

1. Which of the following are found in extreme saline conditions?
  - (1) Archaeobacteria
  - (2) Eubacteria
  - (3) Cyanobacteria
  - (4) Mycobacteria
2. Which one of the following statements is correct with reference to enzymes?
  1. Holoenzyme= Apoenzyme+Coenzyme
  2. Coenzyme= Apoenzyme+Holoenzyme
  3. Holoenzyme= Coenzyme+ CO-factor
  4. Apoenzyme=Holoenzyme+Coenzyme
3. A decrease in blood pressure/volume will not cause the release of
  1. Atrial natriuretic factor
  2. Aldosterone
  3. ADH
  4. Renin
4. Which cells of "Crypts of Lieberkühn" secrete antibacterial lysozyme?
  1. Paneth cells
  2. Zymogen cells
  3. Kupffer cells
  4. Argentaffin cells
5. Which of the following are not polymeric?
  1. Proteins
  2. Polysaccharides
  3. Lipids
  4. Nucleic acids
6. Functional megaspore in an angiosperm develops into?
  1. Endosperm
  2. Embryo sac
  3. Embryo
  4. Ovule
7. Myelin sheath is produced by:
  1. Astrocytes and Schwann cells
  2. Oligodendrocytes and Osteoclasts
  3. Osteoclasts and Astrocytes
  4. Schwann cells and Oligodendrocytes
8. Attractants and rewards are required for:
  1. Entomophily
  2. Hydrophily
  3. Cleistogamy
  4. Anemophily
9. Receptor sites for neurotransmitters are present on:
  1. Pre-synaptic membrane
  2. Tips of axons
  3. Post-synaptic membrane
  4. Membrane of synaptic vesicles
10. Coconut fruit is a:
  1. Berry
  2. Nut
  3. Capsule
  4. Drupe

11. Adult human RBCs are enucleated. Which of the following statement(s) is/ are the most appropriate explanation for this feature?
- They do not need to reproduce
  - They are somatic cells
  - They do not metabolize
  - All their internal space is available for oxygen transport
- Only (a)
  - (a),(c) and (d)
  - (b) and (c)
  - Only (d)
12. Capacitation occurs in:
- Epididymis
  - Vas deference
  - Female reproductive tract
  - Rete testis
13. Asymptote in a logistic growth curve is obtained when:
- $K=N$
  - $K>N$
  - $K<N$
  - The value of 'r' approaches zero
14. Artificial selection to obtain cows yielding higher milk output represents:
- Directional as it pushes the mean of the charcter in one direction
  - Disruptive as it splits the population into two, one yeilding output and the other lower output
  - Stabilizing followed by disruptive as it stablizes the population to produce higher yielding cows
  - Stabilizing selection as it stabilizes this character in the population
15. Select the mismatch:
- Rhodospirillum - Mycorrhiza
  - Anabaena - Nitrogen fixer
  - Rhizobium - Alfalfa
  - Frankia - Alnus
16. Good vision depends on adequate intake of carotene rich food. Select the best option from the following statements:
- Vitamin A derivatives are formed from carotene
  - The photopigments are embedded in the membrane discs of the inner segment
  - Retinal is a derivative of Vitamin A
  - Retinal is a light absorbing part of all the visual photopigments
- (i),(iii) and (iv)
  - (i) and (iii)
  - (ii), (iii) and (iv)
  - (i) and (iv)
17. The DNA fragments separated on an agarose gel can be visualized after staining with:
- Acetocarmine
  - Aniline blue
  - Ethidium bromide
  - Bromophenol blue
18. The hepatic portal vein drains blood to liver from:
- Stomach
  - Kidneys
  - Intestine
  - Heart
19. The vascular cambium normally gives rise to:
- Primary Phloem
  - Secondary xylem
  - Periderm
  - Phelloderm

20. Thalassaemia and sickle cell anaemia are caused due to a problem in globin molecule synthesis. Select the correct statement
1. both are due to a quantitative defect in globin chain synthesis
  2. Thalassaemia is due to less synthesis of globin molecules
  3. Sickle cell anemia is due to a quantitative problem of globin molecules
  4. Both are due to a qualitative defect in globin chain synthesis
21. The genotypes of a husband and Wife are  $I^A I^B$  and  $I^A i$ . Among the blood types of their children, how many different genotypes and phenotypes are possible?
1. 3 genotypes; 4 phenotypes
  2. 4 genotypes; 3 phenotypes
  3. 4 genotypes; 4 phenotypes
  4. 3 genotypes; 3 phenotypes
22. Which of the following facilitates opening of stomatal aperture?
1. Decrease in turgidity of guard cells
  2. Radial orientation of cellulose microfibrils in the cell wall of guard cells.
  3. Longitudinal orientation of cellulose microfibrils in the cell wall of guard cells
  4. Contraction of outer wall of guard cells
23. In Bougainvillea thorns are the modifications of:
1. Adventitious root
  2. Stem
  3. Leaf
  4. Stipules
24. Which one of the following is related to Ex-situ conservation of threatened animals and plants?
1. Biodiversity hot spots
  2. Amazon rainforest
  3. Himalayan region
  4. Wildlife safari parks
25. Root hairs develop from the region of:
1. Elongation
  2. Root cap
  3. Meristematic activity
  4. Maturation
26. A disease caused by an autosomal primary non-disjunction is:
1. Klinefelter's Syndrome
  2. Turner's Syndrome
  3. Sickle Cell Anemia
  4. Down's Syndrome
27. The water potential of pure water is:
1. Less than zero
  2. More than zero but less than one
  3. More than one
  4. Zero
28. Which of the following options gives the correct sequence of events during mitosis?
1. Condensation, nuclear membrane disassembly, arrangement at equator, centromere division, segregation, telophase
  2. Condensation, crossing over, nuclear membrane disassembly, segregation, telophase
  3. Condensation, arrangement at equator, centromere division, segregation, telophase
  4. condensation, nuclear membrane disassembly, crossing over, segregation, telophase

29.

