

1. Name the enzyme that facilitates opening of DNA helix during transcription.  
 (1) DNA polymerase (2) RNA polymerase  
 (3) DNA ligase (4) DNA helicase
2. Which of the following would help in prevention of diuresis?  
 (1) Atrial natriuretic factor causes vasoconstriction  
 (2) Decrease in secretion of renin by JG cells  
 (3) More water reabsorption due to undersecretion of ADH  
 (4) Reabsorption of  $\text{Na}^+$  and water from renal tubules due to aldosterone
3. Meiotic division of the secondary oocyte is completed  
 (1) After zygote formation  
 (2) At the time of fusion of a sperm with an ovum  
 (3) Prior to ovulation  
 (4) At the time of copulation
4. 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) (iii) (iv) (ii) (i)  
 (2) (iv) (i) (ii) (iii)  
 (3) (ii) (i) (iv) (iii)  
 (4) (iv) (iii) (ii) (i)
5. Which of the following pairs is of unicellular algae?  
 (1) *Anabaena* and *Volvox*  
 (2) *Chlorella* and *Spirulina*  
 (3) *Laminaria* and *Sargassum*  
 (4) *Gelidium* and *Gracilaria*
6. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of  
 (1) 1 molecule of 6-C compound  
 (2) 1 molecule of 4-C compound and 1 molecule of 2-C compound  
 (3) 2 molecules of 3-C compound  
 (4) 1 molecule of 3-C compound
7. 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) (i) (ii) (iv) (iii)<br>(2) (ii) (i) (iii) (iv)<br>(3) (iii) (iv) (ii) (i)<br>(4) (iv) (i) (ii) (iii) |
8. Match the following columns and select the correct option.
- | Column-I                  | Column-II  |
|---------------------------|--|
| (a) Placenta              | (i) Androgens  |
| (b) Zona pellucida        | (ii) Human Chorionic Gonadotropin (hCG)  |
| (c) Bulbo-urethral glands | (iii) Layer of the ovum  |
| (d) Leydig cells          | (iv) Lubrication of the Penis  |
| (a) (b) (c) (d)           | (1) (iii) (ii) (iv) (i)<br>(2) (ii) (iii) (iv) (i)<br>(3) (iv) (iii) (i) (ii)<br>(4) (i) (iv) (ii) (iii) |

9. 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) (c) and (d)      (2) (a) and (d)  
(3) (a) only      (4) (a), (b) and (c)
10. Which of the following statements about inclusion bodies is incorrect?  
(1) They lie free in the cytoplasm  
(2) These represent reserve material in cytoplasm  
(3) They are not bound by any membrane  
(4) These are involved in ingestion of food particles
11. Strobili or cones are found in  
(1) *Marchantia*      (2) *Equisetum*  
(3) *Salvinia*      (4) *Pteris*
12. Montreal protocol was signed in 1987 for control of  
(1) Release of Green House gases  
(2) Disposal of e-wastes  
(3) Transport of Genetically modified organisms from one country to another  
(4) Emission of ozone depleting substances
13. Which of the following statements is correct?  
(1) Adenine pairs with thymine through three H-bonds  
(2) Adenine does not pair with thymine  
(3) Adenine pairs with thymine through two H-bonds  
(4) Adenine pairs with thymine through one H-bond
14. The body of the ovule is fused within the funicle at  
(1) Nucellus      (2) Chalaza  
(3) Hilum      (4) Micropyle
15. The sequence that controls the copy number of the linked DNA in the vector, is termed  
(1) Palindromic sequence  
(2) Recognition site  
(3) Selectable marker  
(4) Ori site
16. Identify the wrong statement with regard to Restriction Enzymes.  
(1) They are useful in genetic engineering.  
(2) Sticky ends can be joined by using DNA ligases.  
(3) Each restriction enzyme functions by inspecting the length of a DNA sequence.  
(4) They cut the strand of DNA at palindromic sites.
17. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are  
(1) Ammonia and oxygen  
(2) Ammonia and hydrogen  
(3) Ammonia alone  
(4) Nitrate alone
18. In light reaction, plastoquinone facilitates the transfer of electrons from  
(1) PS-I to NADP<sup>+</sup>  
(2) PS-I to ATP synthase  
(3) PS-II to Cytb<sub>6</sub>f complex  
(4) Cytb<sub>6</sub>f complex to PS-I
19. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle?  
(1) Low concentration of LH  
(2) Low concentration of FSH  
(3) High concentration of Estrogen  
(4) High concentration of Progesterone



