

Test Booklet Code

DEF

No.: 4320843

This Booklet contains 20 pages.

R

Do not open this Test Booklet until you are asked to do so.

**Important Instructions :**

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with **blue/black ball point pen** only.
2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue/Black Ball Point Pen** only for writing particulars on this page/marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must handover the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **R**. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this 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 Admission 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 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 Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
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.

1. Which vector can clone only a small fragment of DNA ?

- (1) Cosmid
- (2) Bacterial artificial chromosome
- (3) Yeast artificial chromosome
- (4) Plasmid

2. Archaeobacteria differ from eubacteria in :

- (1) Mode of reproduction
- (2) Cell membrane structure
- (3) Mode of nutrition
- (4) Cell shape

3. A marine cartilaginous fish that can produce electric current is :

- (1) *Scoliodon*
- (2) *Pristis*
- (3) *Torpedo*
- (4) *Trygon*

4. What gases are produced in anaerobic sludge digesters ?

- (1) Hydrogen Sulphide and  $\text{CO}_2$
- (2) Methane and  $\text{CO}_2$  only
- (3) Methane, Hydrogen Sulphide and  $\text{CO}_2$
- (4) Methane, Hydrogen Sulphide and  $\text{O}_2$

Select the correct matching of the type of the joint with the example in human skeletal system :

| Type of joint             | Example                                     |
|---------------------------|---------------------------------------------|
| (1) Gliding joint -       | between carpals                             |
| (2) Cartilaginous joint - | between frontal and parietal                |
| (3) Pivot joint -         | between third and fourth cervical vertebrae |
| (4) Hinge joint -         | between humerus and pectoral girdle         |

Injury localized to the hypothalamus would most likely disrupt :

- (1) regulation of body temperature.
- (2) short - term memory.
- (3) co-ordination during locomotion.
- (4) executive functions, such as decision making.

7. Which is the particular type of drug that is obtained from the plant whose one flowering branch is shown below ?



- (1) Pain - killer
- (2) Hallucinogen
- (3) Depressant
- (4) Stimulant

8. Identify the hormone with its correct matching of source and function :

- (1) Atrial natriuretic factor - ventricular wall increases the blood pressure.
- (2) Oxytocin - posterior pituitary, growth and maintenance of mammary glands.
- (3) Melatonin - pineal gland, regulates the normal rhythm of sleepwake cycle.
- (4) Progesterone - corpus-luteum, stimulation of growth and activities of female secondary sex organs.

9. The shared terminal duct of the reproductive and urinary system in the human male is :

- (1) Vasa efferentia
- (2) Urethra
- (3) Ureter
- (4) Vas deferens

10. If 20 J of energy is trapped at producer level, then how much energy will be available to peacock as food in the following chain ?

plant → mice → snake → peacock

- (1) 0.0002 J
- (2) 0.02 J
- (3) 0.002 J
- (4) 0.2 J

11. The organization which publishes the Red List of species is :

- (1) WWF
- (2) ICFRE
- (3) IUCN
- (4) UNEP

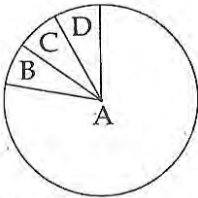
12. Which one of the following growth regulators is known as 'stress hormone' ?  
 (1) Indole acetic acid  
 (2) Abscissic acid  
 (3) Ethylene  
 (4) GA<sub>3</sub>
13. How do parasympathetic neural signals affect the working of the heart ?  
 (1) Heart rate decreases but cardiac output increases.  
 (2) Reduce both heart rate and cardiac output.  
 (3) Heart rate is increased without affecting the cardiac output.  
 (4) Both heart rate and cardiac output increase.
14. Placenta and pericarp are both edible portions in :  
 (1) Potato  
 (2) Apple  
 (3) Banana  
 (4) Tomato
15. An example of edible underground stem is :  
 (1) Potato  
 (2) Carrot  
 (3) Groundnut  
 (4) Sweet potato
16. When the margins of sepals or petals overlap one another without any particular direction, the condition is termed as :  
 (1) Valvate  
 (2) Vexillary  
 (3) Imbricate  
 (4) Twisted
17. In 'S' phase of the cell cycle :  
 (1) amount of DNA is reduced to half in each cell.  
 (2) amount of DNA doubles in each cell.  
 (3) amount of DNA remains same in each cell.  
 (4) chromosome number is increased.
18. Geitonogamy involves :  
 (1) fertilization of a flower by the pollen from a flower of another plant belonging to a distant population.  
 (2) fertilization of a flower by the pollen from another flower of the same plant.  
 (3) fertilization of a flower by the pollen from the same flower.  
 (4) fertilization of a flower by the pollen from a flower of another plant in the same population.
19. Person with blood group AB is considered as universal recipient because he has :  
 (1) both A and B antigens in the plasma but no antibodies.  
 (2) both A and B antigens on RBC but no antibodies in the plasma.  
 (3) both A and B antibodies in the plasma.  
 (4) no antigen on RBC and no antibody in the plasma.
20. Assisted reproductive technology, IVF involves transfer of :  
 (1) Embryo with 16 blastomeres into the fallopian tube.  
 (2) Ovum into the fallopian tube.  
 (3) Zygote into the fallopian tube.  
 (4) Zygote into the uterus.
21. Which one of the following are analogous structures?  
 (1) Flippers of Dolphin and Legs of Horse.  
 (2) Wings of Bat and Wings of Pigeon.  
 (3) Gills of Prawn and Lungs of Man.  
 (4) Thorns of *Bougainvillea* and Tendrils of *Cucurbita*
22. Which one of the following fungi contains hallucinogens ?  
 (1) *Ustilago* sp.  
 (2) *Morchella esculenta*  
 (3) *Amanita muscaria*  
 (4) *Neurospora* sp.
23. A species facing extremely high risk of extinction in the immediate future is called :  
 (1) Extinct  
 (2) Vulnerable  
 (3) Endemic  
 (4) Critically Endangered
24. Which one of the following is a non - reducing carbohydrate ?  
 (1) Ribose 5 - phosphate  
 (2) Maltose  
 (3) Sucrose  
 (4) Lactose
25. Select the correct option :

|     | Direction of RNA synthesis | Direction of reading of the template DNA strand |
|-----|----------------------------|-------------------------------------------------|
| (1) | 3' — 5'                    | 3' — 5'                                         |
| (2) | 5' — 3'                    | 3' — 5'                                         |
| (3) | 3' — 5'                    | 5' — 3'                                         |
| (4) | 5' — 3'                    | 5' — 3'                                         |

26. Which of the following shows coiled RNA strand and capsomeres ?
- (1) Retrovirus
  - (2) Polio virus
  - (3) Tobacco mosaic virus
  - (4) Measles virus

27. Which one of the following is **wrongly** matched ?
- (1) Operon - Structural genes, operator and promoter.
  - (2) Transcription - Writing information from DNA to t-RNA.
  - (3) Translation - Using information in m-RNA to make protein.
  - (4) Repressor protein - Binds to operator to stop enzyme synthesis.

28. Given below is the representation of the extent of global diversity of *invertebrates*. What groups the four portions (A-D) represent respectively ?