The process of separation and purification of expressed protein before marketing is called:

1. Downstream processing
2. Bioprocessing
3. Postproduct processing
4. Upstream processing

30.

A temporary endocrine gland in the human body is:

1. Corpus cardiacum
2. Corpus luteum
3. Corpus allatum
4. Pineal gland

31.

Which of the following is made up of dead cells?

1. Collenchyma
2. Phellem
3. Phloem
4. Xylem parenchyma

32.

An example of colonial alga is:

1. Volvox
2. Ulothrix
3. Spirogyra
4. Chlorella

33.

Match the following sexually transmitted diseases (Column-I) with their causative agent (Column-II) and select the correct option:

**Column-I**

- (a) Gonorrhoea
- (b) Syphilis
- (c) Genital Warts
- (d) AIDS

**Column-II**

- (i) HIV
- (ii) Neisseria
- (iii) Treponema
- (iv) Human Papilloma-Virus

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

34.

The function of copper ions in copper releasing IUD's is:

1. They inhibit gametogenesis
2. They make uterus unsuitable for implantation
3. They inhibit ovulation
4. They suppress sperm motility and fertilizing capacity of sperms

35.

Which of the following in sewage treatment removes suspended solids?

1. Secondary treatment
2. Primary treatment
3. Sludge treatment
4. Tertiary treatment

36.

An important characteristic that Hemichordates share with Chordates is:

1. Ventral tubular nerve cord
2. Pharynx with gill slits
3. Pharynx without gill slits
4. Absence of notochord

37.

The final proof for DNA as the genetic material came from the experiments of:

1. Hershey and chase
2. Avery, McLeod and McCarty
3. Har Gobind Khorana
4. Griffith

38.

Among the following characters, which one was not considered by Mendel in his experiments on pea?

1. Trichomes-Gladular or non-gladular
2. Seed-green or yellow
3. Pod-inflated or constricted
4. Stem-Tall or Dwarf

39.

Plants which produce characteristic pneumatophores and show vivipary belong to:

1. Halophytes
2. Psammophytes
3. Hydrophytes
4. Mesophytes

40.

The pivot joint between atlas and axis is a type of:

1. Cartilaginous joint
2. Synovial joint
3. Saddle joint
4. Fibrous joint

41.

With reference to factors affecting the rate of photosynthesis, which of the following statements is not correct?

1. increasing atmospheric CO<sub>2</sub> concentration up to 0.05% can enhance CO<sub>2</sub> fixation rate
2. C<sub>3</sub> plants respond to higher temperatures with enhanced photosynthesis while C<sub>4</sub> plants have much lower temperature optimum
3. Tomato is a greenhouse crop which can be grown in CO<sub>2</sub> enriched atmosphere for higher yield
4. Light saturation for CO<sub>2</sub> fixation occurs at 10% of full sunlight

42.

DNA fragments are:

1. Negatively charged
2. Neutral
3. Either positively charged depending on their size
4. Positively charged

43.

Which of the following components provides sticky character to the bacterial cell?

1. Nuclear membrane
2. Plasma membrane
3. Glycocalyx
4. Cell Wall

44.

Which of the following options best represents the enzyme composition of pancreatic juice?

1. Amylase, pepsin, trypsinogen, maltase
2. Peptidase, amylase, pepsin, rennin
3. Lipase, amylase, trypsinogen, procarboxypaptidase
4. Amylase, peptidase, trypsonigen, rennin

45. Which among these is the correct combination of aquatic mammals?
1. Dolphin, Seals, Trygon
  2. Whales, Dolphin, Seals
  3. Trygon, Whales, Seals
  4. Seals, Dolphine, Sharks
46. Fruit and leaf drop at early stages can be prevented by the application of:
1. Ethylene
  2. Auxins
  3. Gibberellic acid
  4. Cytokinins
47. Select the correct route for the passage of sperms in male frogs:
1. Testes, Vasa efferentia, Kidney, Seminal Vesicle, Urinogenital duct, Cloaca
  2. Testes, Vasa efferentia, Bidder's canal, Uretar, Cloaca
  3. Testes, Vasa efferentia, Kidney, Bidder's canal, Urinogenital duct, Cloaca
  4. Testes, Bidder's canal, Kidney, Vasa efferentia, Urinogenital duct, Cloaca
48. In case of a couple where the male is having a very low sperm count, which technique will be suitable for fertilization?
1. Gamete intracytoplasmic fallopian transfer
  2. Aritificial insemination
  3. Intracytoplasmic sperm injection
  4. Intrauterine transfer
49. Which ecosystem has the maximum biomass?
1. Grassland ecosystem
  2. Pond ecosystem
  3. Lake ecosystem
  4. Forest ecosystem
50. Lungs are made up of air-filled sacs, the alveoli. They do not collapse even after forceful expiration, because of:
1. Inspiratory Reserve Volume
  2. Tidal Volume
  3. Expiratory Reserve Volume
  4. Residual Volume
51. Presence of plants arranged into well-defined vertical layers depending on their height can be seen best in:
1. Tropical Rain Forest
  2. Grassland
  3. Temperate Forest
  4. Tropical Savannah
52. Which of the following statements is correct?
1. The descending limb of loop of Henle is impermeable to water.
  2. The ascending limb of loop of Henle is permeable to water.
  3. The descending limb of loop of Henle is permeable to electrolytes.
  4. The ascending limb of loop of Henle is impermeable to water.
53. Alexander Von Humboldt described for the first time:
1. Laws of limiting factor
  2. Species-Area relationships
  3. Population Growth equations
  4. Ecological Biodiversity
54. Zygotic meiosis is characteristic of
1. Fucus
  2. Funaria
  3. Chlamydomonas
  4. Marchantia

55.

