

Botany - Section A

1. Stem tendrils are not seen in:
 1. Grapevine
 2. Watermelon
 3. *Citrus*
 4. Cucumber

2. The outer membrane of the nucleus:
 - I. is continuous with the Endoplasmic reticulum
 - II. does not bear ribosomes.
 1. Only I is correct
 2. Only II is correct
 3. Both I and II are correct
 4. Both I and II are incorrect

3. Bivalent chromosomes clearly appear as tetrads during:
 1. Zygotene
 2. Pachytene
 3. Diplotene
 4. Diakinesis

4. Consider the given two statements:
 - I. During G_1 phase the cell is metabolically active and continuously grows but does not replicate its DNA.
 - II. During G_2 phase, proteins are synthesized in preparation for mitosis while cell growth continues.Of the two statements:
 1. Only I is correct
 2. Only II is correct
 3. Both I and II are correct
 4. Both I and II are incorrect

5. In Kreb's cycle, a molecule of GTP is produced during the conversion of:
 1. Citrate into Ketoglutarate
 2. Succinyl-CoA into succinate
 3. Succinate into malate
 4. Malate into oxaloacetate

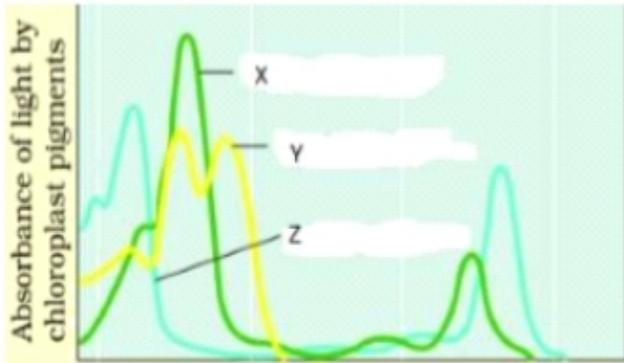
6. In oocyte of some vertebrates, the stage of meiosis I that can last for months or years would be:
 1. Zygotene
 2. Pachytene
 3. Diplotene
 4. Diakinesis

7. The features seen in the gymnosperm *Cycas* include:
 - I. Coralloid roots
 - II. Unbranched stems
 - III. Pinnate persistent leaves for a few years
 - IV. Male cones and megasporophylls borne on same plant
 1. I and II only
 2. I and IV only
 3. I, II and III only
 4. I, II, III, and IV

8. Unless specifically stained by a vital stain like Janus Green, which of the following will not be visible under a microscope?
 1. Rough endoplasmic reticulum
 2. Smooth endoplasmic reticulum
 3. Golgi apparatus
 4. Mitochondria

9.

In the given diagram, X, Y and Z respectively represent the absorption spectrum of:



1. Chlorophyll a, Chlorophyll b and Carotenoids
2. Chlorophyll b, Chlorophyll a and Carotenoids
3. Chlorophyll b, Carotenoids and Chlorophyll a
4. Chlorophyll a, Carotenoids and Chlorophyll b

10.

Watson and Crick based their model of DNA on X-ray diffraction data produced by:

1. Hershey and Chase
2. Marie Curie and Pierre Curie
3. Franklin and Wilkins
4. Meselson and Stahl

11.

Select correct match between Column I and II

- | Column I | Column II |
|--|---------------|
| a. As quick referral system in taxonomical studies | (i) Monograph |
| b. Collection of preserved plants and animals | (ii) Herbaria |
| c. Index to the plant species found in a particular area | (iii) Museum |
| d. Complete information of any one taxon | (iv) Flora |
1. a(iv), b(iii), c(ii), d(i)
 2. a(ii), b(iii), c(i), d(iv)
 3. a(iii), b(ii), c(iv), d(i)
 4. a(ii), b(iii), c(iv), d(i)

12.

Pollen pistil interaction is

1. Chemically mediated process
2. Dynamic process
3. Genetically controlled process
4. More than one option is correct

13.

The famous double-helix model of DNA was proposed by Watson and Crick in ____ and they shared Nobel Prize for Physiology or Medicine in _____ for their effort.

1. 1951, 1971
2. 1943, 1963
3. 1953, 1962
4. 1969, 1972

14.

What can be the blood groups of progeny whose father and mother are of AB and O blood group respectively?

1. A and B only
2. AB only
3. All except O
4. A, B, AB and O

15.

When the two genes in a dihybrid cross are situated on the same chromosome:

1. The proportion of parental gene combinations was much higher than the non-parental type.
2. The proportion of parental gene combinations was much lesser than the non-parental type.
3. The proportion of parental gene combinations was equal to the non-parental type.
4. Only recombinants are formed.

16.

The unequivocal proof that DNA is the genetic material was provided by:

1. Avery, Macleod and McCarty
2. Hershey and Chase
3. Meselson and Stahl
4. Watson and Crick

17.

In a transcription unit, with respect to structural gene, the promoter is located:

1. Upstream and 5'
2. Upstream and 3'
3. Downstream and 5'
4. Downstream and 3'

18.

Select the incorrect statement

1. Species diversity decreases as we move away from the equator towards the poles.
2. The IUCN red list (2004) documents the extinction of 784 species in the last 500 years.
3. Amazon rainforest is so huge that it is called the 'heart of the planet'
4. Extinction of Steller's sea cow and passenger pigeon were due to their overexploitation by humans.

19.

Which of the following characters is/are related to isobilateral leaf?

- (a) Stomata are present on both surfaces.
- (b) Mesophyll is differentiated into palisade and spongy parenchyma.
- (c) Sub-stomatal cavity is present below the stoma of the abaxial epidermis.

1. Only (a)
2. Only (c)
3. Only (a) and (c)
4. (a), (b) and (c)

20.

Which the following pairs is wrongly matched while remaining three are correct

1. Allen's rule – Mammals with shorter ears and limbs in colder area
2. Expanding population – High number of individual at pre-reproductive stage
3. Population density increasing – $(B + I) < (D + E)$
4. Carrying capacity – Logistic growth.

21.

The large holes in 'Swiss cheese' are due to production of CO₂ by

1. *Saccharomyces cerevisiae*.
2. *Lactobacillus acidophilus*.
3. *Propionibacterium sharmanii*.
4. *Penicillium roqueforti*.

22.

Cystic fibrosis, Myotonic dystrophy and Thalassemia are

1. Chromosomal disorders
2. Autosomal recessive disorders
3. Mendelian disorders
4. Autosomal dominant disorders

23.

Which of the following statements is false?

- I. Vallisneria and Hydrilla are fresh water plants while sea-grasses (e.g. Zostera) are marine plant.
- II. Pollination in water lily / Lotus (Nymphaea) and Eichhornia (water hyacinth) takes place by insects.
- III. In majority of aquatic plants flowers emerge above the level of water and are pollinated by insects or wind.
- IV. In most of the water pollinated species, pollen grains are protected from wetting due to presence of mucilaginous covering.
- V. In hydrophilous plants pollen grains are spherical.

1. All
2. None
3. V
4. IV.

24.

Match column I with column II and select the correct option.

Column I

- a. A_{2+4}
- b. Epiphyllous androecium
- c. Ovary inferior
- d. Gamosepalous

Column II

- (i) Tomato
- (ii) Lily
- (iii) Mustard
- (iv) Epigynous flower

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

25.

Thinning of cotton and promotion of femaleness in cucumber are physiological effects of PGR which

1. Helps of withstand desiccation conditions and is antagonistic to GAs
2. Increases the market period of fruits by delaying senescence
3. Is synthesized in large amounts in ripening fruits and tissues undergoing senescence
4. Prevents fruit and leaf drop at early stages and produced by growing apices of stem

26.

Which of the following statement is correct?

1. Glycolysis is present in facultative anaerobes, not in obligate anaerobes
2. Usually carbohydrates are oxidised to release energy in cellular respiration
3. Oxidation of one molecule of NADH gives rise to 3 molecules of ATP in anaerobic respiration
4. Fermentation takes place under anaerobic conditions in prokaryotes only

27.

"Kranz anatomy" is present in

1. All photosynthetic plants
2. Only C_3 plants
3. Only succulent plants
4. Only C_4 plants

28.

