Important Instructions:

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

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

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

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

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

6. The CODE for this Booklet is R1. Make sure that the CODE printed on Side-2 of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.

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

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

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

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

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

12. Use of Electronic/Manual Calculator is prohibited.

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

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

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

Name of the Candidate (in Capitals): KIRTI

Roll Number : in figures 230202259
: in words Two Three zero Two zero Two Two Five Nine

Centre of Examination (in Capitals): DELHI SUSHANT LOK, B-BLOCK, GURUGRAM

Candidate’s Signature : KIRTI Invigilator’s Signature : BHASKAR

Published signature stamp of Centre Superintendent :
Match the following genes of the Lac operon with their respective products:

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

Select the correct option:

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

Match the following structures with their respective location in organs:

(a) Crypts of Lieberkühn \(\rightarrow\) (i) Pancreas
(b) Glisson’s Capsule \(\rightarrow\) (ii) Duodenum
(c) Islets of Langerhans \(\rightarrow\) (iii) Small intestine
(d) Brunner’s Gland \(\rightarrow\) (iv) Liver

Select the correct option from the following:

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

What is the direction of movement of sugars in phloem?

(1) Bi-directional
(2) Non-multidirectional
(3) Upward
(4) Downward

The ciliated epithelial cells are required to move particles or mucus in a specific direction. In humans, these cells are mainly present in:

(1) Bronchioles and Fallopian tubes
(2) Bile duct and Bronchioles
(3) Fallopian tubes and Pancreatic duct
(4) Eustachian tube and Salivary duct

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

(1) Alien species invasion
(2) Habitat loss and fragmentation
(3) Drought and floods
(4) Economic exploitation

Which of the following contraceptive methods involve a role of hormone?

(1) Pills, Emergency contraceptives, Barrier methods
(2) Lactational amenorrhea, Pills, Emergency contraceptives
(3) Barrier method, Lactational amenorrhea, Pills
(4) CuT, Pills, Emergency contraceptives

Which of the following pair of organelles does not contain DNA?

(1) Nuclear envelope and Mitochondria
(2) Mitochondria and Lysosomes
(3) Chloroplast and Vacuoles
(4) Lysosomes and Vacuoles

Placenta, in which ovules develop on the inner wall of the ovary or in peripheral part, is:

(1) Free central
(2) Basal
(3) Axile
(4) Parietal

The Earth Summit held in Rio de Janeiro in 1992 was called:

(1) for immediate steps to discontinue use of CFCs that were damaging the ozone layer
(2) to reduce CO\textsubscript{2} emissions and global warming
(3) for conservation of biodiversity and sustainable utilization of its benefits
(4) to assess threat posed to native species by invasive weed species

19) Purines found both in DNA and RNA are:

(1) Cytosine and thymine
(2) Adenine and thymine
(3) Adenine and guanine
(4) Guanine and cytosine
Match the following hormones with the respective disease:

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

Select the correct option.

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

(1) (ii) (iv) (iii) (i)
(2) (v) (i) (ii) (iii)
(3) (ii) (iv) (iii) (i)
(4) (v) (iv) (i) (iii)

The correct sequence of phases of cell cycle is:

(1) G₁ → S → G₂ → M
(2) M → G₁ → G₂ → S
(3) G₁ → G₂ → S → M
(4) S → G₁ → G₂ → M

Which of the following sexually transmitted diseases is not completely curable?

(a) Chlamydia
(2) Gonorrhoea
(3) Genital warts
(4) Genital herpes

Polylead, a fine powder of recycled modified plastic, has proved to be a good material for:

(1) making tubes and pipes
(2) making plastic sacks
(3) use as a fertilizer
(4) construction of roads

The shorter and longer arms of a submetacentric chromosome are referred to as:

(1) m-arm and n-arm respectively
(2) s-arm and l-arm respectively
(3) p-arm and q-arm respectively
(4) q-arm and p-arm respectively

Following statements describe the characteristics of the enzyme Restriction Endonuclease. Identify the incorrect statement.

(1) The enzyme recognizes a specific palindromic nucleotide sequence in the DNA.
(2) The enzyme cuts DNA molecule at identified position within the DNA.
(3) The enzyme binds DNA at specific sites and cuts only one of the two strands.
(4) The enzyme cuts the sugar-phosphate backbone at specific sites on each strand.

Persistent nucellus in the seed is known as:

(1) Tegmen
(2) Chalaza
(3) Perisperm
(4) Hilum

Identify the cells whose secretion protects the lining of gastrointestinal tract from various enzymes.

(1) Duodenal Cells
(2) Chief Cells
(3) Goblet Cells
(4) Oxintic Cells

Which of the following statements is not correct?

(1) Lysosomes are formed by the process of packaging in the endoplasmic reticulum.
(2) Lysosomes have numerous hydrolytic enzymes.
(3) The hydrolytic enzymes of lysosomes are active under acidic pH.
(4) Lysosomes are membrane-bound structures.

Match the following organisms with the products they produce:

(a) Lactobacillus  (i) Cheese
(b) Saccharomyces  (ii) Curd
cerevisiae
(c) Aspergillus  (iii) Citric Acid
niger
(d) Acetobacter  (iv) Bread
acetii

Select the correct option.