If there are 999 bases in an RNA that codes for a protein with 333 amino acids, and the base at position 901 is deleted such that the length of the RNA becomes 998 bases, how many codons will be altered?

1. 11
2. 33
3. 333
4. 1

56.

Flowers which have single ovule in the ovary and are packed into inflorescence are usually pollinated by:

1. Bee
2. Wind
3. Bat
4. Water

57.

Transplantation of tissues/organs fails often due to non-acceptance by the patient's body. Which type of immune-response is responsible for such rejections?

1. Cell-mediated immune response
2. Hormonal immune response
3. Physiological immune response
4. Autoimmune response

58.

Life cycle of Ectocarpus and Fucus respectively are:

1. Diplontic, Haplodiplontic
2. Haplodiplontic, Diplontic
3. Haplodiplontic, Haplontic
4. Haplontic, Diplontic

59.

A gene whose expression helps to identify transformed cell is known as:

1. Vector
2. Plasmid
3. Structural gene
4. Selectable marker

60.

A dioecious flowering plant prevents both:

1. Autogamy and geitonogamy
2. Geitonogamy and xenogamy
3. Cleistogamy and xenogamy
4. Autogamy and xenogamy

61.

Which statement is wrong for Krebs' cycle?

1. There is one point in the cycle where  $FAD^+$  is reduced to  $FADH_2$
2. During conversion of succinyl CoA to succinic acid, a molecule of GTP is synthesized.
3. The cycle starts with condensation of acetyl group (acetyl CoA) with pyruvic acid to yield citric acid.
4. There are three points in the cycle where  $NAD^+$  is reduced to  $NADH + H^+$

62.

Phosphoenol pyruvate (PEP) is the primary  $CO_2$  acceptor in:

1.  $C_4$  plants
2.  $C_2$  plants
3.  $C_3$  and  $C_4$  plants
4.  $C_3$  plants

63.

During DNA replication, Okazaki fragments are used to elongate:

1. The lagging strand towards replication fork.
2. The leading strand away from replication fork.
3. The lagging strand away from the replication fork.
4. The leading strand towards replication fork.

64.

Which of the following RNA should be most abundant in animal cell?

1. t-RNA
2. m-RNA
3. mi-RNA
4. r-RNA

65. GnRH, a hypothalamic hormone, needed in reproduction, acts on:
1. Anterior pituitary gland and stimulates secretion of LH and FSH.
  2. Posterior pituitary gland and stimulates secretion of oxytocin and FSH.
  3. Posterior pituitary gland and stimulates secretion of LH and relaxin.
  4. Anterior pituitary gland and stimulates secretion of LH and oxytocin.
66. What is the criterion for DNA fragments movement on agarose gel during gel electrophoresis?
1. The smaller the fragment size, the farther it moves
  2. Positively charged fragment move to farther end
  3. Negatively charged fragment do not move
  4. The larger the fragment size, the farther it moves
67. Hypersecretion of Growth Hormone in adults does not cause further increase in height, because
1. Epiphyseal plates close after adolescence.
  2. Bones lose their sensitivity to Growth Hormone in adults.
  3. Muscle fibres do not grow in size after birth.
  4. Growth Hormones become inactive in adults.
68. DNA replication in bacteria occurs:
1. Within nucleolus
  2. Prior to fission
  3. Just before transcription
  4. During S phase
69. Which one from those given below is the period for Mendel's hybridization experiments?
1. 1840-1850
  2. 1857-1869
  3. 1870-1877
  4. 1856-1863
70. Viroids differ from viruses in having;
1. DNA molecules without protein coat
  2. RNA molecules with protein coat
  3. RNA molecules without protein coat
  4. DNA molecules with protein coat
71. MALT constitutes about \_\_\_\_\_ percent of the lymphoid tissue in human body.
1. 20%
  2. 70%
  3. 10%
  4. 50%
72. Which of the following is correctly matched for the product produced by them?
1. Methanobacterium: Lactic acid
  2. Penicillium notatum: Acetic acid
  3. Saccharomyces cerevisiae: Ethanol
  4. Acetobacter aceti: Antibiotics
73. Which among the following are the smallest living cells, known without a definite cell wall, pathogenic to plants as well as animals and can survive without oxygen?
1. Pseudomonas
  2. Mycoplasma
  3. Nostoc
  4. Bacillus
74. Which of the following represents order of Horse'?
1. Perissodactyla
  2. Caballus
  3. Ferus
  4. Equidae

75.

Frog's heart when taken out of the body continues to beat for some time.

Select the best option from the following statements.

- (a) Frog is a poikilotherm.
- (b) Frog does not have any coronary circulation.
- (c) Heart is "myogenic" in nature
- (d) Heart is autoexcitable

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

76.

Homozygous purelines in cattle can be obtained by:

- 1. Mating of unrelated individuals of same breed.
- 2. Mating of individuals of different breed.
- 3. Mating of individuals of different species.
- 4. Mating of related individuals of same breed.

77.

Identify the wrong statement in the context of heartwood:

- 1. It is highly durable
- 2. It conducts water and minerals efficiently
- 3. It comprises dead elements with highly lignified walls
- 4. Organic compounds are deposited in it.

78.

Anaphase Promoting Complex (APC) is protein degradation machinery necessary for proper mitosis of animal cells. If APC is defective in a human cell, which of the following is expected to occur?

- 1. Chromosomes will be fragmented
- 2. Chromosomes will not segregate
- 3. Recombination of chromosome arms will occur
- 4. Chromosomes will not condense

79.

Which of the following cell organelles is responsible for extracting energy from carbohydrates to form ATP?

- 1. Ribosome
- 2. Chloroplast
- 3. Mitochondrion
- 4. Lysosome

80.

Mycorrhizae are the example of:

- 1. Amensalism
- 2. Antibiosis
- 3. Mutualism
- 4. Fungistasis

81.

