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) Chlorophylls
   (4) Carotenoids

3. Which of the following pairs of hormones are not nontic (having each other's action)?
   (1) Epinephrine - Insulin
   (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

---

1. परिक्षार्थ प्रसंस्करण में, जिसमें F₁ द्विशंसक मिश्रित शामिल थी, पुनर्यौगिक प्रकार की संततियों की तुलना में जनक-प्रकार की संततियों अधिक उपस्थित थी। इसमें संकेत मिलते हैं कि:
   (1) दोनों हो लक्षणों का निर्यात एक से अधिक जीनों द्वारा होता है।
   (2) दो जीन दो अलग गुणाकृतियों पर स्थित हैं।
   (3) अर्थ्यौगिक के दौरान गुणाकृति पुष्ट नहीं हो पाए।
   (4) दो जीन सहलन हैं और एक ही गुणाकृति पर विविधता है।

2. पादप कोशिका की रसथानी में जल पुलित वर्ग को से होते हैं?
   (1) एपिफेलिन
   (2) आंटीपोटेनिल
   (3) पर्यायित
   (4) कॉरोटिनाइड

3. होमोजीनों के निम्नलिखित गुणों में से कॉन्स मुग क्या-बुधरे का विरोध (विपरीत प्रभाव वाला) नहीं है?
   (1) डिलेक्सिन - डिलेक्सिन
   (2) पैरास्टोमॉन - कैस्टोस्ऱोमॉन
   (3) ईसिलिन - लूकाडिन
   (4) आर्इडोस्टेरोन - एड्रिनल नेप्ट्रोसिटिक कारक

4. माइटोकोणियूस और कॉलोस्पोस्टस (हरितलवक) हैं?
   (a) अर्थथैवाय अंक हैं।
   (b) पूर्वस्थित अंकों के विवाह से बनते हैं और उनमें DNA होता है, लेकिन प्रोटीन-संरचनीय प्रणाली का अभाव होता है।

निम्नलिखित विकल्पों में से कॉन्स-सा सही है?
   (1) (a) और (b) दोनों हो गलत है।
   (2) (a) और (b) सही है।
   (3) (b) सही है लेकिन (a) गलत है।
   (4) (a) सही है लेकिन (b) गलत है।

5. निम्नलिखित में से कॉन्स सा एक प्लसम्राद का अभिव्यक्ति नहीं है?
   (1) एकल - र्युकुशोप
   (2) स्वतंत्र विश्वकुशीय
   (3) वृक्षय संरचना
   (4) लोका गण योग्य
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?

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuboidal epithelium</td>
<td>Lining of stomach</td>
</tr>
<tr>
<td>Smooth muscle</td>
<td>Wall of intestine</td>
</tr>
<tr>
<td>Areolar tissue</td>
<td>Tendons</td>
</tr>
<tr>
<td>Transitional epithelium</td>
<td>Tip of nose</td>
</tr>
</tbody>
</table>

9. Which of the following statements is not true?

(1) Stored pollen in liquid nitrogen can be used in the crop breeding programs.
(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.

10. 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.
12. The *Avena* curvature is used for bioassay of:
   (1) Ethylen
   (2) ABA
   (3) GA₃
   (4) IAA

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

14. Blood pressure in the pulmonary artery:
   (1) less than that in the venae 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) Diploente
   (2) Pachytenne
   (3) Leptotene
   (4) Zygote

17. Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the kingdom:
   (1) Animalia
   (2) Monera
   (3) Protista
   (4) Fungi
18. Lack of relaxation between successive stimuli in sustained muscle contraction is known as:
   (1) Tone
   (2) Spasm
   (3) Fatigue
   (4) Tetanus

19. Identify the correct statement on inhibin
   (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) Rete gene disorder
   (3) X-linked recessive gene disorder
   (4) Chromosomal recessive 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) *Salix*, *Ginkgo* and *Pinus* are all 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) lactose
   (4) galactose
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 genotypes were in the ratio of:

(1) 1:1: Dwarf : Tall
(2) 1:2:1: Tall homozygous : Tall heterozygous : Dwarf
(3) 1:1: 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, the

28. One of the major components of cell wall of most

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

29. Cotyledon of maize grain is called:

(1) scutellum
(2) plumule
(3) coleorhiza
(4) coleoptile

24. एक लंबे तटरूप प्रजनन उधार माटर पादरी की एक बौने तटरूप प्रजनन उधार माटर पादरी से संयुक्त कराया गया। तब $F_1$ पादरी को स्वयंसृष्टि किया गया तो जीन प्रारूप का परिणाम किस अनुपात में था?

(1) 3:1: बौने:लंबे
(2) 1:2:1: लंबे समयुक्तजी:लंबे सवयमुक्तजी:बौने
(3) 1:2:1: लंबे सवयमुक्तजी:लंबे समयुक्तजी:बौने
(4) 3:1: लंबे:बौने

25. लम्बाक़ा के पीठ का कौन सा भाग *मिलोयडोगाइन* *इनकोजियट* द्वारा संयुक्त होता है?

(1) जड़
(2) पूँछ
(3) पतली
(4) तना

26. कास्कार कोशिकाओं में सामान्य दृष्टि के दौरान निम्नलिखित में से कौन-सा लक्षण नहीं पाया जाता?

(1) सूक्ष्मयुक्तजी
(2) बड़ा-बड़ा लंबा तंतु
(3) केस्ट्रिका का विलोपन
(4) गुणारूप गति

27. उपरिवर्तन के संबंध में कैसे कोशिकाओं के लिए निम्नलिखित कथनों में से कौन-सा सही नहीं है?

(1) उपरिवर्तन टीलोमेरेज के उत्पादन को संदर्भित कर देते हैं।
(2) प्राकृतिक तड़कों में उपरिवर्तन कोशिका-चक्र को लघुरूप कर देते हैं।
(3) उपरिवर्तन टीलोमेरेज संदर्भक को नष्ट कर देते हैं।
(4) उपरिवर्तन कोशिका-नियंत्रण को निष्कर्ष कर देते हैं।

28. अधिकतम क्षयों में कोशिका मतिया का एक प्रमुख अवयव कौन सा है?

(1) जेननसेल्मूलोज
(2) काहिटन
(3) पेप्टीडोग्लाइकलन
(4) सेल्मूलोज

29. मक्खी के दाने के बीजपत्र को कौन कहा जाता है?