Options :

|     | A           | B                   | C                   | D                   |
|-----|-------------|---------------------|---------------------|---------------------|
| (1) | Insects     | Molluscs            | Crustaceans         | Other animal groups |
| (2) | Insects     | Crustaceans         | Other animal groups | Molluscs            |
| (3) | Crustaceans | Insects             | Molluscs            | Other animal groups |
| (4) | Molluscs    | Other animal groups | Crustaceans         | Insects             |

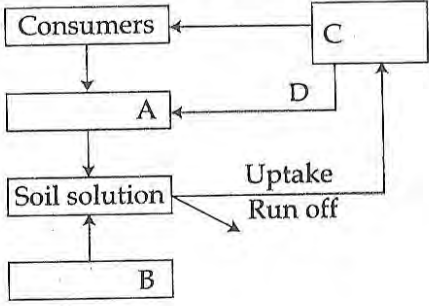
29. Five kingdom system of classification suggested by R.H. Whittaker is **not** based on :
- (1) Complexity of body organisatoin.
  - (2) Presence or absence of a well defined nucleus.
  - (3) Mode of reproduction.
  - (4) Mode of nutrition.

30. Match the following and select the **correct** option :
- |                       |                     |
|-----------------------|---------------------|
| (a) Earthworm         | (i) Pioneer species |
| (b) Succession        | (ii) Detritivore    |
| (c) Ecosystem service | (iii) Natality      |
| (d) Population growth | (iv) Pollination    |
- (a) (b) (c) (d)
- (1) (ii) (i) (iv) (iii)
  - (2) (i) (ii) (iii) (iv)
  - (3) (iv) (i) (iii) (ii)
  - (4) (iii) (ii) (iv) (i)

31. Just as a person moving from Delhi to Shimla to escape the heat for the duration of hot summer, thousands of migratory birds from Siberia and other extremely cold northern regions move to :
- (1) Keolado National Park
  - (2) Western Ghat
  - (3) Meghalaya
  - (4) Corbett National Park

32. Match the following and select the **correct** answer :
- |                 |                                   |
|-----------------|-----------------------------------|
| (a) Centriole   | (i) Infoldings in mitochondria    |
| (b) Chlorophyll | (ii) Thylakoids                   |
| (c) Cristae     | (iii) Nucleic acids               |
| (d) Ribozymes   | (iv) Basal body cilia or flagella |
- (a) (b) (c) (d)
- (1) (iv) (iii) (i) (ii)
  - (2) (iv) (ii) (i) (iii)
  - (3) (i) (ii) (iv) (iii)
  - (4) (i) (iii) (ii) (iv)

33. Given below is a simplified model of phosphorus cycling in a terrestrial ecosystem with four blanks (A-D). Identify the blanks.



Options :

|     | A             | B             | C             | D           |
|-----|---------------|---------------|---------------|-------------|
| (1) | Producers     | Litter fall   | Rock minerals | Detritus    |
| (2) | Rock minerals | Detritus      | Litter fall   | Producers   |
| (3) | Litter fall   | Producers     | Rock minerals | Detritus    |
| (4) | Detritus      | Rock minerals | Producer      | Litter fall |

34. A man whose father was colour blind marries a woman who had a colour blind mother and normal father. What percentage of male children of this couple will be colour blind ?
- (1) 75%
  - (2) 25%
  - (3) 0%
  - (4) 50%

35. Select the option which is **not correct** with respect to enzyme action :
- (1) Malonate is a competitive inhibitor of succinic dehydrogenase.
  - (2) Substrate binds with enzyme at its active site.
  - (3) Addition of lot of succinate does not reverse the inhibition of succinic dehydrogenase by malonate.
  - (4) A non - competitive inhibitor binds the enzyme at a site distinct from that which binds the substrate.
36. Fight-or-flight reactions cause activation of :
- (1) the pancreas leading to a reduction in the blood sugar levels.
  - (2) the parathyroid glands, leading to increased metabolic rate.
  - (3) the kidney, leading to suppression of renin-angiotensin-aldosterone pathway.
  - (4) the adrenal medulla, leading to increased secretion of epinephrine and norepinephrine.
37. Fructose is absorbed into the blood through mucosa cells of intestine by the process called :
- (1) co-transport mechanism
  - (2) active transport
  - (3) facilitated transport
  - (4) simple diffusion
38. The main function of mammalian corpus luteum is to produce :
- (1) relaxin only
  - (2) estrogen only
  - (3) progesterone
  - (4) human chorionic gonadotropin
39. Tracheids differ from other tracheary elements in :
- (1) being lignified
  - (2) having casparian strips
  - (3) being imperforate
  - (4) lacking nucleus
40. Function of filiform apparatus is to :
- (1) Guide the entry of pollen tube
  - (2) Recognize the suitable pollen at stigma
  - (3) Stimulate division of generative cell
  - (4) Produce nectar
41. Choose the correctly matched pair :
- (1) Inner surface of bronchioles - squamous epithelium
  - (2) Inner lining of salivary ducts - Ciliated epithelium
  - (3) Moist surface of buccal cavity - Glandular epithelium
  - (4) Tubular parts of nephrons - Cuboidal epithelium
42. A location with luxuriant growth of lichens on the trees indicates that the :
- (1) location is not polluted
  - (2) trees are very healthy
  - (3) trees are heavily infested
  - (4) location is highly polluted
43. Approximately seventy percent of carbon-dioxide absorbed by the blood will be transported to the lungs :
- (1) as carbamino - haemoglobin
  - (2) as bicarbonate ions
  - (3) in the form of dissolved gas molecules
  - (4) by binding to R.B.C
44. Stimulation of a muscle fiber by a motor neuron occurs at :
- (1) the sarcoplasmic reticulum
  - (2) the neuromuscular junction
  - (3) the transverse tubules
  - (4) the myofibril
45. In a population of 1000 individuals 360 belong to genotype AA, 480 to Aa and the remaining 160 to aa. Based on this data, the frequency of allele A in the population is :
- (1) 0.7
  - (2) 0.4
  - (3) 0.5
  - (4) 0.6
46. Male gametophyte with least number of cells is present in :
- (1) *Pinus*
  - (2) *Pteris*
  - (3) *Funaria*
  - (4) *Lilium*
47. A few normal seedlings of tomato were kept in a dark room. After a few days they were found to have become white-coloured like albinos. Which of the following terms will you use to describe them ?
- (1) Defoliated
  - (2) Mutated
  - (3) Embolised
  - (4) Etiolated

48. A human female with Turner's syndrome :
- (1) is able to produce children with normal husband.
  - (2) has 45 chromosomes with XO.
  - (3) has one additional X chromosome.
  - (4) exhibits male characters.
49. Pollen tablets are available in the market for :
- (1) *Ex situ* conservation
  - (2) In vitro fertilization
  - (3) Breeding programmes
  - (4) Supplementing food
50. Tubectomy is a method of sterilization in which :
- (1) uterus is removed surgically
  - (2) small part of the fallopian tube is removed or tied up.
  - (3) ovaries are removed surgically.
  - (4) small part of vas deferens is removed or tied up.
51. Which one of the following statements is correct ?
- (1) A sterile pistil is called a staminode.
  - (2) The seed in grasses is not endospermic.
  - (3) Mango is a parthenocarpic fruit.
  - (4) A proteinaceous aleurone layer is present in maize grain.
52. The initial step in the digestion of milk in humans is carried out by ?
- (1) Pepsin
  - (2) Lipase
  - (3) Trypsin
  - (4) Rennin
53. An example of *ex situ* conservation is :
- (1) Sacred Grove
  - (2) National Park
  - (3) Seed Bank
  - (4) Wildlife Sanctuary
54. Forelimbs of cat, lizard used in walking; forelimbs of whale used in swimming and forelimbs of bats used in flying are an example of :
- (1) Convergent evolution
  - (2) Analogous organs
  - (3) Adaptive radiation
  - (4) Homologous organs
55. An analysis of chromosomal DNA using the Southern hybridization technique **does not** use :
- (1) PCR
  - (2) Electrophoresis
  - (3) Blotting
  - (4) Autoradiography
56. Anoxygenic photosynthesis is characteristic of :
- (1) *Ulva*
  - (2) *Rhodospirillum*
  - (3) *Spirogyra*
  - (4) *Chlamydomonas*
57. Fruit colour in squash is an example of :
- (1) Inhibitory genes
  - (2) Recessive epistasis
  - (3) Dominant epistasis
  - (4) Complementary genes
58. At which stage of HIV infection does one usually show symptoms of AIDS ?
- (1) When the viral DNA is produced by reverse transcriptase.
  - (2) Within 15 days of sexual contact with an infected person.
  - (3) When the infected retro virus enters host cells.
  - (4) When HIV damages large number of helper T - Lymphocytes.
59. Which one of the following statements is **not** correct ?
- (1) Rhodopsin is the purplish red protein present in rods only.
  - (2) Retinal is the light absorbing portion of visual photo pigments.
  - (3) In retina the rods have the photopigment rhodopsin while cones have three different photopigments.
  - (4) Retinal is a derivative of Vitamin C.
60. Transformation was discovered by :
- (1) Watson and Crick
  - (2) Meselson and Stahl
  - (3) Hershey and Chase
  - (4) Griffith