Out of 'X' pairs of ribs in humans only 'Y' pairs are true ribs. Select the option that correctly represents values of X and Y and provides their explanation:

- 1. X=12, Y=5 True ribs are attached to vertebral column and sternum on the two ends.
- 2. X=24, Y=7 True ribs are dorsally attached to vertebral column but are free on ventral side.
- 3. X=24, Y=12 True ribs are dorsally attached to vertebral column but are free on ventral side.
- 4. X=12, Y=7 True ribs are attached dorsally to vertebral column and ventrally to the sternum.

82.

In case of Poriferans, the spongocoel is lined with flagellated cells called:

- 1. oscula
- 2. Choanocytes
- 3. Mesenchymal cells
- 4. Ostia

83.

Which one of the following statements is not valid for aerosols?

- 1. They alter rainfall and monsoon patterns
- 2. They caused increased agricultural productivity.
- 3. They have negative impact on agricultural land.
- 4. They are harmful to human health.

84.

A baby boy aged two years is admitted to play school and passes through a dental check-up. The dentist observed that the boy had twenty teeth. Which teeth were absent in the boy?

- 1. Canines
- 2. Pre-molars
- 3. Molars
- 4. Incisors

85.

Select the mismatch

1. Cycas - Dioecious
2. Salvinia - Heterosporous
3. Equisetum - Homosporous
4. Pinus - Dioecious

86.

The morphological nature of the edible part of coconut is:

1. Cotyledon
2. Endosperm
3. Pericarp
4. Perisperm

87.

Double fertilization is exhibited by:

1. Algae
2. Fungi
3. Angiosperms
4. Gymnosperms

88.

Spliceosomes are not found in cells of;

1. Fungi
2. Animals
3. Bacteria
4. Plants

89.

The association of histone H1 with a nucleosome indicates:

1. DNA replication is occurring.
2. The DNA is condensed into a Chromatin Fibre.
3. The DNA double helix is exposed.
4. Transcription is occurring.

90.

The region of Biosphere Reserve which is legally Protected and where no human activity is allowed is known as

1. Buffer Zone
2. Transition Zone
3. Restoration Zone
4. Core Zone

91.

Name the gas that can readily decolorized acidified  $\text{KMnO}_4$  solution:

1.  $\text{SO}_2$
2.  $\text{NO}_2$
3.  $\text{P}_2\text{O}_2$
4.  $\text{CO}_2$

92.

Mechanism of a hypothetical reaction

$\text{X}_2 + \text{Y}_2 \rightarrow 2 \text{XY}$  is given below:

- (i)  $\text{X}_2 \rightarrow \text{X} + \text{X}(\text{Fast})$
- (ii)  $\text{X} + \text{Y}_2 \rightleftharpoons \text{XY} + \text{Y}(\text{slow})$
- (iii)  $\text{X} + \text{Y} \rightarrow \text{XY}(\text{Fast})$

The overall order of the reaction will be:

1. 2
2. 0
3. 1.5
4. 1

93.

The element  $Z = 114$  has been discovered recently. It will belong to which of the following family/group and electronic configuration?

1. Carbon family  $[\text{Rn}]5f^{14} 6d^{10}7s^27p^2$
2. Oxygen family  $[\text{Rn}]5f^{14} 6d^{10}7s^27p^4$
3. Nitrogen family  $[\text{Rn}]5f^{14} 6d^{10}7s^27p^6$
4. Halogen family  $[\text{Rn}]5f^{14} 6d^{10}7s^27p^5$

94.

The heating of phenyl-methyl ethers with HI produces

1. Iodobenzene
2. Phenol
3. Benzene
4. Ethyl chlorides

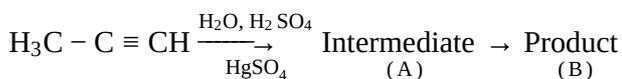
95.

Which one is the correct order of acidity?

1.  $\text{CH} \equiv \text{CH} > \text{CH}_3 - \text{C} \equiv \text{CH} > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{CH}_3$
2.  $\text{CH} \equiv \text{CH} > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{C} \equiv \text{CH} > \text{CH}_3 - \text{CH}_3$
3.  $\text{CH}_3 - \text{CH}_3 > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{C} \equiv \text{CH} > \text{CH} \equiv \text{CH}$
4.  $\text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{CH}_3 > \text{CH}_3 - \text{C} \equiv \text{CH} > \text{CH} \equiv \text{CH}$

96.

Predict the correct intermediate and product in the following reaction:

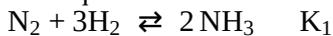


1. A :  $\text{H}_3\text{C} - \underset{\text{OH}}{\text{C}} = \text{CH}_2$  ; B :  $\text{H}_3\text{C} - \underset{\text{SO}_4}{\text{C}} = \text{CH}_2$
2. A :  $\text{H}_3\text{C} - \underset{\text{O}}{\text{C}} - \text{CH}_3$  ; B :  $\text{H}_3\text{C} - \text{C} \equiv \text{CH}$
3. A :  $\text{H}_3\text{C} - \underset{\text{OH}}{\text{C}} = \text{CH}_2$  ; B :  $\text{H}_3\text{C} - \overset{\text{O}}{\parallel} \text{C} - \text{CH}_3$
4. A :  $\text{H}_3\text{C} - \underset{\text{SO}_4}{\text{C}} = \text{CH}_2$  ; B :  $\text{H}_3\text{C} - \overset{\text{O}}{\parallel} \text{C} - \text{CH}_3$

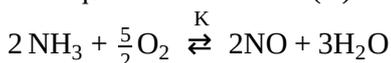
97.