Heterocyst in blue-green algae

1. Lacks photosystem- I
2. Are specialised cells for photosynthesis
3. May perform reproduction
4. Performs nitrogen fixation in anaerobic condition

29.

SO_2 pollution indicator is

1. Fungi
2. Diatoms
3. Lichen
4. Mycorrhiza

30.

Which protein is responsible for active transport:-

1. Pump
2. Channel
3. Symport
4. Uniport

31.

Which is not correct with transporting the food through phloem?

1. Loading is a passive process
2. Translocation is due to hydrostatic force
3. Food translocation is bidirectional
4. Translocation always occur from source to sink

32.

In the rocky intertidal communities of the American pacific coast the starfish *Pisaster* is an important predator. In a field experiment, when all the star fish were removed from an enclosed intertidal area, more than 10 species of invertebrates became extinct within a year, because of :

1. Amensalism
2. Predation
3. Intraspecific competition
4. Interspecific competition

33.

“Pollen grains are well preserved as fossil due to presence of A in the B layer” Complete the above statement by choosing the correct option for A and B.

A **B**

1. Pectin Intine
2. Sporopollenin Intine
3. Pectin Exine
4. Sporopollenin Exine

34.

Select the **incorrect** match

1. Low level of Mo, S, N – delay in flowering
2. Inhibition of cell division – due to lack of Mo, S, N, K
3. Death of tissue – due to deficiency of S, N, Cl
4. Chlorosis – due to deficiency of N, K, Mg, Fe, Mn

35.

Trichoderma polysporum is source of

1. Clot buster
2. Satins
3. Cyclosporin-A
4. Streptokinase

Botany - Section B

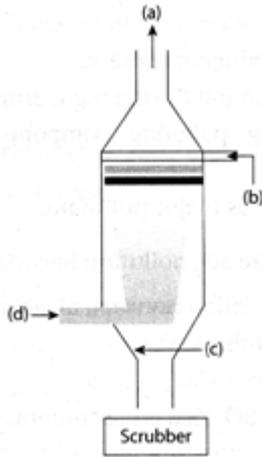
36.

Isogametes are seen in:

1. Cladophora
2. Fucus
3. Human beings
4. Ficus

37.

Identify 1., 2., 3. and 4. in the diagram



1. 1.–Dirty air ; 2.– Water line spray ; 3.– Clean air; 4. – Particulate matter
2. 1.–Clean air ; 2.– Water line spray ; 3.– Particulate matter; 4. – Dirty air
3. 1.–Water line spray ; 2.– Particulate matter; 3.– Clean air; 4. – Dirty air
4. 1.–Particulate matter; 2.– Dirty air ; 3.– Clean air; 4. – Water line spray

38.

The ovule of an angiosperm is technically equivalent to

1. Megasporangium
2. Megasporophyll
3. Megaspore mother cell
4. Megaspore

39.

DNA replication is correctly described as:

1. Semi-conservative and Continuous
2. Semi-conservative and Discontinuous
3. Conservative and Continuous
4. Semi-conservative and Semi-discontinuous

40.

In which part of the atmosphere 'good ozone' is found?

1. Troposphere
2. Stratosphere
3. Ionosphere
4. Exosphere

41.

National Forest Policy __A__ of India has recommended __B__ forest cover for the plains and __C__ for the hills. Fill the blanks with suitable A, B and C

- | | A | B | C |
|----|------|-------|-------|
| 1. | 1988 | 33% | 67% |
| 2. | 1988 | 30% | 19.4% |
| 3. | 1989 | 30% | 65% |
| 4. | 1987 | 19.4% | 30% |

42.

The main arena of cellular activities in plant and animal cells is

1. Cell membrane
2. Mitochondria
3. Cytoplasm
4. Ribosome

43.

The first step in biological nitrogen fixation is the conversion of

1. Ammonia into nitrites.
2. Nitrates into nitrites.
3. Nitrogen into ammonia.
4. Ammonia into nitrates.

44.

Glycerol would enter the respiratory pathway after being converted to-

1. PGAL
2. DPGA
3. PGA
4. Acetyl CoA

45.

Mark the step of Calvin cycle during which carbohydrate is formed at the expense of photochemically made ATP and NADPH

1. Reduction
2. Carboxylation
3. Regeneration
4. Glycolysis

46.

Observe the sex determination in the following:-

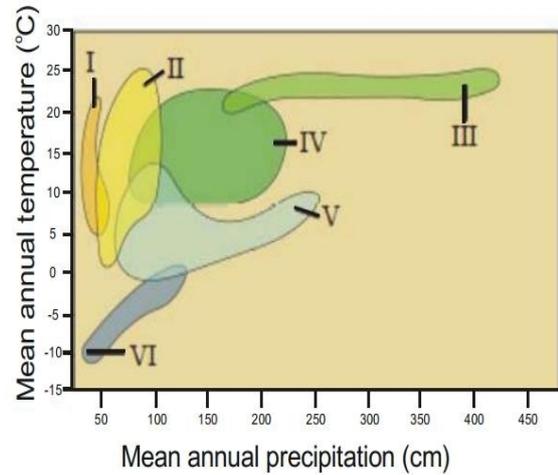
- I. Human males = XY
 - II. Female hen = ZW
 - III. Male Drosophila = XY
 - IV. Male grasshopper = XO
 - V. Male birds = ZZ
- Male heterogamety = A
 Female heterogamety = B
 Male homogamety = C

Which of the following combination is correct?

1. A-I, III, IV, B-II, C-V
2. A-II, IV, B-I, C-III
3. A-II, IV, B-I, C-II
4. A-III, IV, B-II, C-I

47.

In the given figure, identify Coniferous forest, Arctic and Alpine Tundra and tropical forest, respectively:-



1. I, VI and III
2. V, VI and III
3. IV, III and I
4. I, II and III

48.

Choose the correct identification for the given stage of succession and is preceded by which stage respectively :-



1. Submerged plants, reed swamp
2. Scrub stage, forest
3. Marsh meadow, scrub stage
4. Reed swamp, marsh meadow

49.

Himgiri is bred by hybridization and selection for disease resistance to leaf and stripe rust is a variety of which of the given crop?

1. Wheat
2. Brassica
3. Cowpea
4. Chilli

50.

Microtubules attach to kinetochore of sister chromatids during

1. Anaphase-I
2. Prophase-II
3. Metaphase-II
4. Anaphase-II

52.

How many of the characters given below are true for echinoderms?

- I. An endoskeleton of calcareous ossicles
- II. The adult echinoderms are radially symmetrical but larvae are bilaterally symmetrical.
- III. They are triploblastic and coelomate animals.
- IV. Digestive system is complete.
- V. Water vascular system
- VI. Sexual reproduction, internal fertilization and direct development.

1. 3
2. 4
3. 5
4. 6

53.

Contraction of diaphragm:

1. Increases the volume of the thoracic chamber in the antero-posterior axis
2. Increases the volume of the thoracic chamber in the dorso-ventral axis
3. Decreases the volume of the thoracic chamber in the antero-posterior axis
4. Decreases the volume of the thoracic chamber in the dorso-ventral axis

54.

The blood from the glomerulus is carried away by:

1. Afferent arteriole
2. Efferent arteriole
3. Peritubular capillary network
4. Renal vein

Zoology - Section A

51.