61. Which structures perform the function of mitochondria in bacteria ?  
 (1) Mesosomes  
 (2) Nucleoid  
 (3) Ribosomes  
 (4) Cell wall
62. Which of the following is a hormone releasing Intra Uterine Device (IUD) ?  
 (1) Vault  
 (2) Multiload 375  
 (3) LNG - 20  
 (4) Cervical cap
63. During which phase(s) of cell cycle, amount of DNA in a cell remains at 4C level if the initial amount is denoted as 2C ?  
 (1)  $G_2$  and M  
 (2)  $G_0$  and  $G_1$   
 (3)  $G_1$  and S  
 (4) Only  $G_2$
64. In vitro clonal propagation in plants is characterized by :  
 (1) Microscopy  
 (2) PCR and RAPD  
 (3) Northern blotting  
 (4) Electrophoresis and HPLC
65. Dr. F. Went noted that if coleoptile tips were removed and placed on agar for one hour, the agar would produce a bending when placed on one side of freshly-cut coleoptile stumps. Of what significance is this experiment ?  
 (1) It demonstrated polar movement of auxins.  
 (2) It made possible the isolation and exact identification of auxin.  
 (3) It is the basis for quantitative determination of small amounts of growth-promoting substances.  
 (4) It supports the hypothesis that IAA is auxin.
66. An aggregate fruit is one which develops from :  
 (1) Multicarpellary superior ovary  
 (2) Multicarpellary syncarpous gynoecium  
 (3) Multicarpellary apocarpus gynoecium  
 (4) Complete inflorescence
67. Select the Taxon mentioned that represents both marine and fresh water species :  
 (1) Cnidaria  
 (2) Echinoderms  
 (3) Ctenophora  
 (4) Cephalochordata
68. Which one of the following shows isogamy with non-flagellated gametes ?  
 (1) *Spirogyra*  
 (2) *Sargassum*  
 (3) *Ectocarpus*  
 (4) *Ulothrix*
69. The osmotic expansion of a cell kept in water is chiefly regulated by :  
 (1) Ribosomes  
 (2) Mitochondria  
 (3) Vacuoles  
 (4) Plastids
70. Which of the following causes an increase in sodium reabsorption in the distal convoluted tubule ?  
 (1) Decrease in antidiuretic hormone levels  
 (2) Increase in aldosterone levels  
 (3) Increase in antidiuretic hormone levels  
 (4) Decrease in aldosterone levels
71. Choose the correctly matched pair :  
 (1) Cartilage - Loose connective tissue  
 (2) Tendon - Specialized connective tissue  
 (3) Adipose tissue - Dense connective tissue  
 (4) Areolar tissue - Loose connective tissue
72. To obtain virus - free healthy plants from a diseased one by tissue culture technique, which part/parts of the diseased plant will be taken ?  
 (1) Epidermis only  
 (2) Apical meristem only  
 (3) Palisade parenchyma  
 (4) Both apical and axillary meristems

73. The zone of atmosphere in which the ozone layer is present is called :

- (1) Troposphere
- (2) Ionosphere
- (3) Mesosphere
- (4) Stratosphere

74. Which one of the following is **wrong** about *Chara* ?

- (1) Globule is male reproductive structure
- (2) Upper oogonium and lower round antheridium.
- (3) Globule and nucule present on the same plant.
- (4) Upper antheridium and lower oogonium

75. An alga which can be employed as food for human being is :

- (1) *Polysiphonia*
- (2) *Ulothrix*
- (3) *Chlorella*
- (4) *Spirogyra*

76. You are given a fairly old piece of dicot stem and a dicot root. Which of the following anatomical structures will you use to distinguish between the two ?

- (1) Cortical cells
- (2) Secondary xylem
- (3) Secondary phloem
- (4) Protoxylem

77. Commonly used vectors for human genome sequencing are :

- (1) T/A Cloning Vectors
- (2) T-DNA
- (3) BAC and YAC
- (4) Expression Vectors

78. Which one of the following living organisms completely *lacks* a cell wall ?

- (1) Blue-green algae
- (2) Cyanobacteria
- (3) Sea-fan (*Gorgonia*)
- (4) *Saccharomyces*

79. Select the correct option describing gonadotropin activity in a normal pregnant female :

- (1) High level of hCG stimulates the thickening of endometrium.
- (2) High level of FSH and LH stimulates the thickening of endometrium.
- (3) High level of FSH and LH facilitate implantation of the embryo.
- (4) High level of hCG stimulates the synthesis of estrogen and progesterone.

80. The motile bacteria are able to move by :

- (1) pili
- (2) fimbriae
- (3) flagella
- (4) cilia

81. A scrubber in the exhaust of a chemical industrial plant removes :

- (1) particulate matter of the size 2.5 micrometer or less
- (2) gases like sulphur dioxide
- (3) particulate matter of the size 5 micrometer or above
- (4) gases like ozone and methane

82. The enzyme recombinase is required at which stage of meiosis :

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

83. *Planaria* possess high capacity of :

- (1) bioluminescence
- (2) metamorphosis
- (3) regeneration
- (4) alternation of generation

84. Deficiency symptoms of nitrogen and potassium are visible first in :

- (1) Buds
- (2) Senescent leaves
- (3) Young leaves
- (4) Roots

formation ?