30. The transverse section of a plant shows following anatomical features :
- Large number of scattered vascular bundles surrounded by bundle sheath
  - Large conspicuous parenchymatous ground tissue
  - Vascular bundles conjoint and closed
  - Phloem parenchyma absent
- Identify the category of plant and its part :
- Dicotyledonous stem
  - Dicotyledonous root
  - Monocotyledonous stem
  - Monocotyledonous root
31. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask
- $\text{CH}_4$ ,  $\text{H}_2$ ,  $\text{NH}_3$  and water vapor at  $600^\circ\text{C}$
  - $\text{CH}_3$ ,  $\text{H}_2$ ,  $\text{NH}_3$  and water vapor at  $600^\circ\text{C}$
  - $\text{CH}_4$ ,  $\text{H}_2$ ,  $\text{NH}_3$  and water vapor at  $800^\circ\text{C}$
  - $\text{CH}_3$ ,  $\text{H}_2$ ,  $\text{NH}_4$  and water vapor at  $800^\circ\text{C}$
32. Identify the basic amino acid from the following.
- |              |                   |
|--------------|-------------------|
| (1) Lysine   | (2) Valine        |
| (3) Tyrosine | (4) Glutamic Acid |
33. Snow-blindness in Antarctic region is due to
- High reflection of light from snow
  - Damage to retina caused by infra-red rays
  - Freezing of fluids in the eye by low temperature
  - Inflammation of cornea due to high dose of UV-B radiation
34. 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) S phase | (2) $G_2$ phase |
| (3) M phase | (4) $G_1$ phase |
35. Which of the following regions of the globe exhibits highest species diversity?
- Himalayas
  - Amazon forests
  - Western Ghats of India
  - Madagascar
36. Identify the incorrect statement.
- Sapwood is the innermost secondary xylem and is lighter in colour
  - Due to deposition of tannins, resins, oils etc., heart wood is dark in colour
  - Heart wood does not conduct water but gives mechanical support
  - Sapwood is involved in conduction of water and minerals from root to leaf
37. Floridean starch has structure similar to
- Mannitol and algin
  - Laminarin and cellulose
  - Starch and cellulose
  - Amylopectin and glycogen
38. Which of the following is not an attribute of a population?
- |               |                         |
|---------------|-------------------------|
| (1) Mortality | (2) Species interaction |
| (3) Sex ratio | (4) Natality            |
39. The number of substrate level phosphorylations in one turn of citric acid cycle is
- |          |           |
|----------|-----------|
| (1) Two  | (2) Three |
| (3) Zero | (4) One   |
40. Identify the correct statement with reference to human digestive system.
- Ileum is a highly coiled part
  - Vermiform appendix arises from duodenum
  - Ileum opens into small intestine
  - Serosa is the innermost layer of the alimentary canal

41. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive?
- ICSI and ZIFT
  - GIFT and ICSI
  - ZIFT and IUT
  - GIFT and ZIFT
42. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is correct?
- Gross primary productivity and Net primary productivity are one and same
  - There is no relationship between Gross primary productivity and Net primary productivity
  - Gross primary productivity is always less than net primary productivity
  - Gross primary productivity is always more than net primary productivity
43. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.
- Ethylene
  - Abscisic acid
  - Cytokinin
  - Gibberellin
44. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their
- Defence action
  - Effect on reproduction
  - Nutritive value
  - Growth response
45. Select the correct match
- |                         |  |
|-------------------------|--|
| (1) Sickle cell anaemia | - Autosomal recessive trait, chromosome-11 |
| (2) Thalassemia         | - X linked                                 |
| (3) Haemophilia         | - Y linked                                 |
| (4) Phenylketonuria     | - Autosomal dominant trait                 |
46. Select the correct statement.
- Insulin acts on pancreatic cells and adipocytes.
  - Insulin is associated with hyperglycemia.
  - Glucocorticoids stimulate gluconeogenesis.
  - Glucagon is associated with hypoglycemia.
47. Which of the following refer to correct example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action?
- Darwin's Finches of Galapagos islands.
  - Herbicide resistant weeds.
  - Drug resistant eukaryotes.
  - Man-created breeds of domesticated animals like dogs.
- (b), (c) and (d)
  - only (d)
  - only (a)
  - (a) and (c)
48. Choose the correct pair from the following
- |                  |  |
|------------------|--|
| (1) Nucleases    | - Separate the two strands of DNA            |
| (2) Exonucleases | - Make cuts at specific positions within DNA |
| (3) Ligases      | - Join the two DNA molecules                 |
| (4) Polymerases  | - Break the DNA into fragments               |
49. Embryological support for evolution was disapproved by
- Charles Darwin
  - Oparin
  - Karl Ernst von Baer
  - Alfred Wallace
50. Goblet cells of alimentary canal are modified from
- Chondrocytes
  - Compound epithelial cells
  - Squamous epithelial cells
  - Columnar epithelial cells

