ominus = -RT \ln K = -8.314 \text{ J mole}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$$

126. Identify a molecule which does not exist

- (1) Li_2
- (2) C_2
- (3) O_2
- (4) He_2

Ans. (4)

Sol: Bond order of He_2 is zero. It cannot exist.

127. An increase in the concentration of the reactants of a reaction leads to change in :

- (1) heat of reaction
- (2) threshold energy
- (3) collision frequency
- (4) activation energy

Ans. (3)

Sol: An increase in concentration of reactants increases the number of reactant molecules per unit volume thus increases collision frequency.

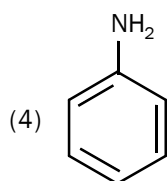
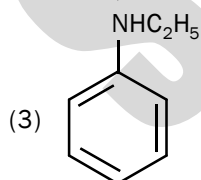
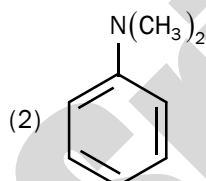
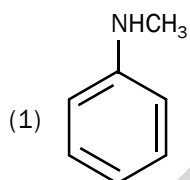
128. Which of the following alkane cannot be made in good yield by Wurtz reaction ?

- (1) 2, 3 - Dimethylbutane
- (2) n - Heptane
- (3) n - Butane
- (4) n - Hexane

Ans. (2)

Sol: Wurtz reaction is not satisfactory in the preparation of alkanes containing odd number of carbon atoms i.e., n-heptane.

129. Which of the following amine will give the carbylamine test ?



Ans. (4)

Sol: Primary amines give carbylamine reaction

130. On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :

- (1) Oxygen gas
- (2) H₂S gas
- (3) SO₂ gas
- (4) Hydrogen gas

Ans. (1)

Sol: $\text{H}_2\text{SO}_4 \longrightarrow 2\text{H}^+ + \text{SO}_4^{2-}$
(dilute)

At anode, $2\text{H}_2\text{O} \longrightarrow 4\text{H}^+ + 4\text{e}^- + \text{O}_2$

131. What is the change in oxidation number of carbon in the following reaction ?

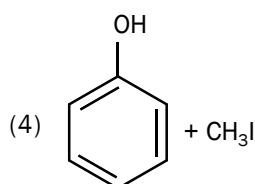
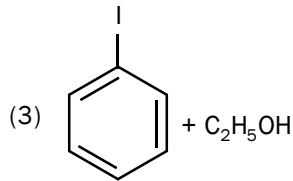
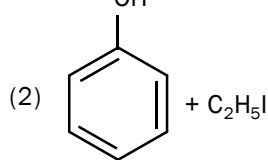
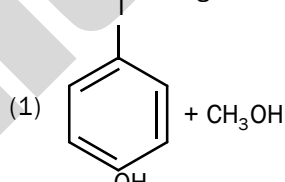


- (1) 0 to +4
- (2) -4 to +4
- (3) 0 to -4
- (4) +4 to +4

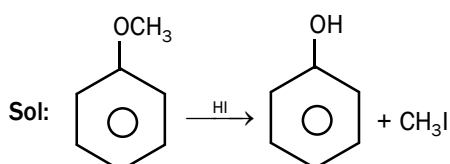
Ans. (2)

Sol: Oxidation state of carbon in CH₄ is -4 and in CCl₄ is +4

132. Anisole on cleavage with HI gives :



Ans. (4)



133. Measuring Zeta potential is useful in determining which property of colloidal solution ?

- (1) Solubility
- (2) Stability of the colloidal particles
- (3) Size of the colloidal particles
- (4) Viscosity

Ans. (2)

Sol: The magnitude of Zeta potential indicates the degree of electrostatic repulsion between similarly charged particles. If zeta potential is high it leads to stability and resist aggregation, if it is small it leads to flocculation

134. Paper chromatography is an example of :

- (1) Partition chromatography
- (2) Thin layer chromatography
- (3) Column chromatography
- (4) Adsorption chromatography

Ans. (1)