Consider the following characters:

- I. Air bladder
- II. Operculum
- III. Viviparity

The characters present in bony fishes include:

1. I, II and III
2. I and III only
3. I and II only
4. II and III only

55. What does RCH stand for?
 1. Reproductive and Complete Health
 2. Regional and Central Healthcare
 3. Reproductive and Child Healthcare
 4. Reproductive and Cumulative Health
56. Birds are not characterized by:
 1. Forelimbs modified into wings
 2. Fully ossified endoskeleton
 3. Skin dry without glands except for oil gland
 4. Oviparous and external fertilization
57. The parietal cells or the oxyntic cells located in the stomach's gastric pits mainly secrete:-
 1. HCl and Intrinsic factor
 2. Pepsinogen and Gastric lipase
 3. Pepsinogen and Pro-rennin
 4. Gastrin and Mucus
58. Congestion of the lungs is one of the main symptoms in:
 1. Hypotension
 2. Coronary artery disease
 3. Angina
 4. Heart failure
59. To protect tobacco plants against *Meloidogyne incognita* using RNAi, nematode specific genes were introduced in the plant using:
 1. Transposons
 2. Retrotransposons
 3. Virus with RNA genome
 4. Agrobacterium
60. A person passes a lot of dilute urine and drinks a lot of water but does not have glycosuria. He is most likely suffering from :
 1. Type 1 diabetes mellitus
 2. Type 2 diabetes mellitus
 3. Pituitary diabetes
 4. Diabetes insipidus
61. Microinjection is suitable for :
 1. Injecting an ovum into the sperm in IVF
 2. Transforming animal cells
 3. Injecting very small sized drug particles into neurons
 4. Conferring antibiotic resistance to a certain strain of bacteria
62. The maximum amount of air that a person can breathe out after a forced inspiration, under normal physiological conditions, would be about:
 1. 1600 ml
 2. 2300 ml
 3. 4500 ml
 4. 5600 ml
63. Malignant tertian malaria is caused by Plasmodium:
 1. vivax
 2. malariae
 3. falciparum
 4. ovale

64.

At the birth of the female child, the follicles in her ovaries contain:

1. Primary oocytes that have been arrested at the S phase of the cell cycle
2. Primary oocytes that have been arrested at the Prophase I of Meiosis I
3. Secondary oocytes that have been arrested at the Prophase I of Meiosis I
4. Secondary oocytes that have been arrested at the Metaphase II of Meiosis II

65.

Which one of the following is the most widely accepted method of contraception in India, at present?

1. Tubectomy
2. Diaphragm
3. IUDs (Intrauterine Devices)
4. Cervical caps

66.

Male reproductive system of cockroach consist of

1. Testis, Vas-deferens, Ejaculatory duct, Seminal Vesicle and Mushroom-shaped gland.
2. Testis, Vas-deferens, Phallomere, Ejaculatory duct and Collateral gland.
3. Testis, Phallic gland, Vestibulum, Pseudopenis and Titillator.
4. Testis, Anal cercus, caudal style, Spermatheca and gonapophysis.

67.

Which of the following physiological changes is not associated with Renin- Angiotensin-Aldosterone system?

1. Increase in GFR.
2. Increase in blood pressure.
3. Increase in blood aldosterone level.
4. Increase in tubular secretion

68.

Select the correct statement .

1. A restriction exonuclease cuts both strands of foreign DNA as well as vector DNA at specific palindromic sequences
2. A restriction endonuclease is named on the basis of scientific name and strain of bacteria from which it is isolated
3. All restriction enzymes cut the strands of DNA in the centre of palindromic site between the same two bases of opposite strand
4. When cut by same restriction enzyme, the resultant DNA fragments generate different kinds of sticky ends

69.

Female accessory ducts related to reproductive system is

- (i) Oviducts
- (ii) Uterus
- (iii) Vagina

1. (i), (ii), (iii)
2. (i) only
3. (i) and (ii) only
4. (iii) only

70.

Which of the following duct is present outside the testis?

- (i) Rete testis
- (ii) Vasa efferentia
- (iii) Vas deferens
- (iv) Epididymis

1. (i), (ii), (iii), (iv)
2. (iii) and (iv) only
3. (ii), (iii), (iv)
4. (iii) only

71. Cell junctions like tight, adhering and gap junctions are mainly present between the neighbouring cells of

1. Neural tissue
2. Connective tissue
3. Muscular tissue
4. Epithelial tissue

72. The longest bone of the body is

1. Phalanges
2. Tarsal
3. Femur
4. Metatarsal

73. Adenohypophysis in humans consists of two portions

1. Pars distalis and Pars nervosa
2. Pars intermedia and Pars distalis
3. Pars nervosa and Pars intermedia
4. Anterior and posterior pituitary.

74. 'Retinal' is present in

1. Rods.
2. Cones.
3. Both 1 and 2.
4. All the retinal layer

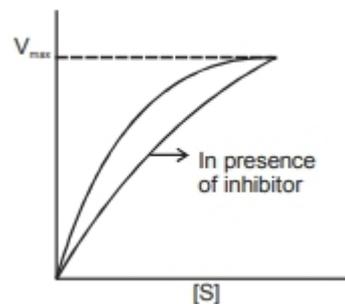
75. Odd one out ?

1. PMNL - neutrophils
2. Monocytes.
3. Natural killer cells.
4. Interferons.

76. The transduction of sound waves to action potentials taken place

1. Within the tectorial membrane as it is stimulated by the hair cells.
2. When hair cells are bent against the tectorial membrane causing them to depolarize and release neurotransmitter molecule that stimulate sensory neurons.
3. As the basilar membrane becomes more permeable to sodium ions and depolarizes, initiating an action potential in a sensory neurons.
4. With in the middle ear as the vibration are amplified by malleus, incus and stapes

77. Which of the following statement is correct regarding the given graph?



1. Permanent binding of inhibitor with enzyme.
2. Km remains the same.
3. It represents inhibition of succinate dehydrogenase by malonate.
4. It represents inhibition of cytochrome oxidase by cyanide.

78. Similarity between Inulin, Lecithin and Insulin is -

1. All are polymeric compound.
2. All are natural polypeptides.
3. All contains C,H,O and N.
4. None of these.

79.

Following is the figure of actin (thin) filaments, Identify A, B and C



1. A-Tropomyosin, B-Troponin, C-F-actin
2. A-Troponin, B-Myosin, C-Tropomyosin
3. A-Troponin, B-Tropomyosin, C-Myosin
4. A-Troponin, B-Tropomyosin, C-F-actin

82.

All the following conditions are observed in Marasmus, except

1. It is found in infants less than a year in age, if the mother's milk is replaced too early by other foods which are poor in both proteins and caloric value
2. The layer of fat beneath the skin disappears
3. Hands and other body parts show fluid accumulation (oedema) and swelling
4. Thinning of limbs and ribs become very prominent

80.

Mark the incorrect statement.

1. By using *Agrobacterium* vectors nematode specific genes were introduced into host plant
2. *Bacillus thuringiensis* forms protein crystals during particular phase of growth
3. C-peptide is not present in mature insulin and is removed during maturation into insulin
4. All vectors naturally contain antibiotic resistance gene.

83.

_____ integrates information received from semicircular canals of ear and _____ regulates emotional reactions with limbic system.

1. Cerebral cortex, Midbrain
2. Cerebellum, Midbrain
3. Cerebral cortex, Hypothalamus
4. Cerebellum, Hypothalamus

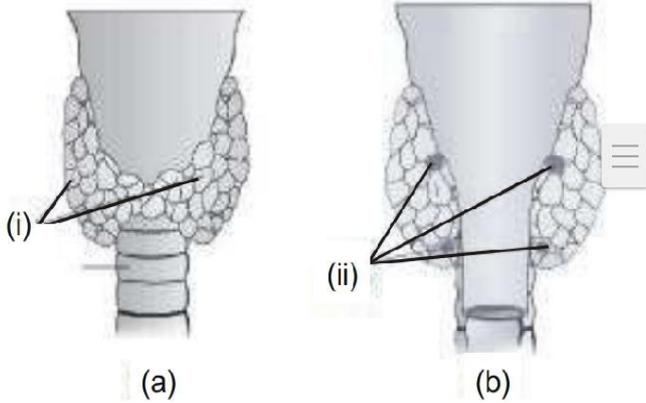
81.

Find the odd statement

1. SA node generates the maximum number of action potential per minute so it sets the pace of the activities of the heart
2. About 70ml of blood is pumped out by each ventricle during a cardiac cycle is stroke volume
3. Heart is autoexcitable, its function can be moderated by neural and hormonal mechanisms
4. Systemic heart includes the right ventricle and left atrium

84.

Identify the gland (a) and (b) shown below and select right option giving their number & function



Gland	Number	Function
a (i) Thyroid	1 pair	Promotes the bone deformation
b (ii) Thyroid	2 pairs	Promotes the stunted growth of growing baby
c (i) Parathyroid	1 pair	Increases the Ca^{+2} level in bone
d (ii) Parathyroid	2 pairs	Increase the Ca^{+2} level in blood

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

85.

