### 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 **Y**. 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.

In case of any ambiguity in translation of any question, English version shall be treated as final.
1. In a testcross involving F₁ dihybrid flies, more parental-type offspring were produced than the recombinant-type offspring. This indicates:

(1) Both of the characters are controlled by more than one gene.
(2) The two genes are located on two different chromosomes.
(3) Chromosomes failed to separate during meiosis.
(4) The two genes are linked and present on the same chromosome.

2. Water soluble pigments found in plant cell vacuoles are:

(1) Anthocyanins
(2) Xanthophylls
(3) Chlorophyll
(4) Carotenoids

3. Which of the following pairs of hormones are not antagonistic (having opposite effects) to each other during parturition?

(1) Refaxin - Inhibin
(2) Parathormone - Calcitonin
(3) Insulin - Glucagon
(4) Aldosterone - Atrial Natriuretic Factor

4. Mitochondria and chloroplast are:

(a) semi-autonomous organelles.
(b) formed by division of pre-existing organelles and they contain DNA but lack protein synthesizing machinery.

Which one of the following options is correct?

(1) Both (a) and (b) are false.
(2) Both (a) and (b) are correct.
(3) (b) is true but (a) is false.
(4) (a) is true but (b) is false.

5. Which of the following is not a feature of the plasmids?

(1) Single-stranded
(2) Independent replication
(3) Circular structure
(4) Transferable
6. A plant in your garden avoids photorespiratory losses, has improved water use efficiency, shows high rates of photosynthesis at high temperatures and has improved efficiency of nitrogen utilisation. In which of the following physiological groups would you assign this plant?
   (1) Nitrogen fixer
   (2)CAM
   (3)C₃
   (4)CAM

7. Emerson’s enhancement effect and Red drop have been instrumental in the discovery of
   (1) Oxidative phosphorylation
   (2) Photophosphorylation and non-cyclic electron transport
   (3) Two photosystems operating simultaneously
   (4) Photophosphorylation and cyclic electron transport

8. Which type of tissue correctly matches with its location?
   Tissue: Cuboidal epithelium, Smooth muscle, Areolar tissue, Transitional epithelium
   Location: Lining of stomach, Wall of intestine, Tendons, Tip of nose

9. When does the growth rate of a population following the logistic model equal zero? The logistic model is given as \( \frac{dN}{dt} = rN(1-N/K) \):
   (1) when death rate is greater than birth rate
   (2) when N/K is exactly one
   (3) when N approaches carrying capacity of the habitat
   (4) when N/K equals zero

10. Which one of the following statements is not true?
    (1) Stored pollen in liquid nitrogen can be used in the crop breeding programmes
    (2) Tapetum helps in the dehiscence of anther
    (3) Exine of pollen grains is made up of sporopollenin
    (4) Pollen grains of many species cause severe allergies

11. Which one of the following statements is wrong?
    (1) Phycomycetes are also called algal fungi.
    (2) Cyanobacteria are also called blue-green algae.
    (3) Golden algae are also called desmids.
    (4) Eubacteria are also called false bacteria.
The Arena curvature is used for bioassay of:
(1) Ethylene
(2) ABA
(3) GA₃
(4) IAA

13. Which of the following structures is homologous to the wing of a bird?
(1) Fin of a Whale
(2) Dorsal fin of a Shark
(3) Wing of a Moth
(4) Hind limb of Rabbit

14. Blood pressure in the pulmonary artery is:
(1) less than that in the veins cavae
(2) same as that in the aorta
(3) more than that in the carotid
(4) more than that in the pulmonary vein

15. Fertilization in humans is practically feasible only if:
(1) the sperms are transported into cervix within 48 hrs of release of ovum in uterus
(2) the sperms are transported into vagina just after the release of ovum in fallopian tube
(3) the ovum and sperms are transported simultaneously to ampullary - isthmic junction of the fallopian tube
(4) the ovum and sperms are transported simultaneously to ampullary - isthmic junction of the cervix.

16. In meiosis crossing over is initiated at:
(1) Diploctene
(2) Pachytene
(3) Leptotene
(4) Zygotene

17. Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the kingdom:
(1) Animalia
(2) Monera
(3) Protista
(4) Fungi

18. The mechanism of fertilization is a prerequisite for:
(1) Pregnancy
(2) Conception
(3) Development
(4) Birth

19. The term ‘coitus’ refers to:
(1) Intercourse
(2) Conception
(3) Insemination
(4) Pregnancy
18. Lack of relaxation between successive stimuli in sustained muscle contraction is known as:
   (1) Tonus
   (2) Spasm
   (3) Fatigue
   (4) Tetanus

19. Identify the correct statement or (inhibit):
   (1) Is produced by nurse cells in testes and inhibits the secretion of LH.
   (2) Inhibits the secretion of LH, FSH, and Prolactin.
   (3) Is produced by granulose cells in ovary and inhibits the secretion of FSH.
   (4) Is produced by granulose cells in ovary and inhibits the secretion of LH.

20. Name the chronic respiratory disorder caused mainly by cigarette smoking:
   (1) Respiratory alkalosis
   (2) Emphysema
   (3) Asthma
   (4) Respiratory acidosis

21. Which of the following most appropriately describes haemophilia?
   (1) Dominant gene disorder
   (2) Recesive gene disorder
   (3) X-linked recessive gene disorder
   (4) Chromosomal disorder

22. Select the correct statement:
   (1) The leaves of gymnosperms are not well adapted to extremes of climate.
   (2) Gymnosperms are both homosporous and heterosporous.
   (3) *Salvia, Ginkgo, and Pinus* all are gymnosperms.
   (4) *Sequoia* is one of the tallest trees.

23. Which of the following is required as inducer(s) for the expression of *lac* operon?
   (1) lactose and galactose
   (2) glucose
   (3) galactose
   (4) lactose
24. A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the F1 plants were selfed, the resulting phenotypes were in the ratio of:

(1) 3:1: Dwarf : Tall
(2) 1:2:1: Tall homozygous : Tall heterozygous : Dwarf
(3) 1:2:1: Tall heterozygous : Tall homozygous : Dwarf
(4) 3:1: Tall : Dwarf

25. Which part of the tobacco plant is infected by *Meloidogyne incognita*?

(1) Root
(2) Flower
(3) Leaf
(4) Stem

26. Which of the following is not a characteristic feature during mitosis in somatic cells?

(1) Synapsis
(2) Spindle fibres
(3) Disappearance of nucleolus
(4) Chromosome movement

27. Which of the following statements is not true for cancer cells in relation to mutations?

(1) Mutations inhibit production of telomerase
(2) Mutations in proto-oncogenes accelerate the cell cycle.
(3) Mutations destroy telomerase inhibitor.
(4) Mutations inactivate the cell control.

28. One of the major components of cell wall of most fungi is:

(1) Hemicellulose
(2) Chitin
(3) Peptidoglycan
(4) Cellulose

29. Cotyledon of maize grain is called:

(1) scutellum
(2) plumule
(3) coleorhiza
(4) coleoptile
30. Which of the following would appear as the pioneer organisms on bare rocks?
(1) Green algae
(2) Lichens
(3) Liverworts
(4) Mosses

31. Changes in GnRH pulse frequency in females is controlled by circulating levels of
(1) progesterone and inhibin
(2) estrogen and progesterone
(3) estrogen and inhibin
(4) progesterone only

32. Antivenom injection contains preformed antibodies while polio drops that are administered into the body contain
(1) Attenuated pathogens
(2) Activated pathogens
(3) Harvested antibodies
(4) Gamma globulin

33. Photosensitive compound in human eye is made up of:
(1) Transducin and Retinene
(2) Guanosine and Retinol
(3) Opsin and Retinal
(4) Opsin and Retinol

34. Specialised epidermal cells surrounding the guard cells are called
(1) Lenticels
(2) Complementary cells
(3) Subsidiary cells
(4) Bulliform cells

35. Which of the following features is not present in the Phylum - Arthropoda?
(1) Jointed appendages
(2) Chitinous exoskeleton
(3) Metameric segmentation
(4) Pteropodia

36. Reduction in pH of blood will:
(1) release bicarbonate ions by the liver
(2) reduce the rate of heart beat
(3) reduce the blood supply to the brain
(4) decrease the affinity of hemoglobin with oxygen

30. एक ग्राम चट्टान पर एक अंग्रेजी जीव के रूप में निम्नलिखित में से कौन आयेगा?
(1) हर्ता रैलीक
(2) लड़केन
(3) तिलपसबर
(4) मास

31. मादाओं में GnRH फ्लॉप वार्यबायास व्यायाम का नियंत्रण किसके परिसंचरण से होता है?
(1) गृहेत्रे और इनबिन
(2) हस्तभे और गृहेत्रे
(3) हस्तभे और इनबिन
(4) केवल गृहेत्रे

32. प्रतिज्ञाविध टीकों में पूर्वानुमान प्रतिक्रियाएं होते हैं जबकि पोलियो की डीप्ला में, जिन्हें पुढ द्वारा दिलाया जाता है, होते हैं:
(1) क्षय का दिखा गए रोगजनक
(2) सर्पकार रोगजनक
(3) बचाए गए प्रतिक्रिया
(4) गाया गोबुड़ूलन

33. मानव नेत्र में प्रकाशसंधीय योगिक का बना होता है?
(1) ट्रांसडिस्प्रिनेस और रीटिनेल से
(2) व्हायनोसिंस और रेरिटिनेल से
(3) अप्सिल और रेरिटिनेल से
(4) अप्सिल और रेरिटिनेल से

34. द्वार कोशिकाओं को परेंट वाली विश्लेषित वाहानारूप कोशिकाओं को क्या कहा जाता है?
(1) अत्तरक
(2) पूरक कोशिकाएं
(3) ताम्रहोल कोशिकाएं
(4) आर्थर्क व्यक्तिकाएं