(1) स्कुटेलम
(2) प्राकुर
(3) गुणावल-चोल
(4) प्राकुर-चोल
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) Testosterone and inhibin
   (2) Estrogen and progestrone
   (3) Estrogen and inhibin
   (4) Progestrone 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) L. epidermels
   (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) Par, endia

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.
37. Which of the following characteristic features always holds true for the corresponding group of animals?

| (1) 3-chambered heart with one incompletely divided ventricle | Reptilia X |
| Cartilaginous endoskeleton | Chondrichthyes |
| Viviparous | Mammalia |
| (4) Possess a mouth with an upper and a lower jaw | Chordata |

38. Match the terms in Column I with their description in Column II and choose the correct option:

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Dominance</td>
<td>(i) Many genes govern a single character</td>
</tr>
<tr>
<td>(b) Codominance</td>
<td>(ii) In a heterozygous organism only one allele expresses itself</td>
</tr>
<tr>
<td>(c) Pleiotropy</td>
<td>(iii) In a heterozygous organism both alleles express themselves fully</td>
</tr>
<tr>
<td>(d) Polygenic inheritance</td>
<td>A single gene influences many characters</td>
</tr>
</tbody>
</table>

Code:

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

39. A typical fat molecule is made up of:

(1) Three glycerol and three fatty acid molecules  
(2) Three glycerol molecules and one fatty acid molecule  
(3) One glycerol and three fatty acid molecules  
(4) One glycerol and one fatty acid molecule

40. Proximal end of the filament of stamen is attached to:

(1) Thalamus or petal  
(2) Anther  
(3) Connective  
(4) Placenta

41. Which one of the following statements is wrong?

(1) Glycine is a sulphur containing amino acid.  
(2) Sucrose is a disaccharide.  
(3) Cellulose is a polysaccharide.  
(4) Uracil is a pyrimidine.

37. निम्नलिखित में से कौन-सा वर्णन हमेशा ही जरूरी होता है?

| (1) तीन लक्ष्यात्मक रूप से विभाजित अणु का अतिक्रमण: घड़ी आकृति एक निश्चित होता है | रेप्टिलिया |
| (2) उपाध्यक्ष आदि: कांककल | कॉर्दिक्थीय |  
| (3) सामीयक्रमक | दातिलिया |  
| (4) अपने और निश्चित जबड़े वाला मुख का पाया जाए | कार्डिया |

38. कार्ल्स 1 को हकदार कौल्स 2 में दिए गए उनके वर्णन से मैथ के रिकार्ड तथा साही विकल्प चुनिए:

<table>
<thead>
<tr>
<th>कार्ल्स 1</th>
<th>कार्ल्स 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) प्रभावित</td>
<td>(i) अनेक जीन एकल लक्षण का नियंत्रण करते हैं।</td>
</tr>
<tr>
<td>(b) सहप्रभावित</td>
<td>(ii) विश्वस्थानीय जीव में केवल एक ही ऐल्लो वय अणु का अभिव्यक्ति करता है।</td>
</tr>
<tr>
<td>(c) बहुप्रभावित</td>
<td>(iii) विश्वस्थानीय जीव में दोनों ही ऐल्लो वयों को पूरी तरह अभिव्यक्ति करता है।</td>
</tr>
<tr>
<td>(d) बहुप्रभावित विकल्प</td>
<td>(iv) एकल जीन अनेक लक्षणों को प्रभावित करता है।</td>
</tr>
</tbody>
</table>

नोट: (iv) (i) (ii) (iii)

39. एक प्राधुनिक विश्व का अणु फिसक के बना होता है?

| (1) तीन ग्लिसरिन और तीन वसा अत्यधिक अणुओं की कीमत | पुष्पांग्न या दल |
| (2) तीन ग्लिसरिन अणुओं और एक वसा अणु की कीमत | पासलकथर |
| (3) एक ग्लिसरिन और तीन वसा अत्यधिक अणुओं की कीमत | सर्पस्तोकक |
| (4) एक ग्लिसरिन और एक वसा अणु की कीमत | बीजाण्डासन |

40. पुंक्सेर के तनु का निकटस्थ सिरा किस से जुड़ा होता है?

| (1) पुष्पांग्न या दल | पुष्पांग्न या दल |
| (2) पासलकथर | पासलकथर |
| (3) सर्पस्तोकक | सर्पस्तोकक |
| (4) बीजाण्डासन | बीजाण्डासन |

41. निम्नलिखित में से कौन-सा कथन सही है?

| (1) ग्लाइसिन एक सल्फरमोल्युक अमिनो अम मस्त | पुष्पांग्न या दल |
| (2) सुक्रोस एक दातिलिया राइड है | पासलकथर |
| (3) सेल्युलोस एक पासलकथर राइड है | सर्पस्तोकक |
| (4) उरासिल एक मिरियमिडिंग है | पुष्पांग्न या दल |
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) Both processes cannot happen simultaneously.
(2) Both processes can happen together because the diffusion coefficient of water and CO₂ is different.
(3) The above processes happen only during nighttime.
(4) One process occurs during day time, and the other at night.

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 cropland 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) Intermembrane 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

43. The opening of stomata is the first step in photosynthesis. Through the stoma, carbon dioxide diffuses into the plant. During photosynthesis, carbon dioxide is used for the formation of glucose, which is then used for the synthesis of other organic compounds.

44. The presence of weeds is a characteristic feature of a cropland ecosystem.

45. Habitat loss and fragmentation is the most important cause of animals and plants being driven to extinction.

46. A chloroplast contains the highest number of protons in the lumen of thylakoids.

47. Restriction enzymes are not required for any of the techniques of DNA fingerprinting.
48. The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the:

(1) Eubacteria
(2) Halophiles
(3) Thermoa cidophiles
(4) Methanogens

49. Which of the following features is not present in *Periplaneta americana*?

(1) Metamerically segmented body
(2) Schizocoelom as body cavity
(3) Indeterminate and radial cleavage during embryonic development
(4) Exoskeleton composed of N-acetylglucosamine

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 butylicum</em></td>
<td>Lipase</td>
<td>removal of oil stains</td>
</tr>
<tr>
<td><em>Trichoderma polysporum</em></td>
<td>Cyclosporin A</td>
<td>immunosuppressive drug</td>
</tr>
<tr>
<td><em>Monascus purpureus</em></td>
<td>Statins</td>
<td>lowering of blood cholesterol</td>
</tr>
<tr>
<td><em>Strepto coccus</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. वे आदिम प्राकृति-द्रवीकृत क्रियाएं, जो समस्त जीवों के गूंधर्म से वायुमानों-उपरात्मक के लिए उत्सर्जन होते हैं, किसके अंतर्गत आते हैं?