Select the correct matching of a hormone, its source and its function –

	Hormone	Source	Function
1.	Norepinephrine	Adrenal medulla	Increases heartbeat, rate of respiration and alertness
2.	Glucagon	Beta-cells of Islets of Langerhans	Stimulates glycogenolysis
3.	Prolactin	Posterior pituitary	Regulates growth of mammary glands and milk formation in females
4.	Vasopressin	Posterior pituitary	Increases loss of water through urine

Zoology - Section B

86.

Major drawback of inbreeding is

1. Increase in homozygosity
2. Decrease in immunity
3. Reduction in fertility
4. Increase in food consumption

87.

The osmotic concentration of glomerular filtrate is the highest at the bottom of the U-shaped Henle's loop. It is about _____ $mOsmL^{-1}$

1. 300
2. 600
3. 900
4. 1200

88. 'Erythroblastosis Foetalis' occurs when

- I. Mother is Rh⁺ and foetus is Rh⁻
- II. Mother is Rh⁻ and foetus is Rh⁺
- III. Mother and foetus both are Rh⁺.
- IV. Mother and foetus both are Rh⁻

1. I & II
2. Only I
3. Only II
4. II, III & IV

89. A motor unit is best described as –

1. All the nerve fibres and muscle fibres in a single muscle bundle
2. One muscle fibre and its single nerve fibre
3. A single motor neuron and all the muscle fibres that it innervates
4. It is the neuron which carries the message from muscle to CNS

90. Which of the following cannot be included under the secondary lymphoid organ?

1. Thymus
2. MALT
3. Spleen
4. Lingual tonsil

91. Each testis in humans is covered by a dense connective tissue covering and has about _____ compartments

1. 2
2. 25
3. 250
4. 500

92. Which statement is correct with reference to chylomicron?

1. They are end products of fat digestion
2. The reconstructed triglycerides in the intestinal cells combine with phospholipids and cholesterol and are released into lymph in the form of protein-coated fat droplets called chylomicrons
3. This is the form in which digested fats are absorbed into intestinal cells
4. These are short chains of fatty acids absorbed directly into blood by diffusion

93. Which of the following neural system relays the impulse from CNS to skeletal muscles?

1. Somatic neural system
2. Sympathetic neural system
3. Parasympathetic neural system
4. Autonomic neural system

94. Select the incorrect match of a hormone, its source, and function

Hormone	Source	Function
1. Oxytocin	Hypothalamus	Milk ejection
2. Vasopressin	Posterior pituitary	Reabsorption of water from the nephric filtrate
3. Cortisol	Adrenal cortex	Anti-inflammatory
4. Adrenaline	Adrenal medulla	Increases Blood pressure and heart rate

95.

In the human body, CO₂ is primarily carried in blood as

1. Dissolved in plasma
2. Carbaminohaemoglobin
3. Sodium bicarbonate
4. Potassium carbonate

96.

Which of the following sequences of PCR is correct?

1. (a) Extension of primer, (b) Annealing, (c) Denaturation
2. (a) Denaturation, (b) Annealing, (c) Extension of Primer
3. (a) Annealing, (b) Extension of Primer, (c) Denaturation
4. (a) Denaturation, (b) Extension of Primer, (c) Annealing

97.

The idea of mutations was brought forth by :

1. Gregor Mendel, who worked on *Pisum sativum*
2. Hardy Weinberg, who worked on allele frequencies in a population
3. Charles Darwin, who observed a wide variety of organisms during sea voyage
4. Hugo de Vries, who worked on evening primrose

98.

Given below are four statements (A-D) each with one or two blanks. Select the option which correctly fills up the blanks in two statements – Statements :

(A) Wings of butterfly and birds look alike and are the results of (i) , evolution

(B) Miller showed that CH₄, H₂, NH₃ and (i) , when exposed to electric discharge in a flask resulted in the formation of (ii) .

(C) Vermiform appendix is a (i) organ and an (ii) evidence of evolution.

(D) According to Darwin evolution took place due to (i) and (ii) of the fittest.

Options :

1. (A) - (i) convergent, (B) - (ii) oxygen, (ii) nucleosides
2. (B) - (i) water vapour, (ii) amino acids, (C) - (i) rudimentary (ii) anatomical
3. (C) - (i) vestigial, (ii) anatomical, (D) - (i) mutations, (ii) multiplication
4. (D) - (i) small variations, (ii) survival, (A) - (i) convergent

99.

Similarities in organism with different genotype indicates :-

1. Microevolution
2. Macroevolution
3. Convergent evolution
4. Divergent evolution

100.

Occurrence of endemic species in south america and Australia due to :-

1. These species has been extinct from other regions
2. Continental separation
3. There is no terrestrial route to these places
4. Retrogressive evolution

Chemistry - Section A

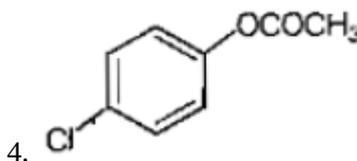
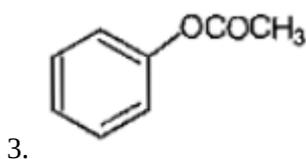
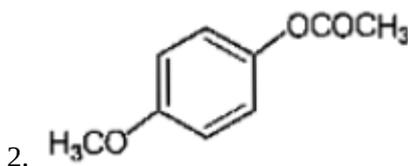
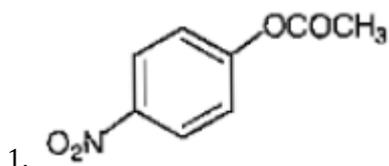
101.

Equal weights of ethane and hydrogen are mixed in an empty container at 25°C. The fraction of the total pressure exerted by hydrogen is

1. 1 : 2
2. 1 : 1
3. 1 : 16
4. 15 : 16

102.

Which one of the following esters get hydrolyzed most easily under alkaline conditions?



103.

The electron gain enthalpies of halogens in kJ mol^{-1} are given below.

F = -332, Cl = -349, Br = -325, I = -295.

The lesser negative value for F as compared to that of Cl is due to:

1. Strong electron-electron repulsions in the compact 2p-subshell of F.
2. Weak electron-electron repulsions in the bigger 3p-subshell of Cl.
3. Smaller electronegativity value of F than Cl.
4. 1 & 2 both

104.

Sodium reacts with water less vigorously than potassium because-

1. It has a higher atomic weight
2. It is less electropositive
3. It is more electronegative
4. It is a metal

105.

A dye absorbs a photon of wavelength λ and re-emits the same energy into two photons of wavelengths λ_1 and λ_2 respectively. The wavelength λ is related with λ_1 and λ_2 as:

1. $\lambda = \frac{\lambda_1 + \lambda_2}{\lambda_1 \lambda_2}$
2. $\lambda = \frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$
3. $\lambda = \frac{\lambda_1^2 + \lambda_2^2}{\lambda_1 + \lambda_2}$
4. $\lambda = \frac{\lambda_1 \lambda_2}{(\lambda_1 + \lambda_2)^2}$

106.

Ether is more volatile than an alcohol having the same molecular formula. This is due to

1. Dipolar character of ethers
2. Alcohols having resonance structures
3. Intermolecular hydrogen bonding in ethers
4. Intermolecular hydrogen bonding in alcohols

107.

The oxidation state of Cr in CrO_6 is -

1. -6
2. +12
3. +6
4. +4

108.

Which of the following compound(s) can react with BF_3 ?

1. Ethers
2. H_2O
3. NH_3
4. All of these

109.

Compound (A) $\text{C}_5\text{H}_{10}\text{O}$ forms a phenyl hydrazone and gives negative Tollen's and iodoform tests. Compound (A) on reduction gives *n*-pentane. Compound (A) is:

1. A primary alcohol
2. An aldehyde
3. A ketone
4. A secondary alcohol

110.

Which of the following have non-zero dipole moment?

1. C_6Cl_6
2. C_2Cl_6
3. $\text{C}(\text{CCl}_3)_4$
4. $:\text{CCl}_2$

111.

Which hydride has the lowest boiling point?

1. H_2O
2. H_2S
3. H_2Se
4. H_2Te

112.