35. निम्नलिखित लक्षणों में से कौन-सा लक्षण पहले - आर्मोडा में नहीं पाया जाता?
(1) संधित उग्ता
(2) काइटिनी बाब्बकाल
(3) बिखडी बंदीभावन
(4) पालबाद

36. रॉसह के pH में होने वाली कस्ट्र के कारण:
(1) फूल के चाय प्राकारसिट का सीमान्त हो जाता है
(2) हड़प-सर्फिंग की दर कम हो जाती है
(3) स्लिपक का रॉसह संभान कम हो जाता है
(4) ऑक्सीजन के साथ ही गोड्या बुद्धि को बढ़ावा देता जाता है
38. Which of the following characteristic features of apples applies?
(a) One incompatibly divided Petal
(b) Cabbage
(c) Incomplete heart with an "A" character
(d) Propolenta
(e) Mountain

39. Match the term in Column I with its correct description in Column II.

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Incomplete heart</td>
<td>(a) Propolenta</td>
</tr>
<tr>
<td>B. Complete heart</td>
<td>(b) Petal</td>
</tr>
<tr>
<td>C. Incomplete heart</td>
<td>(c) Mountain</td>
</tr>
<tr>
<td>D. One incompatibly divided Petal</td>
<td>(d) Flower petal</td>
</tr>
</tbody>
</table>

37. Which of the following statements is wrong?
(a) Citric acid is a sulphur containing amino acid
(b) Inorganic phosphate is a polyphosphate
(c) Chloroplasts are in the thylakoid area
(d) One hundred and one fatty acid molecules are made up of:
   - One glycerol molecule
   - Three fatty acid molecules
   - One unsaturated fatty acid molecule

36. The compound made up of:
(a) One glycerol molecule and three fatty acid molecules
(b) Three glycerol molecules and one fatty acid molecule
(c) A single glycerol molecule and one fatty acid molecule
(d) Polyunsaturated fatty acid molecules

35. Match the terms in Column I with their description in Column II.

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Glycerol</td>
<td>(a) Phospholipid</td>
</tr>
<tr>
<td>B. Phospholipid</td>
<td>(b) Monoglyceride</td>
</tr>
<tr>
<td>C. Monoglyceride</td>
<td>(c) Diglyceride</td>
</tr>
<tr>
<td>D. Diglyceride</td>
<td>(d) Triglyceride</td>
</tr>
</tbody>
</table>

34. Which of the following statements is correct?
(a) The functional end of the filament of stamen is called the anther.
(b) The functional end of the filament of stamen is called the thalamus.
(c) The functional end of the filament of stamen is called the ovule.
(d) The functional end of the filament of stamen is called the pistil.
42. Water vapour comes out from the plant leaf through the stomatal opening. Through the same stomatal opening carbon dioxide diffuses into the plant during photosynthesis. Reason out the above statements using one of the following options:

(1) One process occurs during day time, and the other at night.
(2) Both processes cannot happen simultaneously.
(3) Both processes can happen together because the diffusion coefficient of water and CO$_2$ is different.
(4) The above processes happen only during night time.

43. A complex of ribosomes attached to a single strand of RNA is known as:
(1) Okazaki fragment
(2) Polysome
(3) Polymer
(4) Polypeptide

44. Which one of the following is a characteristic feature of crop land ecosystem?
(1) Ecological succession
(2) Absence of soil organisms
(3) Least genetic diversity
(4) Absence of weeds

45. Which of the following is the most important cause of animals and plants being driven to extinction?
(1) Co-extinctions
(2) Over-exploitation
(3) Alien species invasion
(4) Habitat loss and fragmentation

46. In a chloroplast the highest number of protons are found in:
(1) Antennae complex
(2) Stroma
(3) Lumen of thylakoids
(4) Inter membrane space

47. Which of the following is not required for any of the techniques of DNA fingerprinting available at present?
(1) DNA-DNA hybridization
(2) Polymerase chain reaction
(3) Zinc finger analysis
(4) Restriction enzymes
48. The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the:
   (1) Eubacteria
   (2) Halophiles
   (3) Thermoacidophiles
   (4) Methanogens

49. Which of the following features is not present in *P. amerciana*?
   (1) Metamerically segmented body
   (2) Schizocoelom as body cavity
   (3) Indeterminate and radial cleavage during embryonic development
   (4) Exoskeleton composed of N-acetylglycosamine

50. A system of rotating crops with legume or grass pasture to improve soil structure and fertility is called:
   (1) Shifting agriculture
   (2) Ley farming
   (3) Contour farming
   (4) Strip farming

51. Which of the following is wrongly matched in the given table?

<table>
<thead>
<tr>
<th>Microbe</th>
<th>Product</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Clostridium</em></td>
<td>Lipase</td>
<td>removal of oil stains</td>
</tr>
<tr>
<td><em>Trichoderma</em></td>
<td>Cyclosporin A</td>
<td>immunesuppressive drug</td>
</tr>
<tr>
<td><em>Monascus</em></td>
<td>Statins</td>
<td>lowering of blood cholesterol</td>
</tr>
<tr>
<td><em>Streptococcus</em></td>
<td>Streptokinase</td>
<td>removal of clot from blood vessel</td>
</tr>
</tbody>
</table>

52. In mammals, which blood vessel would normally carry largest amount of urea?
   (1) Hepatic Portal Vein
   (2) Renal Vein
   (3) Dorsal Aorta
   (4) Hepatic Vein

53. Which of the following is not a plant? (Choose the correct option)
   (1) *Kalanchoe*
   (2) *Tulsi*
   (3) *Shake*
   (4) *Bhendi*

54. Which of the following is not a fruit? (Choose the correct option)
   (1) *Gomphrena*
   (2) *Bougainvillea*
   (3) *Rosa*
   (4) *Hyoscyamus*

55. Which of the following is not a flowering plant? (Choose the correct option)
   (1) *Gomphrena*
   (2) *Tulsi*
   (3) *Bougainvillea*
   (4) *Rosa*

56. Which of the following is not a vegetable? (Choose the correct option)
   (1) *Carrot*
   (2) *Tomato*
   (3) *Cucumber*
   (4) *Lentil*

57. Which of the following is not a dry fruit? (Choose the correct option)
   (1) *Gomphrena*
   (2) *Bougainvillea*
   (3) *Rosa*
   (4) *Hyoscyamus*
53. Which of the following are the correct statements?
(a) Haemophilia is a sex-linked recessive disease.
(b) Down’s syndrome is due to aneuploidy.
(c) Phenylketonuria is an autosomal recessive gene disorder.
(d) Sickle cell anaemia is an X-linked recessive gene disorder.

(1) (a), (b) and (c) are correct.
(2) (a) and (d) are correct.
(3) (b) and (d) are correct.
(4) (a), (c) and (d) are correct.

54. Which of the following guards the opening of the hepato-pancreatic duct into the duodenum?
(a) Sphincter of Oddi
(b) Semilunar valve
(c) Ileocaecal valve
(d) Pyloric sphincter

55. Which of the following are the constituents of microtubules?
(a) Centrosome, Nucleosome and Centrioles
(b) Cilia, Flagella and Peroxisomes
(c) Spindle fibres, Centrioles and Cilia
(d) Centrioles, Spindle fibres and Chromatin

56. What is the coconut water from tender coconut represents?
(a) Free nuclear endosperm
(b) Endocarp
(c) Fleshy mesocarp
(d) Free nuclear proembryo

57. Which of the following are the constituents of microtubules?
(a) Centrosome, Nucleosome and Centrioles
(b) Cilia, Flagella and Peroxisomes
(c) Spindle fibres, Centrioles and Cilia
(d) Centrioles, Spindle fibres and Chromatin

58. How many carpels are present in the ovary of a true flower?
(a) One
(b) Two
(c) Three
(d) Four

59. Which of the following is not a stem modification?
(a) Flattened structures of Opuntia
(b) Pitcher of Nepenthes
(c) Thorns of citrus
(d) Tendrils of cucumber

60. Which of the following is not a stem modification?
(a) Flattened structures of Opuntia
(b) Pitcher of Nepenthes
(c) Thorns of citrus
(d) Tendrils of cucumber
59. The taq polymerase enzyme is obtained from:
   (1) Pseudomonas putida
   (2) Thermus aquaticus
   (3) Thiobacillus ferrooxidans
   (4) Bacillus subtilis

60. Stems modified into flat green organs performing the functions of leaves are known as:
   (1) Scales
   (2) Cladodes
   (3) Phylodes
   (4) Phylloclades

61. In higher vertebrates, the immune system can distinguish self-cells and non-self. If this property is lost due to genetic abnormality and it attacks self-cells, then it leads to:
   (1) Active immunity
   (2) Allergic response
   (3) Graft rejection
   (4) Autoimmune disease

62. Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature?
   (1) When written by hand, the names are to be underlined
   (2) Biological names can be written in any language
   (3) The first word in a biological name represents the genus name, and the second is a specific epithet
   (4) The names are written in Latin and are italicised

63. In bryophytes and pteridophytes, transport of male gametes requires:
   (1) Water
   (2) Wind
   (3) Insects
   (4) Birds

59. टैक पॉलिमराजें एनजाइम किससे प्राप्त किया जाता है?
   (1) स्प्रोडीमेक्स पुटिडा
   (2) गर्मीएन एक्स्ट्रेमिस
   (3) फियोबीसिलस फेरोकसीडेडीस
   (4) बासिस्लस सब्टिलिस

60. पत्तियों का कार्य करने वाले, चपटे हो अंग में रूपान्तरित तने को बना कहा जाता है?
   (1) गला
   (2) पर्णाभ पर्व
   (3) पर्णाभ
   (4) पर्णाभ गुः