Question 52

The equilibrium constant of the following are:



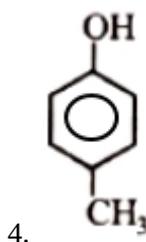
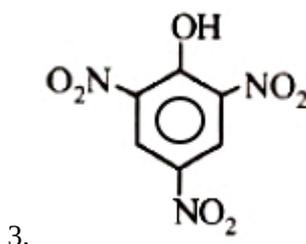
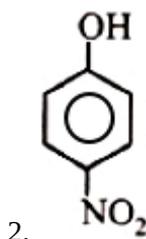
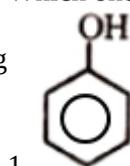
The equilibrium constant (K) of the reaction:



1.  $K_2K_3^3/K_1$
2.  $K_2K_3/K_1$
3.  $K_2^3K_3/K_1$
4.  $K_1K_3^3/K_2$

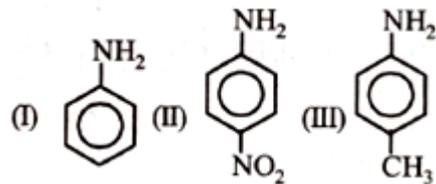
98.

Which one is the most acidic compound?



99.

The correct increasing order of basic strength for the following compounds is:



1. III<I<II
2. III<II<I
3. II<I<III
4. II<III<I

100.

Ionic mobility of which of the following alkali metal ions is lowest when aqueous solution of their salts are put under an electric field?

1. K
2. Rb
3. Li
4. Na

101.

The most suitable method of separation of 1:1 mixture of ortho and para-nitrophenols is:

1. Chromatography
2. Crystallization
3. Steam distillation
4. Sublimation

102.

$\text{HgCl}_2$  and  $\text{I}_2$  both, when dissolved in water containing  $\text{I}^-$  ions the pair of species formed is

1.  $\text{HgI}_2$ ,  $\text{I}^-$
2.  $\text{HgI}_4^{2-}$ ,  $\text{I}_3^-$
3.  $\text{Hg}_2\text{I}_2$ ,  $\text{I}^-$
4.  $\text{HgI}_2$ ,  $\text{I}_3^-$

103.

Mixture of chloroxylenol and terpineol acts as:

1. Antiseptic
2. Antipyretic
3. Antibiotic
4. Analgesic

104.

An example of a sigma bonded organometallic compound is:

1. Gignard's reagent
2. Ferrocene
3. Cobaltocene
4. Ruthenocene

105.

A first order reaction has a specific reaction rate of  $10^{-2} \text{ sec}^{-1}$ . How much time will it take for 20g of the reactant to reduce to 5 g?

1. 138.6 sec
2. 346.5 sec
3. 693.0 sec
4. 238.6 sec

106.

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

Column-I

- (A)  $XX'$
- (B)  $XX'_3$
- (C)  $XX'_5$
- (D)  $XX'_7$

Column-II

- (i) T-shape
- (ii) Pentagonal bipyramidal
- (iii) Linear
- (iv) Square Pyramidal
- (v) Tetrahedral

1. A-(iii) B-(i) C-(iv) D-(ii)
2. A-(v) B-(iv) C-(iii) D-(ii)
3. A-(iv) B-(iii) C-(ii) D-(i)
4. A-(iii) B-(iv) C-(i) D-(ii)

107.

The concentration of the  $Ag^+$  ions in a saturated solution of  $Ag_2C_2O_4$  is  $2.2 \times 10^{-4} molL^{-1}$ . The solubility product of  $Ag_2C_2O_4$  is

1.  $2.66 \times 10^{-12}$
2.  $4.5 \times 10^{-11}$
3.  $5.3 \times 10^{-12}$
4.  $2.42 \times 10^{-8}$

108.

In the electrochemical cell:

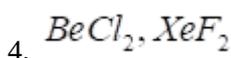
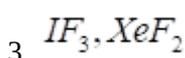
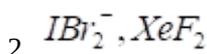
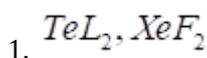
$Zn | ZnSO_4(0.01M) || CuSO_4(1.0M) | Cu$ , the emf of this Daniel cell is  $E_1$ . When the concentration of  $ZnSO_4$  is changed to 1.0 M and that of  $CuSO_4$  changed to 0.01M, the emf changes to  $E_2$ . From the followings, which one is the relationship between  $E_1$  and  $E_2$ ?

$$\left( \text{Given, } \frac{RT}{F} = 0.059 \right)$$

1.  $E_1 < E_2$
2.  $E_1 > E_2$
3.  $E_2 = 0 \neq E_1$
4.  $E_1 = E_2$

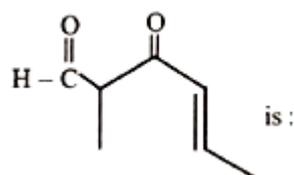
109.

Which of the following pairs of the compound is isoelectronic and isostructural?



110.

The IUPAC name of the compound



1. 5-formylhex-2-en-3-one
2. 5-methyl-4-2-en-5-el
3. 3-keto-2-methylhex-5-enal
4. 3-keto-2-methylhex-4-enal

111.

Which one is the wrong statement?

1. The uncertainty principle is  $\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$
2. Half-filled and fully filled orbitals have greater stability due to greater exchange energy, greater symmetry and a more balanced arrangement.
3. The energy of 2s orbital is less than the energy of 2p orbital in the case of hydrogen-like atoms.
4. de-Broglie's wavelength is given by  $\lambda = \frac{h}{mv}$ , where  $m$  = mass of the particle,  $v$  = group velocity of the particle.

112.

Which is the incorrect statement?

1. Density decreases in case of crystals with Schottk's defect
2. NaCl(s) is insulator, silicon is semiconductor, silver is conductor, quartz is piezo electric crystal
3. Frenkel defect is favoured in those ionic compounds in which sizes of cation and anions have large difference in sizes.
4.  $Fe_{0.98}$  has non stoichiometric metal excess metal defect

113.

The species, having bond angles of  $120^\circ$  is :

1.  $ClF_3$
2.  $NCl_3$
3.  $BCl_3$
4.  $PH_3$

114.