The two complexes $\text{PtCl}_4 \cdot 2\text{NH}_3$ and $\text{PtCl}_4 \cdot 2\text{KCl}$ do not give a precipitate of AgCl when treated with AgNO_3 . They give zero and three moles of ions respectively in solutions for one mole of the complex. The structural formulae of both complexes are-

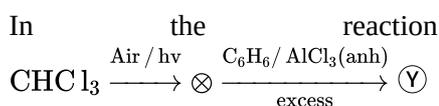
1. $[\text{PtCl}_2(\text{NH}_3)_2]\text{Cl}_2$ and $\text{K}_2[\text{PtCl}_6]$ respectively
2. $[\text{PtCl}_4(\text{NH}_3)_2]$ and $\text{K}_2[\text{PtCl}_2(\text{NH}_3)_2]$ respectively
3. $[\text{PtCl}_4(\text{NH}_3)_2]$ and $\text{K}_2[\text{PtCl}_6]$ respectively
4. $[\text{PtCl}_4] \cdot 2\text{NH}_3$ and $[\text{PtCl}_4] \cdot 2\text{KCl}$ respectively

113.

Which of the following is present in a maximum amount in acid rain?

1. HNO_3
2. H_2SO_4
3. HCl
4. H_2CO_3

114.



The product (Y)

1. COCl_2
2. $\text{C}_6\text{H}_5 - \overset{\text{O}}{\parallel} \text{C} - \text{C}_6\text{H}_5$
3. $\text{C}_6\text{H}_5\text{CHO}$
4. $\text{C}_6\text{H}_5\text{COOH}$

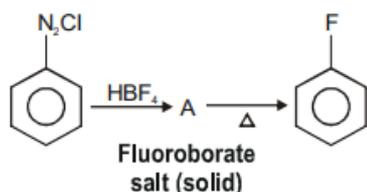
115.

For a reaction $\text{A} \rightarrow \text{B}$; Arrhenius equation is given as $\log_e k = 4 - \frac{1000}{T}$; what will be the activation energy in J/mol for above reaction?

1. 8314
2. 2000
3. 2814
4. 3412

116.

The following reaction is best method to introduce - F at benzene :-



The structure of intermediate compound A is

- 1.
- 2.
- 3.
- 4.

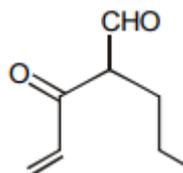
117.

sequence Total vapour pressure of mixture of 1 mol X ($P_x^a = 150$ torr) and 2 mol Y ($P_Y^a = 300$ torr) is 240 torr. In this case:-

1. There is a negative deviation from Raoult's law
2. There is a positive deviation from Raoult's law
3. There is no deviation from Raoult's law
4. Can not be decided

118.

The IUPAC name of the give compounds



1. 3 - keto - 2 - methyl - pent - 4 - enal
2. 2 - keto - 2 - ethyl but - 2 - enal
3. 3 - keto - 2 - propyl pent - 4 - enal
4. 2 - keto - 2 - propyl pent - 4 - enal

119.

Which of the following on reaction with cyclohexanol gives best yield cyclohexene?

1. conc. H_3PO_4
2. conc. HCl
3. conc. HBr
4. all of these

120.

Plants and living beings are examples of

1. Isolated system
2. Adiabatic system
3. Open system
4. Closed system

121.

Among the following the maximum covalent character is shown by the compound:

1. $MgCl_2$
2. $FeCl_2$
3. $AlCl_3$
4. $SnCl_2$

122.

The lanthanide contraction is responsible for the fact that

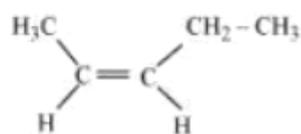
1. Zr and Y have about the same radius
2. Zr and Zn have the same oxidation state
3. Zr and Hf have about the same atomic radius
4. Zr and Nb have a similar oxidation state

123.

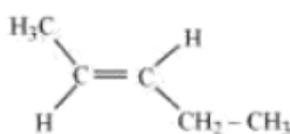
Toluene when refluxed with Br_2 in the presence of light mainly gives

1. p-Bromotoluene
2. Benzyl bromide
3. o-Bromotoluene
4. Mixture of o- and p-bromotoluene

124.



Cis - isomer



Trans - isomer

The reason behind higher boiling point of one isomer of Hex-2-ene is-

1. Cis - less polar than trans
2. Trans - more polar than cis
3. Cis - more intermolecular forces
4. Trans - more dipole-dipole interactions

125.

What will be the molarity of a solution, which contains 5.85 g of $NaCl(s)$ per 500 mL?

1. 4 mol L^{-1}
2. 20 mol L^{-1}
3. 0.2 mol L^{-1}
4. 2 mol L^{-1}

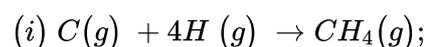
126.

Which of the following order of energies of molecular orbitals of N_2 is correct?

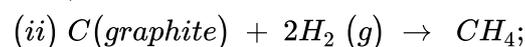
1. $(\pi 2p_y) < (\sigma 2p_z) < (\pi^* 2p_x) \approx (\pi^* 2p_y)$
2. $(\pi 2p_y) > (\sigma 2p_z) > (\pi^* 2p_x) \approx (\pi^* 2p_y)$
3. $(\pi 2p_y) < (\sigma 2p_z) = (\pi^* 2p_x) \approx (\pi^* 2p_y)$
4. $(\pi 2p_y) > (\sigma 2p_z) < (\pi^* 2p_x) \approx (\pi^* 2p_y)$

127.

Consider the reactions given below. On the basis of these reactions find out which of the algebraic relationship given in options (a) to (d) is correct?



$$\Delta H_r = x \text{ kJ mol}^{-1}$$



$$\Delta H_r = y \text{ kJ mol}^{-1}$$

1. $x=y$
2. $x=2y$
3. $x>y$
4. $x<y$

128.

Which of the following will produce a buffer solution when mixed in equal volumes?

1. $0.1 \text{ mol dm}^{-3} \text{ NH}_4\text{OH}$ and $0.1 \text{ mol dm}^{-3} \text{ HCl}$
2. $0.05 \text{ mol dm}^{-3} \text{ NH}_4\text{OH}$ and $0.1 \text{ mol dm}^{-3} \text{ HCl}$
3. $0.1 \text{ mol dm}^{-3} \text{ NH}_4\text{OH}$ and $0.05 \text{ mol dm}^{-3} \text{ HCl}$
4. $0.1 \text{ mol dm}^{-3} \text{ CH}_3\text{COONa}$ and $0.1 \text{ mol dm}^{-3} \text{ NaOH}$

129.

K_a for CH_3COOH is 1.8×10^{-5} and K_b for NH_4OH is 1.8×10^{-5} . The pH of ammonium acetate will be

1. 7.005
2. 4.75
3. 7.0
4. Between 6 and 7

130.

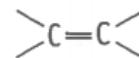
In which of the following reactions, the equilibrium remains unaffected on addition of small amount of argon at constant volume?

1. $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$
2. $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$
3. $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$
4. The equilibrium will remain unaffected in all the three cases

131.

The addition of HCl to an alkene proceeds in two steps.

The first step is the attack of H^+ ion to



portion which can be shown as

- 1.
- 2.
- 3.

4. All of these are possible

132.

The main component present in starch and glycogen is

1. Amylose
2. Glucose
3. Amylopectin
4. Cellulose

133.

Molar conductivities (\wedge°_m) at infinite dilution of NaCl, HCl and CH_3COONa are 126.4, 425.9 and $91.0 \text{ S cm}^2 \text{ mol}^{-1}$ respectively. (\wedge°_m) for CH_3COOH will be:

1. $180.5 \text{ S cm}^2 \text{ mol}^{-1}$
2. $290.8 \text{ S cm}^2 \text{ mol}^{-1}$
3. $390.5 \text{ S cm}^2 \text{ mol}^{-1}$
4. $425.5 \text{ S cm}^2 \text{ mol}^{-1}$

134.