(1) सूक्ष्मवादुओं के
(2) लगवायतार्हियों के
(3) ताप-चमत्कार शास्त्रीय के
(4) मिठाईजनकों के

49. निम्नलिखित में से कौन-सा लक्षण *Periplaneta americana* में नहीं पाया जाता?

(1) फिक्सेशन: खिड़की देखा
(2) देखना: इकुणिका के रूप में दोंगुआ
(3) धृष्टी रखने के पत्र अनतिरीक्त और अर्थी विद्युत
(4) N-एसिटिल-डीक्सीमीन से विभेदित वाल्काकार

50. मुद्रा संरचना और उवांक में सूक्ष्म ताल के लिए फसलों का फलीदार चीजी (लेदू) या पानी चाराग के साथ बढ़कर लगाने का कारण जाता है?

(1) स्थानान्तरीकृति कृषि
(2) ले खेती
(3) समोचर खेती
(4) पुंडीडार खेती

51. नीचे दी गयी तालिका में गलत प्रश्नावली गाथों को चुनिए :

<table>
<thead>
<tr>
<th>सूक्ष्म रसायन</th>
<th>उपादान</th>
<th>अनुप्रयोग</th>
</tr>
</thead>
<tbody>
<tr>
<td>लिपाइज़र</td>
<td>लाइप्पैज़</td>
<td>तेल के धब्बों को हटाना</td>
</tr>
<tr>
<td>गैलेक्टॉर्म</td>
<td>साइक्लोस्पोरिन - A</td>
<td>प्रतिरक्षा संदर्भक, औषधियाँ</td>
</tr>
<tr>
<td>स्ट्रीप्टोकॉकस</td>
<td>स्ट्रीप्टोकॉकस</td>
<td>संतत्तकों को कम करना</td>
</tr>
</tbody>
</table>

52. स्तनपितामहों में, कौन-सा स्थिर-वाल्क श्रेणी समावेश है?

(1) यकृत निवासिक सिरा
(2) तक्क - शीरा
(3) पुंड महायमनी
(4) यकृत - शीरा
53. Pick out the correct statements.
(a) Haemophilia is a sex-linked recessive disease.
(b) Down’s syndrome is due to aneuploid.
(c) Phenylketonuria is an autosomal recessive disease.
(d) Sickle cell anaemia is an X-linked recessive disease.
(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 duodenum?
(1) Sphincter of Oddi
(2) Semilunar valve
(3) Ileocaecal valve
(4) Pyloric sphincter

55. Microtubules are the constituents of:
(1) Centrosome, Nucleosome and Centrioles
(2) Cilia, Flagella and Peroxisomes
(3) Spindle fibres, Centrioles and Cilia
(4) Centrioles, Spindle fibres and Chromatin

56. The coconut water from tender coconut represents:
(1) Free nuclear endosperm
(2) Endocarp
(3) Fleshy mesocarp
(4) Free nuclear proembryo

57. Tricarpellary, syncarpous gynoecium is found in flowers of:
(1) Poaceae
(2) Liliaceae
(3) Solanaceae
(4) Fabaceae

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

60. Stems modified into flat green organs performing the functions of leaves are known as
(1) Scales
(2) Cladodes
(3) Phyllodes
(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) Auto-immune 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
64. In context of **Amniocentesis**, which of the following statement is incorrect?

- It can be used for detection of Cleft palate.

- It is usually done when a woman is between 14-16 weeks pregnant.

- It is used for prenatal sex determination.

- It can be used for detection of Down syndrome.

65. In the stomach, gastric acid is secreted by the:

- Acidic cells

- Gastrin secreting cells

- Parietal cells

- Peptic cells

66. Spindle fibres attach on to:

- Kinetosome of the chromosome

- Telomere of the chromosome

- Kinetochores of the chromosomes

- Centromere of the chromosome

67. Which is the National Aquatic Animal of India?

- Sea horse

- Gangetic shark

- River dolphin

- Blue whale

68. Which one of the following cell organelles is enclosed by a single membrane?

- Nuclei

- Mitochondria

- Chloroplasts

- Lysosomes

69. The two polypeptides of human insulin are linked together by:

- Disulphide bridges

- Hydrogen bonds

- Phosphodiester bond

- Covalent bond

64. उच्चवेधन के संदर्भ में, निम्नलिखित में से कौन-सा कथन गलत है?

- इसे खंडनात्मक कार्पस पैलेट का पता लगाने के लिए प्रयुक्त किया जाता है।

- यह आपसीय से तत्कालिक रूप से जब सर्वाधिक 14-16 सप्ताह के बीच का गर्भ होता है।

- इसे प्राकृतिक फिस्टिल-निष्पादन के लिए प्रयुक्त किया जाता है।

- इसे डाउन सिंड्रोम का पता लगाने के लिए प्रयुक्त किया जाता है।

65. **आमाशय में जटलर रस का स्वाद होता है।**

- अम्ल कॉशिकाओं से

- शैक्षितक का स्वाद करने वाली कॉशिकाओं से

- भिंति फाइबरीन कॉशिकाओं से

- पेंटाक्रॉम कॉशिकाओं से

66. **तद्दृष्टि तंतु** लगते हैं:

- गुणमूल के कैबेनेटोसेम पर

- गुणमूल के अधिष्ठान पर

- गुणमूल के कैबेनेटोसेम पर

- गुणमूल के सुक्रेन्द्र पर

67. भारत का राष्ट्रीय जलीय प्राणी कौन-सा है?

- समुद्री धोंगा

- गंगा की शारीर

- नदी की थालिस्टोन

- ब्लू हवेल

68. निम्नलिखित में से कौन-सा कोशिकांग के बीच द्विकल कला से चिह्न होता है?

- केन्द्र

- सुक्रेन्द्र

- हरितक्रॉम

- व्हयनकाय

69. मानव इन्जुक्सन के दो पॉटेंटियाइड आपस में किसके द्वारा संयोजित होते हैं?

- डाइसल्फाइड सेटु

- हाइड्रोजन वन्ध

- फास्फोडाइएस्टर वन्ध

- साहसीयों द्वारा
70. In which of the following, all three are macronutrients?

(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 viroids?