- (1) *Sphagnum*
- (2) *Marchantia*
- (3) *Riccia*
- (4) *Funaria*

86. Viruses have :

- (1) Both DNA and RNA
- (2) DNA enclosed in a protein coat
- (3) Prokaryotic nucleus
- (4) Single chromosome

87. Non-albuminous seed is produced in :

- (1) Pea
- (2) Maize
- (3) Castor
- (4) Wheat

88. The solid linear cytoskeletal elements having a diameter of 6 nm and made up of a single type of monomer are known as :

- (1) Lamins
- (2) Microtubules
- (3) Microfilaments
- (4) Intermediate filaments

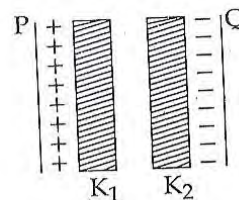
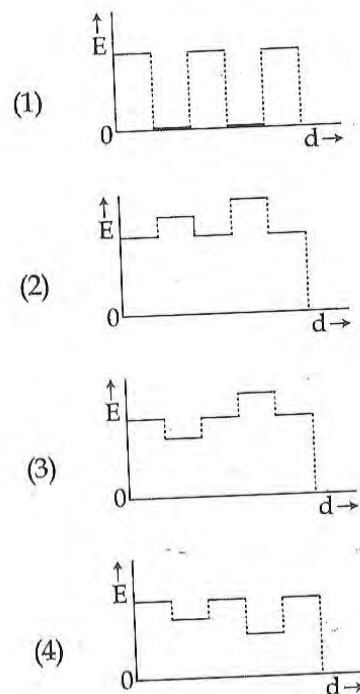
89. The first human hormone produced by recombinant DNA technology is :

- (1) Progesterone
- (2) Insulin
- (3) Estrogen
- (4) Thyroxin

90. In which one of the following processes  $\text{CO}_2$  is not released ?

- (1) Lactate fermentation
- (2) Aerobic respiration in plants
- (3) Aerobic respiration in animals
- (4) Alcoholic fermentation

parallel plate capacitor, as shown in the figure. The variation of electric field 'E' between the plates with distance 'd' as measured from plate P is correctly shown by :



92. Two cities are 150 km apart. Electric power is sent from one city to another city through copper wires. The fall of potential per km is 8 volt and the average resistance per km is  $0.5 \Omega$ . The power loss in the wire is :

- (1) 12.2 kW
- (2) 19.2 W
- (3) 19.2 kW
- (4) 19.2 J

93. The mean free path of molecules of a gas, (radius 'r') is inversely proportional to :

- (1)  $\sqrt{r}$
- (2)  $r^3$
- (3)  $r^2$
- (4)  $r$

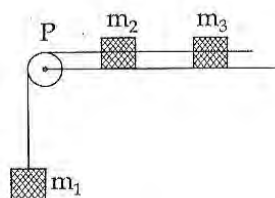
94. In a region, the potential is represented by  $V(x, y, z) = 6x - 8xy - 8y + 6yz$ , where  $V$  is in volts and  $x, y, z$  are in meters. The electric force experienced by a charge of 2 coulomb situated at point (1, 1, 1) is:

- (1)  $4\sqrt{35}$  N
- (2)  $6\sqrt{5}$  N
- (3) 30 N
- (4) 24 N

95. A system consists of three masses  $m_1, m_2$  and  $m_3$  connected by a string passing over a pulley P. The mass  $m_1$  hangs freely and  $m_2$  and  $m_3$  are on a rough horizontal table (the coefficient of friction =  $\mu$ ).

The pulley is frictionless and of negligible mass. The downward acceleration of mass  $m_1$  is:

(Assume  $m_1 = m_2 = m_3 = m$ )



- (1)  $\frac{g(1 - 2\mu)}{2}$
- (2)  $\frac{g(1 - g\mu)}{9}$
- (3)  $\frac{2g\mu}{3}$
- (4)  $\frac{g(1 - 2\mu)}{3}$

96. A body of mass (4m) is lying in  $x$ - $y$  plane at rest. It suddenly explodes into three pieces. Two pieces, each of mass ( $m$ ) move perpendicular to each other with equal speeds ( $v$ ). The total kinetic energy generated due to explosion is:

- (1)  $4mv^2$
- (2)  $mv^2$
- (3)  $\frac{3}{2}mv^2$
- (4)  $2mv^2$

97. Steam at  $100^\circ\text{C}$  is passed into 20 g of water at  $10^\circ\text{C}$ . When water acquires a temperature of  $80^\circ\text{C}$ , the mass of water present will be:

[Take specific heat of water =  $1 \text{ cal g}^{-1}^\circ\text{C}^{-1}$  and latent heat of steam =  $540 \text{ cal g}^{-1}$ ]

- (1) 22.5 g
- (2) 24 g
- (3) 31.5 g
- (4) 42.5 g

98. A potentiometer circuit has been set up for finding the internal resistance of a given cell. The main battery, used across the potentiometer wire, has an emf of 2.0 V and a negligible internal resistance. The potentiometer wire itself is 4 m long. When the resistance,  $R$ , connected across the given cell, has values of.

- (i) infinity
- (ii)  $9.5 \Omega$ ,

the 'balancing lengths', on the potentiometer wire are found to be 3 m and 2.85 m, respectively.

The value of internal resistance of the cell is:

- (1)  $0.75 \Omega$
- (2)  $0.25 \Omega$
- (3)  $0.95 \Omega$
- (4)  $0.5 \Omega$

99. If the kinetic energy of the particle is increased to 16 times its previous value, the percentage change in the de-Broglie wavelength of the particle is:

- (1) 50
- (2) 25
- (3) 75
- (4) 60

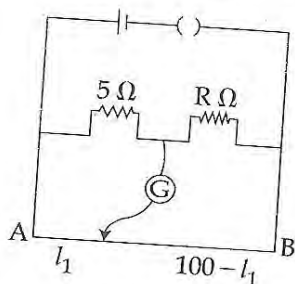
100. Light with an energy flux of  $25 \times 10^4 \text{ Wm}^{-2}$  falls on a perfectly reflecting surface at normal incidence. If the surface area is  $15 \text{ cm}^2$ , the average force exerted on the surface is:

- (1)  $3.0 \times 10^{-6} \text{ N}$
- (2)  $1.25 \times 10^{-6} \text{ N}$
- (3)  $2.50 \times 10^{-6} \text{ N}$
- (4)  $1.20 \times 10^{-6} \text{ N}$

101. If  $n_1, n_2$  and  $n_3$  are the fundamental frequencies of three segments into which a string is divided, then the original fundamental frequency  $n$  of the string is given by:

- (1)  $n = n_1 + n_2 + n_3$
- (2)  $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$
- (3)  $\frac{1}{\sqrt{n}} = \frac{1}{\sqrt{n_1}} + \frac{1}{\sqrt{n_2}} + \frac{1}{\sqrt{n_3}}$
- (4)  $\sqrt{n} = \sqrt{n_1} + \sqrt{n_2} + \sqrt{n_3}$

102. The resistances in the two arms of the meter bridge are  $5\ \Omega$  and  $R\ \Omega$ , respectively. When the resistance  $R$  is shunted with an equal resistance, the new balance point is at  $1.6 l_1$ . The resistance ' $R$ ', is :