Match the interhalogen compounds of column I with the geometry in column-II and assign the correct code:

Column-I	Column-II
(A) XX'	(i) T-shape
(B) XX'_3	(ii) Pentagonal bipyramidal
(C) XX'_5	(iii) Linear
(D) XX'_7	(iv) Square Pyramidal

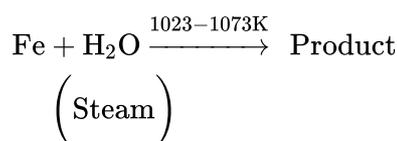
1. A-(iii) B-(i) C-(iv) D-(ii)

2. A-(i) B-(iv) C-(iii) D-(ii)

3. A-(iv) B-(iii) C-(ii) D-(i)

4. A-(iii) B-(iv) C-(i) D-(ii)

135.



Product formed is

1. $\text{FeO} + \text{H}_2$

2. $\text{Fe}_2\text{O}_3 + \text{H}_2\text{O}$

3. $\text{Fe}_2\text{O}_3 + \text{H}_2$

4. $\text{Fe}_3\text{O}_4 + \text{H}_2$

Chemistry - Section B

136.

Melamine plastic crockery is a copolymer of:

1. HCHO and melamine

2. HCHO and ethylene

3. Melamine and ethylene

4. none of the above

137.

How much oxygen is dissolved in 100ml water at 298K if partial pressure of oxygen is 0.5 atm and $K_{\text{H}} = 1.4 \times 10^{-3} \text{ M/atm}$?

1. 22.4 mg

2. 22.4 g

3. 2.24 g

4. 2.24 mg

138.

Which of the following is electron-deficient?

1. $(\text{SiH}_3)_2$

2. $(\text{BH}_3)_2$

3. PH_3

4. $(\text{CH}_3)_2$

139.

Among the following, the narrow-spectrum antibiotic is:

1. Chloramphenicol

2. Penicillin G

3. Ampicillin

4. Amoxicillin

140.

The number of S=O bonds in $H_2S_2O_8$ is

- 1
- 2
- 3
- 4

141.

During the process of electrolytic refining of copper, some metals are present as impurities and settle as anode mud. These are

- Ag and Au
- Pb and Zn
- Fe and Ni
- Sn and Ag

142.

The pH of 0.01 M NaOH (aq) solution will be-

- 7.01
- 2
- 12
- 9

143.

The formula of nickel oxide with metal deficiency defect in its crystal is $Ni_{0.98}O$. The crystal contains Ni^{2+} and Ni^{3+} ions. The fraction of nickel existing as Ni^{2+} ions in the crystal is-

- 0.96
- 0.04
- 0.50
- 0.31

144.

What is the rate equation for reaction $2A + B \rightarrow C$ if the order of the reaction is zero?

- $k [A]^0 [B]^0$
- $k [A]^1 [B]^0$
- $k [A]^1 [B]^1$
- None of these

145.

IUPAC name of the given compound is



- 3-Phenylpropane
- Phenyl-1-butane
- 2-Benzylethane
- Propyl benzene

146.

An emulsion cannot be broken by -

- Heating.
- Adding more amount of dispersion medium.
- Freezing.
- Centrifuging.

147.

Which of the following actinoids show oxidation states up to +7?

- Am
- Th
- U
- Np

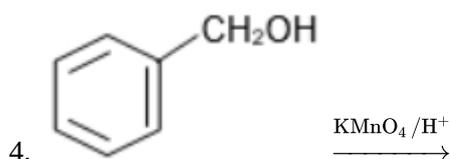
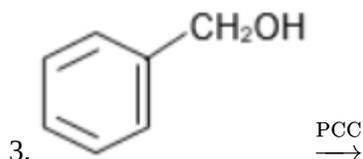
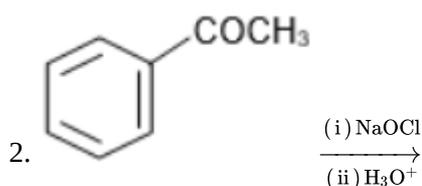
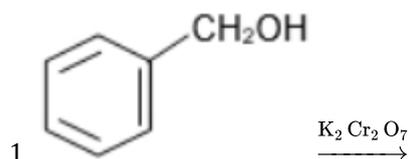
148.

Iron carbonyl, $\text{Fe}(\text{CO})_5$ is

1. Tetranuclear
2. Mononuclear
3. Trinuclear
4. dinuclear

149.

The reaction that does not give benzoic acid as the major product is-



150.

An alkene 'A' on ozonolysis gives a mixture of ethanal and pentane-3-one. The IUPAC name of 'A' is -

1. 3-Ethylpent-2-ene
2. 3-Ethylpent-2-yne
3. 2-Ethylpent-3-ene
4. 3-Ethylpent-4-yne

Physics - Section A

151.

An electron moves in a circular orbit with a uniform speed v . It produces a magnetic field B at the centre of the circle. The radius of the circle is:

1. $\frac{\mu_0 ev}{2\pi B}$
2. $\sqrt{\frac{\mu_0 ev}{4\pi B}}$
3. $\frac{ev}{2\pi B^2}$
4. $\sqrt{\frac{ev}{2\pi B}}$

152.

The voltage sensitivity of a moving coil galvanometer becomes K times when the number of turns is tripled. The value of K is:

1. 9
2. 3
3. 27
4. 1

153.

Let f_1 be the maximum frequency of Lyman series, f_2 be the frequency of the first line of the Lyman series and f_3 the frequency of the series limit of the Balmer series. Then which of the following is correct?

1. $f_1 - f_2 = f_3$
2. $f_2 - f_1 = f_3$
3. $f_1 + f_2 = f_3$
4. $2f_1 = f_2 + f_3$

154.

Like angular momentum, which another physical quantity is quantized in Bohr's model of a hydrogen atom?

1. Kinetic energy
2. Magnetic moment
3. Potential energy
4. Mechanical energy

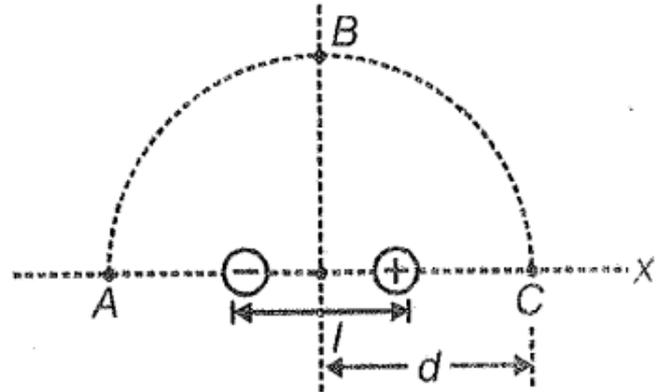
155.

The statement which is incorrect about nuclear force between two protons is:

1. These are always attractive forces
2. These are non-central forces
3. These are charge independent
4. These are short-range forces

156.

An electric dipole is kept at the origin as shown in the diagram. The point A, B, C are on a circular arc with the centre of curvature at the origin. If the electric fields at A, B and C respectively are \vec{E}_1 , \vec{E}_2 , \vec{E}_3 , then which of the following is incorrect? ($d \gg l$)



1. $\vec{E}_1 = -\vec{E}_3$
2. $\vec{E}_1 = -2\vec{E}_2$
3. $\vec{E}_1 = \vec{E}_3$
4. $\vec{E}_3 = -2\vec{E}_2$

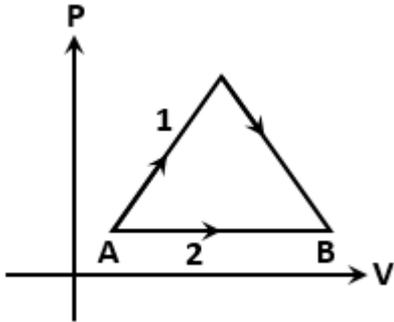
157.

The efficiency of a Carnot heat engine working between the temperatures $27^\circ C$ and $227^\circ C$ is:

1. 0.1
2. 0.6
3. 0.2
4. 0.4

158.

A gas undergoes the change in its thermodynamic state from A to B via two different paths as shown in the given pressure (P) versus volume (V) graph, then:



1. The temperature of the gas decreases in path 1 from A to B
2. The heat absorbed by the gas in path 1 is greater than in path 2
3. The heat absorbed by the gas in path 2 is greater than in path 1
4. Change in internal energy in path 1 is greater than in path 2

159.