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

(1) (ii) (i) (iii) (v)
(2) (ii) (iv) (v) (iii)
(3) (ii) (iv) (iii) (i)
(4) (iii) (iv) (v) (i)
21. Which part of the brain is responsible for thermoregulation?
   (1) Medulla oblongata
   (2) Cerebrum
   (3) Hypothalamus
   (4) Corpus callosum

22. In *Antirrhinum* (Snapdragon), a red flower was crossed with a white flower and in F₁ generation, pink flowers were obtained. When pink flowers were selfed, the F₂ generation showed white, red and pink flowers. Choose the incorrect statement from the following:
   (1) Law of Segregation does not apply in this experiment.
   (2) This experiment does not follow the Principle of Dominance.
   (3) Pink colour in F₁ is due to incomplete dominance.
   (4) Ratio of F₂ is $\frac{1}{4}$ (Red) : $\frac{2}{4}$ (Pink) : $\frac{1}{4}$ (White)

23. Which of the following can be used as a biocontrol agent in the treatment of plant disease?
   (1) *Lactobacillus*
   (2) *Trichoderma*
   (3) *Chlorella*
   (4) *Abaeosa*

   Select the correct group of biocontrol agents.
   (1) *Nostoc, Azospirillum, Nucleopolyhedrovirus*
   (2) *Bacillus thuringiensis, Tobacco mosaic virus, Aphids*
   (3) *Trichoderma, Baculovirus, Bacillus thuringiensis*
   (4) *Oscillatoria, Rhizobium, Trichoderma*

24. The frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes was explained by:
   (1) Sutton Boveri
   (2) T.H. Morgan
   (3) Gregor J. Mendel
   (4) Alfred Sturtevant

25. Respiratory Quotient (RQ) value oftripalmitin is:
   (1) 0.68
   (2) 0.9
   (3) 0.7
   (4) 0.97

26. What would be the heart rate of a person if cardiac output is 5 L, blood volume in the heart at the end of diastole is 100 mL and in ventricular systole is 50 mL?
   (1) 125 beats per minute
   (2) 50 beats per minute
   (3) 75 beats per minute
   (4) 100 beats per minute

27. From evolutionary point of view, select the female gametophyte with developing sporophyte on the parent sporophyte for some time observed in:
   (1) Gymnosperms
   (2) Liverworts
   (3) Mosses
   (4) Pteridophytes

28. Which of the following ecological pyramids generally inverted?
   (1) Pyramid of biomass in a sea
   (2) Pyramid of numbers in grassland
   (3) Pyramid of energy
   (4) Pyramid of biomass in a forest

29. Colostrum, the yellowish fluid, secreted by the mother during the initial days of lactation is very important to impart immunity to the newborn infant because it contains:
   (1) Immunoglobulin A
   (2) Natural killer cells
   (3) Monocytes
   (4) Macrophages

30. Phloem in gymnosperms lacks:
   (1) Both sieve tubes and companion cells
   (2) Albuminoid cells and sieve cells
   (3) Sieve tubes only
   (4) Companion cells only

31. Match the following organisms with respective characteristics:
   (a) *Pila*          (b) *Bombyx*          (c) *Pleurobrachia*          (d) *Taenia*  
   (i) Flame cells  (ii) Comb plates  (iii) Radula  (iv) Malpighian tubules

   Select the correct option from the following:
   (1) (iii) (ii) (iv) (d)
   (2) (iii) (ii) (i) (iv)
   (3) (iii) (iv) (ii) (i)
Use of an artificial kidney during hemodialysis may result in:
(a) Nitrogenous waste build-up in the body
(b) Non-elimination of excess potassium ions
(c) Reduced absorption of calcium ions from gastrointestinal tract
(d) Reduced RBC production

Which of the following options is the most appropriate?
(1) (a) and (d) are correct
(2) (a) and (b) are correct
(3) (b) and (c) are correct
(4) (c) and (d) are correct

Which of the following statements is correct?
(1) Cornea consists of dense matrix of collagen and is the most sensitive portion of the eye.
(2) Cornea is an external, transparent and protective proteinaceous covering of the eye-ball.
(3) Cornea consists of dense connective tissue of elastin and can repair itself.
(4) Cornea is convex, transparent layer which is highly vascularized.

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

The concept of "Omnis cellula-e cellula" regarding cell division was first proposed by:
(1) Aristotle
(2) Rudolf Virchow
(3) Theodore Schwann
(4) Schleiden

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

38. Thiobacillus is a group of bacteria helpful in carrying out:
(1) Denitrification
(2) Nitrogen fixation
(3) Chemosynthetic fixation
(4) Nitrification

39. Due to increasing air-borne allergens and pollutants, many people in urban areas are suffering from respiratory disorder causing wheezing due to:
(1) reduction in the secretion of surfactants by pneumocytes.
(2) benign growth on mucous lining of nasal cavity.
(3) inflammation of bronchi and bronchioles.
(4) proliferation of fibrous tissues and damage of the alveolar walls.

40. In some plants, the female gamete develops into embryo without fertilization. This phenomenon is known as:
(1) Parthenogenesis
(2) Autogamy
(3) Parthenocarpy
(4) Syngamy

41. Select the correct option.
(1) There are seven pairs of vertebrosternal, three pairs of vertebrochondral and two pairs of vertebral ribs.
(2) 8th, 9th and 10th pairs of ribs articulate directly with the sternum.
(3) 11th and 12th pairs of ribs are connected to the sternum with the help of hyaline cartilage.
(4) Each rib is a flat thin bone and all the ribs are connected dorsally, to the thoracic vertebrae and ventrally to the sternum.
42. How does steroid hormone influence the cellular activities?
(1) Using aquaporin channels as second messenger.
(2) Changing the permeability of the cell membrane.
✓ Binding to DNA and forming a gene-hormone complex.
(4) Activating cyclic AMP located on the cell membrane.

38. Select the correctly written scientific name of Mango which was first described by Carolus Linnaeus:
(1) Mangifera Indica
(2) Mangifera indica Car. Linn.
✓ Mangifera indica Linn.
(4) Mangifera indica

44. What map unit (Centimorgan) is adopted in the construction of genetic maps?
(1) A unit of distance between genes on chromosomes, representing 50% cross over.
(2) A unit of distance between two expressed genes, representing 10% cross over.
(3) A unit of distance between two expressed genes, representing 100% cross over.
(4) A unit of distance between genes on chromosomes, representing 1% cross over.