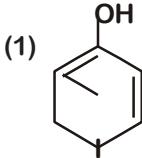
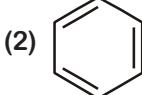
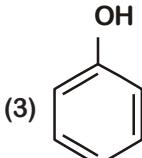
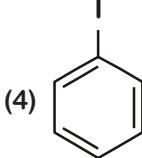
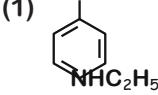
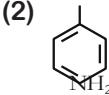
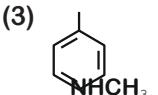
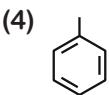
51. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to  
 (1) Plant nematodes  
 (2) Insect predators  
 (3) Insect pests  
 (4) Fungal diseases
52. Which of the following statements are true for the phylum-Chordata?  
 (a) In Urochordata 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) (a) and (b)  
 (2) (b) and (c)  
 (3) (d) and (c)  
 (4) (c) and (a)
53. Which of the following is put into Anaerobic sludge digester for further sewage treatment?  
 (1) Effluents of primary treatment  
 (2) Activated sludge  
 (3) Primary sludge  
 (4) Floating debris
54. Identify the substances having glycosidic bond and peptide bond, respectively in their structure  
 (1) Cellulose, lecithin  
 (2) Inulin, insulin  
 (3) Chitin, cholesterol  
 (4) Glycerol, trypsin
55. 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) (1) (ii)   | (b) (i)                 | (c) (iii) | (d) (iv) |
| (2) (iv)       | (i)                     | (ii)      | (iii)    |
| (3) (i)        | (iii)                   | (ii)      | (iv)     |
| (4) (iii)      | (iv)                    | (i)       | (ii)     |
56. 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) (1) (i)                       | (b) (ii)                              | (c) (iv) | (d) (iii) |
| (2) (iv)                          | (iii)                                 | (ii)     | (i)       |
| (3) (iii)                         | (iv)                                  | (ii)     | (i)       |
| (4) (ii)                          | (i)                                   | (iv)     | (iii)     |
57. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams?  
 (1) Cross breeding  
 (2) Inbreeding  
 (3) Out crossing  
 (4) Mutational breeding

58. Select the correct events that occur during inspiration.
- Contraction of diaphragm
  - Contraction of external inter-costal muscles
  - Pulmonary volume decreases
  - Intra pulmonary pressure increases
- (a), (b) and (d)
  - only (d)
  - (a) and (b)
  - (c) and (d)
59. Match the following columns and select the correct option.
- | Column-I  | Column-II               |
|---|-------------------------|
| (a) Gregarious,<br>polyphagous pest                                       | (i) <i>Asterias</i>     |
| (b) Adult with radial<br>symmetry and larva<br>with bilateral<br>symmetry | (ii) Scorpion           |
| (c) Book lungs  | (iii) <i>Ctenoplana</i> |
| (d) Bioluminescence   | (iv) <i>Locusta</i>     |
| (a) (b) (c) (d)   |                         |
| (1) (iii) (ii) (i) (iv)   |                         |
| (2) (ii) (i) (iii) (iv)   |                         |
| (3) (i) (iii) (ii) (iv)   |                         |
| (4) (iv) (i) (ii) (iii)   |                         |
60. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells?
- Golgi bodies
  - Polysomes
  - Endoplasmic reticulum
  - Peroxisomes
61. The specific palindromic sequence which is recognized by EcoRI is
- 5' - CTTAAG - 3'  
3' - GAATTC - 5'
  - 5' - GGATCC - 3'  
3' - CCTAGG - 5'
  - 5' - GAATTC - 3'  
3' - CTTAAG - 5'
  - 5' - GGAACC - 3'  
3' - CCTTGG - 5'
62. Dissolution of the synaptonemal complex occurs during
- Diplotene
  - Leptotene
  - Pachytene
  - Zygotene
63. Match the trophic levels with their correct species examples in grassland ecosystem.
- Fourth trophic level (i) Crow
  - Second trophic level (ii) Vulture
  - First trophic level (iii) Rabbit
  - Third trophic level (iv) Grass
- Select the correct option
- | (a)       | (b)   | (c)   | (d)  |
|-----------|-------|-------|------|
| (1) (iv)  | (iii) | (ii)  | (i)  |
| (2) (i)   | (ii)  | (iii) | (iv) |
| (3) (ii)  | (iii) | (iv)  | (i)  |
| (4) (iii) | (ii)  | (i)   | (iv) |
64. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits?
- 14
  - 8
  - 4
  - 2