For a given reaction,  $\Delta H = 35.5 \text{KJmol}^{-1}$  and  $\Delta S = 83.6 \text{JK}^{-1}\text{mol}^{-1}$ . The reaction is spontaneous at: (Assume that  $\Delta H$  and  $\Delta S$  do not vary with temperature)

1.  $T > 425\text{K}$
2. All temperatures
3.  $T > 298\text{K}$
4.  $T < 425\text{K}$

115.

Which is the main carrier of oxygen in the blood?

1. Microorganisms present in the soil.
2. Oceans
3. Hemoglobin
4. Both microorganisms and hemoglobin

116.

If the molality of the dilute solutions is doubled, the value of molal depression constant ( $K_f$ ) will be:

1. Halved
2. Tripled
3. Unchanged
4. Doubled

117.

Which of the following is dependent on temperature?

1. Molarity
2. Mole fraction
3. Weight percentage
4. Molality

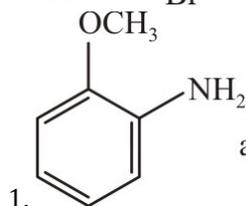
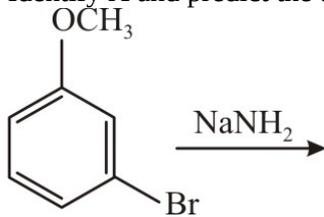
118.

Which one of the following statements is not correct?

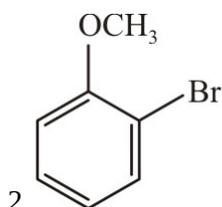
1. The value of equilibrium constant is changed in the presence of a catalyst in the reaction at equilibrium.
2. Enzymes catalyse mainly bio-chemical reactions
3. Coenzymes increase the catalytic activity of enzyme
4. Catalyst does not initiate any reaction

119.

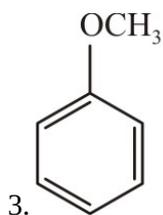
Identify A and predict the type of reaction



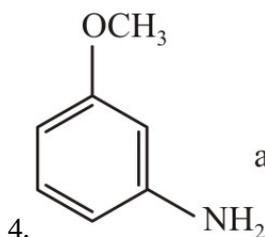
and elimination addition reaction



and cine substitution reaction



and cine substitution reaction



and substitution reaction

120.

The correct order of the stoichiometries of  $\text{AgCl}$  formed when  $\text{AgNO}_3$  in excess is treated with the complexes:  $\text{CoCl}_3 \cdot 6\text{NH}_3$ ,  $\text{CoCl}_3 \cdot 5\text{NH}_3$ ,  $\text{CoCl}_3 \cdot 4\text{NH}_3$  respectively is:

1.  $3\text{AgCl}$ ,  $1\text{AgCl}$ ,  $2\text{AgCl}$
2.  $3\text{AgCl}$ ,  $2\text{AgCl}$ ,  $1\text{AgCl}$
3.  $2\text{AgCl}$ ,  $3\text{AgCl}$ ,  $1\text{AgCl}$
4.  $1\text{AgCl}$ ,  $3\text{AgCl}$ ,  $2\text{AgCl}$

121.

The correct statement regarding electrophile is

1. Electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from another electrophile
2. Electrophiles are generally neutral species and can form a bond by accepting a pair of electrons from a nucleophile
3. Electrophile can be either neutral or positively charged species and can form a bond accepting a pair of electrons from a nucleophile
4. Electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from a nucleophile

122.

A gas is allowed to expand in a well insulated container against a constant external pressure of  $2.5\text{atm}$  from an initial volume of  $2.50\text{L}$  to a final volume of  $4.50\text{L}$ . The change in internal energy  $U$  of the gas in joules will be:

1.  $-500\text{J}$
2.  $-505\text{J}$
3.  $-506\text{J}$
4.  $-508\text{J}$

123.

Which of the following reactions is appropriate for converting acetamide to methanamine?

1. Hoffmann hypobromamide reaction
2. Stephens reaction
3. Gabriels phthalimide synthesis
4. Carbylamine reaction

124.

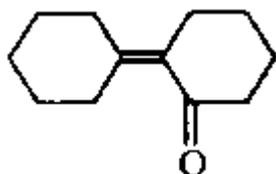
With respect to the conformers of ethane, which of the following statements is true?

1. Bond angle changes but bond length remains same
2. Both bond angle and bond length change
3. Both bond angle and bond length remains same
4. Bond angle remains same but bond length changes

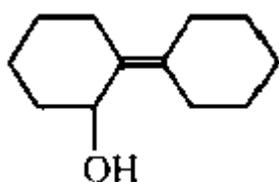


129.

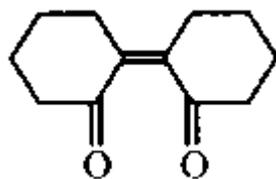
Of the following, which is the product formed when cyclohexanone undergoes aldol condensation followed by heating?



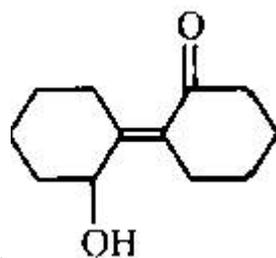
1.



2.



3.



4.

130.

Which of the following pairs of species have the same bond order?

1.  $O_2^-$ ,  $NO^+$
2.  $CN^-$ ,  $CO$
3.  $N_2$ ,  $O_2^-$
2.  $CO$ ,  $NO$

131.

Extraction of gold and silver involves leaching with  $CN^-$  ion. Silver is later recovered by:

1. Distillation
2. Zone refining
3. Displacement with Zn
4. Liquefaction

132.