61. उच्चजात करोड़कारियों में, प्रतिलक्ष तंत्र स्व-कोशिकाओं और नैर-कोशिकाओं में भेद कर सकता है। यदि तंत्र का अनुसरणिक अपराधात्मात्मा के कारण यह गुण नष्ट हो जाए और इस स्व-कोशिकाओं को नष्ट करने से लेकर इसके परिणामस्वरूप बना होगा?
   (1) विभ्रत्य प्रतिलक्ष
   (2) एल्युमनी अनुक्रिया
   (3) नियोपाग्रहीकार कर देना
   (4) न्याशरारता विकार

62. नाम - पद्धति कुछ विशेष सार्वजनिक मान्य नियमों द्वारा निर्धारित होती है। नैमिन्तिकता में से कौन सा एक कानन नाम - पद्धति के नियमों के निर्देश है?
   (1) नाम को जब हाथ से लिखते हैं तो उसे रखकर किया जाता है
   (2) वैज्ञानिक नाम को किसी भी भाषा में लिखा जा सकता है
   (3) वैज्ञानिक नाम में पहला शब्द नाम और दूसरा शब्द जारी सकते हैं निर्देश करता है
   (4) नामों को लीटिन भाषा में और लिखे अक्षरों में लिखा जाता है

63. ब्रांचोफाइट और टिंटोस्फाइट में नर गुणक के अभिप्रेरण के लिए किसकी आवश्यकता होती है?
   (1) जल
   (2) पत्ता
   (3) कोट
   (4) पत्ती
64. In context of Amniocentesis, which of the following statements is incorrect?
(1) It can be used for detection of Cleft palate.
(2) It is usually done when a woman is between 14-16 weeks pregnant.
(3) It is used for prenatal sex determination.
(4) It can be used for detection of Down syndrome.

65. In the stomach, gastric acid is secreted by the:
(1) acidic cells
(2) gastrin secreting cells
(3) parietal cells
(4) peptic cells

66. Spindle fibres attach on to:
(1) Kinetosome of the chromosome
(2) Telomere of the chromosome
(3) Centromere of the chromosome
(4) Kinetochores of the chromosome

67. Which is the National Aquatic Animal of India?
(1) Sea horse
(2) Ganges shark
(3) River dolphin
(4) Blue whale

68. Which one of the following cell organelles is enclosed by a single membrane?
(1) Nuclei
(2) Mitochondria
(3) Chloroplasts
(4) Lysosomes

69. The two polypeptides of human insulin are linked together by:
(1) Disulphide bridges
(2) Hydrogen bonds
(3) Phosphodiester bond
(4) Covalent bond
70. In which of the following, all three are macro nutrients?

(1) Nitrogen, nickel, phosphorus
(2) Boron, zinc, manganese
(3) Iron, copper, molybdenum
(4) Molybdenum, magnesium, manganese

71. Which of the following statements is wrong for viruses?

(1) Their RNA is of high molecular weight
(2) They lack a protein coat
(3) They are smaller than viruses
(4) They cause infections

72. Analogous structures are a result of:

(1) Stabilizing selection
(2) Divergent evolution
(3) Convergent evolution
(4) Shared ancestry

73. Select the incorrect statement:

(1) LH triggers secretion of androgens from the Leydig cells.
(2) FSH stimulates the Sertoli cells which help in spermiogenesis.
(3) LH triggers ovulation in ovary.
(4) LH and FSH decrease gradually during the follicular phase.

74. Which one of the following characteristics is not shared by birds and mammals?

(1) Warm blooded nature
(2) Ossified endoskeleton
(3) Breathing using lungs
(4) Viviparity

75. Which of the following statements is not correct?

(1) Some reptiles have also been reported as pollinators in some plant species.
(2) Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of the same species grows into the style.
(3) Insects that consume pollen or nectar without bringing about pollination are called pollen/nectar robbers.
(4) Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil.

76. निम्नलिखित में से कौन सा स्तन पशु का भाग है?

(1) नाथनी, निकट, परस्पर से पाएगा
(2) त्रितांत, चिंता, मैथिनेह
(3) ला़ह, ताम, मैथिनेह
(4) मैथिनेह, परस्पर से पाएगा

77. निम्नलिखित में से कौन सा कागज एंड्रोजन के विषय में गलत है?

(1) उसका अर्थ एन.ए, जन्म एंड्रोजन भर साला होता है
(2) उसके प्रभाव अवकाश का अभाव होता है
(3) ये विपर्ययों से अपेक्षाकृत छोटे होते हैं
(4) ये संक्रमण करते हैं

78. समुच्चित संरचनाएं किस कारण उत्पन्न होती है?

(1) उत्तराधिकारी बच्चा
(2) अनुसारी विकास के
(3) अभिव्यवहारी विकास के
(4) साहित्य पर्यन्त

79. गतक जन्तु को बुनाई?

(1) LH तीर्थें कोशिकाओं से एंड्रोजन के साथ को प्रेरित करता है।
(2) FSH सेतोकोशिकाओं को प्रेरित करता है जो शुकुलाणन में सहायता करता है।
(3) LH अंडात्मा में अंडात्मा को प्रेरित करता है।
(4) LH और FSH पुट्ट-अवस्था के दौरान पीथ-पीथ पट्टा जाता है।

80. निम्नलिखित लक्षणों में से कौन-सा एक लक्षण पशुओं और स्तनपायों में भी पाया जाता है?

(1) निवासी प्रकृति
(2) अनिवासी अंत-केंद्र
(3) दूरी द्वारा प्रवेश
(4) सहीहता

81. निम्नलिखित में से कौन सा कागज सही नहीं है?

(1) कुछ सरपूर, कुछ पाद पत्तियों में परागण करते हैं बहावे गये हैं
(2) बहुत सस्ती जातियों के पारम्परिक पुष्प के वर्णीय पर अस्तित्व हो सकते हैं परन्तु उन्हें जाति के पारम्परिक पुष्प के वर्णीय पर अस्तित्व है
(3) कोट जो बिना परागण दिखाई पाएँगे या मकरंद की ग्रहण करते हैं उनां पराग/मकरंद की जाति करते हैं
(4) परागण अंकुशता तथा पराग-निलंबक तथा स्निश्चरि की पारंपरिक खिला के पारम्परिक उपजन रासायनिक पद्धति द्वारा निर्मित होती है।
76. Seed formation without fertilization in flowering plants involves the process of:

1. Apomixis
2. Sporulation
3. Budding
4. Somatic hybridization

77. Which of the following approaches does not give the defined action of contraceptive?

- Vasectomy prevents spermatogenesis
- Barrier methods prevent fertilization
- Intra uterine devices increase phagocytosis of sperms, suppress sperm motility and fertilizing capacity of sperms
- Hormonal contraceptives prevent/retard entry of sperms, prevent ovulation and fertilization

78. The amino acid Tryptophan is the precursor for the synthesis of:

1. Cortisol and Cortisone
2. Melatonin and Serotonin
3. Thyroxine and Triiodothyronine
4. Estrogen and Progesterone

79. A river with an inflow of domestic sewage rich in organic waste may result in:

1. Death of fish due to lack of oxygen.
2. Drying of the river very soon due to algal bloom.
3. Increased population of aquatic food web organisms.
4. An increased production of fish due to biodegradable nutrients.

---

76. पौधों में प्रजनन के बीज बनने निम्नलिखित में से कौन सी प्रक्रिया है?

1. असेमिजन
2. बीजापुक्कन
3. सुमक्कल
4. कायमक संक्षय

77. निम्नलिखित उपायों में से कौन-सा उपाय किसी गर्भनिरोध को परिशोधित किया नहीं जाता?

1. स्कन्धाक्षक उपचरण
2. सुधारण प्रचारियों निवेशता जांच चेकेट हैं
3. अंत: जलस्वादी पुलिसीयों
4. होर्मोन गर्भनिरोध

78. अमीनो अम्ल ट्रिपोफाइन किसके संलेखन के लिए पूर्वागमी होता है?

1. कोर्टिसोल और कोर्टिसोन
2. मेलाटोनिन और सेलोटोनिन
3. थायरोजिनिन और ट्रायडोस्परमिन
4. इंट्रॉक्सिन और प्रोस्ट्रेरिन

79. एक नदी में जब कार्यकाल आपातक से भरपूर घरेलू उत्पाद मल बहकर गिरता है, तो उसका परिणाम क्या होगा?

1. अल्कोहोल की कमी के कारण मालिकाओं पर जाएंगे।
2. शैक्षणिक प्रकटन के कारण नदी जलदी गी सुरु जाएंगे।
3. जलीय भोजन को सर्वश्रेष्ठ में उपभोक्ता हो जाएगा।
4. वायरोडियमेटिक्स लोपण के कारण मालिकाओं उपयुक्त हो जाएगा।
80. Gause's principle of competitive exclusion states that:

(1) Larger organisms exclude smaller ones through competition.
(2) More abundant species will exclude the less abundant species through competition.
(3) Competition for the same resources excludes species having different food preferences.
(4) No two species can occupy the same niche indefinitely for the same limiting resources.

81. Asthma may be attributed to:

(1) accumulation of fluid in the lungs
(2) bacterial infection of the lungs
(3) allergic reaction of the mast cells in the lungs
(4) inflammation of the trachea

82. The standard petal of a papilionaceous corolla is also called:

(1) Corona
(2) Carina
(3) Pappus
(4) Vexillum

83. Which of the following is a restriction endonuclease?

(1) RNase
(2) Hind II
(3) Protease
(4) DNase I

84. It is much easier for a small animal to run uphill than for a large animal, because:

(1) The efficiency of muscles in large animals is less than in the small animals.
(2) It is easier to carry a small body weight.
(3) Smaller animals have a higher metabolic rate.
(4) Smaller animals have a lower O₂ requirement.
85. Following are the two statements regarding the origin of life:
(a) The earliest organisms that appeared on the earth were non-green and presumably anaerobes.
(b) The first autotrophic organisms were the chemoautotrophs that never released oxygen.