65. 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) (ii)  | (iii) | (iv)  | (i)   |
| (2) (i)   | (ii)  | (iii) | (iv)  |
| (3) (iv)  | (i)   | (ii)  | (iii) |
| (4) (iii) | (ii)  | (i)   | (iv)  |
66. 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) (iv)  | (ii)  | (iii) | (i)  |
| (2) (i)   | (iv)  | (iii) | (ii) |
| (3) (ii)  | (iii) | (iv)  | (i)  |
| (4) (iii) | (iv)  | (i)   | (ii) |
67. The process of growth is maximum during
- (1) Senescence
  - (2) Dormancy
  - (3) Log phase
  - (4) Lag phase
68. Identify the wrong statement with reference to immunity.
- (1) Active immunity is quick and gives full response.
  - (2) Foetus receives some antibodies from mother, it is an example for passive immunity.
  - (3) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".
  - (4) When ready-made antibodies are directly given, it is called "Passive immunity".
69. 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) (iii) | (ii)  | (iv) | (i)   |
| (2) (iv)  | (iii) | (i)  | (ii)  |
| (3) (ii)  | (iv)  | (i)  | (iii) |
| (4) (i)   | (iii) | (ii) | (iv)  |
70. If the distance between two consecutive base pairs is  $0.34 \text{ nm}$  and the total number of base pairs of a DNA double helix in a typical mammalian cell is  $6.6 \times 10^9 \text{ bp}$ , then the length of the DNA is approximately
- (1) 2.2 meters
  - (2) 2.7 meters
  - (3) 2.0 meters
  - (4) 2.5 meters
71. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus?
- (1) Ketonuria and Glycosuria
  - (2) Renal calculi and Hyperglycaemia
  - (3) Uremia and Ketonuria
  - (4) Uremia and Renal Calculi

72. Bilaterally symmetrical and acoelomate animals are exemplified by  
 (1) Aschelminthes    (2) Annelida  
 (3) Ctenophora    (4) Platyhelminthes
73. Ray florets have  
 (1) Hypogynous ovary  
 (2) Half inferior ovary  
 (3) Inferior ovary  
 (4) Superior ovary
74. The infectious stage of *Plasmodium* that enters the human body is  
 (1) Female gametocytes  
 (2) Male gametocytes  
 (3) Trophozoites  
 (4) Sporozoites
75. Which of the following statements is not correct?  
 (1) The functional insulin has A and B chains linked together by hydrogen bonds.  
 (2) Genetically engineered insulin is produced in *E.Coli*.  
 (3) In man insulin is synthesised as a proinsulin  
 (4) The proinsulin has an extra peptide called C-peptide.
76. In water hyacinth and water lily, pollination takes place by :  
 (1) Wind and water  
 (2) Insects and water  
 (3) Insects or wind  
 (4) Water currents only
77. Cuboidal epithelium with brush border of microvilli is found in  
 (1) Proximal convoluted tubule of nephron  
 (2) Eustachian tube  
 (3) Lining of intestine  
 (4) Ducts of salivary gland
78. 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)           | (i)                      | (iv) | (ii)  |
| (2) (ii)            | (i)                      | (iv) | (iii) |
| (3) (iv)            | (iii)                    | (i)  | (ii)  |
| (4) (iii)           | (ii)                     | (i)  | (iv)  |
79. Which one of the following is the most abundant protein in the animals?  
 (1) Lectin  
 (2) Insulin  
 (3) Haemoglobin  
 (4) Collagen
80. If the head of cockroach is removed, it may live for few days because  
 (1) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.  
 (2) the head holds a 1/3<sup>rd</sup> of a nervous system while the rest is situated along the dorsal part of its body.  
 (3) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.  
 (4) the cockroach does not have nervous system.
81. Flippers of Penguins and Dolphins are examples of  
 (1) Industrial melanism  
 (2) Natural selection  
 (3) Adaptive radiation  
 (4) Convergent evolution