Sol: Partition chromatography

135. Match the following and identify the correct option.

- | | |
|---|---|
| (a) $\text{CO(g)} + \text{H}_2\text{(g)}$ | (i) $\text{Mg}(\text{HCO}_3)_2 + \text{Ca}(\text{HCO}_3)_2$ |
| (b) Temporary hardness of water | (ii) An electron deficient hydride |
| (c) B_2H_6 | (iii) Synthesis gas |
| (d) H_2O_2 | (iv) Non-planar |

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

Ans. (4)

Sol: (a) $\text{CO}_{(g)} + \text{H}_{2(g)}$ - (iii) Synthesis gas

(b) Temporary hardness of water - (i) $\text{Mg}(\text{HCO}_3)_2 + \text{Ca}(\text{HCO}_3)_2$

(c) B_2H_6 - (ii) Electron deficient compound

(d) H_2O_2 - (iv) Non planar structure

PHYSICS

136. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase

difference between current and voltage is $\frac{\pi}{3}$. If instead

C is removed from the circuit, the phase difference is

again $\frac{\pi}{3}$ between current and voltage. The power

factor of the circuit is :

- (1) 0.5
- (2) 1.0
- (3) -1.0
- (4) zero

Ans. (2)

Sol: $\tan \theta = \frac{X_c}{R} = \sqrt{3}$

$$X_c = \sqrt{3}R$$

$$\tan \theta = \frac{X_L}{R} = \sqrt{3}$$

$$X_c = \sqrt{3}R$$

$$X_L = X_c \Rightarrow \text{Given}$$

Circuit is LCR resonate circuit

$$\text{power factor } \cos \theta = \frac{R}{Z} = \frac{R}{\sqrt{(X_L - X_c)^2 + R^2}} = 1$$

137. A wire of length L, area of cross section A is hanging from a fixed support. The length of the wire changes to

L_1 when mass M is suspended from its free end. The expression for Young's modulus is

$$(1) \frac{Mg(L_1 - L)}{AL}$$

$$(2) \frac{MgL}{AL_1}$$

$$(3) \frac{MgL}{A(L_1 - L)}$$

$$(4) \frac{MgL_1}{AL}$$

Ans. (3)

Sol: $y = \frac{F}{A \Delta l}$

$$= \frac{Mg(L)}{A(L_1 - L)}$$

138. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is:

$$(\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1})$$

- (1) $3.14 \times 10^{-4} \text{ T}$
- (2) $6.28 \times 10^{-5} \text{ T}$
- (3) $3.14 \times 10^{-5} \text{ T}$
- (4) $6.28 \times 10^{-4} \text{ T}$

Ans. (4)

Sol: $B = \mu_0 nI$

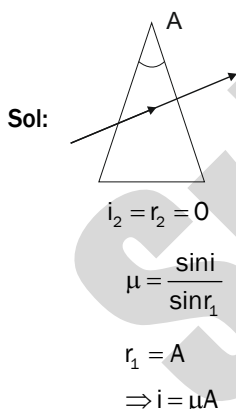
$$= 4\pi \times 10^{-7} \times \frac{100}{0.5} \times 2.5$$

$$= 2\pi \times 10^{-4} \text{ T} = 6.28 \times 10^{-4} \text{ T}$$

139. A ray is incident at an angle of incidence i on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ , then the angle of incidence is nearly equal to :

- (1) $\frac{2A}{\mu}$
- (2) μA
- (3) $\frac{\mu A}{2}$
- (4) $\frac{A}{2\mu}$

Ans. (2)



140. In a certain region of space with volume 0.2 m^3 , the electric potential is found to be 5V throughout. The magnitude of electric field in this region is:

- (1) 0.5 N/C
- (2) 1 N/C
- (3) 5 N/C
- (4) zero

Ans. (4)

Sol: As the given space is equipotential volume

$$E = -\left(\frac{dv}{dr}\right) = 0$$

141. For which one of the following, Bohr model is not valid?

- (1) Singly ionised helium atom (He^+)
- (2) Deuteron atom
- (3) Singly ionised neon atom (Ne^+)
- (4) Hydrogen atom