Of the above statements which one of the following options is correct?
(1) Both (a) and (b) are false.
(2) (a) is correct but (b) is false.
(3) (b) is correct but (a) is false.
(4) Both (a) and (b) are correct.

86. A cell at telophase stage is observed by a student in a plant brought from the field. He tells his teacher that this cell is not like other cells at telophase stage. There is no formation of cell plate and thus the cell is containing more number of chromosomes as compared to other dividing cells. This would result in:
(1) Polyteny
(2) Aneuploidy
(3) Polyploidy
(4) Somaclonal variation

87. Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers:
(1) Methane
(2) Nitrous oxide
(3) Ozone
(4) Ammonia

88. Joint Forest Management Concept was introduced in India during:
(1) 1990s
(2) 1960s
(3) 1970s
(4) 1980s

89. Which one of the following is the starter codon?
(1) UAG
(2) AUG
(3) UGA
(4) UAA

90. The term ecosystem was coined by:
(1) E. Warming
(2) E.P. Odum
(3) A.G. Tansley
(4) E. Haeckel
91. What is the minimum velocity with which a body of mass \( m \) must enter a vertical loop of radius \( R \) so that it can complete the loop?

\[
\begin{align*}
(1) & \, \sqrt{2gR} \\
(2) & \, \sqrt{gR} \\
(3) & \, \sqrt{g} \\
(4) & \, \sqrt{3gR}
\end{align*}
\]

92. If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is:

\[
\begin{align*}
(1) & \, 180^\circ \\
(2) & \, 0^\circ \\
(3) & \, 90^\circ \\
(4) & \, 45^\circ
\end{align*}
\]

93. At what height from the surface of the earth the gravitation potential and the value of \( g \) are \(-5.4 \times 10^7 \text{ J kg}^{-2}\) and \(6.0 \text{ m s}^{-2}\) respectively? Take the radius of earth as 6400 km:

\[
\begin{align*}
(1) & \, 2000 \text{ km} \\
(2) & \, 2600 \text{ km} \\
(3) & \, 1600 \text{ km} \\
(4) & \, 1400 \text{ km}
\end{align*}
\]

A long solenoid has 1000 turns. When a current of 4A flows through it, the magnetic flux linked with each turn of the solenoid is \(4 \times 10^{-3} \text{ Wb} \). The self-inductance of the solenoid is:

\[
\begin{align*}
(1) & \, 1 \text{ H} \\
(2) & \, 4 \text{ H} \\
(3) & \, 3 \text{ H} \\
(4) & \, 2 \text{ H}
\end{align*}
\]

An inductor 20 mH, a capacitor 50 \( \mu \text{F} \) and a resistor 40 \( \Omega \) are connected in series across a source of emf \( V = 10 \sin 340 \text{ t} \). The power loss in A.C. circuit is:

\[
\begin{align*}
(1) & \, 0.89 \text{ W} \\
(2) & \, 0.51 \text{ W} \\
(3) & \, 0.67 \text{ W} \\
(4) & \, 0.76 \text{ W}
\end{align*}
\]
96. Two identical charged spheres suspended from a common point by two massless strings of lengths \( l \), are mutually at a distance \( d < l \) apart because of their mutual repulsion. The charges begin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity \( v \). Then \( v \) varies as a function of the distance \( x \) between the spheres, as:

1. \( v \propto x^{-1} \)
2. \( v \propto x \)
3. \( v \propto x^2 \)
4. \( v \propto x^{-2} \)

\[ \frac{v}{x} = k \]

97. A capacitor of 2 \( \mu F \) is charged as shown in the diagram. When the switch \( S \) is turned to position 2, the percentage of its stored energy dissipated is:

1. 80%
2. 0%
3. 20%
4. 75%

98. A particle moves so that its position vector is given by \( \mathbf{r} = \cos \omega t \mathbf{i} + \sin \omega t \mathbf{j} \). Where \( \omega \) is a constant.

Which of the following is true?

1. Velocity is perpendicular to \( \mathbf{r} \) and acceleration is directed away from the origin.
2. Velocity and acceleration both are perpendicular to \( \mathbf{r} \).
3. Velocity and acceleration both are parallel to \( \mathbf{r} \).
4. Velocity is perpendicular to \( \mathbf{r} \) and acceleration is directed towards the origin.
99. From a disc of radius $R$ and mass $M$, a circular hole of diameter $R$, whose rim passes through the centre is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis, passing through the centre?

- (1) $9MR^2/32$
- (2) $15MR^2/32$
- (3) $11MR^2/32$
- (4) $13MR^2/32$

100. The ratio of escape velocity at earth ($v_e$) to the escape velocity at a planet ($v_p$) whose radius and mean density are twice as that of earth is:

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

101. A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50 cm and 10 cm from the positive end of the wire in the two cases. The ratio of emf's is:

- (1) 3:2
- (2) 5:1
- (3) 5:4
- (4) 3:4

102. A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at a speed of 15 m/s. Then, the frequency of sound that the observer hears in the echo reflected from the cliff is:

(Take velocity of sound in air = 330 m/s)

- (1) 885 Hz
- (2) 765 Hz
- (3) 800 Hz
- (4) 838 Hz
103. To get output 1 for the following circuit, the correct choice for the input is:

\[
\begin{array}{c}
A = 1, B = 0, C = 1 \\
(2) A = 0, B = 1, C = 0 \\
(3) A = 1, B = 0, C = 0 \\
(4) A = 1, B = 1, C = 0 \\
\end{array}
\]

104. In a diffraction pattern due to a single slit of width ‘a’, the first minimum is observed at an angle 30° when light of wavelength 5000 Å is incident on the slit. The first secondary maximum is observed at an angle of:

\[\sin^{-1}\left(\frac{3}{4}\right)\]

\[\sin^{-1}\left(\frac{1}{2}\right)\]

\[\sin^{-1}\left(\frac{1}{2}\right)\]

\[\sin^{-1}\left(\frac{1}{3}\right)\]

105. When a metallic surface is illuminated with radiation of wavelength \(\lambda\), the stopping potential is \(V\). If the same surface is illuminated with radiation of wavelength \(2\lambda\), the stopping potential is \(\frac{V}{4}\). The threshold wavelength for the metallic surface is:

\(\frac{3\lambda}{4}\)

\(\frac{4\lambda}{5}\)

\(\frac{5\lambda}{2}\)

106. When an \(\alpha\)-particle of mass ‘m’ moving with velocity \(v\) bombards on a heavy nucleus of charge \(Ze\), its distance of closest approach from the nucleus depends on ‘m’ as:

\(\frac{1}{\sqrt{m}}\)

\(\frac{1}{m^2}\)
107. Match the corresponding entries of column 1 with column 2. [Where \( m \) is the magnification produced by the mirror]

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) ( m = -2 )</td>
<td>(a) Convex mirror</td>
</tr>
<tr>
<td>(B) ( m = -\frac{1}{2} )</td>
<td>(b) Concave mirror</td>
</tr>
<tr>
<td>(C) ( m = +2 )</td>
<td>(c) Real image</td>
</tr>
<tr>
<td>(D) ( m = +\frac{1}{2} )</td>
<td>(d) Virtual image</td>
</tr>
</tbody>
</table>

(1) \( A \rightarrow c \) and \( a \); \( B \rightarrow b \) and \( c \); \( C \rightarrow a \) and \( d \);
(2) \( A \rightarrow a \) and \( b \); \( B \rightarrow b \) and \( c \); \( C \rightarrow c \) and \( d \);
(3) \( A \rightarrow a \) and \( c \); \( B \rightarrow b \) and \( d \); \( C \rightarrow b \) and \( c \);
(4) \( A \rightarrow a \) and \( b \); \( B \rightarrow b \) and \( c \); \( C \rightarrow b \) and \( a \);

108. A particle of mass 10 g moves along a circle of radius 6.4 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to \( 8 \times 10^{-4} \) J by the end of the second revolution after the beginning of the motion?

- (1) \( 0.2 \) m/s²
- (2) \( 0.1 \) m/s²
- (3) \( 0.15 \) m/s²
- (4) \( 0.18 \) m/s²

109. A small signal voltage \( V(t) = V_0 \sin \omega t \) is applied across an ideal capacitor \( C \):

- (1) Current \( I(t) \) leads voltage \( V(t) \) by 180°.
- (2) Current \( I(t) \) lags voltage \( V(t) \) by 90°.
- (3) Over a full cycle the capacitor \( C \) does not consume any energy from the voltage source.
- (4) Current \( I(t) \) is in phase with voltage \( V(t) \).

110. A disk and a sphere of same radius but different masses roll off on two inclined planes of the same altitude and length. Which one of the two objects gets to the bottom of the plane first?

- (1) Depends on their masses
- (2) Disk
- (3) Sphere
- (4) Both reach at the same time
111. Coefficient of linear expansion of brass and steel rods are \( \alpha_1 \) and \( \alpha_2 \). Lengths of brass and steel rods are \( L_1 \) and \( L_1 \) respectively. If \( (L_2 - L_1) \) is maintained same at all temperatures, which one of the following relations holds good?