82. 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) Imbibition      (2) Plasmolysis  
 (3) Transpiration    (4) Root pressure
83. Match the following with respect to meiosis  
 (a) Zygote           (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) (i)    (ii)    (iv)    (iii)  
 (2) (ii)    (iv)    (iii)    (i)  
 (3) (iii)   (iv)    (i)    (ii)  
 (4) (iv)    (iii)   (ii)    (i)
84. The QRS complex in a standard ECG represents  
 (1) Depolarisation of ventricles  
 (2) Repolarisation of ventricles  
 (3) Repolarisation of auricles  
 (4) Depolarisation of auricles
85. Select the option including all sexually transmitted diseases.  
 (1) AIDS, Malaria, Filaria  
 (2) Cancer, AIDS, Syphilis  
 (3) Gonorrhoea, Syphilis, Genital herpes  
 (4) Gonorrhoea, Malaria, Genital herpes
86. Identify the wrong statement with reference to the gene 'I' that controls ABO blood groups.  
 (1) When  $I^A$  and  $I^B$  are present together, they express same type of sugar.  
 (2) Allele 'i' does not produce any sugar.  
 (3) The gene (I) has three alleles.  
 (4) A person will have only two of the three alleles.
87. Which of the following is not an inhibitory substance governing seed dormancy?  
 (1) Phenolic acid      (2) Para-ascorbic acid  
 (3) Gibberellic acid    (4) Abscisic acid
88. 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)     |                                      |
| (4) (iii)   (i)    (iv)    (ii) |                                      |
| (1) (iv)    (ii)   (i)    (iii) |                                      |
| (2) (i)    (ii)    (iv)   (iii) |                                      |
| (3) (ii)   (iii)   (i)    (iv)  |                                      |
89. The ovary is half inferior in :  
 (1) Sunflower          (2) Plum  
 (3) Brinjal            (4) Mustard
90. Match the following
- |                                     |               |
|-------------------------------------|---------------|
| (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)    (iv)    (i)    (ii)  
 (2) (ii)    (iii)   (i)    (iv)  
 (3) (ii)    (iv)    (iii)   (i)  
 (4) (iii)   (i)    (iv)   (ii)

91. Which of the following oxoacid of sulphur has – O – O – linkage?
- $\text{H}_2\text{S}_2\text{O}_8$ , peroxodisulphuric acid
  - $\text{H}_2\text{S}_2\text{O}_7$ , pyrosulphuric acid
  - $\text{H}_2\text{SO}_3$ , sulphurous acid
  - $\text{H}_2\text{SO}_4$ , sulphuric acid
92. An increase in the concentration of the reactants of a reaction leads to change in
- threshold energy
  - collision frequency
  - activation energy
  - heat of reaction
93. Identify the incorrect match.
- | Name            | IUPAC Official Name |
|-----------------|---------------------|
| (a) Unnilunium  | (i) Mendelevium     |
| (b) Unniltrium  | (ii) Lawrencium     |
| (c) Unnilhexium | (iii) Seaborgium    |
| (d) Unununniun  | (iv) Darmstadtium   |
| (1) (c), (iii)  | (2) (d), (iv)       |
| (3) (a), (i)    | (4) (b), (ii)       |
94. A mixture of  $\text{N}_2$  and Ar gases in a cylinder contains 7 g of  $\text{N}_2$  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  $\text{N}_2$  is :  
 [Use atomic masses (in g mol<sup>-1</sup>) : N = 14, Ar = 40]
- 15 bar
  - 18 bar
  - 9 bar
  - 12 bar
95. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as
- Cross Cannizzaro's reaction
  - Cross Aldol condensation
  - Aldol condensation
  - Cannizzaro's reaction
96. Which one of the followings has maximum number of atoms ?
- 1 g of  $\text{O}_2(\text{g})$  [Atomic mass of O = 16]
  - 1 g of  $\text{Li}(\text{s})$  [Atomic mass of Li = 7]
  - 1 g of  $\text{Ag}(\text{s})$  [Atomic mass of Ag = 108]
  - 1 g of  $\text{Mg}(\text{s})$  [Atomic mass of Mg = 24]
97. Anisole on cleavage with HI gives
-  +  $\text{C}_2\text{H}_5\text{I}$
  -  +  $\text{C}_2\text{H}_5\text{OH}$
  -  +  $\text{CH}_3\text{I}$
  -  +  $\text{CH}_3\text{OH}$
98. Which of the following amine will give the carbylamine test?
- $\text{N}(\text{CH}_3)_2$
  - 
  - 
  - 
  - 

99. Identify the incorrect statement.

- (1) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.
- (2) The oxidation states of chromium in  $\text{CrO}_4^{2-}$  and  $\text{Cr}_2\text{O}_7^{2-}$  are not the same.
- (3)  $\text{Cr}^{2+}$  ( $d^4$ ) is a stronger reducing agent than  $\text{Fe}^{2+}$  ( $d^6$ ) in water.
- (4) 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.