(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 terminate 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. 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 do not give the defined action of contraceptive?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vasectomy prevents spermatogenesis</td>
</tr>
<tr>
<td>2</td>
<td>Barrier methods prevent fertilization</td>
</tr>
<tr>
<td>3</td>
<td>Intrauterine devices increase phagocytosis of sperms, suppress sperm motility and fertilizing capacity of sperms</td>
</tr>
<tr>
<td>4</td>
<td>Hormonal contraceptives prevent/retard entry of sperms, prevent ovulation and fertilization</td>
</tr>
</tbody>
</table>

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.
80. Cause'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. Small 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 chemosynthetic organisms 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?

- \( \sqrt{5gR} \)
- \( \sqrt{gR} \)
- \( \sqrt{2gR} \)
- \( \sqrt{3gR} \)

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

- \( 180^\circ \)
- \( 0^\circ \)
- \( 90^\circ \)
- \( 45^\circ \)

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

- 2000 km
- 2600 km
- 1600 km
- 1400 km

94. 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 \( 4 \times 10^{-3} \) Wb. The self-inductance of the soleno

- 1 H
- 4 H
- 3 H
- 2 H

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

- 0.89 W
- 0.51 W
- 0.67 W
- 0.76 W
96. Two identical charged spheres suspended from a common point by two massless strings of lengths \( l \), are mutually at a distance \( d \) \((d << l)\) 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:

- \( v \propto x^{-1} \)
- \( v \propto x \)
- \( v \propto x^{1/2} \)
- \( v \propto x^2 \)

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 \( \mathbf{r} = \cos \omega t \mathbf{x} + \sin \omega t \mathbf{y} \). 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?

\[ \begin{align*}
(1) & \quad 9 MR^2/32 \\
(2) & \quad 15 MR^2/32 \\
(3) & \quad 13 MR^2/32 \\
(4) & \quad 11 MR^2/32
\end{align*} \]

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:

\[ \begin{align*}
(1) & \quad 1 : \sqrt{2} \\
(2) & \quad \sqrt{2} \\
(3) & \quad 2\sqrt{2} \\
(4) & \quad 1 : 4
\end{align*} \]

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:

\[ \begin{align*}
(1) & \quad 3 : 2 \\
(2) & \quad 5 : 1 \\
(3) & \quad 5 : 4 \\
(4) & \quad 3 : 4
\end{align*} \]

102. A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at a speed of 15 ms\(^{-1}\). Then, the frequency of sound that the observer hears in the echo reflected from the cliff is:

(Take velocity of sound in air = 330 ms\(^{-1}\))

\[ \begin{align*}
(1) & \quad 885 \text{ Hz} \\
(2) & \quad 765 \text{ Hz} \\
(3) & \quad 800 \text{ Hz} \\
(4) & \quad 838 \text{ Hz}
\end{align*} \]

103. The ratio of resonance frequency \((f_2)\) to resonance frequency \((f_1)\) of a resonant circuit is 1 : 2. Then, the ratio of quality factor \((Q)\) of the circuit is:

\[ \begin{align*}
(1) & \quad 1 : \sqrt{2} \\
(2) & \quad 1 : 2 \\
(3) & \quad 1 : 2\sqrt{2} \\
(4) & \quad 1 : 4
\end{align*} \]
103. To get output 1 for the following circuit, the correct choice for the input is:

```
A B C Y
(1) 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
```

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:

1. \( \sin^{-1}\left(\frac{3}{4}\right) \)
2. \( \sin^{-1}\left(\frac{1}{4}\right) \)
3. \( \sin^{-1}\left(\frac{2}{3}\right) \)
4. \( \sin^{-1}\left(\frac{1}{2}\right) \)

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:

1. \( 3\lambda \)
2. \( 4\lambda \)
3. \( 5\lambda \)
4. \( \frac{5\lambda}{2} \)

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:

1. \( m \)
2. \( \frac{1}{m} \)
3. \( \sqrt{m} \)
4. \( \frac{1}{m^2} \)

107. नीचे दिए गए परिपत में, निर्गत त्रिष्ण के लिए निर्धारण का सही विकल्प है:

```
A B C Y
(1) 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
```

108. जब चौड़ा ‘\( a \)’ को किसी एकल झिंगोल पर 5000 Å तरंगदैर्घ्य का प्रकाश आपत्ति करता है, तो झिंगोल के कारण उत्पन्न विच्छेद पैटर्न में 30° के कोण पर पहला निर्धारण दिखाई देता है। पहला विच्छेदित उज्ज्वल कितने कोण पर दिखाई देगा, यह है:

```
\[ \sin^{-1}\left(\frac{3}{4}\right) \]
(2) \( \sin^{-1}\left(\frac{1}{4}\right) \)
(3) \( \sin^{-1}\left(\frac{2}{3}\right) \)
(4) \( \sin^{-1}\left(\frac{1}{2}\right) \)
```

109. जब किसी धात्विक पृष्ठ को तरंगदैर्घ्य \( \lambda \) के विकिरणों से प्रदीप्त किया जाता है, तो निरोधी विभाजन \( V \) है। यदि इसी पृष्ठ को तरंगदैर्घ्य \( 2\lambda \) के विकिरणों से प्रदीप्त किया जाए, तो निरोधी विभाजन \( \frac{V}{4} \) हो जाता है। इस धात्विक पृष्ठ को दोहरी तरंगदैर्घ्य है:

1. \( 3\lambda \)
2. \( 4\lambda \)
3. \( \frac{5\lambda}{2} \)
4. \( \frac{5\lambda}{2} \)

110. जब द्रव्यमान \( m' \) तथा वेग \( v' \) से गतिमान कोई \( \alpha-कण 'Ze' \) आक्रमण के किसी भारी नाभिक पर बम्बारी करता है, तो उसकी नाभिक से निकलतम उपगमन की दूरी, \( m \) पर इस प्रकार निर्भर करती है:

1. \( m \)
2. \( \frac{1}{m} \)
3. \( \sqrt{m} \)
4. \( \frac{1}{m^2} \)
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 → c and d; B → a and d; C → b and c; D → e and d
- (2) A → a and c; B → a and d; C → a and d; D → c and d
- (3) A → a and d; B → b and c; C → b and d; D → b and c

108. A particle of mass 10 kg 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. $0.2 \text{ m/s}^2$
2. $0.1 \text{ m/s}^2$
3. $0.15 \text{ m/s}^2$
4. $0.18 \text{ m/s}^2$

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 the 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

107. कॉलम-1 की संगत प्रतिस्पर्धियों का आलादा कॉलम-2 की प्रतिस्पर्धियों से कोई जीता। यहाँ 'm' दर्शाने द्वारा उत्पन्न आवर्तन हैं।