45. Cells in G₀ phase:
(1) terminate the cell cycle
✓ exit the cell cycle
(3) enter the cell cycle
(4) suspend the cell cycle

46. Which one of the following statements regarding post-fertilization development in flowering plants is incorrect?
✓ Ovules develop into embryo sac
(2) Ovary develops into fruit
(3) Zygote develops into embryo
(4) Central cell develops into endosperm

47. Which of the following features of genetic code allow bacteria to produce human insulin recombinant DNA technology?
(1) Genetic code is specific
✓ Genetic code is not ambiguous
(3) Genetic code is redundant
(4) Genetic code is nearly universal

48. Which of the following glucose transporters are insulin-dependent?
(1) GLUT IV
(2) GLUT I
(3) GLUT II
(4) GLUT III

49. Under which of the following conditions will there be no change in the reading frame of mRNA?
5' AACAGCGGUGCUAAUU 3'
(1) Deletion of GGU from 7th, 8th positions
(2) Insertion of G at 5th position
(3) Deletion of G from 5th position
(4) Insertion of A and G at 4th and 5th positions respectively

50. Select the hormone-releasing Intra-Uterine Devices.
(1) Lippes Loop, Multiload 375
(2) Vauls, LNG-20
✓ Multiload 375, Progestaert
(4) Progestaert, LNG-20

51. Variations caused by mutation, as proposed by Hugo de Vries, are:
✓ small and directionless
(2) random and directional
(3) random and directionless
(4) small and directional

52. Expressed Sequence Tags (ESTs) refers to:
(1) Novel DNA sequences
(2) Genes expressed as RNA
✓ Polypeptide expression
(4) DNA polymorphism
What triggers activation of protoxin to active Bt toxin of *Bacillus thuringiensis* in boll worm?

1. Acidic pH of stomach
2. Body temperature
3. Moist surface of midgut
4. Alkaline pH of gut

Match the hominids with their correct brain size:

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

Select the correct option.

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

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

Which of the following pairs of gases is mainly responsible for green house effect?

1. Carbon dioxide and Methane
2. Ozone and Ammonia
3. Oxygen and Nitrogen
4. Nitrogen and Sulphur dioxide

Match Column - I with Column - II.

**Column - I**  
(a) *Saprophyte*  
(b) *Parasite*  
(c) *Lichens*  
(d) *Mycorrhiza*

**Column - II**  
(i) Symbiotic association of fungi with plant roots
(ii) Decomposition of dead organic materials
(iii) Living on living plants or animals
(iv) Symbiotic association of algae and fungi

Choose the correct answer from the options given below:

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

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

Which of the following is true for Golden rice?

1. It has yellow grains, because of a gene introduced from a primitive variety of rice.
2. It is Vitamin A enriched, with a gene from *daffodil*.
3. It is pest resistant, with a gene from *Bacillus thuringiensis*.
4. It is drought tolerant, developed using *Agrobacterium vector*.

What is the genetic disorder in which an individual has an overall masculine development, gynaecomastia, and is sterile?

1. Down’s syndrome
2. Turner’s syndrome
3. Klenefelter’s syndrome
4. Edward syndrome

Extrusion of second polar body from egg nucleus occurs:

1. Simultaneously with first cleavage
2. After entry of sperm but before fertilization
3. After fertilization
4. Before entry of sperm into ovum

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

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

What is the fate of the male gametes discharged in the synergid?

1. One fuses with the egg and other fuses with central cell nuclei.
2. One fuses with the egg, other(s) degenerate in the synergid.
3. All fuse with egg.
62. In a species, the weight of newborn ranges from 2 to 5 kg. 97% of the newborn with an average weight between 3 to 3.3 kg survive whereas 99% of the infants born with weights from 2 to 2.5 kg or 4.5 to 5 kg die. Which type of selection process is taking place?
(1) Cyclical Selection
(2) Directional Selection
(3) Stabilizing Selection
(4) Disruptive Selection

63. Which of the following muscular disorders is inherited?
(1) Botulism
(2) Tetany
(3) Muscular dystrophy
(4) Myasthenia gravis

64. Which of the following protocols did aim for reducing emission of chlorofluorocarbons into the atmosphere?
(1) Geneva Protocol
(2) Montreal Protocol
(3) Kyoto Protocol
(4) Gothenburg Protocol

65. Consider the following statements:
(A) Coenzyme or metal ion that is tightly bound to enzyme protein is called prosthetic group.
(B) A complete catalytic active enzyme with its bound prosthetic group is called apoenzyme.
Select the correct option.
(1) (A) is false but (B) is true.
(2) Both (A) and (B) are true.
(3) (A) is true but (B) is false.
(4) Both (A) and (B) are false.

66. Consider the following features:
(a) Organ system level of organisation
(b) Bilateral symmetry
(c) True coelomates with segmentation of body
Select the correct option of animal groups which possess all the above characteristics.
(1) Annelida, Mollusca and Chordata
(2) Annelida, Arthropoda and Chordata
(3) Annelida, Arthropoda and Mollusca
(4) Arthropoda, Mollusca and Chordata

67. Pinus seed cannot germinate and it germinates only without fungal association. This is because
(1) its seeds contain inhibitors that prevent germination.
(2) its embryo is immature.
(3) it has obligate association with mycorrhiza.
(4) it has very hard seed coat.

68. Select the correct sequence of organs of alimentary canal of cockroach starting from mouth:
(1) Pharynx → Oesophagus → Ileum → Crop → Gizzard → Colon → Rectum
(2) Pharynx → Oesophagus → Crop → Gizzard → Ileum → Colon → Rectum
(3) Pharynx → Oesophagus → Gizzard → Ileum → Colon → Rectum
(4) Pharynx → Oesophagus → Gizzard → Crop → Ileum → Colon → Rectum

69. Which of the following statements regarding mitochondria is incorrect?
(1) Mitochondrial matrix contains single circular DNA molecule and ribosomes.
(2) Outer membrane is permeable to monomers of carbohydrates, fats and proteins.
(3) Enzymes of electron transport are embedded in outer membrane.
(4) Inner membrane is convoluted with infoldings.