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

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

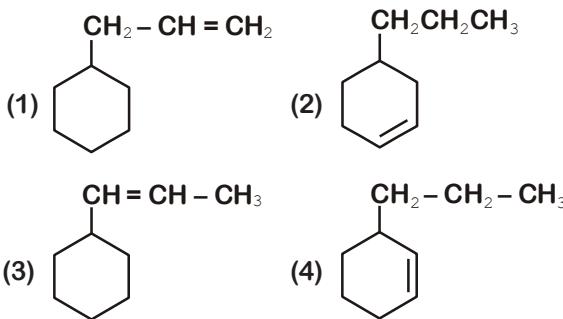
101. Which of the following is a natural polymer?

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

102. 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) $\text{B}_2\text{H}_6$                | (iii) Synthesis gas   |
| (d) $\text{H}_2\text{O}_2$                | (iv) Non-planar structure                                   |
- (a) (b) (c) (d)
- (1) (iii) (iv) (ii) (i)  
(2) (i) (iii) (ii) (iv)  
(3) (iii) (i) (ii) (iv)  
(4) (iii) (ii) (i) (iv)

103. An alkene on ozonolysis gives methanal as one of the product. Its structure is



104. 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) 500 s  
(2) 1000 s  
(3) 100 s  
(4) 200 s

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

- (1)  $\text{H}_2\text{S}$  gas  
(2)  $\text{SO}_2$  gas  
(3) Hydrogen gas  
(4) Oxygen gas

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

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

107. Sucrose on hydrolysis gives

- (1)  $\alpha$ -D-Glucose +  $\beta$ -D-Fructose  
(2)  $\alpha$ -D-Fructose +  $\beta$ -D-Fructose  
(3)  $\beta$ -D-Glucose +  $\alpha$ -D-Fructose  
(4)  $\alpha$ -D-Glucose +  $\beta$ -D-Glucose

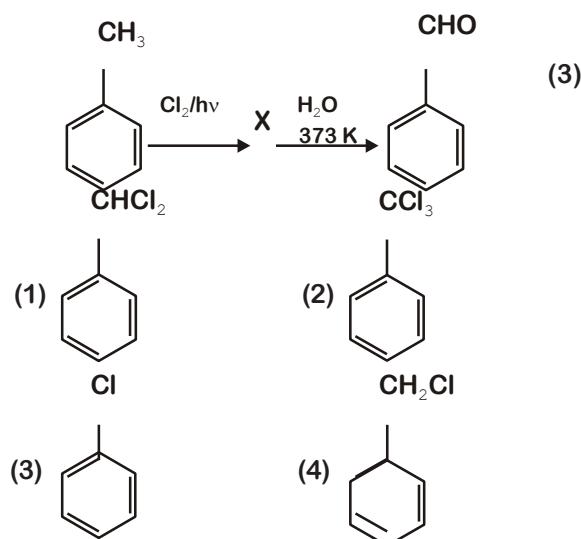
108. Which of the following is not correct about carbon monoxide?

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

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

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

110. Identify compound X in the following sequence of reactions



111. 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) 0.40 K
- (2) 0.60 K
- (3) 0.20 K
- (4) 0.80 K

112. Which of the following is a cationic detergent?

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

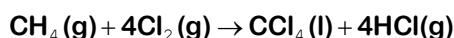
113. Paper chromatography is an example of

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

114. Identify the correct statement from the following :

- (1) Vapour phase refining is carried out for Nickel by Van Arkel method.
- (2) Pig iron can be moulded into a variety of shapes.  
Wrought iron is impure iron with 4% carbon.
- (4) Blister copper has blistered appearance due to evolution of  $\text{CO}_2$ .

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

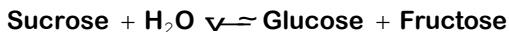


- (1) -4 to +4
- (2) 0 to -4
- (3) +4 to +4
- (4) 0 to +4

116. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is

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

117. Hydrolysis of sucrose is given by the following reaction.



If the equilibrium constant ( $K_C$ ) is  $2 \times 10^{13}$  at 300 K, the value of  $\Delta_r G^\circ$  at the same temperature will be :

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

118. Match the following :

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

Which of the following is correct option?