Ans. (3)

Sol: It is valid only for unielectron systems

142. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 cm^2 . The energy received by the surface during time span of 1 minute is:

- (1) $12 \times 10^3 \text{ J}$
- (2) $24 \times 10^3 \text{ J}$
- (3) $48 \times 10^3 \text{ J}$
- (4) $10 \times 10^3 \text{ J}$

Ans. (2)

Sol: $E = I \times \text{surface area} \times \text{time}$

$$= 20 \times 10^4 \times 20 \times 10^{-4} \times 60$$

$$= 24 \times 10^3 \text{ J}$$

143. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is $1.227 \times 10^{-2} \text{ nm}$, the potential difference is:

- (1) 10^2 V
- (2) 10^3 V
- (3) 10^4 V
- (4) 10 V

Ans. (3)

Sol: $\lambda = \frac{h}{mv}$

$$= \frac{h}{\sqrt{2vm}}$$

$$\Rightarrow \lambda = \frac{12.27}{\sqrt{v}} \text{ \AA}$$

$$1.227 \times 10^{-11} = \frac{12.27}{\sqrt{v}} \times 10^{-10}$$

$$\sqrt{v} = 10^2 \Rightarrow v = 10^4 \text{ V}$$

144. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?

- (1) 32 N
- (2) 30 N
- (3) 24 N
- (4) 48 N

Ans. (1)

Sol: $mg = 72$

$$\frac{g^1}{g} = \left(\frac{R}{R+h} \right)^2$$

$$\frac{g^1}{g} = \left(\frac{2R}{3R} \right)^2$$

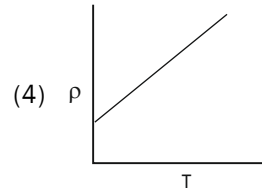
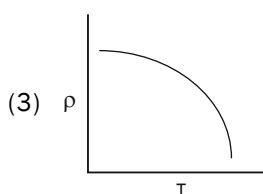
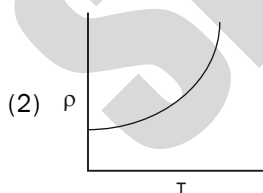
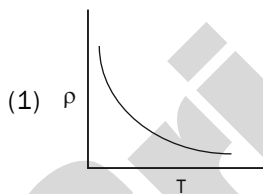
$$g^1 = \frac{4}{9}g$$

$$F^1 = mg^1$$

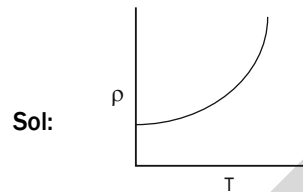
$$= m \times \frac{4}{9}g$$

$$= \frac{4}{9} \times 72 = 32\text{N}$$

145. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper?



Ans. (2)



with rise in temperature resistance of copper increases, non-linearly

146. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?

- (1) four times
- (2) one-fourth
- (3) zero
- (4) double

Ans. (3)

Sol: conceptual

147. A $40\mu\text{F}$ capacitor is connected to a 200 V , 50 Hz ac supply. The rms value of the current in the circuit is , nearly :

- (1) 2.05 A
- (2) 2.5 A
- (3) 25.1 A
- (4) 1.7 A

Ans. (2)

Sol: $Z = \frac{1}{C\omega} = \frac{1}{40 \times 10^{-6} \times 2\pi \times 50}$

$$I = \frac{V}{Z} = 200 \times 40 \times 10^{-6} \times 2\pi \times 50 = 2.512$$

148. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

- (1) 1.83×10^{-7} rad
- (2) 7.32×10^{-7} rad

(3) 6.00×10^{-7} rad

(4) 3.66×10^{-7} rad

Ans. (4)

Sol: $\theta = \frac{1.22\lambda}{a} = \frac{1.22 \times 600 \times 10^{-9}}{2} = 3.66 \times 10^{-7}$ rad

 149. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ($g=10 \text{ m/s}^2$)

(1) 340 m

(2) 320 m

(3) 300 m

(4) 360 m

Ans. (3)

Sol: $v^2 - u^2 = 2as$

$80^2 - 20^2 = 2 \times 10 \times h$

$h = \frac{100 \times 60}{20} = 300 \text{ m}$

 150. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C .