70. Drug called 'Heroin' is synthesized by:
(1) nitration of morphine
(2) methylation of morphine
(3) acetylation of morphine
(4) glycosylation of morphine

71. Conversion of glucose to glucose-6-phosphate by:
(1) Phosphofructokinase
(2) Aldolase
(3) Hexokinase
(4) Endonuclease
DNA precipitation out of a mixture of biomolecules can be achieved by treatment with:

(1) Chilled chloroform  
(2) Isopropanol  
(3) Chilled ethanol  
(4) Methanol at room temperature

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

(1) Lipases  
(2) Cyclosporin A  
(3) Statins  
(4) Streptokinase

Which one of the following equipments is essentially required for growing microbes on a large scale, for industrial production of enzymes?

(1) Bioreactor  
(2) BOD incubator  
(3) Sludge digester  
(4) Industrial oven

Which of the following statements is incorrect?

(1) Prions consist of abnormally folded proteins.  
(2) Viruses lack a protein coat.  
(3) Viruses are obligate parasites.  
(4) Infective constituent in viruses is the protein coat.

Grass leaves curl inwards during very dry weather. Select the most appropriate reason from the following:

(1) Tyloses in vessels  
(2) Closure of stomata  
(3) Flaccidity of bulliform cells  
(4) Shrinkage of air spaces in spongy mesophyll

Xylem translocates:

(1) Water, mineral salts, some organic nitrogen and hormones  
(2) Water only  
(3) Water and mineral salts only  
(4) Water, mineral salts and some organic nitrogen only

Select the correct sequence for transport of sperm cells in male reproductive system.

(1) Testis → Epididymis → Vasa efferentia → Vas deferens → Ejaculatory duct → Inguinal canal → Urethra
(2) Testis → Epididymis → Vasa efferentia → Rete testis → Inguinal canal → Urethra
(3) Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory duct → Urethra → Urethral meatus
(4) Seminiferous tubules → Vasa efferentia → Epididymis → Inguinal canal → Urethra

Which of these following methods is the most suitable for disposal of nuclear waste?

(1) Bury the waste within rocks deep below the Earth’s surface.  
(2) Shoot the waste into space  
(3) Bury the waste under Antarctic ice-cover  
(4) Dump the waste within rocks under deep ocean

Which of the following immune responses is responsible for rejection of kidney graft?

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

What is the site of perception of photoperiod necessary for induction of flowering in plants?

(1) Leaves  
(2) Lateral buds  
(3) Pulvinus  
(4) Shoot apex

Identify the correct pair representing the causative agent of typhoid fever and the confirmatory test for typhoid.

(1) Salmonella typhi / Widal test  
(2) Plasmodium vivax / UTI test  
(3) Streptococcus pneumoniae / Widal test  
(4) Salmonella typhi / Anthrone test
Concanavalin A is:
(1) a pigment
(2) an alkaloid
(3) an essential oil
(4) a lectin

It takes very long time for pineapple plants to produce flowers. Which combination of hormones can be applied to artificially induce flowering in pineapple plants throughout the year to increase yield?
(1) Cytokinins and Abscisic acid
(2) Auxins and Ethylene
(3) Gibberelins and Cytokinins
(4) Gibberelins and Abscisic acid

Select the incorrect statement:
(1) Inbreeding helps in accumulation of superior genes and elimination of undesirable genes.
(2) Inbreeding increases homozygosity.
(3) Inbreeding is essential to evolve pure lines in any animal.
(4) Inbreeding selects harmful recessive genes that reduce fertility and productivity.

Which of the following statements is incorrect?
(1) Yeasts have filamentous bodies with long thread-like hyphae.
(2) Morels and truffles are edible delicacies.
(3) Claviceps is a source of many alkaloids and LSD.
(4) Conidia are produced exogenously and ascospores endogenously.

Tidal Volume and Expiratory Reserve Volume of an athlete is 500 mL and 1000 mL respectively. What will be his Expiratory Capacity if the Residual Volume is 1200 mL?
(1) 2700 mL
(2) 1500 mL
(3) 1700 mL
(4) 2200 mL

Which one of the following is not a method for in situ conservation of biodiversity?
(1) Sacred Grove
(2) Biosphere Reserve
(3) Wildlife Sanctuary
(4) Botanical Garden

Which of the following factors is responsible for the formation of concentrated urine?
(1) Hydrostatic pressure during glomerular filtration.
(2) Low levels of antidiuretic hormone.
(3) Maintaining hyperosmolarity towards the medullary interstitium in the kidney.
(4) Secretion of erythropoietin in the juxtaglomerular complex.

Match the Column - I with Column - II.

Column - I
(a) P-wave
(b) QRS complex
(c) T-wave
(d) Reduction in size of T-wave

Column - II
(i) Depolarization of ventricles
(ii) Repolarization of ventricles
(iii) Coronary ischemia
(iv) Depolarization of atria
(v) Repolarization of atria

Select the correct option.
(a) (b) (c) (d)
(1) (ii) (i) (iii) (iv)
(2) (iv) (i) (ii) (iii)
(3) (iv) (i) (ii) (v)
(4) (iv) (ii) (v) (iii)
96. When an object is shot from the bottom of a long smooth inclined plane kept at an angle 60° with horizontal, it can travel a distance \( x_1 \) along the plane. But when the inclination is decreased to 30° and the same object is shot with the same velocity, it can travel \( x_2 \) distance. Then \( x_1 : x_2 \) will be:

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

97. A soap bubble, having radius of 1 mm, is blown from a detergent solution having a surface tension of 2.5 \( \times 10^{-2} \) N/m. The pressure inside the bubble equals at a point \( Z_0 \) below the free surface of water in a container. Taking \( g = 10 \) m/s², density of water = 10³ kg/m³, the value of \( Z_0 \) is:

1. 0.5 cm
2. 100 cm
3. 10 cm
4. 1 cm

98. Two similar thin equi-convex lenses, of focal length \( f \) each, are kept coaxially in contact with each other such that the focal length of the combination is \( f_1 \). When the space between the two lenses is filled with glycerin (which has the same refractive index \( \mu = 1.5 \)) as that of glass then the equivalent focal length is \( f_2 \). The ratio \( f_1 : f_2 \) will be:

1. 3 : 4
2. 2 : 1
3. 1 : 2
4. 2 : 3

99. α-particle consists of:

1. 2 protons only
2. 2 protons and 2 neutrons only
3. 2 electrons, 2 protons and 2 neutrons
4. 2 electrons and 4 protons only

100. In an experiment, the percentage of error occurred in the measurement of physical quantities A, B, C and D are 1%, 2%, 3% and 4% respectively. Then the maximum percentage of error in the measurement \( X \), where \( X = \frac{A^2 B^{1/2}}{C^{1/2} D^3} \), will be:

1. 10%
2. \( \left( \frac{3}{13} \right) \)%
3. 16%
4. –10%
102. Two parallel infinite line charges with linear charge densities \( + \lambda \text{ C/m} \) and \( -\lambda \text{ C/m} \) are placed at a distance of \( 2R \) in free space. What is the electric field mid-way between the two line charges?

\[
\begin{align*}
(1) & \quad \frac{\lambda}{2\pi\varepsilon_0 R} \text{ N/C} \\
(2) & \quad \text{zero} \\
(3) & \quad \frac{\lambda}{\pi\varepsilon_0 R} \text{ N/C} \\
(4) & \quad \frac{\lambda}{\varepsilon_0 R} \text{ N/C}
\end{align*}
\]

103. The unit of thermal conductivity is:

\[
\begin{align*}
(1) & \quad \text{W m}^{-1} \text{ K}^{-1} \\
(2) & \quad \text{J m K}^{-1} \\
(3) & \quad \text{J m}^{-1} \text{ K}^{-1} \\
(4) & \quad \text{W m K}^{-1}
\end{align*}
\]

104. The displacement of a particle executing simple harmonic motion is given by:

\[ y = A_0 + A \sin \omega t + B \cos \omega t. \]

Then the amplitude of its oscillation is given by:

\[
\begin{align*}
(1) & \quad A + B \\
(2) & \quad A_0 + \sqrt{A^2 + B^2}
\end{align*}
\]

105. In a double slit experiment, when light of wavelength 400 nm was used, the angular width of the first minima formed on a screen placed 1 m away, was found to be 0.2°. What will be the angular width of the first minima, if the entire experimental apparatus is immersed in water (\( \eta_{\text{water}} = 4/3 \))?

\[
\begin{align*}
(1) & \quad 0.1^\circ \\
(2) & \quad 0.266^\circ \\
(3) & \quad 0.15^\circ \\
(4) & \quad 0.05^\circ
\end{align*}
\]

106. A body weighs 200 N on the surface of the earth. How much will it weigh halfway down to the core of the earth?

\[
\begin{align*}
(1) & \quad 100 \text{ N} \\
(2) & \quad 150 \text{ N} \\
(3) & \quad 200 \text{ N} \\
(4) & \quad 250 \text{ N}
\end{align*}
\]

107. A particle moving with velocity \( \vec{v} \) is acted by three forces shown by the triangle PQR. The velocity of the particle will:

\[
\begin{align*}
(1) & \quad \text{change according to the smallest force} \\
(2) & \quad \text{increase} \\
(3) & \quad \text{decrease} \\
(4) & \quad \text{remain constant}
\end{align*}
\]

108. Two particles A and B are moving in uniform circular motion in concentric circles of radii \( r_A \) and \( r_B \) with speed \( v_A \) and \( v_B \) respectively. The time period of rotation is the same. The ratio of angular speed of A to that of B will be:

\[
\begin{align*}
(1) & \quad 1 : 1 \\
(2) & \quad \frac{r_A}{r_B}
\end{align*}
\]
18. A 800 turn coil of effective area 0.05 m² is kept perpendicular to a magnetic field $5 \times 10^{-5}$ T. When the plane of the coil is rotated by 90° around any of its coplanar axis in 0.1 s, the emf induced in the coil will be:

1. $0.02 \, \text{V}$
2. $2 \, \text{V}$
3. $0.2 \, \text{V}$
4. $2 \times 10^{-3} \, \text{V}$

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

1. $10 \pi \, \text{rad/s}$
2. $\sqrt{10} \, \text{rad/s}$
3. $\frac{10}{2\pi} \, \text{rad/s}$
4. $10 \, \text{rad/s}$

111. When a block of mass $M$ is suspended by a long wire of length $L$, the length of the wire becomes $(L + h)$. The elastic potential energy stored in the extended wire is:

1. $\frac{1}{2} MgL$
2. $MgL$
3. $MgL$
4. $\frac{1}{2} MgL$

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

1. decrease in intermolecular distance
2. increase in its mass
3. increase in its kinetic energy
4. decrease in its pressure

114. Body A of mass 4m moving with speed $u$ collides with another body B of mass 2m, at rest. The collision is head on and elastic in nature. After the collision the fraction of energy lost by the colliding body A is:

1. $\frac{5}{9}$
2. $\frac{1}{9}$
3. $\frac{8}{9}$
4. $\frac{4}{9}$

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

1. violet
2. red
3. blue
4. green
16. A copper rod of 88 cm and an aluminium rod of unknown length have their increase in length independent of increase in temperature. The length of aluminium rod is: (\(\alpha_{Cu} = 1.7 \times 10^{-5} \text{ K}^{-1}\) and \(\alpha_{Al} = 2.2 \times 10^{-5} \text{ K}^{-1}\))

(1) 68 cm
(2) 6.8 cm
(3) 113.9 cm
(4) 88 cm

117. For a p-type semiconductor, which of the following statements is true?

(1) Electrons are the majority carriers and pentavalent atoms are the dopants.
(2) Electrons are the majority carriers and trivalent atoms are the dopants.
(3) Holes are the majority carriers and trivalent atoms are the dopants.
(4) Holes are the majority carriers and pentavalent atoms are the dopants.