<table>
<thead>
<tr>
<th>कॉलम - 1</th>
<th>कॉलम - 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) $m = -2$</td>
<td>(a) उत्पन्न दर्शाने</td>
</tr>
<tr>
<td>(B) $m = -\frac{1}{2}$</td>
<td>(b) अवकल दर्शाने</td>
</tr>
<tr>
<td>(C) $m = +2$</td>
<td>(c) वास्तविक प्रतिस्पर्धियों</td>
</tr>
<tr>
<td>(D) $m = +\frac{1}{2}$</td>
<td>(d) आपातक प्रतिस्पर्धियों</td>
</tr>
</tbody>
</table>

- (1) A → c एंड d; B → a एंड d; C → b एंड c; D → e एंड d
- (2) A → a एंड c; B → a एंड d; C → a एंड d; D → c एंड d
- (3) A → a एंड d; B → b एंड c; C → b एंड d; D → b एंड c

108. 10 kg द्वारमा का कोई कण 6.4 से मी. लम्बी किर्ने के बुने के अनुकूल किसी नियत स्थर-रेखीय त्वरण से गति करता है। यदि गति आर्थक करने के पश्चात दो दलिताओं पूरी करने पर कण की गति उल्टी $8 \times 10^{-4}$ J हो जाती है, तो इस त्वरण का परिमाण क्या है?

1. $0.2 \text{ m/s}^2$
2. $0.1 \text{ m/s}^2$
3. $0.15 \text{ m/s}^2$
4. $0.18 \text{ m/s}^2$

109. कोई लघु विस्तार वोल्टेज $V(t) = V_0 \sin \omega t$ किसी आदर्श संपर्कन C के सिरों पर अनुप्रृक्त की गई है?

1. भारा $I(t)$, वोल्टेज $V(t)$ से 180° आता है।
2. भारा $I(t)$, वोल्टेज $V(t)$ से 90° पश्चात है।
3. एक पूर्ण चक्र में संपर्कन C वोल्टेज केंद्र से कोई ऊंची उपयुक्त नहीं किया।
4. भारा $I(t)$, वोल्टेज $V(t)$ की कितने है?

110. कोई डिस्क और कोई गोला, जिनके जिन्दगी समान पर्यंत द्वारमा भिड़ा है, समान उड़ान और नाम दो अन्तर समयत्र लाते हैं। इन दोनों पिक्सों में से तात्पर्य तक पहले कोने पहुँचेंगा?

1. इनके द्वारमा निम्नलिखित करता है?
2. डिस्क
3. गोला
4. दोनों एक ही समय पहुँचेंगे
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 $l_2$ 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. $\alpha_1 l_2 = \alpha_2 l_1$
3. $\alpha_1 l_2 = \alpha_2 l_1$
4. $\alpha_1^2 l_2 = \alpha_2^2 l_1$

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 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 \(D = 10d\)?

(1) \(\frac{I_0}{2}\)

(2) \(I_0\)

(3) \(\frac{I_0}{4}\)

(4) \(\frac{I_0}{3}\)

117. \(n(n > 1)\) 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 \(pL\) (\(p < 1\)) in the denser liquid. The density \(d\) is equal to:

(1) \(\{1 + (n - 1)p\}\)

(2) \(\{1 + (n + 1)p\}\)

(3) \(\{2 + (n + 1)p\}\)

(4) \(\{2 + (n - 1)p\}\)

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

\[\begin{align*}
A +4V & \quad 1\, \text{k}\Omega & \quad 1\, \text{k}\Omega & \quad B -6V \\
(1) & \quad 10^{-3}\, \text{A} & \quad 10^{-1}\, \text{A} \\
(2) & \quad 0\, \text{A} & \quad 10^{-2}\, \text{A} \\
(3) & \quad 10^{-2}\, \text{A} & \quad 10^{-1}\, \text{A} \\
(4) & \quad 0\, \text{A} & \quad 10^{-3}\, \text{A}
\end{align*}\]
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:

\[
\sqrt{\frac{g\mu_s + \tan\theta}{R^2}} \quad (1)
\]

\[
\sqrt{\frac{gR^2 \mu_s + \tan\theta}{1 - \mu_s \tan\theta}} \quad (2)
\]

\[
\frac{gR \mu_s + \tan\theta}{1 - \mu_s \tan\theta} \quad (3)
\]

\[
\frac{g}{R} \mu_s + \tan\theta \quad (4)
\]

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 $B$ and $B'$, at radial distances $\frac{a}{2}$ and $2a$ respectively, from the axis of the wire is:

\[
\frac{B}{B'} = 4 \quad (1)
\]

\[
\frac{B}{B'} = \frac{1}{4} \quad (2)
\]

\[
\frac{B}{B'} = \frac{1}{2} \quad (3)
\]

\[
\frac{B}{B'} = 1 \quad (4)
\]

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

\[
(1) \quad 2.5 \times 10^7 \text{ m}^{-1}
\]

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

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

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

122. If the velocity of a particle is $v = At + Bt^2$, where $A$ and $B$ are constants, then the distance travelled by the particle between $t = 1$ and $2t$ is:

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

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

\[
3A + 7B \quad (3)
\]

\[
\frac{3}{2}A + \frac{7}{3}B \quad (4)
\]
123. The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism is 60°. 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°; \( \frac{1}{\sqrt{2}} \)
2. 45°; \( \frac{1}{\sqrt{2}} \)
3. 30°; \( \sqrt{2} \)
4. 45°; \( \sqrt{2} \)

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. 100
2. \( 100\sqrt{2} \)
3. 400
4. \( 100\sqrt{2} \)

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

123. प्रिज्म के किसी आवर्तक पृष्ठ पर किसी प्रकाश किरण के लिए आपत्तन कोण का मान 45° है। प्रिज्म कोण का मान 60° है। यदि यह किरण प्रिज्म से न्यूनतम विचलन होती है, तो न्यूनतम विचलन कोण तथा प्रिज्म के

1. 30°; \( \frac{1}{\sqrt{2}} \)
2. 45°; \( \frac{1}{\sqrt{2}} \)
3. 30°; \( \sqrt{2} \)
4. 45°; \( \sqrt{2} \)

124. ताप 27°C और दबां 1.0 \( \times \) \( 10^5 \) Nm\(^{-2}\) पर किसी दिए गए द्रव्यमान की गैस के अनुग्रह का वार्षिक माध्यम मूल (r.m.s.) बेग 200 ms\(^{-1}\) है। जब इस गैस के ताप और दबां क्रमशः 127°C और 0.05 \( \times \) \( 10^5 \) Nm\(^{-2}\) हैं, तो ms\(^{-1}\) में इस गैस के अनुग्रह का वार्षिक माध्यम मूल बेग है:

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

125. एक सिरे पर बन तथा दूसरे सिरे पर खुला कोई वायु स्तर किसी स्वर्ण दिन्तुज के साथ उस समय अनुग्रह करता है जब इस वायु स्तर को कम-से-कम लम्बाई 50 से.मी. होती है। इसी स्वर्ण दिन्तुज के साथ अनुग्रह करने वाली स्तर को अपनी बड़ी लम्बाई है:

1. 200 से.मी.
2. 66.7 से.मी.
3. 100 से.मी.
4. 150 से.मी.