Three identical particles each of mass M are located at the vertices of an equilateral triangle of side a. The escape speed of one particle will be:

1. $\sqrt{\frac{4GM}{a}}$
2. $\sqrt{\frac{3GM}{a}}$
3. $\sqrt{\frac{2GM}{a}}$
4. $\sqrt{\frac{GM}{a}}$

160.

A charged particle q of mass m is released on the y-axis at y = a in an electric field $\vec{E} = -4y\hat{j}$. The speed of particle on reaching origin will be:

1. $\sqrt{\frac{2a}{mq}}$
2. $\frac{a}{\sqrt{mq}}$
3. $2a\sqrt{\frac{q}{m}}$
4. $2\sqrt{\frac{a}{mq}}$

161.

A boy is standing on a disc rotating about the vertical axis passing through its centre. He pulls his arms towards himself reducing his moment of inertia by a factor m. The new angular speed of the disc becomes double its initial value. If the moment of inertia of the boy is I_0 , then the moment of inertia of the disc will be:

1. $2I_0m$
2. $I_0\left(1 - \frac{2}{m}\right)$
3. $I_0\left(1 - \frac{1}{m}\right)$
4. $\left(\frac{I_0}{2m}\right)$

162.

Five particles of mass 2 kg each are attached to the circumference of a circular disc of the radius of 0.1 m and negligible mass. Moment of inertia of the system about the axis passing through the centre of disc and perpendicular to its plane is:

1. 1 kg-m²
2. 0.1 kg-m²
3. 2 kg-m²
4. 0.2 kg-m²

163.

In the case of a potentiometer if the resistance of rheostat is increased, then the balancing length for the same cell in the secondary circuit will:

1. Increase
2. Decrease
3. Remains same
4. May increase or decrease

164.

If the potential difference across ends of a metallic wire is doubled, the drift velocity of charge carriers will become:

1. Double
2. Halved
3. Four times
4. One-fourth

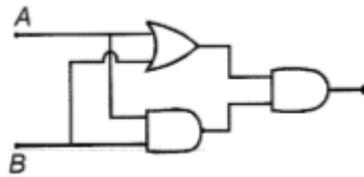
165.

The ratio of the velocity of light in a medium to the velocity of light in a vacuum is $\frac{4}{5}$. If the ray of light is emerging from this medium into the air, then the critical angle for this interface of medium and air will be:

1. 30°
2. 37°
3. 53°
4. 45°

166.

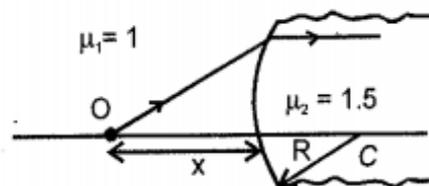
The combination of gates shown in the diagram is equivalent to:



1. OR
2. AND
3. NAND
4. NOT

167.

In the following diagram what is the distance x if the radius of curvature is $R = 15$ cm?



1. 30 cm
2. 20 cm
3. 15 cm
4. 10 cm

168.

Two iron balls when fully immersed in water experience thrust force in the ratio of 1:2, then the ratio of the masses of balls will be:

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

169.

Two particles are simultaneously projected in opposite directions horizontally from a given point in space where gravity g is uniform. If u_1 and u_2 be their initial speeds, then the time t after which their velocities are mutually perpendicular is given by:

1. $\frac{\sqrt{u_1 u_2}}{g}$
2. $\frac{\sqrt{u_1^2 + u_2^2}}{g}$
3. $\frac{\sqrt{u_1(u_1 + u_2)}}{g}$
4. $\frac{\sqrt{u_2(u_1 + u_2)}}{g}$

170.

If $x = \frac{a \sin \theta + b \cos \theta}{a + b}$, then :

1. the dimensions of x and a are the same.
2. the dimensions of a and b are not the same.
3. x is dimensionless.
4. None of these

171.

A helicopter moving vertically upwards releases a packet when it is at a certain height above the ground. The packet initially moves upwards for a time t_1 and then falls downwards for a time t_2 until it reaches the ground. Then:

1. $t_1 < t_2$
2. $t_1 = t_2$
3. $t_1 > t_2$
4. Data insufficient

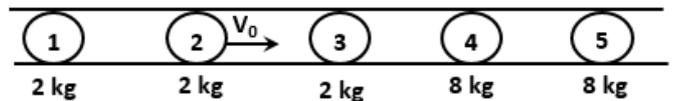
172.

A parallel plate air capacitor is charged to potential difference V . After disconnecting the battery, the distance between the plates of the capacitor is increased using an insulating handle. As a result the potential difference between the plates:

1. Decreases
2. Increases
3. Becomes zero
4. Does not change

173.

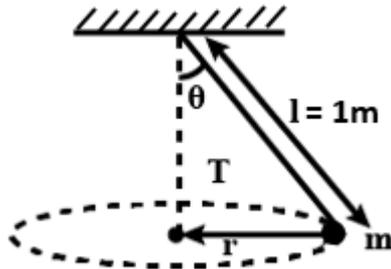
Five balls are placed one after another along a straight line as shown in the figure. Initially, all the balls are at rest. Then the second ball has been projected with speed V_0 towards the third ball. Mark the correct statement. (Assume all collisions to be head-on and elastic):



1. The total number of collisions in the process is 5
2. The velocity of separation between the first and fifth ball after the last possible collision is V_0
3. Finally three balls remain stationary
4. All of the above are correct

174.

A massless string of length 1 m fixed at one end carries a mass of 2 kg at the other end. The string makes $\frac{2}{\pi}$ rev/s around the axis through the fixed end as shown in the figure. The tension in the string is:



1. 32 N
2. 3 N
3. 16 N
4. 4 N

175.

The de-Broglie wavelength of a particle accelerated by 150 Volt potential difference is 10^{-10} m. If it is accelerated by 600 volts potential difference, its wavelength will be:

1. 0.25 \AA
2. 0.5 \AA
3. 1.5 \AA
4. 2 \AA

176.

A sufficiently long-closed organ pipe has a small hole at its bottom. Initially, the pipe is empty. Water is poured into the pipe at a constant rate. The fundamental frequency of the air column in the pipe:

1. Continuously increases
2. First increases then become constant
3. Continuously decreases
4. First decreases then becomes constant

177.

Which statement(s) is(are) correct for X-rays and gamma rays?

1. X-rays are emitted from electronic transitions while gamma rays are emitted from nuclear transitions.
2. X-rays have less penetrating power in comparison to gamma rays, in general.
3. The frequency of gamma rays is more than the frequency of X-rays, in general.
4. All of the above.

178.

A geyser heats water flowing at the rate of 3.0 liter per minute from 27°C to 77°C . If the geyser operates on a gas burner and its heat of combustion is 4.0×10^4 J/g, then what is the rate of combustion of fuel (approx)?

1. 24 g/min
2. 12 g/min
3. 32 g/min
4. 16 g/min

179.

An air-cored solenoid having a length of 30 cm whose area is 25 cm^2 , and the number of turns is 500 carries a current of 2.5 A. Suddenly the current is turned off and the time taken for it is 10^{-3} s. What would be the average value of the induced back-emf across the ends of the open switch in the circuit? (Neglect the variation in the magnetic field near the ends of the solenoid.)

1. 5.5 V
2. 4.5 V
3. 6.5 V
4. 4.0 V

180.

The ratio of the average translatory kinetic energy of He gas molecules to O₂ gas molecules is:

1. $\frac{25}{21}$
2. $\frac{21}{25}$
3. $\frac{3}{2}$
4. 1

181.

A steel rod has a radius 10 mm and a length of 1.0 m. A force stretches it along its length and produces a strain of 0.32%. Young's modulus of the steel is $2.0 \times 10^{11} \text{ Nm}^{-2}$. What is the magnitude of the force stretching the rod?

1. 100.5 kN
2. 201 kN
3. 78 kN
4. 150 kN

182.