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

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

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

119. A force \(F = 20 + 10y\) acts on a particle in \(y\)-direction, where \(F\) is in newton and \(y\) in meter. Work done by this force to move the particle from \(y = 0\) to \(y = 1\) m is:

(1) 20 J
(2) 30 J
(3) 5 J
(4) 25 J

120. A mass \(m\) is attached to a thin wire and whirled in a vertical circle. The wire is most likely to break when:

(1) inclined at an angle of 60° from vertical
(2) the mass is at the highest point
(3) the wire is horizontal
(4) the mass is at the lowest point

121. Average velocity of a particle executing SHM, one complete vibration is:

(1) zero
(2) \(\frac{A_0}{2}\)
(3) \(A_0\)
(4) \(\frac{A_0^2}{2}\)

122. Pick the wrong answer in the context with rainbow.

(1) Rainbow is a combined effect of dispersion, refraction and reflection of sunlight.
(2) When the light rays undergo two internal reflections in a water drop, a second rainbow is formed.
(3) The order of colours is reversed in secondary rainbow.
(4) An observer can see a rainbow when his face is towards the sun.

123. An electron is fired from a metal with a potential difference of 20 V.

(1) Thomson
(2) Momentum of electron
(3) Energy of electron
(4) Charge of electron
124. A disc of radius 2 m and mass 100 kg rolls on a horizontal floor. Its centre of mass has speed of 20 cm/s. How much work is needed to stop it?
   (1) 1 J  
   (2) 3 J  
   (3) 30 kJ  
   (4) 2 J

125. The correct Boolean operation represented by the circuit diagram drawn is:
   (1) NOR  
   (2) AND  
   (3) OR  
   (4) NAND

126. Ionized hydrogen atoms and α-particles with same momenta enter perpendicular to a constant magnetic field, B. The ratio of their radii of their paths $r_H : r_\alpha$ will be:
   (1) $\frac{1}{4}$  
   (2) $\frac{2}{1}$  
   (3) $\frac{1}{2}$  
   (4) $\frac{4}{1}$

127. Two point charges A and B, having charges $+Q$ and $-Q$ respectively, are placed at certain distance apart and force acting between them is F. If 25% charge of A is transferred to B, then force between the charges becomes:
   (1) $\frac{4F}{3}$  
   (2) F  
   (3) $\frac{9F}{16}$  
   (4) $\frac{16F}{9}$

128. In which of the following devices, the eddy current effect is not used?
   (1) electric heater  
   (2) induction furnace  
   (3) magnetic braking in train  
   (4) electromagnet

129. At a point A on the earth’s surface the angle of dip, $\delta = +25^\circ$. At a point B on the earth’s surface the angle of dip, $\delta = -25^\circ$. We can interpret that:
   (1) A and B are both located in the southern hemisphere.  
   (2) A and B are both located in the northern hemisphere.  
   (3) A is located in the southern hemisphere and B is located in the northern hemisphere.  
   (4) A is located in the northern hemisphere and B is located in the southern hemisphere.

130. Six similar bulbs are connected as shown in the figure with a DC source of emf E, and zero internal resistance.
   The ratio of power consumption by the bulbs when (i) all are glowing and (ii) in the situation when two from section A and one from section B are glowing, will be:
   (1) $\frac{1}{2}$  
   (2) $\frac{2}{1}$  
   (3) $\frac{4}{9}$  
   (4) $\frac{1}{2}$

131. A small hole of area of cross-section 2 mm$^2$ is present near the bottom of a fully filled open tank of height 2 m. Taking $g = 10 \text{ m/s}^2$, the rate of flow of water through the open hole would be nearly:
   (1) $6.4 \times 10^{-6} \text{ m}^3/\text{s}$  
   (2) $12.6 \times 10^{-6} \text{ m}^3/\text{s}$  
   (3) $8.9 \times 10^{-6} \text{ m}^3/\text{s}$  
   (4) $2.23 \times 10^{-6} \text{ m}^3/\text{s}$
133. The work done to raise a mass $m$ from the surface of the earth to a height $h$, which is equal to the radius of the earth, is:

$$W = mgR$$

134. In which of the following processes, heat is neither absorbed nor released by a system?

(1) isochoric
(2) isothermal
(3) adiabatic
(4) isobaric

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

(1) $2 \times 10^6$ N m
(2) $2 \times 10^8$ N m

136. Which one is malachite from the following?

(1) CuCO$_3$·Cu(OH)$_2$
(2) CuFeS$_2$
(3) Cu(OH)$_2$
(4) Fe$_5$O$_4$

137. Enzymes that utilize ATP in phosphate transfer require an alkaline earth metal (M) as the cofactor. M is:

(1) Sr
(2) Be
(3) Mg
(4) Ca

138. For an ideal solution, the correct option is:

(1) $\Delta_{\text{mix}} G = 0$ at constant $T$ and $P$
(2) $\Delta_{\text{mix}} S = 0$ at constant $T$ and $P$
(3) $\Delta_{\text{mix}} V \neq 0$ at constant $T$ and $P$
(4) $\Delta_{\text{mix}} H = 0$ at constant $T$ and $P$

139. What is the correct electronic configuration for the central atom in $K_4[Fe(CN)_6]$ based on crystal field theory?

(1) $e^4 t^2_2$
(2) $t^4_2 e^2_g$
(3) $t^6_2 e^0_g$
(4) $e^3 t^3_2$

140. The number of sigma (σ) and pi (π) bonds in pent-2-en-4-yne is:

(1) 13 σ bonds and no π bond
(2) 10 σ bonds and 3 π bonds
(3) 8 σ bonds and 5 π bonds
(4) 11 σ bonds and 2 π bonds