A 20 litre container at 400 K contains  $CO_2$  (g) at pressure 0.4 atm and an excess of SrO (neglect the volume of solid SrO). The volume of the container is now decreased by moving the movable piston fitted in the container. The maximum volume of the container, when pressure of  $CO_2$  attains its maximum value, will be:

Given that:  $SrCO_3(s) \rightleftharpoons SrO(s) + CO_2(g)$ ,  $K_p = 1.6$  atm

1. 10 litre
2. 2 litre
3. 4 litre
4. 5 litre

133.

Pick out the correct statement with respect to  $[Mn(CN)_6]^{3-}$

1. It is  $sp^3d^2$  hybridised and tetrahedral
2. It is  $d^2sp^3$  hybridised and octahedral
3. It is  $dsp^2$  hybridised and square planar
4. It is  $sp^3d^2$  hybridised and octahedral

134.

The reason for greater range of oxidation states in actinoids is attributed to:

1. actinoid contraction
2. 5f, 6d and 7s levels having comparable energies.
3. 4f and 5d levels being close in energies.
4. The radioactive nature of actinoids

135.

Which of the following statements is not correct?

1. Ovalbumin is a simple food reserve in egg white
2. Blood proteins thrombin and fibrinogen are involved in blood clotting
3. Denaturation makes the proteins more active.
4. Insulin maintains sugar level in the blood of a human body.

136.

A spring of force constant  $k$  is cut into lengths of ratio 1:2:3. They are connected in series and the new force constant is  $k'$ . Then they are connected in parallel and force constant is  $k''$ . Then  $k':k''$  is:

1. 1:9
2. 1:11
3. 1:14
4. 1:6

137.

The ratio of resolving powers of an optical microscope for two wavelengths  $\lambda_1=4000 \text{ \AA}$  and  $\lambda_2 = 6000 \text{ \AA}$  is:-

1. 9:4
2. 3:2
3. 16:81
4. 8:27

138.

The two nearest harmonics of a tube closed at one end and open at the other end are 220 Hz and 260 Hz. What is the fundamental frequency of the system?

1. 20 Hz
2. 30 Hz
3. 40 Hz
4. 10 Hz

139.

Consider a drop of rainwater having a mass of 1gm falling from a height of 1 km. It hits the ground with a speed of 50 m/s. Take 'g' constant with a value  $10 \text{ m/s}^2$ . The work done by the (i) gravitational force and the (ii) resistive force of air is:

1. (i) 1.25 J (ii) -8.25 J
2. (i) 100 J (ii) 8.75 J
3. (i) 10 J (ii) -8.75 J
4. (i) -10 J (ii) -8.75 J

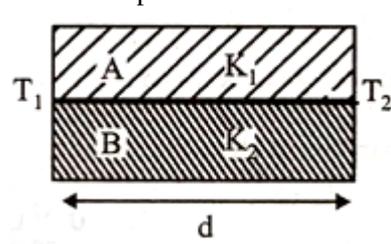
140.

A physical quantity of the dimensions of length that can be formed out of  $c$ ,  $G$  and  $\frac{e^2}{4\pi\epsilon_0}$  is [c is the velocity of light, G is the universal constant of gravitation and e is charge]:

1.  $c^2 \left[ G \frac{e^2}{4\pi\epsilon_0} \right]^{\frac{1}{2}}$
2.  $\frac{1}{c^2} \left[ \frac{e^2}{4G\pi\epsilon_0} \right]^{\frac{1}{2}}$
3.  $\frac{1}{c} G \frac{e^2}{4\pi\epsilon_0}$
4.  $\frac{1}{c^2} \left[ G \frac{e^2}{4\pi\epsilon_0} \right]^{\frac{1}{2}}$

141.

Two rods A and B of different materials are welded together as shown in the figure. Their thermal conductivities are  $K_1$  and  $K_2$ . The thermal conductivity of the composite rod will be:



1.  $\frac{3(K_1+K_2)}{2}$
2.  $K_1 + K_2$
3.  $2(K_1 + K_2)$
4.  $\frac{K_1+K_2}{2}$

142.

A capacitor is charged by a battery. The battery is removed and another identical uncharged capacitor is connected in parallel. The total electrostatic energy of resulting system:-

1. Decreases by a factor of 2
2. Remains the same
3. Increases by a factor of 2
4. Increases by a factor of 4

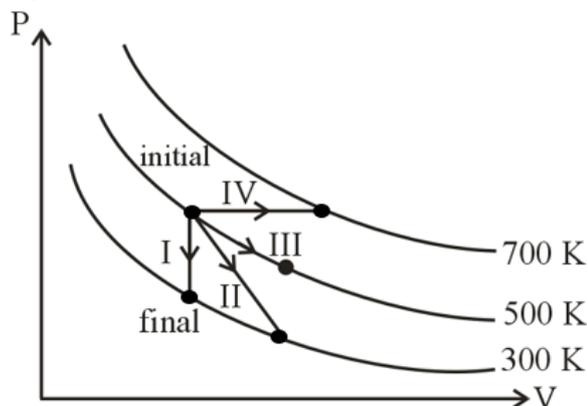
143.

In a common-emitter transistor amplifier, the audio signal voltage across the collector is 3V. The resistance of the collector is  $3k\Omega$ . If current gain is 100 and the base resistance is  $2k\Omega$ , the voltage and power gain of the amplifier is:

1. 15 and 200
2. 150 and 15000
3. 20 and 2000
4. 200 and 1000

144.

Thermodynamic processes are indicated in the following diagram:



Match the following

**Column-I**

- P. Process I
- Q. Process II
- R. Process III
- S. Process IV

**Column-II**

- a. Adiabatic
- b. Isobaric
- c. Isochoric
- d. Isothermal

1. P → c, Q → a, R → d, S → b
2. P → c, Q → d, R → b, S → a
3. P → d, Q → b, R → a, S → c
4. P → a, Q → c, R → d, S → b

145.