1. \( \alpha_1 L_1 = \alpha_2 L_2 \)
2. \( \alpha_1 L_1 = \alpha_2 L_1 \)
3. \( \alpha_1 L_2 = \alpha_2 L_2 \)
4. \( \alpha_1 L_2 = \alpha_2 L_1 \)

112. A astronomical telescope has objective and eyepiece of focal lengths 40 cm and 4 cm respectively. To view an object 200 cm away from the objective, the lenses must be separated by a distance:

1. 54.0 cm
2. 37.3 cm
3. 46.0 cm
4. 50.0 cm

113. A uniform circular disc of radius 50 cm at rest is free to turn about an axis which is perpendicular to its plane and passes through its centre. It is subjected to a torque which produces a constant angular acceleration of 2.0 rad s\(^{-2}\). Its net acceleration in ms\(^{-2}\) at the end of 2.0 s is approximately:

1. 3.0
2. 8.0
3. 7.0
4. 6.0

114. A refrigerator works between 4°C and 30°C. It is required to remove 600 calories of heat every second in order to keep the temperature of the refrigerated space constant. The power required is:

(Take 1 cal = 4.2 Joules)

1. 2365 W
2. 2.365 W
3. 23.65 W
4. 236.5 W
115. A gas is compressed isothermally to half its initial volume. The same gas is compressed separately through an adiabatic process until its volume is again reduced to half. Then:

1. Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas.
2. Compressing the gas isothermally will require more work to be done.
3. Compressing the gas through adiabatic process will require more work to be done.
4. Compressing the gas isothermally or adiabatically will require the same amount of work.

116. The intensity at the maximum in a Young's double slit experiment is $I_0$. Distance between two slits is $d = 5\lambda$, where $\lambda$ is the wavelength of light used in the experiment. What will be the intensity in front of one of the slits on the screen placed at a distance $D = 10\, d$?

117. Two non-mixing liquids of densities $\rho_1$ and $\rho_2 (n > 1)$ are put in a container. The height of each liquid is $h$. A solid cylinder of length $L$ and density $d$ is put in this container. The cylinder floats with its axis vertical and length $hl$. $p < 1$ in the denser liquid. The density $d$ is equal to:

1. $[1 + (n-1)p] \rho_1$
2. $[1 + (n+1)p] \rho_2$
3. $[2 + (n+1)p] \rho_2$
4. $[2 + (n-1)p] \rho_2$

118. Consider the junction diode as ideal. The value of current flowing through AB is:

\[ V = V_a - V_B \]

1. $10^{-3} \, A$
2. $0 \, A$
3. $10^{-2} \, A$
4. $10^{-1} \, A$
119. A car is negotiating a curved road of radius \( R \). The road is banked at an angle \( \theta \). The coefficient of friction between the tyres of the car and the road is \( \mu_s \). The maximum safe velocity on this road is:

\[
\begin{align*}
(1) & \quad \frac{g \mu_s + \tan \theta}{\sqrt{R^2 - \mu_s \tan \theta}} \\
(2) & \quad \frac{gR^2 \mu_s + \tan \theta}{1 - \mu_s \tan \theta} \\
(3) & \quad \frac{gR^2 \mu_s + \tan \theta}{1 - \mu_s \tan \theta} \\
(4) & \quad \frac{g \mu_s + \tan \theta}{1 - \mu_s \tan \theta}
\end{align*}
\]

120. A long straight wire of radius \( a \) carries a steady current \( I \). The current is uniformly distributed over its cross-section. The ratio of the magnetic fields at radial distances \( \frac{a}{2} \) and \( 2a \) respectively, from the axis of the wire is:

\[
(1) \quad \frac{1}{4} \\
(2) \quad \frac{1}{8} \\
(3) \quad \frac{1}{2} \\
(4) \quad 1
\]

121. Given the value of Rydberg constant is \( 10^7 \text{ m}^{-1} \), the wave number of the last line of the Balmer series in hydrogen spectrum will be:

\[
(1) \quad 2.5 \times 10^7 \text{ m}^{-1} \\
(2) \quad 0.025 \times 10^7 \text{ m}^{-1} \\
(3) \quad 2.5 \times 10^7 \text{ m}^{-1} \\
(4) \quad 0.25 \times 10^7 \text{ m}^{-1}
\]

122. If the velocity of a particle is \( v = At + Br^2 \), where \( A \) and \( B \) are constants, then the distance travelled by it between \( 1s \) and \( 2s \) is:

\[
(1) \quad \frac{2}{3} + \frac{B}{3} \\
(2) \quad \frac{3}{2}A + 4B \\
(3) \quad 3A + 7B \\
(4) \quad \frac{3}{2}A + \frac{7}{3}B
\]

123. Given the value of Rydberg constant is \( 10^7 \text{ m}^{-1} \), the wave number of the last line of the Balmer series in hydrogen spectrum will be:

\[
(1) \quad 2.5 \times 10^7 \text{ m}^{-1} \\
(2) \quad 0.025 \times 10^7 \text{ m}^{-1} \\
(3) \quad 2.5 \times 10^7 \text{ m}^{-1} \\
(4) \quad 0.25 \times 10^7 \text{ m}^{-1}
\]

124. If the velocity of a particle is \( v = At + Br^2 \), where \( A \) and \( B \) are constants, then the distance travelled by it between \( 1s \) and \( 2s \) is:

\[
(1) \quad \frac{2}{3} + \frac{B}{3} \\
(2) \quad \frac{3}{2}A + 4B \\
(3) \quad 3A + 7B \\
(4) \quad \frac{3}{2}A + \frac{7}{3}B
\]
123. The angle of incidence for a ray of light at a refracting surface of a prism is $45^\circ$. The angle of prism is $60^\circ$. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are:

(1) $30^\circ, \frac{1}{\sqrt{2}}$
(2) $45^\circ, \frac{1}{\sqrt{2}}$
(3) $30^\circ, \sqrt{2}$
(4) $45^\circ, \sqrt{2}$

124. The molecules of a given mass of a gas have r.m.s. velocity of 200 ms$^{-1}$ at 27°C and $1.0 \times 10^5$ Nm$^{-2}$ pressure. When the temperature and pressure of the gas are respectively, 127°C and $0.05 \times 10^5$ Nm$^{-2}$, the r.m.s. velocity of its molecules in ms$^{-1}$ is:

(1) $\frac{100}{3}$
(2) $100\sqrt{2}$
(3) $400\sqrt{3}$
(4) $100\sqrt{2} \div 3$

125. An air column, closed at one end and open at the other, resonates with a tuning fork when the smallest length of the column is 50 cm. The next larger length of the column resonating with the same tuning fork is:

(1) 200 cm
(2) 66.7 cm
(3) 100 cm
(4) 150 cm

126. The magnetic susceptibility is negative for:

(1) paramagnetic and ferromagnetic materials
(2) diamagnetic material only
(3) paramagnetic material only
(4) ferromagnetic material only
127. An electron of mass $m$ and a photon have same energy $E$. The ratio of de-Broglie wavelengths associated with them is:

1. \( \frac{1}{c} \left( \frac{2m}{E} \right)^{\frac{1}{2}} \)
2. \( \frac{1}{c} \left( \frac{E}{2m} \right)^{\frac{1}{2}} \)
3. \( \frac{E}{2m} \)
4. \( \frac{1}{2} \left( 2mc^2 \right)^{\frac{1}{2}} \) (velocity of light)

128. A body of mass 1 kg begins to move under the action of a time-dependent force \( F = (2t + 3t^2) \text{N} \), where \( t \) and \( x \) are unit vectors along \( x \) and \( y \) axis. What power will be developed by the force at the time \( t = 2 \)?

1. \( 2t^2 + 3t^3 \text{W} \)
2. \( 2t^2 \text{W} \)
3. \( 2t^2 + 3t^3 \text{W} \)
4. \( 2t^2 \text{W} \)

129. The charge flowing through a resistance \( R \) varies with time \( t \).

The total heat produced in \( R \) is:

1. \( \frac{a^2R}{b} \)
2. \( \frac{a^2R}{6b} \)
3. \( \frac{a^2R}{3b} \)
4. \( \frac{a^2R}{2b} \)

130. A npn transistor is connected in common emitter configuration in a given amplifier. A load resistance of 800 Ω is connected in the collector circuit and the voltage drop across it is 0.8 V. If the current amplification factor is 0.96 and the input resistance of the circuit is 192 Ω, the voltage gain and the power gain of the amplifier will respectively be:

1. 4.369
2. 4.384
3. 3.69, 3.84
4. 4.4
131. A piece of ice falls from a height $h$ so that it melts completely. Only one-quarter of the heat produced is absorbed by the ice and all energy of ice gets converted into heat during its fall. The value of $h$ is:

$[\text{Latent heat of ice is } 3.4 \times 10^5 \text{ J/kg and } g = 10 \text{ N/kg}]$

1. $68 \text{ km}$
2. $34 \text{ km}$
3. $544 \text{ km}$
4. $136 \text{ km}$

132. A square loop ABCD carrying a current $i$, is placed near and coplanar with a long straight conductor XY carrying a current $I$, the net force on the loop will be:

1. $\frac{\mu_0 L^2 I}{2\pi}$
2. $\frac{2\mu_0 L I}{3\pi}$
3. $\frac{\mu_0 L I}{2\pi}$
4. $\frac{2\mu_0 L^3 I}{3\pi}$

133. A uniform rope of length $L$ and mass $m_1$ hangs vertically from a rigid support. A block of mass $m_2$ is attached to the free end of the rope. A transverse pulse of wavelength $\lambda_1$ is produced at the lower end of the rope. The wavelength of the pulse when it reaches the top of the rope is $\lambda_2$. The ratio $\lambda_2/\lambda_1$ is:

1. $\sqrt{\frac{m_1 + m_2}{m_1}}$
2. $\sqrt{\frac{m_1}{m_2}}$
3. $\sqrt{\frac{m_1 + m_2}{m_2}}$
4. $\sqrt{\frac{m_2}{m_1}}$

131. वर्फ का कोई टुकड़ा कैचाई $h$ से इस प्रकार गिरता है कि कही पूर्णतः पिघल जाता है। उसक होने वाली ऊर्जा का केवल एक-चौथाई भाग ही वर्फ़ द्वारा अपव्ययित किया जाता है तथा वर्फ़ की समस्त ऊर्जा इसके निर्देश समय ऊर्जा में सुनिश्चित हो जाती है। यदि वर्फ़ की गुणज ऊर्जा $3.4 \times 10^5$ J/kg तथा $g = 10 \text{ N/kg}$ है, तो औसत $h$ का मान है:

1. $68$ कि.मी.
2. $34$ कि.मी.
3. $544$ कि.मी.
4. $136$ कि.मी.