126. चुम्बकीय सुग्राहिता अणुभाग्य की होती है:

1. अनुचुम्बकीय और लौह-चुम्बकीय पदार्थों के लिए
2. केवल प्रतिचुम्बकीय पदार्थ के लिए
3. केवल अनुचुम्बकीय पदार्थ के लिए
4. केवल लौह-चुम्बकीय पदार्थ के लिए
127. An electron of mass \( m \) and a photon have the same energy \( E \). The ratio of de-Broglie wavelengths associated with them is:

\[
\begin{align*}
(1) & \quad \frac{1}{c} \left( \frac{2m}{E} \right)^2 \\
(2) & \quad \frac{1}{c} \left( \frac{E}{2m} \right)^2 \\
(3) & \quad \left( \frac{E}{2m} \right)^2 \\
(4) & \quad c \left( \frac{2mE}{c} \right)^{1/2}
\end{align*}
\]

(c being velocity of light)

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

\[
\begin{align*}
(1) & \quad (2t^3 + 3t^5) \text{W} \\
(2) & \quad (2t^2 + 3t^3) \text{W} \\
(3) & \quad (2t^2 + 4t^3) \text{W} \\
(4) & \quad (2t^2 + 3t^4) \text{W}
\end{align*}
\]

129. The charge flowing through a resistance \( R \) varies with time as \( Q = at - bT \), where \( a \) and \( b \) are positive constants. The total heat produced in \( R \) is:

\[
\begin{align*}
(1) & \quad \frac{a^2}{b} R \\
(2) \\
(3) & \quad \frac{3b}{2} R \\
(4) & \quad \frac{a^2}{b} R
\end{align*}
\]

130. A npn transistor is connected in common emitter configuration in a given amplifier. A load resistance of 800 \( \Omega \) 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 \( \Omega \), the voltage gain and the power gain of the amplifier will respectively be:

\[
\begin{align*}
(1) & \quad 4, 3.69 \\
(2) & \quad 4, 3.84 \\
(3) & \quad 3.69, 3.84 \\
(4) & \quad 4, 4
\end{align*}
\]
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:

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

(1) 68 km
(2) 34 km
(3) 544 km
(4) 136 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:

$$
\frac{\mu_0 liL}{2\pi}
$$

(1) $\frac{\mu_0 liL}{2\pi}$
(2) $\frac{2\mu_0 liL}{3\pi}$
(3) $\frac{\mu_0 liL}{2\pi}$
(4) $\frac{2\mu_0 liL}{3\pi}$

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) $\sqrt{\frac{m_2}{m_1}}$

134. A pendulum $m_1$ and a block $m_2$ are attached to the lower end of the same string. The block $m_2$ is dropped from a height $h$. The wavelength $\lambda_1$ of the wave produced at the lower end 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) $\sqrt{\frac{m_2}{m_1}}$
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) $U_3 = 0$
(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 $\text{H}_2$ 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. For the following reactions:
(a) \[ \text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{KOH} \rightarrow \text{CH}_3\text{CH}=\text{CH}_2 + \text{KBr} + \text{H}_2\text{O} \]
(b) \[ \text{CH}_3\text{CH}_2\text{Br} + \text{KOH} \rightarrow \text{CH}_3\text{CH}_2\text{OH} + \text{KBr} \]
(c) \[ \text{Br} + \text{Br}_2 \rightarrow \text{Br}_2 \]
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 alkyamines, because the nitrogen atom in arylamines is sp-hybridized.
(2) Arylamines are generally less basic than alkyamines because the nitrogen lone-pair electrons are delocalized by interaction with the aromatic ring π electron system.
(3) Arylamines are generally more basic than alkyamines because the nitrogen lone-pair electrons are not delocalized by interaction with the aromatic ring π electron system.
(4) Arylamines are generally more basic than alkyamines because of aryl group.

142. Equal mole 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) 1/2
(2) 1/8
(3) 1/4
(4) 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 property indicated against it?

(1) Li < Na < K < Rb (increasing metallic radius)

(2) Al$^{3+}$ < Mg$^{2+}$ < Na$^+$ < F$^-$ (increasing ionic size)

(3) B < C < N < O (increasing first ionisation enthalpy)

(4) F < Cl < Br < I (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) 44.1 s

146. When copper is heated with conc. HNO$_3$ it produces:

(1) Cu(NO$_3$)$_2$ and N$_2$O

(2) Cu(NO$_3$)$_2$ and NO$_2$

(3) Cu(NO$_3$)$_2$ and NO

(4) Cu(NO$_3$)$_2$, NO and NO$_2$

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

(1) 3-mercaptobenzoic acid bond

(2) $\alpha$-glycosidic bond

(3) $\beta$-glycosidic bond

(4) peptide bond

148. Fog is a colloidal solution of:

(1) Gas in gas

(2) Liquid in gas

(3) Gas in liquid

(1) Solid in gas

149. 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) 44.1 s

150. When copper is heated with conc. HNO$_3$ it produces:

(1) Cu(NO$_3$)$_2$ and N$_2$O

(2) Cu(NO$_3$)$_2$ and NO$_2$

(3) Cu(NO$_3$)$_2$ and NO

(4) Cu(NO$_3$)$_2$, NO and NO$_2$

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

(1) 3-mercaptobenzoic acid bond

(2) $\alpha$-glycosidic bond

(3) $\beta$-glycosidic bond

(4) peptide bond

152. Fog is a colloidal solution of:

(1) Gas in gas

(2) Liquid in gas

(3) Gas in liquid

(1) Solid in gas
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>
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<tbody>
<tr>
<td>(a) Cyanide process</td>
<td>(i) Ultrapure Ge</td>
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<td>(b) Froth floatation process</td>
<td>(ii) Dressing of ZnS</td>
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<td>(c) Electrolytic reduction</td>
<td>(iii) Extraction of Al</td>
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<td>(d) Zone refining</td>
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<td>(4)</td>
<td>(i)</td>
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</table>