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

119. Identify a molecule which does not exist.

- (1) C<sub>2</sub>
- (2) O<sub>2</sub>
- (3) He<sub>2</sub>
- (4) Li<sub>2</sub>

120. The number of Faradays(F) required to produce 20 g of calcium from molten CaCl<sub>2</sub> (Atomic mass of Ca = 40 g mol<sup>-1</sup>) is

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

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

- (1) Cu(OH)<sub>2</sub>
- (2) CuCO<sub>3</sub>·Cu(OH)<sub>2</sub>
- (3) CuSO<sub>4</sub>
- (4) [Cu(NH<sub>3</sub>)<sub>4</sub>]<sup>2+</sup>

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

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

123. The number of protons, neutrons and electrons in <sup>175</sup>Lu, respectively, are

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

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

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

125. HCl was passed through a solution of CaCl<sub>2</sub>, MgCl<sub>2</sub> and NaCl. Which of the following compound(s) crystallise(s)?

- (1) Only MgCl<sub>2</sub>
- (2) NaCl, MgCl<sub>2</sub> and CaCl<sub>2</sub>
- (3) Both MgCl<sub>2</sub> and CaCl<sub>2</sub>
- (4) Only NaCl

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

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

127. Find out the solubility of  $\text{Ni(OH)}_2$  in 0.1 M NaOH. Given that the ionic product of  $\text{Ni(OH)}_2$  is  $2 \times 10^{-15}$
- $1 \times 10^{-13} \text{ M}$
  - $1 \times 10^8 \text{ M}$
  - $2 \times 10^{-13} \text{ M}$
  - $2 \times 10^{-8} \text{ M}$
128. For the reaction,  $2\text{Cl(g)} \longrightarrow \text{Cl}_2\text{(g)}$ , the correct option is :
- $\Delta_r\text{H} < 0$  and  $\Delta_r\text{S} > 0$
  - $\Delta_r\text{H} < 0$  and  $\Delta_r\text{S} < 0$
  - $\Delta_r\text{H} > 0$  and  $\Delta_r\text{S} > 0$
  - $\Delta_r\text{H} > 0$  and  $\Delta_r\text{S} < 0$
129. The calculated spin only magnetic moment of  $\text{Cr}^{2+}$  ion is
- 5.92 BM
  - 2.84 BM
  - 3.87 BM
  - 4.90 BM
130. Identify the correct statements from the following :
- $\text{CO}_2\text{(g)}$  is used as refrigerant for ice-cream and frozen food.
  - The structure of  $\text{C}_{60}$  contains twelve six carbon rings and twenty five carbon rings.
  - ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.
  - CO is colorless and odourless gas.
- (b) and (c) only
  - (c) and (d) only
  - (a), (b) and (c) only
  - (a) and (c) only
131. 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.
- Calcium
  - Potassium
  - Iron
  - Copper
132. Which of the following set of molecules will have zero dipole moment?
- Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene
  - Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene
  - Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene
  - Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene
133. The correct option for free expansion of an ideal gas under adiabatic condition is
- $q < 0$ ,  $\Delta T = 0$  and  $w = 0$
  - $q > 0$ ,  $\Delta T > 0$  and  $w > 0$
  - $q = 0$ ,  $\Delta T = 0$  and  $w = 0$
  - $q = 0$ ,  $\Delta T < 0$  and  $w > 0$
134. Which of the following is the correct order of increasing field strength of ligands to form coordination compounds?
- $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
  - $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$
  - $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
  - $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$
135. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?
- R effect of -  $\text{CH}_3$  groups
  - Hyperconjugation
  - I effect of -  $\text{CH}_3$  groups
  - + R effect of -  $\text{CH}_3$  groups



144. 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?

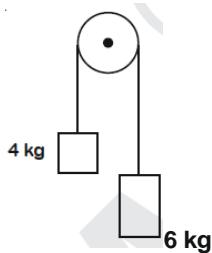
- (1) one-fourth                          (2) zero  
(3) doubled                              (4) four times

145. 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) 0.5 mm                          (2) 1.0 mm  
(3) 0.01 mm                        (4) 0.25 mm

146. Two bodies of mass 4 kg and 6 kg 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 :





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

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

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

- (1) Deuteron atom
  - (2) Singly ionised neon atom ( $\text{Ne}^+$ )
  - (3) Hydrogen atom
  - (4) Singly ionised helium atom ( $\text{He}^+$ )

149. 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 5 g. Another capillary tube of radius  $2r$  is immersed in water. The mass of water that will rise in this tube is :



150. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)

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

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

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

- (1)  $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$   
(2)  $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$   
(3)  $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$   
(4)  $8.0 \times 10^{-5} \text{ T m A}^{-1}$