132. कोई चर्चाकार पास (लूप) ABCD जिससे गायब; प्रवाहित हो रहा है, इसकी लम्बी सीधे चालक XY जिससे धारा $I$ प्रवाहित हो रहा है के निकट एक हो तल में रखा है। इस पास पर लम्बे काला नेत्र बना होगा:

1. $\frac{\mu_0 L^2 I}{2\pi}$
2. $\frac{2\mu_0 L I}{3\pi}$
3. $\frac{\mu_0 L I}{2\pi}$
4. $\frac{2\mu_0 L^3 I}{3\pi}$

133. टॉपसे $m_1$ तथा टॉप से $L$ की कोई एक्समान रस्सी किसी टूने टूने से उत्पादित रखती है। इस रस्सी के गुणज से से टॉपसे $m_2$ का कोई पुरुषा बुझा है। रस्सी के गुणज सर्जर पर तरंगदैर्घ्य $\lambda_1$ का कोई अनुपात सपन्द उत्पन्न किया जाता है। यदि रस्सी के शीर्ष तक पहुंचने पर इस सपन्द की तरंगदैर्घ्य $\lambda_2$ हो जाती है। तब अनुपात $\lambda_2/\lambda_1$ का मान है:

1. $\sqrt{\frac{m_1 + m_2}{m_1}}$
2. $\sqrt{\frac{m_1}{m_2}}$
3. $\sqrt{\frac{m_1 + m_2}{m_2}}$
4. $\sqrt{\frac{m_2}{m_1}}$
134. A black body is at a temperature of 5760 K. The energy of radiation emitted by the body at wavelength 250 nm is $U_1$, at wavelength 500 nm is $U_2$ and that at 1000 nm is $U_3$. Wien’s constant, $b = 2.88 \times 10^6$ nmK. Which of the following is correct?

(1) $U_2 > U_1$
(2) $U_1 = 0$
(3) $U_2 = 0$
(4) $U_1 > U_2$

135. Out of the following options which one can be used to produce a propagating electromagnetic wave?

(1) An accelerating charge
(2) A charge moving at constant velocity
(3) A stationary charge
(4) A chargeless particle

136. Which one of the following characteristics is associated with adsorption?

(1) $\Delta G$ and $\Delta S$ are negative but $\Delta H$ is positive
(2) $\Delta G$ is negative but $\Delta H$ and $\Delta S$ are positive
(3) $\Delta G, \Delta H$ and $\Delta S$ all are negative
(4) $\Delta G$ and $\Delta H$ are negative but $\Delta S$ is positive

137. The pressure of $H_2$ required to make the potential of $H_2^-$ electrode zero in pure water at 298 K is:

(1) $10^{-4}$ atm
(2) $10^{-14}$ atm
(3) $10^{-12}$ atm
(4) $10^{-10}$ atm

138. The addition of a catalyst during a chemical reaction alters which of the following quantities?

(1) Activation energy
(2) Entropy
(3) Internal energy
(4) Enthalpy

139. The equation $y = mx + c$ represents a straight line that passes through the origin. Which of the following must be true?

(1) $m = 0$
(2) $c = 0$
(3) Both $m$ and $c$ are zero
(4) $m$ and $c$ are non-zero

140. Which of the following is not a characteristic of a crystal?

(1) Regularity
(2) Homogeneity
(3) isotropy
(4) randomness
139. For the following reactions:
(a) \( \text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{KOH} \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{K} + \text{H}_2\text{O} \)
(b) \( \text{H}_2\text{C} \text{C}_3 \text{H}_4 + \text{KOH} \rightarrow \text{H}_2\text{C} \text{C}_3 \text{H}_4 \text{OH} + \text{KBr} \)
(c) \( \text{Br} + \text{KOH} \rightarrow \text{Br}^{-} + \text{KBr} \)
Which of the following statements is correct?
(1) (a) is substitution, (b) and (c) are addition reactions.
(2) (a) and (b) are elimination reactions and (c) is addition reaction.
(3) (a) is elimination, (b) is substitution and (c) is addition reaction.
(4) (a) is elimination, (b) and (c) are substitution reactions.

140. The product formed by the reaction of an aldehyde with a primary amine is:
(1) Aromatic acid
(2) Schiff base
(3) Ketone
(4) Carboxylic acid

141. The correct statement regarding the basicity of arylamines is:
(1) Arylamines are generally more basic than alkylamines, because the nitrogen atom in arylamines is sp-hybridized.
(2) Arylamines are generally less basic than alkylamines because the nitrogen lone-pair electrons are delocalized by interaction with the aromatic ring electron system.
(3) Arylamines are generally more basic than alkylamines because the nitrogen lone-pair electrons are delocalized by interaction with the aromatic ring electron system.
(4) Arylamines are generally more basic than alkylamines because of aryl group.

142. Equal moles of hydrogen and oxygen gases are placed in a container with a pin-hole through which both can escape. What fraction of the oxygen escapes in the time required for one-half of the hydrogen to escape?
(1) \( \frac{1}{2} \)
(2) \( \frac{1}{8} \)
(3) \( \frac{1}{4} \)
(4) \( \frac{3}{8} \)
143. The correct statement regarding the comparison of staggered and eclipsed conformations of ethane is:

1. The staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strain.
2. The staggered conformation of ethane is less stable than eclipsed conformation, because staggered conformation has torsional strain.
3. The eclipsed conformation of ethane is more stable than staggered conformation, because eclipsed conformation has no torsional strain.
4. The eclipsed conformation of ethane is more stable than staggered conformation even though the eclipsed conformation has torsional strain.

144. In which of the following options the order of arrangement does not agree with the variation of properly indicated against it?

1. Li < Na < K < Rb (increasing metallic radius)
2. Al < Mg < Na < F< (increasing ionic size)
3. B < C < N < O (increasing first ionisation enthalpy)
4. I < Br < Cl < F (increasing electron gain enthalpy)

145. The rate of a first-order reaction is 0.04 mol l⁻¹ s⁻¹ at 10 seconds and 0.03 mol l⁻¹ s⁻¹ at 20 seconds after initiation of the reaction. The half-life period of the reaction is:

1. 54.1 s
2. 24.1 s
3. 34.1 s
4. 41.1 s

146. When copper is heated with conc. HNO₃ it produces:

1. Cu(NO₃)₂ and N₂O
2. Cu(NO₂)₂ and NO₂
3. Cu(NO₃)₂ and NO
4. Cu(NO₄)₂, NO and NO₂

147. In a protein molecule various amino acids are linked together by:

1. covalent bond
2. α - glycosidic bond
3. β - glycosidic bond
4. peptide bond

148. For is a colloidal solution of:

1. Gas in gas
2. Liquid in gas
3. Gas in liquid
4. Solid in gas

\[ \text{Cu} + \text{NO}_2 \rightarrow \text{Cu(NO}_3\text{)}_2 + 3\text{NO}_2 \]
149. Match items of Column I with the items of Column II and assign the correct code:

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Cyanide process</td>
<td>(i) Ultrapure Ge</td>
</tr>
<tr>
<td>(b) Froth flotation process</td>
<td>(ii) Dressing of ZnS</td>
</tr>
<tr>
<td>(c) Electrolytic reduction</td>
<td>(iii) Extraction of Al</td>
</tr>
<tr>
<td>(d) Zone refining</td>
<td>(iv) Extraction of Au</td>
</tr>
<tr>
<td>(e)</td>
<td>(v) Purification of Ni</td>
</tr>
</tbody>
</table>

**Code:**

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

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

150. Which one given below is a non-reducing sugar?

1. Sucrose
2. Maltose
3. Lactose
4. Glucose

151. The correct statement regarding RNA and DNA, respectively is:

1. The sugar component in RNA is 2'-deoxyribose and the sugar component in DNA is ribose.
2. The sugar component in RNA is ribose and the sugar component in DNA is 2'-deoxyribose.
3. The sugar component in RNA is arabinose and the sugar component in DNA is 2'-deoxyribose.
4. The sugar component in RNA is arabinose and the sugar component in DNA is ribose.

152. The correct thermodynamic conditions for the spontaneous reaction at all temperatures is:

1. \( \Delta H < 0 \) and \( \Delta S < 0 \)
2. \( \Delta H < 0 \) and \( \Delta S = 0 \)
3. \( \Delta H > 0 \) and \( \Delta S < 0 \)
4. \( \Delta H < 0 \) and \( \Delta S > 0 \)

\[ \Delta G = \Delta H - T \Delta S \]
153. Which is the correct statement for the given acids?
   (1) Phosphinic acid is a diprotic acid while phosphonic acid is a monoprotic acid.
   (2) Phosphinic acid is a monoprotic acid while phosphonic acid is a diprotic acid.
   (3) Both are diprotic acids.
   (4) Both are triprotic acids.

154. MY and NY₃ are two nearly insoluble salts, have the same Kₛₚ values of 6.2 x 10⁻¹³ at room temperature. Which statement would be true in regard to MY and NY₃?
   (1) The addition of the salt of KY to solution of MY and NY₃ will have no effect on their solubilities.
   (2) The molar solubilities of MY and NY₃ in water are identical.
   (3) The molar solubility of MY in water is less than that of NY₃.
   (4) The salts MY and NY₃ are more soluble in 0.5 M KY than in pure water.