- (1)  $25\ \Omega$   
 (2)  $10\ \Omega$   
 (3)  $15\ \Omega$   
 (4)  $20\ \Omega$
103. Hydrogen atom in ground state is excited by a monochromatic radiation of  $\lambda = 975\ \text{\AA}$ . Number of spectral lines in the resulting spectrum emitted will be :
- (1) 10  
 (2) 3  
 (3) 2  
 (4) 6
104. A black hole is an object whose gravitational field is so strong that even light cannot escape from it. To what approximate radius would earth (mass  $= 5.98 \times 10^{24}\ \text{kg}$ ) have to be compressed to be a black hole ?
- (1) 100 m  
 (2)  $10^{-9}\ \text{m}$   
 (3)  $10^{-6}\ \text{m}$   
 (4)  $10^{-2}\ \text{m}$
105. The ratio of the accelerations for a solid sphere (mass ' $m$ ' and radius ' $R$ ') rolling down an incline of angle ' $\theta$ ' without slipping and slipping down the incline without rolling is :
- (1) 7:5  
 (2) 5:7  
 (3) 2:3  
 (4) 2:5
- 11
106. A solid cylinder of mass 50 kg and radius 0.5 m is free to rotate about the horizontal axis. A massless string is wound round the cylinder with one end attached to it and other hanging freely. Tension in the string required to produce an angular acceleration of  $2\ \text{revolutions s}^{-2}$  is :
- (1) 157 N  
 (2) 25 N  
 (3) 50 N  
 (4) 78.5 N
107. If force ( $F$ ), velocity ( $V$ ) and time ( $T$ ) are taken as fundamental units, then the dimensions of mass are :
- (1)  $[F V^{-1} T]$   
 (2)  $[F V T^{-1}]$   
 (3)  $[F V T^{-2}]$   
 (4)  $[F V^{-1} T^{-1}]$
108. A speeding motorcyclist sees traffic jam ahead of him. He slows down to 36 km/hour. He finds that traffic has eased and a car moving ahead of him at 18 km/hour is honking at a frequency of 1392 Hz. If the speed of sound is 343 m/s, the frequency of the honk as heard by him will be :
- (1) 1454 Hz  
 (2) 1332 Hz  
 (3) 1372 Hz  
 (4) 1412 Hz
109. When the energy of the incident radiation is increased by 20%, the kinetic energy of the photoelectrons emitted from a metal surface increased from 0.5 eV to 0.8 eV. The work function of the metal is :
- (1) 1.5 eV  
 (2) 0.65 eV  
 (3) 1.0 eV  
 (4) 1.3 eV

10. A balloon with mass ' $m$ ' is descending *down* with an acceleration ' $a$ ' (where  $a < g$ ). How much mass should be removed from it so that it starts moving *up* with an acceleration ' $a$ '?

- (1)  $\frac{ma}{g-a}$   
 (2)  $\frac{2ma}{g+a}$   
 (3)  $\frac{2ma}{g-a}$   
 (4)  $\frac{ma}{g+a}$

111. A monoatomic gas at a pressure  $P$ , having a volume  $V$  expands isothermally to a volume  $2V$  and then adiabatically to a volume  $16V$ . The final pressure of the gas is : (take  $\gamma = 5/3$ )

- (1)  $16P$   
 (2)  $64P$   
 (3)  $32P$   
 (4)  $P/64$

112. Certain quantity of water cools from  $70^\circ\text{C}$  to  $60^\circ\text{C}$  in the first 5 minutes and to  $54^\circ\text{C}$  in the next 5 minutes. The temperature of the surroundings is :

- (1)  $10^\circ\text{C}$   
 (2)  $45^\circ\text{C}$   
 (3)  $20^\circ\text{C}$   
 (4)  $42^\circ\text{C}$

113. The number of possible natural oscillations of air column in a pipe closed at one end of length 85 cm whose frequencies lie below  $1250\text{ Hz}$  are : (velocity of sound  $= 340\text{ ms}^{-1}$ )

- (1) 6  
 (2) 4  
 (3) 5  
 (4) 7

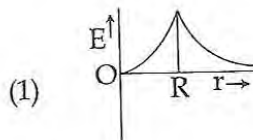
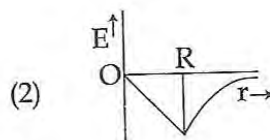
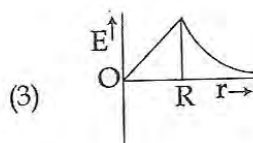
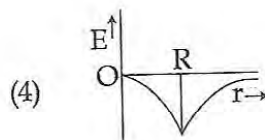
114. The barrier potential of a p-n junction depends on :

- (a) type of semi conductor material  
 (b) amount of doping  
 (c) temperature

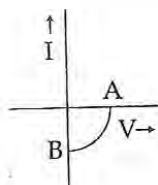
Which one of the following is correct?

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

115. Dependence of intensity of gravitational field ( $E$ ) on earth with distance ( $r$ ) from centre of earth is correctly represented by :



116. The given graph represents V - I characteristic for semiconductor device.



Which of the following statement is correct?

- (1) It is for a LED and points A and B represent open circuit voltage and short circuit current respectively.  
 (2) It is V - I characteristic for solar cell where point A represents open circuit voltage and point B short circuit current.  
 (3) It is for a solar cell and points A and represent open circuit voltage and current respectively.  
 (4) It is for a photodiode and points A and represent open circuit voltage and current respectively.

(1)  $\frac{500}{499} \text{ G}$

(2)  $\frac{1}{499} \text{ G}$

(3)  $\frac{499}{500} \text{ G}$

(4)  $\frac{1}{500} \text{ G}$

118. A radio isotope 'X' with a half life  $1.4 \times 10^9$  years decays to 'Y' which is stable. A sample of the rock from a cave was found to contain 'X' and 'Y' in the ratio 1 : 7. The age of the rock is :

(1)  $8.40 \times 10^9$  years

(2)  $1.96 \times 10^9$  years

(3)  $3.92 \times 10^9$  years

(4)  $4.20 \times 10^9$  years

119. A certain number of spherical drops of a liquid of radius 'r' coalesce to form a single drop of radius 'R' and volume 'V'. If 'T' is the surface tension of the liquid, then :

(1) energy is neither released nor absorbed.

(2) energy  $= 4VT \left( \frac{1}{r} - \frac{1}{R} \right)$  is released.

(3) energy  $= 3VT \left( \frac{1}{r} + \frac{1}{R} \right)$  is absorbed.

(4) energy  $= 3VT \left( \frac{1}{r} - \frac{1}{R} \right)$  is released.

120. If the focal length of objective lens is increased then magnifying power of :

(1) microscope will decrease but that of telescope will increase.

(2) microscope will increase but that of telescope decrease.

(3) microscope and telescope both will increase.

(4) microscope and telescope both will decrease.

secondary coil and the current in the primary coil respectively are :

(1) 600 V, 15 A

(2) 300 V, 15 A

(3) 450 V, 15 A

(4) 450 V, 13.5 A

122. Copper of fixed volume 'V' is drawn into wire of length 'l'. When this wire is subjected to a constant force 'F', the extension produced in the wire is ' $\Delta l$ '. Which of the following graphs is a straight line ?

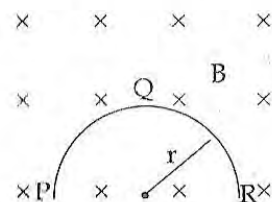
(1)  $\Delta l$  versus  $l$

(2)  $\Delta l$  versus  $1/l$

(3)  $\Delta l$  versus  $l^2$

(4)  $\Delta l$  versus  $1/l^2$

123. A thin semicircular conducting ring (PQR) of radius 'r' is falling with its plane vertical in a horizontal magnetic field B, as shown in figure. The potential difference developed across the ring when its speed is v, is :



(1)  $2rBv$  and R is at higher potential

(2) Zero

(3)  $Bv\pi r^2/2$  and P is at higher potential

(4)  $\pi rBv$  and R is at higher potential

124. A particle is moving such that its position coordinates (x, y) are  
(2m, 3m) at time  $t = 0$ ,  
(6m, 7m) at time  $t = 2$  s and  
(13m, 14m) at time  $t = 5$  s.