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 arabinose.
2. The sugar component in RNA is arabinose and the sugar component in DNA is 2'-deoxyribose.
3. The sugar component in RNA is ribose 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 \( \Delta S > 0 \)
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, two nearly insoluble salts, have the same K_sp 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 carbonian, CH₃C≡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) HClO₂ < HClO < HClO₃ < HClO₄

158. Which one of the following statements is correct when SO₂ is passed through acidified K₂Cr₂O₇ solution?
(1) Green Cr₂(SO₄)₃ is formed.
(2) The solution turns blue.
(3) The solution is decolourised.
(4) SO₂ is reduced.
159. Predict the correct order among the following:
(1) lone pair - bond pair > bond pair - bond pair > lone pair - lone pair
(2) lone pair - lone pair > lone pair - bond pair > bond pair - bond pair
(3) lone pair - lone pair > bond pair - bond pair > lone pair - bond pair
(4) bond pair - bond pair > lone pair - bond pair > lone pair - lone pair

160. Two electrons occupying the same orbital are
(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 C
(1) Ca$_2$CN
(2) Ca(CN)$_2$
(3) CaCN
(4) CaCN$_3$

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) F$_2$ > Cl$_2$ > Br$_2$ > I$_2$
(2) I$_2$ > Br$_2$ > Cl$_2$ > F$_2$
(3) Cl$_2$ > Br$_2$ > F$_2$ > I$_2$
(4) Br$_2$ > I$_2$ > F$_2$ > Cl$_2$

164. The reaction
\[ \text{HO-} + \text{NaH} \rightarrow \text{O-} \text{Na} + \text{Me-I} \]
can be classified as:
(1) Williamson alcohol synthesis reaction
(2) Williamson ether synthesis reaction
(3) Alcohol formation reaction
(4) Dehydration reaction

159. निम्न में से सही रूप होगा:
(1) एकाकी युग्म - आबंधी युग्म - आबंधी युग्म - एकाकी युग्म - एकाकी युग्म - एकाकी युग्म
(2) एकाकी युग्म - एकाकी युग्म - एकाकी युग्म - आबंधी युग्म - आबंधी युग्म - एकाकी युग्म - एकाकी युग्म
(3) एकाकी युग्म - एकाकी युग्म - एकाकी युग्म - आबंधी युग्म - आबंधी युग्म
(4) आबंधी युग्म - एकाकी युग्म - एकाकी युग्म - आबंधी युग्म - एकाकी युग्म - एकाकी युग्म

160. दो इलेक्ट्रॉन जो किसी ही कक्ष में हैं। इनमें अंतर किसके
(1) प्रत्यक्ष क्षौतं संख्या
(2) सुधा क्षौतं संख्या
(3) नवन्तर क्षौतं संख्या
(4) दिशाशीय क्षौतं संख्या

161. नाइट्रीड का CaC$_2$ के साथ अभिक्रिया से प्राप्त उत्पाद हैः
(1) Ca$_2$CN
(2) Ca(CN)$_2$
(3) CaCN
(4) CaCN$_3$

162. प्राकृतिक रक्ष में :
(1) अनियमित सिस-एवं ट्रार्स-विन्यास है।
(2) सभी सिस-विन्यास है।
(3) सभी ट्रार्स-विन्यास है।
(4) एकांतर सिस-एवं ट्रार्स-विन्यास है।

163. निम्नलिखित में से कौन रूप है जो एक रूप वियुजित एल्कोहोल के लिये सही है?
(1) F$_2$ > Cl$_2$ > Br$_2$ > I$_2$
(2) I$_2$ > Br$_2$ > Cl$_2$ > F$_2$
(3) Cl$_2$ > Br$_2$ > F$_2$ > I$_2$
(4) Br$_2$ > I$_2$ > F$_2$ > Cl$_2$

164. अभिक्रिया
\[ \text{O-} + \text{NaH} \rightarrow \text{O-} \text{Na} + \text{Me-I} \]
को वर्गीकृत किया जा सकता हैः
(1) विलयन एल्कोहोल संशोधन अभिक्रिया
(2) विलयन इंध संशोधन अभिक्रिया
(3) ऐल्कोहोल विरचन अभिक्रिया
(4) निरंतर विकरण अभिक्रिया
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. \((N_A = 6.02 \times 10^{23} \text{ mol}^{-1})\)

\[
x = \frac{\sqrt{3}}{2} \times \frac{\text{Density}}{\text{Density} \times N_A} = \frac{\sqrt{3}}{2} \times \frac{530}{530 \times 6.02 \times 10^{23}} \\
(1) \ 264 \text{ pm} \\
(2) \ 154 \text{ pm} \\
(3) \ 352 \text{ pm} \\
(4) \ 527 \text{ pm}
\]

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

\[
\text{(1) } 2 \\
\text{(2) } 6 \\
\text{(3) } 4 \\
\text{(4) } 8
\]

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 \(K_p = 0.52\), the boiling point of this solution will be:

\[
\text{(1) } 103°C \\
\text{(2) } 101°C \\
\text{(3) } 100°C \\
\text{(4) } 102°C
\]

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

\[
\text{(1) } [\text{Xe}]4f^76s^2, [\text{Xe}]4f^75d^16s^2 \text{ and } [\text{Xe}]4f^96s^2 \\
\text{(2) } [\text{Xe}]4f^76s^2, [\text{Xe}]4f^86s^2 \text{ and } [\text{Xe}]4f^85d^16s^2 \\
\text{(3) } [\text{Xe}]4f^85d^16s^2, [\text{Xe}]4f^75d^16s^2 \text{ and } [\text{Xe}]4f^96s^2 \\
\text{(4) } [\text{Xe}]4f^85d^16s^2, [\text{Xe}]4f^75d^16s^2 \text{ and } [\text{Xe}]4f^85d^16s^2
\]

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

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

165. लिथियम की bcc संरचना है। इसका घनत्व 530 kg m\(^{-3}\) तथा प्रमाण प्रवर्धन 6.94 g mol\(^{-1}\) है। लिथियम घनत्व के एकल कोडिंग के कोड को लम्बाई है:\n
\[
(N_A = 6.02 \times 10^{23} \text{ mol}^{-1}) \\
(1) \ 264 \text{ pm} \\
(2) \ 154 \text{ pm} \\
(3) \ 352 \text{ pm} \\
(4) \ 527 \text{ pm}
\]