 Its density is : ($R=8.3 \text{ Jmol}^{-1}\text{K}^{-1}$)

(1) 0.2 kg/m^3

(2) 0.1 kg/m^3

(3) 0.02 kg/m^3

(4) 0.5 kg/m^3

Ans. (1)

Sol: $PV = nRT$

$d = \frac{PM}{RT} = \frac{249 \times 10^3 \times 2 \times 10^{-3}}{8.3 \times 300} \text{ Kg/m}^3$

$d = 0.2 \text{ Kg/m}^3$

 151. When a uranium isotope ${}_{92}^{235}\text{U}$ is bombarded with a

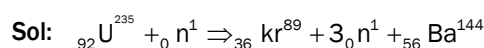
 neutron, it generate ${}_{36}^{89}\text{Kr}$, three neutrons and :

(1) ${}_{40}^{91}\text{Zr}$

(2) ${}_{36}^{101}\text{Kr}$

(3) ${}_{36}^{103}\text{Kr}$

(4) ${}_{56}^{144}\text{Ba}$

Ans. (4)


152. The increase in the width of the depletion region in a p-n junction diode is due to :

(1) reverse bias only

(2) both forward bias and reverse bias

(3) increase in forward current

(4) forward bias only

Ans. (1)
Sol: conceptual

153. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :

(1) $\frac{3\pi}{2}$ rad

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

(3) zero

 (4) π rad

Ans. (4)
Sol: 180° (or) π radian

 154. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1} . The permeability of the material of the rod is

$(\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1})$

(1) $8.0 \times 10^{-5} \text{ TmA}^{-1}$

(2) $2.4\pi \times 10^{-5} \text{ TmA}^{-1}$

(3) $2.4\pi \times 10^{-7} \text{ TmA}^{-1}$

(4) $2.4\pi \times 10^{-4} \text{ TmA}^{-1}$

Ans. (4)

Sol: $\mu = \mu_0 \mu_r = \mu_0 (x + 1)$

$4\pi \times 10^{-7} (599 + 1) = 24\pi \times 10^{-5} = 2.4\pi \times 10^{-4}$

155. The quantities of heat required to raise the temperature

of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5r_2$) through 1 K are in the ratio:

- (1) $\frac{9}{4}$
 (2) $\frac{3}{2}$
 (3) $\frac{5}{3}$
 (4) $\frac{27}{8}$

Ans. (4)

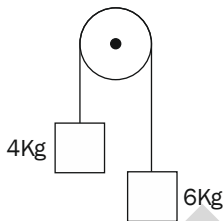
Sol: $Q = ms\Delta t$

$$Q \propto r^3$$

$$\frac{Q_1}{Q_2} = \left(\frac{1.5r_2}{r_2}\right)^3$$

$$= \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} = \frac{27}{8}$$

156. Two bodies of mass 4 kg and 6kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :



- (1) $g/2$
 (2) $g/5$
 (3) $g/10$
 (4) g

Ans. (2)

Sol: $a = \frac{(6-4)g}{10} = \frac{g}{5}$

157. The mean free path for a gas, with molecular diameter d and number density n can be expressed as :

- (1) $\frac{1}{\sqrt{2}n\pi d^2}$
 (2) $\frac{1}{\sqrt{2}n^2\pi d^2}$

- (3) $\frac{1}{\sqrt{2}n^2\pi^2 d^2}$
 (4) $\frac{1}{\sqrt{2}n\pi d}$

Ans. (1)

Sol: $\lambda = \frac{1}{\sqrt{2}n\pi d^2}$

158. A short electric dipole has a dipole moment of $16 \times 10^{-9} \text{ Cm}$. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is :

$$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2 / \text{C}^2\right)$$

- (1) 200 V
 (2) 400 V
 (3) zero
 (4) 50 V

Ans. (1)