Average velocity vector  $\left( \vec{V}_{av} \right)$  from  $t = 0$  to  $t = 5$  s is :

(1)  $\frac{11}{5} (\hat{i} + \hat{j})$

(2)  $\frac{1}{5} (13\hat{i} + 14\hat{j})$

(3)  $\frac{7}{3} (\hat{i} + \hat{j})$

(4)  $2 (\hat{i} + \hat{j})$

R

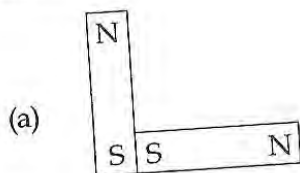
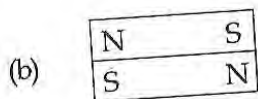
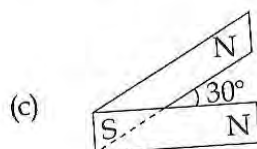
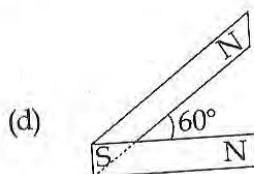
125. The Binding energy per nucleon of  ${}^7_3\text{Li}$  and  ${}^4_2\text{He}$  nuclei are 5.60 MeV and 7.06 MeV, respectively. In the nuclear reaction  ${}^7_3\text{Li} + {}^1_1\text{H} \rightarrow {}^4_2\text{He} + {}^4_2\text{He} + Q$ , the value of energy  $Q$  released is:

- (1) 17.3 MeV
- (2) 19.6 MeV
- (3) -2.4 MeV
- (4) 8.4 MeV

126. The angle of a prism is 'A'. One of its refracting surfaces is silvered. Light rays falling at an angle of incidence  $2A$  on the first surface returns back through the same path after suffering reflection at the silvered surface. The refractive index  $\mu$ , of the prism is:

- (1)  $\tan A$
- (2)  $2 \sin A$
- (3)  $2 \cos A$
- (4)  $\frac{1}{2} \cos A$

127. Following figures show the arrangement of bar magnets in different configurations. Each magnet has magnetic dipole moment  $\vec{m}$ . Which configuration has highest net magnetic dipole moment?

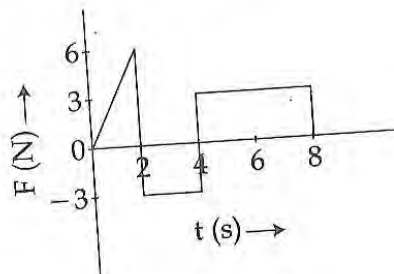


- (1) (d)
- (2) (a)
- (3) (b)
- (4) (c)

128. A projectile is fired from the surface of the earth with a velocity of  $5 \text{ ms}^{-1}$  and angle  $\theta$  with the horizontal. Another projectile fired from another planet with a velocity of  $3 \text{ ms}^{-1}$  at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is (in  $\text{ms}^{-2}$ ) is: (given  $g = 9.8 \text{ ms}^{-2}$ )

- (1) 110.8
- (2) 3.5
- (3) 5.9
- (4) 16.3

129. The force 'F' acting on a particle of mass 'm' is indicated by the force-time graph shown below. The change in momentum of the particle over the time interval from zero to 8 s is:



- (1) 6 Ns
- (2) 24 Ns
- (3) 20 Ns
- (4) 12 Ns

130. In the Young's double-slit experiment, the intensity of light at a point on the screen where the path difference is  $\lambda$  is  $K$ , ( $\lambda$  being the wave length of light used). The intensity at a point where the path difference is  $\lambda/4$ , will be:

- (1) Zero
- (2)  $K$
- (3)  $K/4$
- (4)  $K/2$

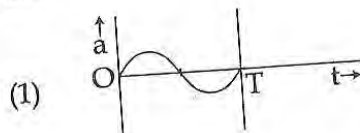
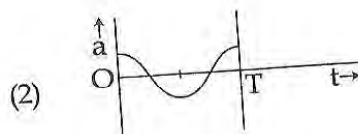
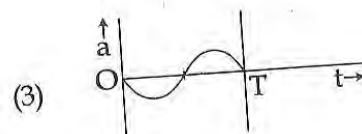
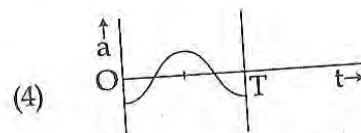
131. The oscillation of a body on a smooth horizontal surface is represented by the equation,

$$X = A \cos(\omega t)$$

where  $X$  = displacement at time  $t$

$\omega$  = frequency of oscillation

Which one of the following graphs shows correctly the variation 'a' with 't'?

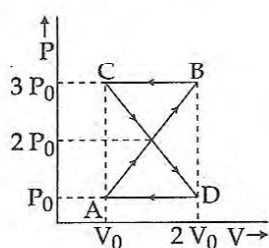


Here  $a$  = acceleration at time  $t$   
 $T$  = time period

132. A conducting sphere of radius  $R$  is given a charge  $Q$ . The electric potential and the electric field at the centre of the sphere respectively are :

- (1) Both are zero
- (2) Zero and  $\frac{Q}{4\pi\epsilon_0 R^2}$
- (3)  $\frac{Q}{4\pi\epsilon_0 R}$  and Zero
- (4)  $\frac{Q}{4\pi\epsilon_0 R}$  and  $\frac{Q}{4\pi\epsilon_0 R^2}$

133. A thermodynamic system undergoes cyclic process ABCDA as shown in Fig. The work done by the system in the cycle is :



- (1) Zero
- (2)  $P_0 V_0$
- (3)  $2P_0 V_0$
- (4)  $\frac{P_0 V_0}{2}$

134. A beam of light of  $\lambda = 600 \text{ nm}$  from a distant source falls on a single slit  $1 \text{ mm}$  wide and the resulting diffraction pattern is observed on a screen  $2 \text{ m}$  away. The distance between first dark fringes on either side of the central bright fringe is :

- (1)  $2.4 \text{ mm}$
- (2)  $1.2 \text{ cm}$
- (3)  $1.2 \text{ mm}$
- (4)  $2.4 \text{ cm}$

135. Two identical long conducting wires AOB and COD are placed at right angle to each other, with one above other such that 'O' is their common point for the two. The wires carry  $I_1$  and  $I_2$  currents, respectively. Point 'P' is lying at distance 'd' from 'O' along a direction perpendicular to the plane containing the wires. The magnetic field at the point 'P' will be :

- (1)  $\frac{\mu_0}{2\pi d} (I_1^2 + I_2^2)^{1/2}$
- (2)  $\frac{\mu_0}{2\pi d} (I_1/I_2)$
- (3)  $\frac{\mu_0}{2\pi d} (I_1 + I_2)$
- (4)  $\frac{\mu_0}{2\pi d} (I_1^2 - I_2^2)$

136. Equal masses of  $\text{H}_2$ ,  $\text{O}_2$  and methane have been taken in a container of volume  $V$  at temperature  $27^\circ\text{C}$  in identical conditions. The ratio of the volumes of gases  $\text{H}_2 : \text{O}_2 : \text{methane}$  would be :

- (1)  $8 : 1 : 2$
- (2)  $8 : 16 : 1$
- (3)  $16 : 8 : 1$
- (4)  $16 : 1 : 2$

137. Which one is most reactive towards Nucleophilic addition reaction ?

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

138. Which of the following molecules has the maximum dipole moment ?

- (1)  $\text{NF}_3$
- (2)  $\text{CO}_2$
- (3)  $\text{CH}_4$
- (4)  $\text{NH}_3$

139. Which of the following statements is correct for the spontaneous adsorption of a gas?

- (1)  $\Delta S$  is positive and, therefore,  $\Delta H$  should also be highly positive.
- (2)  $\Delta S$  is negative and, therefore,  $\Delta H$  should be highly positive.
- (3)  $\Delta S$  is negative and therefore,  $\Delta H$  should be highly negative.
- (4)  $\Delta S$  is positive and, therefore,  $\Delta H$  should be negative.