152. The Brewsters angle  $i_b$  for an interface should be

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

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

- (1)  $\frac{\pi}{2}$  rad      (2) zero  
 (3)  $\pi$  rad      (4)  $\frac{3\pi}{2}$  rad

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

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

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

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

- (1)  $1.28 \times 10^6$  N/C      (2)  $1.28 \times 10^7$  N/C  
 (3)  $1.28 \times 10^4$  N/C      (4)  $1.28 \times 10^5$  N/C

156. 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)  $7.32 \times 10^{-7}$  rad  
 (2)  $6.00 \times 10^{-7}$  rad  
 (3)  $3.66 \times 10^{-7}$  rad  
 (4)  $1.83 \times 10^{-7}$  rad

157. A charged particle having drift velocity of  $7.5 \times 10^{-4}$  m s<sup>-1</sup> in an electric field of  $3 \times 10^{-10}$  V m<sup>-1</sup>, has a mobility in m<sup>2</sup> V<sup>-1</sup> s<sup>-1</sup> of :

- (1)  $2.5 \times 10^{-6}$       (2)  $2.25 \times 10^{-15}$   
 (3)  $2.25 \times 10^{15}$       (4)  $2.5 \times 10^6$

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

- (1) 9.980 m      (2) 9.9 m  
 (3) 9.9801 m      (4) 9.98 m

159. The energy equivalent of 0.5 g of a substance is :

- (1)  $1.5 \times 10^{13}$  J      (2)  $0.5 \times 10^{13}$  J  
 (3)  $4.5 \times 10^{16}$  J      (4)  $4.5 \times 10^{13}$  J

160. When a uranium isotope  $^{235}_{92}\text{U}$  is bombarded with a neutron, it generates  $^{89}_{36}\text{Kr}$ , three neutrons and :

- (1)  $^{101}_{36}\text{Kr}$       (2)  $^{103}_{36}\text{Kr}$   
 (3)  $^{144}_{56}\text{Ba}$       (4)  $^{91}_{40}\text{Zr}$

161. A short electric dipole has a dipole moment of  $16 \times 10^{-9}$  C m. 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 :

$$\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2$$

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

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

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

- (1) 0.1 kg/m<sup>3</sup>  
 (2) 0.02 kg/m<sup>3</sup>  
 (3) 0.5 kg/m<sup>3</sup>  
 (4) 0.2 kg/m<sup>3</sup>

163. The average thermal energy for a mono-atomic gas is : ( $k_B$  is Boltzmann constant and T, absolute temperature)

$$(1) \frac{5}{2} k_B T$$

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

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

$$(4) \frac{3}{2} k_B T$$

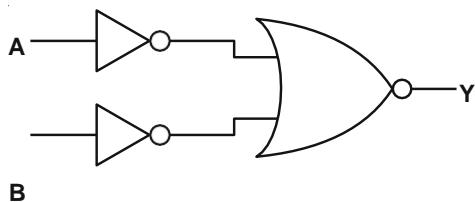
164. The color code of a resistance is given below



The values of resistance and tolerance, respectively, are

- (1) 4.7 kΩ, 5%      (2) 470 Ω, 5%  
 (3) 470 kΩ, 5%      (4) 47 kΩ, 10%

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



(1)	A	B	Y
0	0	1	1
0	1	1	1
1	0	1	1
1	1	0	0

(2)	A	B	Y
0	0	1	1
0	1	0	0
1	0	0	0
1	1	0	0

(3)	A	B	Y
0	0	0	0
0	1	0	0
1	0	0	0

(4)	A	B	Y
0	0	0	0
0	1	1	1
1	0	1	1
1	1	1	1

166. A resistance wire connected in the left gap of a metre bridge balances a  $10\ \Omega$  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 1  $\Omega$  of the resistance wire is :

- (1)  $1.5 \times 10^{-1}$  m      (2)  $1.5 \times 10^{-2}$  m  
 (3)  $1.0 \times 10^{-2}$  m      (4)  $1.0 \times 10^{-1}$  m

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

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

168. 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) $\frac{MgL}{AL_1}$ | (2) $\frac{MgL}{A(L_1 - L)}$ |
| (3) $\frac{MgL_1}{AL}$ | (4) $\frac{Mg(L_1 - L)}{AL}$ |

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

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

170. 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) 30 N      (2) 24 N  
 (3) 48 N      (4) 32 N

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

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

172. 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  $\mu$ , then the angle of incidence is nearly equal to :

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

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

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