Sol: $V = \frac{kp \cos \theta}{r^2}$

$$= \frac{9 \times 10^9 \times 16 \times 10^{-9} \times 1}{2 \times 0.36}$$

$$= \frac{9 \times 16}{2 \times 0.36} = \frac{9 \times 16}{2 \times 36} = 200 \text{ V}$$

159. Dimensions of stress are :

- (1) $[ML^2T^{-2}]$
 (2) $[ML^0T^{-2}]$
 (3) $[ML^{-1}T^{-2}]$
 (4) $[MLT^{-2}]$

Ans. (3)

Sol: $ML^{-1}T^{-2}$

160. The energy required to break one bond in DNA is 10^{-20} J . This value in eV is nearly :

- (1) 0.6

- (2) 0.06
- (3) 0.006
- (4) 6

Ans. (2)

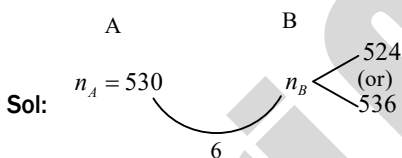
Sol: $1\text{eV} = 1.6 \times 10^{-19} \text{ J}$

Then 10^{-20} J is equal to $= \frac{10^{-20}}{1.6 \times 10^{-19}} \text{ eV}$
 $= 0.06 \text{ eV}$

161. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. when tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :

- (1) 524 Hz
- (2) 536 Hz
- (3) 537 Hz
- (4) 523 Hz

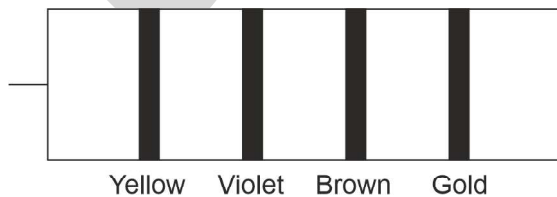
Ans. (1)



When tension decreases frequency decreases then again beat frequency increases.

\therefore frequency of B must be 524

162. The color code of a resistance is given below :

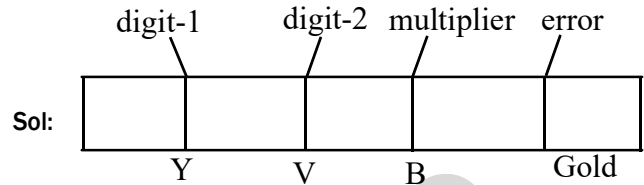


The values of resistance and tolerance, respectively, are :

- (1) $47\text{k}\Omega, 10\%$
- (2) $4.7\text{k}\Omega, 5\%$

- (3) $470\Omega, 5\%$
- (4) $470\text{k}\Omega, 5\%$

Ans. (3)



Y - 4

V - 7

B - 10^1

$\therefore 470, 5\%$

163. The Brewsters angle i_b for an interface should be

- (1) $30^\circ < i_b < 45^\circ$
- (2) $45^\circ < i_b < 90^\circ$
- (3) $i_b = 90^\circ$
- (4) $0^\circ < i_b < 30^\circ$

Ans. (2)

Sol: μ is greater than 1

$\therefore \mu = \tan \theta$

$\therefore \theta$ must be greater than 45° but less than 90°

164. The capacitance a parallel plate capacitor with air as medium is $6\mu\text{F}$. With the introduction of a dielectric medium, the capacitance becomes $30\mu\text{F}$. The permittivity of the medium is

$(\epsilon_0 = 8.55 \times 10^{-12} \text{ C}^2\text{N}^{-1}\text{m}^{-2})$

- (1) $1.77 \times 10^{-12} \text{ C}^2\text{N}^{-1}\text{m}^{-2}$
- (2) $0.44 \times 10^{-10} \text{ C}^2\text{N}^{-1}\text{m}^{-2}$
- (3) $5.00 \text{ C}^2\text{N}^{-1}\text{m}^{-2}$
- (4) $0.44 \times 10^{-13} \text{ C}^2\text{N}^{-1}\text{m}^{-2}$

Ans. (2)

Sol: $C_{\text{air}} = \frac{\epsilon_0 A}{d}$

$$C_{\text{med}} = \frac{K\epsilon_0 A}{d}$$

$$C_{\text{med}} = KC_{\text{air}}$$

$$30 = K6$$

$$K=5$$

$$\frac{\epsilon}{\epsilon_0} = 5$$

$$\epsilon = 5\epsilon_0 = 5 \times 8.85 \times 10^{-12}$$

$$= 0.44 \times 10^{-10}$$

165. Find the torque about the origin when a force of $3\hat{j}$ N acts on a particle whose position vector is $2\hat{k}$ m.