140. When 0.1 mol  $\text{MnO}_4^{2-}$  is oxidised the quantity of electricity required to completely oxidise  $\text{MnO}_4^{2-}$  to  $\text{MnO}_4^-$  is:

- (1) 96.50 C
- (2) 96500 C
- (3)  $2 \times 96500$  C
- (4) 9650 C

141. Which one of the following is an example of a thermosetting polymer?

- (1)
- (2)  $\text{-(CH}_2\text{-C(CH}_3\text{)=CH-CH}_2\text{))}_n$
- (3)  $\text{-(CH}_2\text{-CH(Cl))}_n$
- (4)  $\text{-(NH-(CH}_2\text{)}_6\text{-N-C(=O)-(CH}_2\text{)}_4\text{-C(=O))}_n$

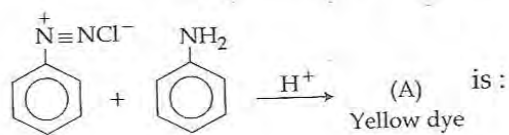
142. Which one of the following species has plane triangular shape?

- (1)  $\text{CO}_2$
- (2)  $\text{N}_3$
- (3)  $\text{NO}_3^-$
- (4)  $\text{NO}_2^-$

143. Which of the following will be most stable diazonium salt  $\text{RN}_2^+ \text{X}^-$ ?

- (1)  $\text{C}_6\text{H}_5\text{CH}_2\text{N}_2^+ \text{X}^-$
- (2)  $\text{CH}_3\text{N}_2^+ \text{X}^-$
- (3)  $\text{C}_6\text{H}_5\text{N}_2^+ \text{X}^-$
- (4)  $\text{CH}_3\text{CH}_2\text{N}_2^+ \text{X}^-$

144. In the following reaction, the product (A) is:



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

145. Which of the following complexes is used to be an anticancer agent?

- (1)  $\text{Na}_2\text{CoCl}_4$
- (2)  $\text{mer-[Co(NH}_3\text{)}_3\text{Cl}_3]$
- (3)  $\text{cis-[PtCl}_2\text{(NH}_3\text{)}_2]$
- (4)  $\text{cis-K}_2[\text{PtCl}_2\text{Br}_2]$

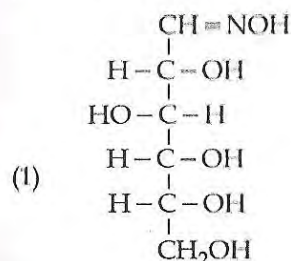
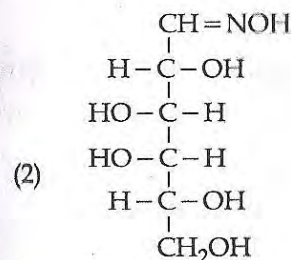
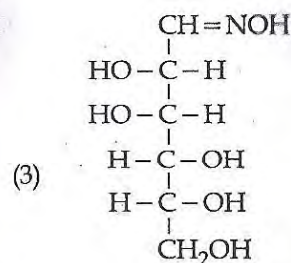
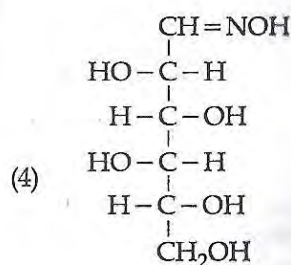
146. Which of the following salts will give highest pH water?

- (1)  $\text{CuSO}_4$
- (2)  $\text{KCl}$
- (3)  $\text{NaCl}$
- (4)  $\text{Na}_2\text{CO}_3$

147. Calculate the energy in joule corresponding to 1 of wavelength 45 nm : (Planck's constant  $h = 6.63 \times 10^{-34}$  Js ; speed of light  $c = 3 \times 10^8$  m/s)

- (1)  $4.42 \times 10^{-18}$
- (2)  $6.67 \times 10^{15}$
- (3)  $6.67 \times 10^{11}$
- (4)  $4.42 \times 10^{-15}$

D(+) glucose reacts with hydroxylamine and yields an oxime. The structure of the oxime would be :



9. The reaction of aqueous  $\text{KMnO}_4$  with  $\text{H}_2\text{O}_2$  in acidic conditions gives :

- (1)  $\text{Mn}^{4+}$  and  $\text{MnO}_2$
- (2)  $\text{Mn}^{4+}$  and  $\text{O}_2$
- (3)  $\text{Mn}^{2+}$  and  $\text{O}_2$
- (4)  $\text{Mn}^{2+}$  and  $\text{O}_3$

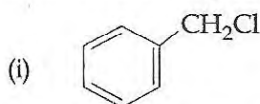
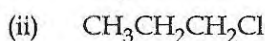
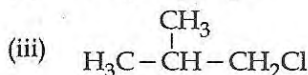
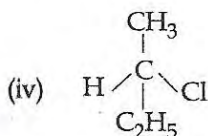
10. The weight of silver (at.wt. = 108) displaced by a quantity of electricity which displaces 5600 mL of  $\text{O}_2$  at STP will be :

- (1) 108.0 g
- (2) 5.4 g
- (3) 10.8 g
- (4) 54.0 g

151. Which one of the following is **not** a common component of Photochemical Smog ?

- (1) Chlorofluorocarbons
- (2) Ozone
- (3) Acrolein
- (4) Peroxyacetyl nitrate

152. Which of the following compounds will undergo racemisation when solution of  $\text{KOH}$  hydrolyses ?



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

153. Reason of lanthanoid contraction is :

- (1) Decreasing screening effect
- (2) Negligible screening effect of 'f' orbitals
- (3) Increasing nuclear charge
- (4) Decreasing nuclear charge

154. For a given exothermic reaction,  $K_p$  and  $K'_p$  are the equilibrium constants at temperatures  $T_1$  and  $T_2$ , respectively. Assuming that heat of reaction is constant in temperature range between  $T_1$  and  $T_2$ , it is readily observed that :

- (1)  $K_p = \frac{1}{K'_p}$
- (2)  $K_p > K'_p$
- (3)  $K_p < K'_p$
- (4)  $K_p = K'_p$

155. Among the following sets of reactants which one produces anisole ?

- (1)  $\text{C}_6\text{H}_5-\text{CH}_3$ ;  $\text{CH}_3\text{COCl}$ ;  $\text{AlCl}_3$
- (2)  $\text{CH}_3\text{CHO}$ ;  $\text{RMgX}$
- (3)  $\text{C}_6\text{H}_5\text{OH}$ ;  $\text{NaOH}$ ;  $\text{CH}_3\text{I}$
- (4)  $\text{C}_6\text{H}_5\text{OH}$ ; neutral  $\text{FeCl}_3$

156. Which of the following hormones is produced under the condition of stress which stimulates glycogenolysis in the liver of human beings?
- Estradiol
  - Thyroxin
  - Insulin
  - Adrenaline
157. (a)  $\text{H}_2\text{O}_2 + \text{O}_3 \rightarrow \text{H}_2\text{O} + 2\text{O}_2$   
 (b)  $\text{H}_2\text{O}_2 + \text{Ag}_2\text{O} \rightarrow 2\text{Ag} + \text{H}_2\text{O} + \text{O}_2$   
 Role of hydrogen peroxide in the above reactions is respectively:
- oxidizing in (a) and (b)
  - oxidizing in (a) and reducing in (b)
  - reducing in (a) and oxidizing in (b)
  - reducing in (a) and (b)
158. Which property of colloids is **not** dependent on the charge on colloidal particles?
- Tyndall effect
  - Coagulation
  - Electrophoresis
  - Electro-osmosis
159. Among the following complexes the one which shows **Zero** crystal field stabilization energy (CFSE) is:
- $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
  - $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$
  - $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
  - $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$
160. Which of the following will **not** be soluble in sodium hydrogen carbonate?
- Benzenesulphonic acid
  - 2, 4, 6 - trinitrophenol
  - Benzoic acid
  - o* - Nitrophenol
161. Of the following 0.10 m aqueous solutions, which one will exhibit the largest freezing point depression?
- $\text{K}_2\text{SO}_4$
  - $\text{KCl}$
  - $\text{C}_6\text{H}_{12}\text{O}_6$
  - $\text{Al}_2(\text{SO}_4)_3$