155. Which of the following is an analgesic?
   (1) Chloromycetin
   (2) Novalgin
   (3) Penicillin
   (4) Streptomycin

156. The pair of electron in the given carbon, CH₄C≡C⁻ is present in which of the following orbitals?
   (1) sp
   (2) 2p
   (3) sp³
   (4) sp²

157. Among the following, the correct order of acidity is:
   (1) HClO₄ < HClO₂ < HClO < HClO₃
   (2) HClO₃ < HClO₂ < HClO < HClO₄
   (3) HClO < HClO₂ < HClO₃ < HClO₄
   (4) HClO₄ < HClO < HClO₂ < HClO₃

158. Which one of the following statements is correct when SO₃ is passed through acidified K₂Cr₂O₇ solution?
   (1) Green Cr₂(SO₄)₃ is formed.
   (2) The solution turns blue.
   (3) The solution is decolourized.
   (4) SO₃ is reduced.

159. Which of the following is the correct statement for the given acids?
   (1) Phosphinic acid is a diprotic acid while phosphonic acid is a monoprotic acid.
   (2) Phosphinic acid is a monoprotic acid while phosphonic acid is a diprotic acid.
   (3) Both are diprotic acids.
   (4) Both are triprotic acids.

154. NY₃ and NY₃⁻, two nearly insoluble salts, have the Kₛₚ values of 6.2 x 10⁻¹³ at room temperature. Which statement would be true in regard to NY₃ and NY₃⁻?
   (1) The addition of the salt of K₃ to solution of MY and NY₃ will have no effect on their solubilities.
   (2) The molar solubilities of MY and NY₃ in water are identical.
   (3) The molar solubility of MY in water is less than that of NY₃.
   (4) The salts MY and NY₃ are more soluble in 0.5 M K₃Y than in pure water.

155. Which of the following is an analgesic?
   (1) Chloromycetin
   (2) Novalgin
   (3) Penicillin
   (4) Streptomycin

156. The pair of electron in the given carbon, CH₄C≡C⁻ is present in which of the following orbitals?
   (1) sp
   (2) 2p
   (3) sp³
   (4) sp²

157. Among the following, the correct order of acidity is:
   (1) HClO₄ < HClO₂ < HClO < HClO₃
   (2) HClO₃ < HClO₂ < HClO < HClO₄
   (3) HClO < HClO₂ < HClO₃ < HClO₄
   (4) HClO₄ < HClO < HClO₂ < HClO₃

158. Which one of the following statements is correct when SO₃ is passed through acidified K₂Cr₂O₇ solution?
   (1) Green Cr₂(SO₄)₃ is formed.
   (2) The solution turns blue.
   (3) The solution is decolourized.
   (4) SO₃ is reduced.
159. Predict the correct order among the following:

(1) lone pair - bond pair > bond pair - bond pair
(2) lone pair - lone pair > bond pair - bond pair
(3) lone pair - lone pair > bond pair - bond pair
(4) bond pair - bond pair > lone pair - lone pair

160. Two electrons occupying the same orbital are distinguished by:

(1) Spin quantum number
(2) Principal quantum number
(3) Magnetic quantum number
(4) Azimuthal quantum number

161. The product obtained as a result of a reaction of nitrogen with $\text{CaC}_2$ is $\text{Ca}_2\text{N}_2$.

162. Natural rubber has:

(1) Random cis - and trans-configuration
(2) All cis-configuration
(3) All trans-configuration
(4) Alternate cis - and trans-configuration

163. Which one of the following orders is correct for the bond dissociation enthalpy of halogen molecules?

(1) $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$
(2) $\text{I}_2 > \text{Br}_2 > \text{Cl}_2 > \text{F}_2$
(3) $\text{Cl}_2 > \text{Br}_2 > \text{F}_2 > \text{I}_2$
(4) $\text{Br}_2 > \text{I}_2 > \text{F}_2 > \text{Cl}_2$

164. The reaction:

\[
\begin{align*}
\text{OH} + \text{NaH} & \rightarrow \text{O}^{\ominus} + \text{Na}^{+} + \text{Me}_{-1}
\end{align*}
\]

can be classified as:

(1) Williamson alcohol synthesis reaction
(2) Williamson ether synthesis reaction
(3) Alcohol formation reaction
(4) Dehydration reaction
165. Lithium has a bcc structure. Its density is 530 kg m\(^{-3}\) and its atomic mass is 6.94 g mol\(^{-1}\).

Calculate the edge length of a unit cell of Lithium metal. \(N_A = 6.02 \times 10^{23} \text{ mol}^{-1}\)

(1) 264 pm  
(2) 154 pm  
(3) 32 pm  
(4) 527 pm

166. The ionic radii of A\(^+\) and B\(^-\) ions are 0.98 \(\times 10^{-10}\) m and 1.81 \(\times 10^{-10}\) m. The coordination number of each ion in AB is:

(1) 2  
(2) 4  
(3) 6  
(4) 8

167. At 100°C the vapour pressure of a solution of 6.5 g of a solute in 100 g water is 732 mm. If \(K_b = 0.52\), the boiling point of this solution will be:

(1) 103°C  
(2) 101°C  
(3) 100°C  
(4) 102°C

168. The electronic configurations of Eu (Atomic No. 63), Gd (Atomic No. 64) and Tb (Atomic No. 65) are:

(1) [Xe]4f\(^{7}\)6s\(^2\), [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\) and [Xe]4f\(^{7}\)6s\(^2\)
(2) [Xe]4f\(^{7}\)6s\(^2\), [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\) and [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\)
(3) [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\), [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\) and [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\)
(4) [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\), [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\) and [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\)

169. Which of the following statements about hydrogen is incorrect?

1. Hydrogen does not act as a reducing agent.  
2. Hydrogen has three isotopes of which tritium is the most common.  
3. Hydrogen never acts as cation in ionic salts.  
4. Hydronium ion, H\(_3\)O\(^+\) exists freely in solution.

---

165. लिथियम की bcc संरचना है। इसका प्रमाण 530 Kg m\(^{-3}\) तथा परमाणु व्युत्पन्न 6.94 g mol\(^{-1}\) है। लिथियम भाजन के एक वोडिक के कार की तमामी है। \(N_A = 6.02 \times 10^{23} \text{ mol}^{-1}\)

(1) 264 pm  
(2) 154 pm  
(3) 352 pm  
(4) 527 pm

166. A\(^+\) एवं B\(^-\) आणयों की आयनिक विभाजन क्रमशः 0.98 \(\times 10^{-10}\) m एवं 1.81 \(\times 10^{-10}\) m है। AB में प्रतियेक आणि की उपसंहारण संख्या है:

(1) 2  
(2) 4  
(3) 6  
(4) 8

167. 6.5 g विलियों का 100 g जल में विलियों का 100°C पर वाष्प दबाव 732 mm है। यदि \(K_b = 0.52\), तो इस विलियों का वाष्प दबाव होगा:

(1) 103°C  
(2) 101°C  
(3) 100°C  
(4) 102°C

168. Eu (प.स. 63), Gd (प.स. 64) और Tb (प.स. 65) के इलेक्ट्रॉनिक विनाश हैं:

(1) [Xe]4f\(^{7}\)6s\(^2\), [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\) और [Xe]4f\(^{7}\)6s\(^2\)
(2) [Xe]4f\(^{7}\)6s\(^2\), [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\) और [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\)
(3) [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\), [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\) और [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\)
(4) [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\), [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\) और [Xe]4f\(^{7}\)5d\(^{1}\)6s\(^2\)

169. निम्नलिखित में से कौन सा कारण हाइड्रोजन के लिए असाध्य है?

1. हाइड्रोजन अणुपक के रूप में कार्य नहीं करता है।  
2. हाइड्रोजन के तीन समरूपताओं हैं जिसमें से त्रिउट्यम प्रतिरूप में है।  
3. हाइड्रोजन आयनिक लक्षणों में भाग नहीं करता है।  
4. हाइड्रोजन आणि, H\(_3\)O\(^+\) का असिल विलियों में मुक्त रूप में होता है।
170. In the reaction
H–C=CH
\(1) \text{NaNH}_2/\text{aq NH}_3 \text{(1) NaNH}_2/\text{aq NH}_3\)
\(2) \text{CH}_3\text{CH}_2\text{Br} \text{(1) NaNH}_2/\text{aq NH}_3 \text{(1) NaNH}_2/\text{aq NH}_3\)
\(3) \text{CH}_3\text{CH}_2\text{Br} \text{(1) NaNH}_2/\text{aq NH}_3 \text{(1) NaNH}_2/\text{aq NH}_3\)
\(X\) and \(Y\) are:
(1) \(X=1\)-Butyne, \(Y=2\)-Hexyne
(2) \(X=1\)-Butyne, \(Y=3\)-Hexyne
(3) \(X=2\)-Butyne, \(Y=3\)-Hexyne
(4) \(X=2\)-Butyne, \(Y=2\)-Hexyne

171. Consider the following liquid-vapour equilibrium.

Which of the following relations is correct?

(1) \(\frac{d\ln P}{dT} = \frac{\Delta H_v}{RT^2}\)
(2) \(\frac{d\ln P}{dT^2} = \frac{\Delta H_v}{RT^2}\)
(3) \(\frac{d\ln P}{dT} = \frac{-\Delta H_v}{RT}\)
(4) \(\frac{d\ln P}{dT^2} = \frac{-\Delta H_v}{RT^2}\)

172. Which of the following statements about the composition of the vapour over an ideal 1:1 molar mixture of benzene and toluene is correct? Assume that the temperature is constant at 25°C. (Given: Vapour Pressure Data at 25°C, benzene = 12.8 kPa, toluene = 3.85 kPa)

(1) Not enough information is given to make a prediction.
(2) The vapour will contain a higher percentage of benzene.
(3) The vapour will contain a higher percentage of toluene.
(4) The vapour will contain equal amounts of benzene and toluene.