- (1) $6\hat{j}$ Nm
- (2) $-6\hat{i}$ Nm
- (3) $6\hat{k}$ Nm
- (4) $6\hat{i}$ Nm

Ans. (2)

Sol: $\vec{\tau} = \vec{r} \times \vec{F}$

$$\vec{\tau} = 2\hat{k} \times 3\hat{j}$$

$$= -6\hat{i}$$

166. A resistance wire connected in the left gap of a metre bridge balances a 10Ω resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1Ω of the resistance wire is :

- (1) 1.0×10^{-1} m
- (2) 1.5×10^{-1} m
- (3) 1.5×10^{-2} m
- (4) 1.0×10^{-2} m

Ans. (1)

Sol: $\frac{x}{10} = \frac{3}{2}$

$$x = 15\Omega$$

$$15\Omega \text{ ----- } 1.5\text{m}$$

$$1\Omega \text{ ----- } ?$$

then resistance of wire is $= \frac{1.5}{15} = 1 \times 10^{-1}$ m

167. For transistor action, which of the following statements is correct?

- (1) Base, emitter and collector regions should have same size
- (2) Both emitter junction as well as the collector junctions are forward biased
- (3) The base region must be very thin and lightly doped
- (4) Base, emitter and collector regions should have same doping concentrations

Ans. (3)

Sol: It is conceptual question



E emitter region moderate and heavily doped

C region thick moderately doped

B region very thin and very lightly doped

168. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic waves is :

(c = speed of electromagnetic waves)

- (1) 1 : 1
- (2) 1 : c
- (3) 1 : c^2
- (4) c : 1

Ans. (1)

Sol: In an electromagnetic wave electric field and magnetic field contributions are same

169. A charged particle having drift velocity of $7.5 \times 10^{-4} \text{ ms}^{-1}$ in an electric field of $3 \times 10^{-10} \text{ Vm}^{-1}$, has a mobility in $\text{m}^2 \text{V}^{-1} \text{s}^{-1}$ of

- (1) 2.5×10^6
- (2) 2.5×10^{-6}
- (3) 2.25×10^{-15}
- (4) 2.25×10^{15}

Ans. (1)

$$\text{Sol: } \mu = \frac{V_d}{E} = \frac{7.5 \times 10^{-4}}{3 \times 10^{-10}}$$

$$\mu = 2.5 \times 10^6$$

170. A spherical conductor of radius 10cm has a charge of $3.2 \times 10^{-7} \text{ C}$ distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere

$$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2 / \text{C}^2 \right)$$

(1) $1.28 \times 10^5 \text{ N / C}$

(2) $1.28 \times 10^6 \text{ N / C}$

(3) $1.28 \times 10^7 \text{ N / C}$

(4) $1.28 \times 10^4 \text{ N / C}$

Ans. (1)

$$\text{Sol: } E = \frac{1}{4\pi\epsilon_0} \cdot \frac{q}{r^2}$$

$$E = 9 \times 10^9 \times \frac{3.2 \times 10^{-7}}{(15 \times 10^{-2})^2}$$

$$E = 1.28 \times 10^5 \text{ N / C}$$

171. Taking into account of the significant figures, what is the value of $9.99 \text{ m} - 0.0099 \text{ m}$?

(1) 9.98m

(2) 9.980 m

(3) 9.9 m

(4) 9.9801 m

Ans. (1)

9.99

$$\text{Sol: } \frac{0.010}{9.980} \therefore \text{rounding off to 3 significant figures} = 9.98$$

172. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes

(1) half

(2) four times

(3) one-fourth

(4) double

Ans. (2)

$$\text{Sol: } \beta = \frac{\lambda D}{d}$$

$$\beta' = \frac{\lambda (2D)}{d/2} = \frac{4\lambda D}{d}$$

$$\beta' = 4\beta$$

173. Two cylinder A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is

(1) adiabatic

(2) isochoric

(3) isobaric

(4) isothermal

Ans. (1)**Sol:** Thermally insulated and suddenly opened \therefore process is adiabatic

174. The energy equivalent of 0.5g of a substance is

(1) $4.5 \times 10^{13} \text{ J}$

- (2) 1.5×10^{13} J
- (3) 0.5×10^{13} J
- (4) 4.5×10^{16} J

Ans. (1)

Sol: $E = mc^2$

$$E = 0.5 \times 10^{-3} \times (3 \times 10^8)^2 = 4.5 \times 10^{13} \text{ J}$$

175. A capillary tube of radius r is immersed in water and water rises in it to a height h . The mass of the water in the capillary is 5g. Another capillary tube of radius $2r$ is immersed in water. The mass of water that will rise in this tube is:

- (1) 5.0 g
- (2) 10.0 g
- (3) 20.0 g
- (4) 2.5 g

Ans. (2)

Sol: $T \cos \theta \times 2\pi r = mg$

$$m \propto r$$

radius doubled mass doubled

176. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale:

The pitch of the screw gauge is:

- (1) 0.25 mm
- (2) 0.5 mm
- (3) 1.0 mm
- (4) 0.01 mm

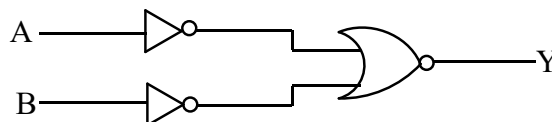
Ans. (2)

Sol: least count = $\frac{\text{pitch of screw}}{\text{no. of divisions on circular scale}}$

$$0.01 = \frac{\text{pitch}}{50}$$

$$\text{pitch} = 50 \times 0.01 = 0.5 \text{ mm}$$

177. For the logic circuit shown, the truth table is :



(1)

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

(2)

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

(3)

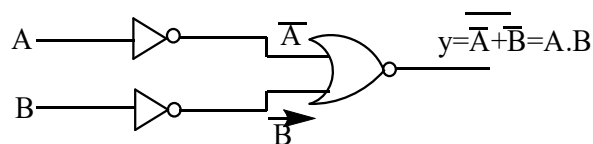
A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(4)

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

Ans. (4)

Sol:



∴ And gate

178. The average thermal energy for a mono-atomic gas is:

(k_B is Boltzman constant and T, absolute temperature)

(1) $\frac{3}{2} k_B T$

(2) $\frac{5}{2} k_B T$

(3) $\frac{7}{2}k_B T$

(4) $\frac{1}{2}k_B T$

Ans. (1)**Sol:** Average thermal energy = $\frac{3}{2}K_B T$

179. The solids which have the negative temperature coefficient of resistance are:

- (1) insulators only
- (2) semiconductors only
- (3) insulators and semiconductors
- (4) metals

Ans. (3)**Sol:** Both insulators and semiconductor have negative temperature coefficient of resistance.

180. Two particles of mass 5kg and 10kg respectively are attached to the two ends of a rigid rod of length 1m with negligible mass.

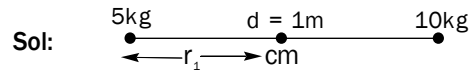
The centre of mass of the system from the 5kg particle is nearly at a distance of

- (1) 50 cm

- (2) 67 cm

- (3) 80 cm

- (4) 33 cm

Ans. (2)

$$r_1 = \frac{m_2 d}{m_1 + m_2} = \frac{10 \times 1}{5 + 10} = \frac{10}{15} = \frac{2}{3} \text{ m}$$

$$r_1 = 0.67 \text{ m} = 67 \text{ cm}$$