162. If  $a$  is the length of the side of a cube, the distance between the body centered atom and one corner atom in the cube will be:
- $\frac{\sqrt{3}}{2} a$
  - $\frac{2}{\sqrt{3}} a$
  - $\frac{4}{\sqrt{3}} a$
  - $\frac{\sqrt{3}}{4} a$
163. Magnetic moment 2.83 BM is given by which of the following ions?  
 (At. nos. Ti = 22, Cr = 24, Mn = 25, Ni = 28)
- $\text{Mn}^{2+}$
  - $\text{Ti}^{3+}$
  - $\text{Ni}^{2+}$
  - $\text{Cr}^{3+}$
164. 1.0 g of magnesium is burnt with 0.56 g  $\text{O}_2$  in a closed vessel. Which reactant is left in excess and how much?  
 (At. wt. Mg = 24; O = 16)
- $\text{O}_2$ , 0.28 g
  - Mg, 0.16 g
  - $\text{O}_2$ , 0.16 g
  - Mg, 0.44 g
165. The pair of compounds that can exist together is
- $\text{FeCl}_3$ , KI
  - $\text{FeCl}_3$ ,  $\text{SnCl}_2$
  - $\text{HgCl}_2$ ,  $\text{SnCl}_2$
  - $\text{FeCl}_2$ ,  $\text{SnCl}_2$
166. For the reaction:  
 $\text{X}_2\text{O}_4(l) \longrightarrow 2\text{XO}_2(g)$   
 $\Delta U = 2.1 \text{ k cal}$ ,  $\Delta S = 20 \text{ cal K}^{-1}$  at 300 K  
 Hence,  $\Delta G$  is:
- 9.3 k cal
  - 2.7 k cal
  - 2.7 k cal
  - 9.3 k cal
167. In acidic medium,  $\text{H}_2\text{O}_2$  changes  $\text{Cr}_2\text{O}_7^{2-}$  to  $\text{Cr}^{3+}$  which has two (-O-O-) bonds. Oxidation state of Cr in  $\text{CrO}_5$  is:
- 10
  - +5
  - +3
  - +6
168. For the reversible reaction:  
 $\text{N}_2(g) + 3\text{H}_2(g) \rightleftharpoons 2\text{NH}_3(g) + \text{heat}$   
 The equilibrium shifts in forward direction:
- by increasing pressure and decreasing temperature
  - by increasing the concentration of  $\text{NH}_3(g)$
  - by decreasing the pressure
  - by decreasing the concentrations of  $\text{N}_2(g)$  and  $\text{H}_2(g)$

169. Artificial sweetener which is stable under cold conditions only is :  
 (1) Alitame  
 (2) Saccharine  
 (3) Sucralose  
 (4) Aspartame
170. Which of the following orders of ionic radii is correctly represented?  
 (1)  $\text{Al}^{3+} > \text{Mg}^{2+} > \text{N}^{3-}$   
 (2)  $\text{H}^- > \text{H}^+ > \text{H}$   
 (3)  $\text{Na}^+ > \text{F}^- > \text{O}^{2-}$   
 (4)  $\text{F}^- > \text{O}^{2-} > \text{Na}^+$
171. When 22.4 litres of  $\text{H}_2(\text{g})$  is mixed with 11.2 litres of  $\text{Cl}_2(\text{g})$ , each at S.T.P., the moles of  $\text{HCl}(\text{g})$  formed is equal to :  
 (1) 1.5 mol of  $\text{HCl}(\text{g})$   
 (2) 1 mol of  $\text{HCl}(\text{g})$   
 (3) 2 mol of  $\text{HCl}(\text{g})$   
 (4) 0.5 mol of  $\text{HCl}(\text{g})$
172.  $\text{Be}^{2+}$  is isoelectronic with which of the following ions?  
 (1)  $\text{Mg}^{2+}$   
 (2)  $\text{H}^+$   
 (3)  $\text{Li}^+$   
 (4)  $\text{Na}^+$
173. What is the maximum number of orbitals that can be identified with the following quantum numbers?  
 $n=3, l=1, m_l=0$   
 (1) 4  
 (2) 1  
 (3) 2  
 (4) 3
174. Identify Z in the sequence of reactions:  
 $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2 \xrightarrow{\text{HBr}/\text{H}_2\text{O}_2} \text{Y} \xrightarrow{\text{C}_2\text{H}_5\text{ONa}} \text{Z}$   
 (1)  $\text{CH}_3\text{CH}_2-\text{CH}(\text{CH}_3)-\text{O}-\text{CH}_2\text{CH}_3$   
 (2)  $\text{CH}_3-(\text{CH}_2)_3-\text{O}-\text{CH}_2\text{CH}_3$   
 (3)  $(\text{CH}_3)_2\text{CH}_2-\text{O}-\text{CH}_2\text{CH}_3$   
 (4)  $\text{CH}_3(\text{CH}_2)_4-\text{O}-\text{CH}_3$
175. Using the Gibbs energy change,  $\Delta G^\circ = +63.3 \text{ kJ}$ , for the following reaction,  
 $\text{Ag}_2\text{CO}_3(\text{s}) \rightleftharpoons 2\text{Ag}^+(\text{aq}) + \text{CO}_3^{2-}(\text{aq})$   
 the  $K_{\text{sp}}$  of  $\text{Ag}_2\text{CO}_3(\text{s})$  in water at  $25^\circ\text{C}$  is :  
 ( $R=8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ )  
 (1)  $7.9 \times 10^{-2}$   
 (2)  $3.2 \times 10^{-26}$   
 (3)  $8.0 \times 10^{-12}$   
 (4)  $2.9 \times 10^{-3}$
176. Which of the following organic compounds has same hybridization as its combustion product ( $\text{CO}_2$ )?  
 (1) Ethanol  
 (2) Ethane  
 (3) Ethyne  
 (4) Ethene
177. Which of the following organic compounds polymerizes to form the polyester Dacron?  
 (1) Benzoic acid and para  $\text{HO}-(\text{C}_6\text{H}_4)-\text{OH}$   
 (2) Propylene and para  $\text{HO}-(\text{C}_6\text{H}_4)-\text{OH}$   
 (3) Benzoic acid and ethanol  
 (4) Terephthalic acid and ethylene glycol
178. Acidity of diprotic acids in aqueous solutions increases in the order :  
 (1)  $\text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{S}$   
 (2)  $\text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$   
 (3)  $\text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{Te}$   
 (4)  $\text{H}_2\text{Te} < \text{H}_2\text{S} < \text{H}_2\text{Se}$
179. What products are formed when the following compound is treated with  $\text{Br}_2$  in the presence of  $\text{FeBr}_3$ ?
- 
- (1) and
- (2) and
- (3) and
- (4) and
180. In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralized 10 mL of 1M  $\text{H}_2\text{SO}_4$ . The percentage of nitrogen in the soil is :  
 (1) 43.33  
 (2) 37.33  
 (3) 45.33  
 (4) 35.33