173. Which of the following biphenyls is optically active?

174. The reaction
H–C=CH
\(1) \text{NaNH}_2/\text{aq NH}_3 \text{(1) NaNH}_2/\text{aq NH}_3\)
\(2) \text{CH}_3\text{CH}_2\text{Br} \text{(1) NaNH}_2/\text{aq NH}_3 \text{(1) NaNH}_2/\text{aq NH}_3\)
\(X\) and \(Y\) are:
(1) \(X=1\)-Butyne, \(Y=2\)-Hexyne
(2) \(X=1\)-Butyne, \(Y=3\)-Hexyne
(3) \(X=2\)-Butyne, \(Y=3\)-Hexyne
(4) \(X=2\)-Butyne, \(Y=2\)-Hexyne

175. Consider the following liquid-vapour equilibrium.

Which of the following relations is correct?

(1) \(\frac{d\ln P}{dT} = \frac{\Delta H_v}{RT^2}\)
(2) \(\frac{d\ln P}{dT^2} = \frac{\Delta H_v}{RT^2}\)
(3) \(\frac{d\ln P}{dT} = \frac{-\Delta H_v}{RT}\)
(4) \(\frac{d\ln P}{dT^2} = \frac{-\Delta H_v}{RT^2}\)

176. The reaction
H–C=CH
\(1) \text{NaNH}_2/\text{aq NH}_3 \text{(1) NaNH}_2/\text{aq NH}_3\)
\(2) \text{CH}_3\text{CH}_2\text{Br} \text{(1) NaNH}_2/\text{aq NH}_3 \text{(1) NaNH}_2/\text{aq NH}_3\)
\(X\) and \(Y\) are:
(1) \(X=1\)-Butyne, \(Y=2\)-Hexyne
(2) \(X=1\)-Butyne, \(Y=3\)-Hexyne
(3) \(X=2\)-Butyne, \(Y=3\)-Hexyne
(4) \(X=2\)-Butyne, \(Y=2\)-Hexyne

177. Consider the following liquid-vapour equilibrium.

Which of the following relations is correct?

(1) \(\frac{d\ln P}{dT} = \frac{\Delta H_v}{RT^2}\)
(2) \(\frac{d\ln P}{dT^2} = \frac{\Delta H_v}{RT^2}\)
(3) \(\frac{d\ln P}{dT} = \frac{-\Delta H_v}{RT}\)
(4) \(\frac{d\ln P}{dT^2} = \frac{-\Delta H_v}{RT^2}\)

178. The reaction
H–C=CH
\(1) \text{NaNH}_2/\text{aq NH}_3 \text{(1) NaNH}_2/\text{aq NH}_3\)
\(2) \text{CH}_3\text{CH}_2\text{Br} \text{(1) NaNH}_2/\text{aq NH}_3 \text{(1) NaNH}_2/\text{aq NH}_3\)
\(X\) and \(Y\) are:
(1) \(X=1\)-Butyne, \(Y=2\)-Hexyne
(2) \(X=1\)-Butyne, \(Y=3\)-Hexyne
(3) \(X=2\)-Butyne, \(Y=3\)-Hexyne
(4) \(X=2\)-Butyne, \(Y=2\)-Hexyne

179. Consider the following liquid-vapour equilibrium.

Which of the following relations is correct?

(1) \(\frac{d\ln P}{dT} = \frac{\Delta H_v}{RT^2}\)
(2) \(\frac{d\ln P}{dT^2} = \frac{\Delta H_v}{RT^2}\)
(3) \(\frac{d\ln P}{dT} = \frac{-\Delta H_v}{RT}\)
(4) \(\frac{d\ln P}{dT^2} = \frac{-\Delta H_v}{RT^2}\)
174. Which of the following reagents would distinguish cis-cyclopentadiene from the trans-isomer?

1. Aluminium isopropoxide
2. Acetone
3. Ozone
4. MnO₂

175. The correct statement regarding a carbonyl compound with a hydrogen atom on its alpha-carbon is:

1. A carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol.
2. A carbonyl compound with a hydrogen atom on its alpha-carbon never equilibrates with its corresponding enol.
3. A carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as keto-enol tautomerism.
4. A carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as carboxylation.

176. Consider the molecules CH₃NH₂ and H₂O. Which of the given statements is false?

1. The H – C – H bond angle in CH₃ is larger than the H – N – H bond angle in NH₃.
2. The H – C – H bond angle in CH₄, the H – N – H bond angle in NH₃, and the H – O – H bond angle in H₂O are all greater than 90°.
3. The H – O – H bond angle in H₂O is larger than the H – C – H bond angle in CH₄.
4. The H – O – H bond angle in H₂O is smaller than the H – N – H bond angle in NH₃.
177. Match the compounds given in column I with the hybridisation and shape given in column II and mark the correct option.

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

Code:

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

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

178. Consider the nitration of benzene using mixed conc. H₂SO₄ and HNO₃. If a large amount of KH₂SO₄ is added to the mixture, the rate of nitration will be:

(1) doubled
(2) faster
(3) slower
(4) unchanged

179. Which of the following statements is false?

(1) Mg²⁺ ions are important in the green parts of plants.
(2) Mg²⁺ ions form a complex with ATP.
(3) Ca²⁺ ions are important in blood clotting.
(4) Ca²⁺ ions are not important in maintaining the regular beating of the heart.

180. Which of the following has longest C–O bond length? (Free C–O bond length in CO is 1.128 Å)

(1) [Mn(CO)₆]⁺
(2) Ni(CO)₄
(3) [Co(CO)₄]²⁺
(4) [Fe(CO)₄]²⁻

177. स्तंभ I में दिए गए यौगिकों को उनके संकेतन एवं आकार जो कि स्तंभ II में दिए गए हैं को विलयान तथा राशि विकल्पों को चिह्नित करिए।

<table>
<thead>
<tr>
<th>स्तंभ I</th>
<th>स्तंभ II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) XeF₆</td>
<td>(i) विकृत आटफलक्षीप</td>
</tr>
<tr>
<td>(b) XeO₃</td>
<td>(ii) वर्ग समतली</td>
</tr>
<tr>
<td>(c) XeOF₄</td>
<td>(iii) पिरामिडी</td>
</tr>
<tr>
<td>(d) XeF₄</td>
<td>(iv) वर्ग सिस्ताईड</td>
</tr>
</tbody>
</table>

कोड:

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

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

178. बेंजीन का नाइट्रोकरण साथे H₂SO₄ एवं HNO₃ की उपस्थिति में हो रहा है। यदि इस निष्कर्ष में ज्यादा मात्रा में KH₂SO₄ डालते हैं तो नाइट्रोकरण का बह शोषण होगा:

(1) घटा
(2) तेज
(3) धीर
(4) अपरिवर्तित

179. निम्नलिखित में से कौन सा कठिन अस्तर है?

(1) Mg²⁺ आयन पीपी के हरती भागों के लिए महत्वपूर्ण है।
(2) Mg²⁺ आयन एटीपी के साथ संयुक्त बनते हैं।
(3) Ca²⁺ आयन को प्लाज्मा के लिए महत्वपूर्ण है।
(4) Ca²⁺ आयन द्वारा गति को नियंत्रित रखने में महत्वपूर्ण नहीं है।

180. निम्नलिखित में से किसकी C–O आयांक संबंधी अधिकतम है? (मुख्य C–O आयांक संबंधी CO में 1.128 Å है।)

(1) [Mn(CO)₆]⁺
(2) Ni(CO)₄
(3) [Co(CO)₄]²⁺
(4) [Fe(CO)₄]²⁻
Read carefully the following instructions:

1. Each candidate must show on demand his/her Admit Card to the Invigilator.
2. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
3. 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.
4. Use of Electronic/Manual Calculator is prohibited.
5. 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.
6. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
7. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

निम्नलिखित निर्देश ध्यान से पढ़ें:

1. पूछे जाने पर प्रत्येक परीक्षार्थी, निरीक्षक को अपना प्रवेश-कार्य दिखाएं।
2. अभिषेक या निरीक्षक की विशेष अनुमति के बिना कोई परीक्षार्थी अपना स्थान न छोड़ें।
3. कार्यस्थल निरीक्षक को अपना उत्तर पत्र दिए बिना एवं उपस्थिति-पत्र पर दुबारा हस्ताक्षर किए बिना कोई परीक्षार्थी परीक्षा होती नहीं छोड़ें। यदि किसी परीक्षार्थी ने दुसरी बार उपस्थिति-पत्र पर हस्ताक्षर नहीं किए तो वह माना जाएगा कि उसके उत्तर पत्र नहीं लिखित है और यह अनुपत्त सामना का मामला माना जाएगा।
4. कैंस्कॉप्टर/उपस्थिति परीक्षक का उपयोग बाधित है।
5. परीक्षा-हॉल में आवरण के लिए परीक्षार्थी बोर्ड के नियमों एवं विभिन्न बोर्डों द्वारा नियमित हैं। अनुपर्याय संदेह के सभी मामलों का फैसला बोर्ड के नियमों एवं विभिन्न बोर्डों के अनुसार होगा।
6. किसी हाल में परीक्षा पुरस्कार और उत्तर पत्र का कोई भाग अलग न करें।
7. परीक्षा-पुरस्कार / उत्तर पत्र में दिए गए परीक्षा पुरस्कार संबंधी को परीक्षार्थी सही तरीके से उपस्थिति-पत्र में लिखें।