141. A compound is formed by cation C and anions A. The anions form hexagonal close packed (HCP) lattice and the cations occupy 75% of octahedral voids. The formula of the compound is:

(1) $C_4A_3$
(2) $C_2A_3$
143. Which of the following is incorrect statement?
(1) SnF₄ is ionic in nature
(2) PbF₂ is covalent in nature
(3) SiCl₄ is easily hydrolysed
(4) GeX₄ (X = F, Cl, Br, I) is more stable than GeX₂

144. Which of the following is an amphoteric hydroxide?
(1) Be(OH)₂
(2) Sr(OH)₂
(3) Ca(OH)₂
(4) Mg(OH)₂

145. The manganate and permanganate ions are tetrahedral, due to:
(1) The π bonding involves overlap of d-orbitals of oxygen with d-orbitals of manganese
(2) The π bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese
(3) There is no π bonding
(4) The π bonding involves overlap of p-orbitals of oxygen with p-orbitals of manganese

146. pH of a saturated solution of Ca(OH)₂ is 9. The solubility product (K_sp) of Ca(OH)₂ is:
(1) 0.5 × 10⁻¹⁰
(2) 0.5 × 10⁻¹⁵
(3) 0.25 × 10⁻¹⁰
(4) 0.125 × 10⁻¹⁵

147. The mixture that forms maximum boiling azeotrope is:
(1) Heptane + Octane
(2) Water + Nitric acid
(3) Ethanol + Water
(4) Acetone + Carbon disulphide

148. Match the Xenon compounds in Column - I with its structure in Column - II and assign the correct code:

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

Code:
(1) (i) (iv) (i) (ii)
(2) (ii) (ii) (iii) (iv)
(3) (ii) (iii) (i) (iv)
(4) (ii) (iii) (i) (iv)

149. Which of the following reactions are disproportionation reaction?
(a) 2Cu⁺ → Cu²⁺ + Cu⁰
(b) 3MnO₄⁻ + 4H⁺ → 2MnO₄⁻ + MnO₂ + 2H₂O
(c) 2KMnO₄ → K₂MnO₄ + MnO₂ + O₂
(d) 2MnO₄⁻ + 3Mn²⁺ + 2H₂O → 5MnO₂ + 4H⁺

Select the correct option from the following:
(1) (a) and (d) only
(2) (a) and (b) only
(3) (a), (b) and (c)
(4) (a), (c) and (d)

150. Conjugate base for Brønsted acids H₂O and HF are:

| (1) H₃O⁺ and H₂F⁺, respectively |
| (2) OH⁻ and H₂F⁺, respectively |
| (3) H₃O⁺ and F⁻, respectively |
| OH⁻ and F⁻, respectively |
151. Among the following, the reaction that proceeds through an electrophilic substitution, is:

(1) \[ \text{CH}_2=\text{CH}_2 + \text{H}_2\text{O} \xrightarrow{\text{heat}} \text{CH}_3\text{CH}_2\text{OH} \]

(2) \[ \text{CH}_2=\text{CH}_2 + \text{Cl}_2 \xrightarrow{\text{UV light}} \text{CH}_2=\text{CHCl} \]

(3) \[ \text{AlCl}_3 + \text{CH}_2=\text{CH}_2 \rightarrow \text{Cl}_2 + \text{HCl} \]

(4) \[ \text{H}_2\text{C}=\text{CHCl} \xrightarrow{\text{HCl}} \text{Cl} \]

An alkene "A" on reaction with \( \text{O}_2 \) and \( \text{Zn} - \text{H}_2\text{O} \) gives propanoic acid and ethanol in equimolar ratio. Addition of HCl to alkene "A" gives "B" as the major product. The structure of product "B" is:

(5) \[ \text{CH}_2=\text{CH}_2 \]

(6) \[ \text{CH}_3 \text{C}-\text{CH}-\text{CH}_2 \]

(7) \[ \text{Cl} \]

155. In which case change in entropy is negative?

(1) \( 2\text{H}_2(\text{g}) \rightarrow \text{H}_2(\text{g}) \)

(2) Evaporation of water

(3) Expansion of a gas at constant temperature

(4) Sublimation of solid to gas

156. Under isothermal condition, a gas at 30°C expands from 0.1 L to 0.25 L against a constant external pressure of 2 bar. The work done by the gas is:

\[ W = \Delta \text{PV} \]

\[ W = 0.25 \times \Delta \text{bar} \times 0.15 \]

(1) 30 J

(2) 30 J

(3) 5 kJ

(4) 25 J

157. Which of the following species is not stable?

(1) \([\text{SiCl}_4]^2-\)

(2) \([\text{SiF}_6]^2-\)

(3) \([\text{GeCl}_4]^2-\)

(4) \([\text{Sn}^{\text{IV}}(\text{OH})_6]^2-\)

158. For a cell involving one electron \( \text{E}^{\text{cell}} = 0.59 \text{ V} \) at 298 K, the equilibrium constant for the cell reaction is:

\[ K = \frac{1}{2.303 \text{RT}} \]

\[ K = 0.059 \text{ V} \]

(1) \( 1.0 \times 10^{30} \)

(2) \( 1.0 \times 10^2 \)

(3) \( 1.0 \times 10^5 \)

(4) \( 1.0 \times 10^{10} \)

159. The method used to remove temporary hardness of water is:

(1) Synthetic resins method

(2) Calgon's method

(3) Clark's method

(4) Ion-exchange method
163. Which will make basic buffer?