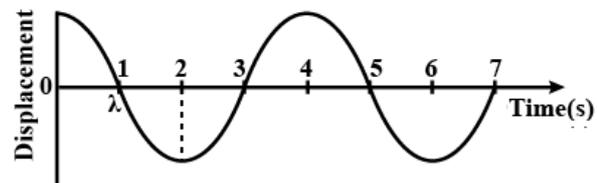
In a series, LC circuit, if $L = 10^{-3} \text{ H}$ and $C = 3 \times 10^{-7} \text{ F}$ is connected to a 100 V-50 Hz a.c. source, the impedance of the circuit is:

1. $\frac{10^5}{3\pi} - 10\pi$
2. $0.1\pi - 3 \times 10^{-5}\pi$
3. $\frac{10^5}{3\pi} - \frac{\pi}{10}$
4. None of these

183.

Displacement versus time curve for a particle executing SHM is shown in the figure. Choose the correct statements.

- a. Phase of the oscillator is the same at $t = 0 \text{ s}$ and $t = 2 \text{ s}$
- b. Phase of the oscillator is the same at $t = 2 \text{ s}$ and $t = 6 \text{ s}$
- c. Phase of the oscillator is the same at $t = 1 \text{ s}$ and $t = 7 \text{ s}$
- d. The phase of the oscillator is the same at $t = 1 \text{ s}$ and $t = 5 \text{ s}$



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

184.

Identify the function which represents a periodic motion.

1. $e^{\omega t}$
2. $\log_e(\omega t)$
3. $\sin \omega t + \cos \omega t$
4. $e^{-\omega t}$

185.

A circular coil expands radially in a region of magnetic field and no electromotive force is produced in the coil. This can be because

- (a) the magnetic field is constant
- (b) the magnetic field is in the same plane as the circular coil and it may or may not vary
- (c) the magnetic field has a perpendicular (to the plane of the coil) component whose magnitude is decreasing suitably
- (d) there is a constant magnetic field in the perpendicular (to the plane of the coil) direction

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

Physics - Section B

186.

S.I. unit of intensity of magnetization is :

- 1. Ampere-metre
- 2. Ampere-metre²
- 3. Ampere/metre
- 4. Ampere/metre²

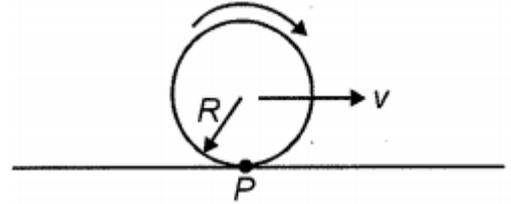
187.

Binding energy per nucleon of a fixed nucleus ${}_A X$ is 8 MeV. It absorbs a neutron moving with kinetic energy 4 MeV and converts into Y emitting a photon of energy 2 MeV. The binding energy per nucleon of Y (in MeV) is-

- 1. $\frac{8A+2}{A+1}$
- 2. $\frac{8A-2}{A+1}$
- 3. $\frac{8A-1}{A+1}$
- 4. $\frac{8A}{A+1}$

188.

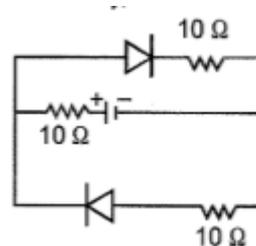
A disc is performing pure rolling with constant angular velocity on a smooth stationary surface. Then at any instant, for point of contact P of the disc-



- 1. Velocity is v, acceleration is zero
- 2. Velocity is zero, acceleration is $\frac{v^2}{R}$
- 3. Velocity is zero, acceleration is zero
- 4. Velocity is v, acceleration is $\frac{v^2}{R}$

189.

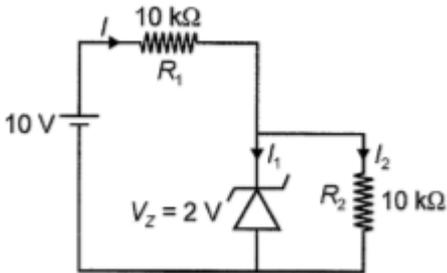
What is the equivalent resistance across the terminals of the battery if the diodes are ideal?



- 1. 10Ω
- 2. 20Ω
- 3. 15Ω
- 4. $\frac{10}{3} \Omega$

190.

Current I_1 through the Zener diode shown in the circuit is-



1. Zero
2. 0.6 mA
3. 0.2 mA
4. 0.8 mA

191.

The radius of an air bubble is double that of another. The ratio of the excess pressure in the bubbles will be

1. $1: \sqrt{2}$
2. 1: 2
3. 1: 4
4. 1: 8

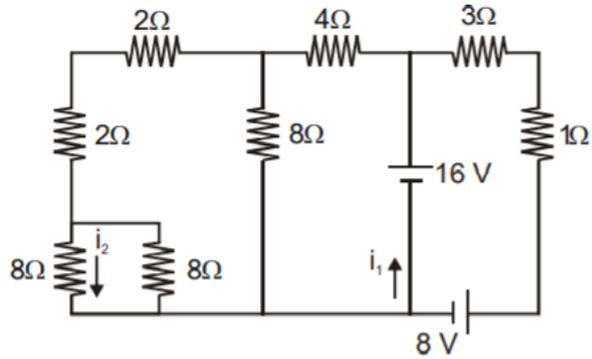
192.

The electric potential difference between two parallel plates is 2000 V. If the plates are separated by 2 mm, what is the magnitude of the electrostatic force on a charge of $4 \times 10^{-6} C$ located midway between the plates?

1. 4 N
2. 6 N
3. 8 N
4. $1.5 \times 10^{-6} N$

193.

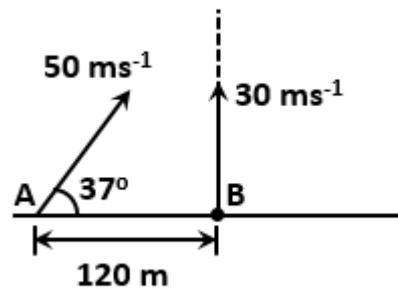
In the circuit shown in the figure, the ratio of currents, i_1/i_2 is:



1. 2
2. 8
3. 0.5
4. 4

194.

Balls A and B are thrown from two points lying on the same horizontal plane separated by a distance of 120 m. Which of the following statements is correct?



1. The balls can never meet.
2. The balls can meet if the ball B is thrown 1 s later.
3. The two balls meet at a height of 45 m.
4. None of the above

195.

The force required to just move a body up the inclined plane is double the force required to just prevent the body from sliding down the plane. If the coefficient of friction is μ and θ is the angle of inclination of the plane, then $\tan \theta$ is equal to:

1. μ
2. 3μ
3. 2μ
4. 0.5μ

196.

LC oscillations are not sustainable for long due to the following reason:

1. Every inductor has some resistance.
2. The effect of resistance is to introduce a damping effect on the charge & current in the circuit and the oscillations finally die away.
3. Even if the resistance is zero, the total energy of the system is radiated away from the system in the form of electromagnetic radiation.
4. All of the above

197.

A particle moves with velocity $(5\hat{i} - 3\hat{j} + 6\hat{k})\text{m/s}$ under the influence of a constant force $\vec{F} = (10\hat{i} + 10\hat{j} + 20\hat{k})\text{N}$. The instantaneous power applied to the particle is:

1. 200 J/sec
2. 40 J/sec
3. 140 J/sec
4. 170 J/sec

198.

Red light is generally used to observe diffraction patterns from a single slit. If the blue light is used instead of red light, then diffraction pattern:

1. Will be more clear
2. Will contract
3. Will expand
4. Will not be visualized

199.

A concave mirror gives an image three times as large as the object placed at a distance of 20 cm from it. For the image to be real, the focal length should be:

1. 10 cm
2. 15 cm
3. 20 cm
4. 30 cm

200.

A helicopter of mass 1000 kg rises with a vertical acceleration of 15ms^{-2} . The crew and the passengers weigh 300 kg. The magnitude and direction of the action of the rotor of the helicopter on the surrounding air are:

1. $3.25 \times 10^4\text{N}$ (upwards)
2. $3.25 \times 10^4\text{N}$ (downwards)
3. $7.5 \times 10^3\text{N}$ (upwards)
4. $7.5 \times 10^3\text{N}$ (downwards)

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