166. \(A^+\) एवं \(B^-\) आपातों की आयनिक जिन्हारे क्रमशः 0.98 \times 10^{-10} \text{ m} एवं 1.81 \times 10^{-10} \text{ m} हैं। \(AB\) में प्रत्येक आयन की उपस्थलायन संख्या हैं:

\[
\text{(1) } 2 \\
\text{(2) } 6 \\
\text{(3) } 4 \\
\text{(4) } 8
\]

167. एक 6.5 g विलेन का 100 g जल में विलेन का 100°C पर वापस दब 732 mm है। \(\text{यदि } K_p = 0.52\) तो इस विलेन का क्वान्टित व जोह सही होगा:

\[
\text{(1) } 103°C \\
\text{(2) } 101°C \\
\text{(3) } 100°C \\
\text{(4) } 102°C
\]

168. यू (प.स. 63), ग्यांड (प.स. 64) और टीबी (प.स. 65) के इलेक्ट्रॉनिक विनायक हैं:

\[
\text{(1) } [\text{Xe}]4f^76s^2, [\text{Xe}]4f^75d^16s^2 \text{ और } [\text{Xe}]4f^96s^2 \\
\text{(2) } [\text{Xe}]4f^76s^2, [\text{Xe}]4f^86s^2 \text{ और } [\text{Xe}]4f^85d^16s^2 \\
\text{(3) } [\text{Xe}]4f^85d^16s^2, [\text{Xe}]4f^75d^16s^2 \text{ और } [\text{Xe}]4f^96s^2 \\
\text{(4) } [\text{Xe}]4f^85d^16s^2, [\text{Xe}]4f^75d^16s^2 \text{ और } [\text{Xe}]4f^85d^16s^2
\]

169. निम्नलिखित में से कौन सा कहन हाइड्रोजन के लिए असत्य है?

\[
\text{(1) हाइड्रोजन अपचायक के रूप में कार्य नहीं करता है।} \\
\text{(2) हाइड्रोजन के तीन सम्प्रभाविक है जिनमें से ट्राइडियम प्रत्यक्ष है।} \\
\text{(3) हाइड्रोजन आयनिक लक्षणों में धनात्मक की तरह व्यवहार नहीं करता है।} \\
\text{(4) हाइड्रोजन आयन, H}_3\text{O}^+ \text{ का अवस्थ विलेन में मुक्त रूप में होता है।}
\]
170. In the reaction

\[ H - C = CH \quad (1) \quad NaNH_2/\text{liq NH}_3 \quad (2) \quad CH_3CH_2Br \quad X \quad (3) \quad CH_3CH_2Br \quad (1) \quad NaNH_2/\text{liq NH}_3 \quad X \quad (2) \quad CH_3CH_2Br \quad \text{Y} \]

\( X \) and \( Y \) are:
1. \(-\text{Butyne}; \text{Y} = 2\text{-Hexyne}\)
2. \( X = 1\text{-Butyne}; \text{Y} = 3\text{-Hexyne}\)
3. \( X = 2\text{-Butyne}; \text{Y} = 3\text{-Hexyne}\)
4. \( X = 2\text{-Butyne}; \text{Y} = 2\text{-Hexyne}\)

171. Consider the following liquid - vapour equilibrium.

\[ \text{Liquid} \quad \leftrightarrow \quad \text{Vapour} \]

Which of the following relations is correct?

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

172. Which of the following statements about the composition of the vapour over an ideal T : 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?

- CH₃
- O₂N
- Br Br

174. अभिक्रिया में

\[ H - C = CH \quad (1) \quad NaNH_2/\text{liq NH}_3 \quad (2) \quad CH_3CH_2Br \quad X \quad (3) \quad CH_3CH_2Br \quad (1) \quad NaNH_2/\text{liq NH}_3 \quad X \quad (2) \quad CH_3CH_2Br \quad \text{Y} \]

\( X \) और \( Y \) हैं:
1. \(-\text{Butyne}; \text{Y} = 2\text{-Hexyne}\)
2. \( X = 1\text{-Butyne}; \text{Y} = 3\text{-Hexyne}\)
3. \( X = 2\text{-Butyne}; \text{Y} = 3\text{-Hexyne}\)
4. \( X = 2\text{-Butyne}; \text{Y} = 2\text{-Hexyne}\)

175. नीचे दिये गये द्रव - वाष्प सामग्रीस्था,

\[ \text{द्रव} \quad \leftrightarrow \quad \text{वाष्प} \]

में से कौन सा संयोजन सही है?

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

176. बेंजीन एवं टोलीड़ के 1 : 1 आदर्श मोलर मिश्रण के वा संयोजन के लिए निम्नलिखित में से कौन सा कथन सत्य है

कल्पना करें कि तापमान 25°C पर है। (दिये गये वा द्रव 25°C पर बेंजीन = 12.8 kPa, टोलीड़ = 3.85 kPa)

1. अपयोगी सूचनाओं के कारण कोई पूर्वपुरुष नहीं लगा सकता है।
2. वाष्प में बेंजीन की अधिक प्रतिशतता होगी।
3. वाष्प में टोलीड़ की अधिक प्रतिशतता होगी।
4. वाष्प में समान मात्रा में बेंजीन एवं टोलीड़ होगी।

177. निम्न में से कौन सा बाइफेनियल प्रकाशिक सक्रिय है?

- O₂N
- CH₃
- Br Br

178. निम्न में से कौन सा बाइफेनियल प्रकाशिक सक्रिय है?

- O₂N
- CH₃
174. Which of the following reagents would distinguish cis-cyclopenta-1,2-diol 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 and this process is known as keto-enol tautomerism.
(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 aldehyde-ketone equilibration.
(4) A carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as carbonylation.

176. Consider the molecules CH₄, NH₃, and H₂O. Which of the given statements is false?

(1) The H – C – H bond angle in CH₄ 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>
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<th>Column I</th>
<th>Column II</th>
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<tr>
<td>(a) XeF₆</td>
<td>distorted octahedral</td>
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<tr>
<td>(b) XeO₃</td>
<td>square planar</td>
</tr>
<tr>
<td>(c) XeOF₄</td>
<td>pyramidal</td>
</tr>
<tr>
<td>(d) XeF₄</td>
<td>square pyramidal</td>
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**Code:**

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<th>(a)</th>
<th>(b)</th>
<th>(c)</th>
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<td>(iii)</td>
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<td>(iv)</td>
<td>(iii)</td>
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**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 clottin
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)₉]²⁻