(1) 100 mL of 0.1 M HCl + 100 mL of 0.1 M NaOH
(2) 50 mL of 0.1 M NaOH + 25 mL of 0.1 M CH₃COOH
(3) 100 mL of 0.1 M CH₃COOH + 100 mL of 0.1 M NaOH
(4) 100 mL of 0.1 M HCl + 200 mL of 0.1 M NH₃ OH

164. The correct structure of tribromoctaoxide is:

(1) \( \text{O} \equiv \text{Br} - \text{Br} - \text{Br} - \text{O} \)
(2) \( \text{O} \equiv \text{Br} - \text{Br} - \text{Br} - \text{O} \)
(3) \( \text{O} \equiv \text{Br} - \text{Br} - \text{Br} - \text{O} \)
(4) \( \text{O} \equiv \text{Br} - \text{Br} - \text{Br} - \text{O} \)

165. The major product of the following reaction is:

\[
\begin{array}{c}
\text{COOH} \\
+ \text{NH}_3 \\
\rightarrow \\
\text{COOH}
\end{array}
\]

(1) \( \text{NH}_2 \text{Ph} \equiv \text{O} \equiv \text{H} \)
(2) \( \text{H} \equiv \text{O} \equiv \text{H} \)
(3) \( \text{H}_2 \text{C} \equiv \text{O} \equiv \text{H} \)
(4) \( \text{H}_2 \text{C} \equiv \text{O} \equiv \text{CH}_3 \)

166. Which is the correct thermal stability order for \( \text{H}_2\text{E} \) (\( \text{E} = \text{O}, \text{S}, \text{Se}, \text{Te} \text{ and } \text{Po} \))?

(1) \( \text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po} < \text{H}_2\text{O} < \text{H}_2\text{S} \)
(2) \( \text{H}_2\text{S} < \text{H}_2\text{O} < \text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po} \)
(3) \( \text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po} \)
(4) \( \text{H}_2\text{Po} < \text{H}_2\text{Te} < \text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{O} \)
168. Match the following:

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

Which of the following is the correct option?

(1) (a) (iv) (ii) (i) (iii)
(2) (i) (ii) (iv) (i) (iii)
(3) (i) (ii) (iv) (i) (iii)
(4) (ii) (iv) (i) (iii) (i)

168. For the chemical reaction

\[ \text{N}_2(g) + 3\text{H}_2(g) \rightarrow 2\text{NH}_3(g) \]

the correct option is:

(1) \[ \frac{d[\text{H}_2]}{dt} = 2 \frac{d[\text{NH}_3]}{dt} \]
(2) \[ -\frac{1}{3} \frac{d[\text{H}_2]}{dt} = -\frac{1}{2} \frac{d[\text{NH}_3]}{dt} \]
(3) \[ -\frac{d[\text{N}_2]}{dt} = 2 \frac{d[\text{NH}_3]}{dt} \]
(4) \[ -\frac{d[\text{N}_2]}{dt} = \frac{1}{2} \frac{d[\text{NH}_3]}{dt} \]

169. The non-essential amino acid among the following is:

(1) lysine
(2) valine
(3) leucine
(4) alanine
170. Which of the following diatomic molecular species has only $\pi$ bonds according to Molecular Orbital Theory?

(1) Be$_2$
(2) O$_2$
(3) N$_2$
(4) C$_2$

171. The correct order of the basic strength of methyl substituted amines in aqueous solution is:

(1) CH$_3$NH$_2$ > (CH$_3$)$_2$NH > (CH$_3$)$_3$N
(2) (CH$_3$)$_2$NH > CH$_3$NH$_2$ > (CH$_3$)$_3$N
(3) (CH$_3$)$_2$NH > (CH$_3$)$_3$N > CH$_3$NH$_2$
(4) (CH$_3$)$_3$N > (CH$_3$)$_2$NH > CH$_3$NH$_2$

172. Which mixture of the solutions will lead to the formation of negatively charged colloidal [AgI] sol?  

(1) 50 mL of 0.1 M AgNO$_3$ + 50 mL of 0.1 M KI  
(2) 50 mL of 1 M AgNO$_3$ + 50 mL of 1.5 M KI  
(3) 50 mL of 1 M AgNO$_3$ + 50 mL of 2 M KI  
(4) 50 mL of 2 M AgNO$_3$ + 50 mL of 1.5 M KI

173. Identify the incorrect statement related to PCl$_5$ from the following:

(1) PCl$_5$ molecule is non-reactive  
(2) Three equatorial P–Cl bonds make an angle of 120° with each other  
(3) Two axial P–Cl bonds make an angle of 180° with each other  
(4) Axial P–Cl bonds are longer than equatorial P–Cl bonds

174. Among the following, the narrow spectrum antibiotic is:

(1) chloramphenicol  
(2) penicillin G  
(3) ampicillin  
(4) amoxycillin

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

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

176. For the second period elements the correct increasing order of first ionisation enthalpy is:

(1) Li < Be < B < C < O < N < P < Ne  
(2) Li < Be < B < C < O < N < F < Ne  
(3) Li < B < Be < C < O < N < F < Ne  
(4) Li < B < Be < C < N < O < F < Ne

177. 4d, 5p, 5f and 6p orbitals are arranged in the order of decreasing energy. The correct option is:

(1) 5f > 6p > 4d > 5p  
(2) 5f > 6p > 5p > 4d  
(3) 6p > 5f > 5p > 4d  
(4) 6p > 5f > 4d > 5p

178. For the cell reaction:

$2Fe^{3+}(aq) + 2I^- (aq) \rightarrow 2Fe^{2+}(aq) + I_2(aq)$

$E^o_{\text{cell}} = 0.24 \text{ V at 298 K}$. The standard Gibbs energy ($\Delta_r G^o$) of the cell reaction is:

[Given that Faraday constant $F = 96500 \text{ C mol}^{-1}$.]

(1) $23.16 \text{ kJ mol}^{-1}$  
(2) $-46.32 \text{ kJ mol}^{-1}$  
(3) $-23.16 \text{ kJ mol}^{-1}$  
(4) $46.32 \text{ kJ mol}^{-1}$

179. Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region?

(1) Brackett series  
(2) Lyman series  
(3) Balmer series  
(4) Paschen series

180. The biodegradable polymer is:

(1) Buna-S  
(2) nylon-6, 6  
(3) nylon 2-nylon 6  
(4) nylon-6