Suppose the charge of a proton and an electron differ slightly. One of them is  $-e$ , the other is  $(e + \Delta e)$ . If the net of electrostatic force and gravitational force between two hydrogen atoms placed at a distance  $d$  (much greater than atomic size) apart is zero, then  $\Delta e$  is of the order of? [Given mass of hydrogen  $m_h = 1.67 \times 10^{-27}$  kg]

1.  $10^{-23}$  C
2.  $10^{-37}$  C
3.  $10^{-47}$  C
4.  $10^{-20}$  C

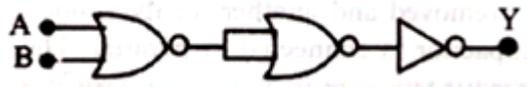
146.

The resistance of a wire is 'R' ohm. If it is melted and stretched 'n' times its original length, its new resistance will be:-

1.  $\frac{R}{n}$
2.  $n^2R$
3.  $\frac{R}{n^2}$
4.  $nR$

147.

The given electrical network is equivalent to:



1. OR gate
2. NOR gate
3. NOT gate
4. AND gate

148.

Which one of the following represents the forward bias diode?

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

149.

A long solenoid of diameter 0.1 m has  $2 \times 10^4$  turns per meter. At the center of the solenoid, a coil of 100 turns and radius 0.01 m is placed with its axis coinciding with solenoid axis. The current in the solenoid reduces at a constant rate to 0A from 4A in 0.05 s. If the resistance of the coil is  $10\pi^2 \Omega$ . The total charge flowing through the coil during this time is:-

1.  $16\mu C$
2.  $32\mu C$
3.  $16\pi\mu C$
4.  $32\pi\mu C$

150.

Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time  $t_1$ . On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time  $t_2$ . The time taken by her to walk upon the moving escalator will be:

1.  $\frac{t_1 t_2}{t_2 - t_1}$
2.  $\frac{t_1 t_2}{t_2 + t_1}$
3.  $t_1 - t_2$
4.  $\frac{t_1 + t_2}{2}$

151.

Young's double-slit experiment is first performed in air and then in a medium other than air. It is found that the 8<sup>th</sup> bright fringe in the medium lies where the 5<sup>th</sup> dark fringe lies in the air. The refractive index of the medium is nearly:-

1. 1.59
2. 1.69
3. 1.78
4. 1.25

152.

A beam of light from a source L is incident normally on a plane mirror fixed at a certain distance  $x$  from the source. The beam is reflected back as a spot on a scale placed just above the source L. When the mirror is rotated through a small angle  $\theta$ , the spot of the light is found to move through a distance  $y$  on the scale. The angle  $\theta$  is given by:-

1.  $\frac{y}{x}$
2.  $\frac{x}{2y}$
3.  $\frac{x}{y}$
4.  $\frac{y}{2x}$

153.

If  $\theta_1$  and  $\theta_2$  be the apparent angles of dip observed in two vertical planes at right angles to each other, then the true angle of dip  $\theta$  is given by:-

1.  $\tan^2 \theta = \tan^2 \theta_1 + \tan^2 \theta_2$
2.  $\cot^2 \theta = \cot^2 \theta_1 - \cot^2 \theta_2$
3.  $\tan^2 \theta = \tan^2 \theta_1 + \tan^2 \theta_2$
4.  $\cot^2 \theta = \cot^2 \theta_1 + \cot^2 \theta_2$

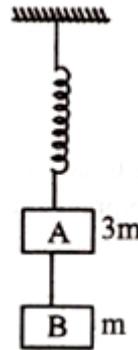
154.

Two cars moving in opposite directions approach each other with speeds of 22 m/s and 16.5 m/s respectively. The driver of the first car blows a horn having a frequency of 400 Hz. The frequency heard by the driver of the second car is [velocity of sound 340 m/s]:

1. 361 Hz
2. 411 Hz
3. 448 Hz
4. 350 Hz

155.

Two blocks A and B of masses  $3m$  and  $m$  respectively are connected by a massless and inextensible string. The whole system is suspended by a massless spring as shown in the figure. The magnitudes of acceleration of A and B immediately after the string is cut, are respectively:



1.  $\frac{g}{3}, g$
2.  $g, g$
3.  $\frac{g}{3}, \frac{g}{3}$
4.  $g, \frac{g}{3}$

156.

A thin prism having refracting angle  $10^\circ$  is made of glass of refractive index 1.42. This prism is combined with another thin prism of a glass of refractive index 1.7. This combination produces dispersion without deviation. The refracting angle of the second prism should be:-

1.  $6^\circ$
2.  $8^\circ$
3.  $10^\circ$
4.  $4^\circ$

157.

The acceleration due to gravity at a height 1 km above the earth's surface is the same as at a depth  $d$  below the surface of the earth. Then:

1.  $d = 1 \text{ Km}$
2.  $d = \frac{3}{2} \text{ Km}$
3.  $d = 2 \text{ Km}$
4.  $d = \frac{1}{2} \text{ Km}$

158.

A potentiometer is an accurate and versatile device to make electrical measurements of E.M.F. because the method involves:-

1. Potential gradients
2. A condition of no current flow through the galvanometer
3. A condition of cells, galvanometer, and resistances
4. Cells

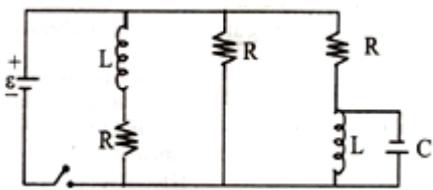
159.

A spherical black body with a radius of 12 cm radiates 450-watt power at 500 K. If the radius were halved and the temperature is doubled, the power radiated in watt would be:

1. 450
2. 1000
3. 1800
4. 225

160.

The figure shows a circuit that contains three identical resistors with resistance  $R = 9.0\Omega$  each, two identical inductors with inductance  $L = 2.0 \text{ mH}$  each, and an ideal battery with emf  $\epsilon = 18$ . The current 'i' through the battery just after the switch closed is:



1. 0.2A
2. 2A
3. 4 A
4. 2mA

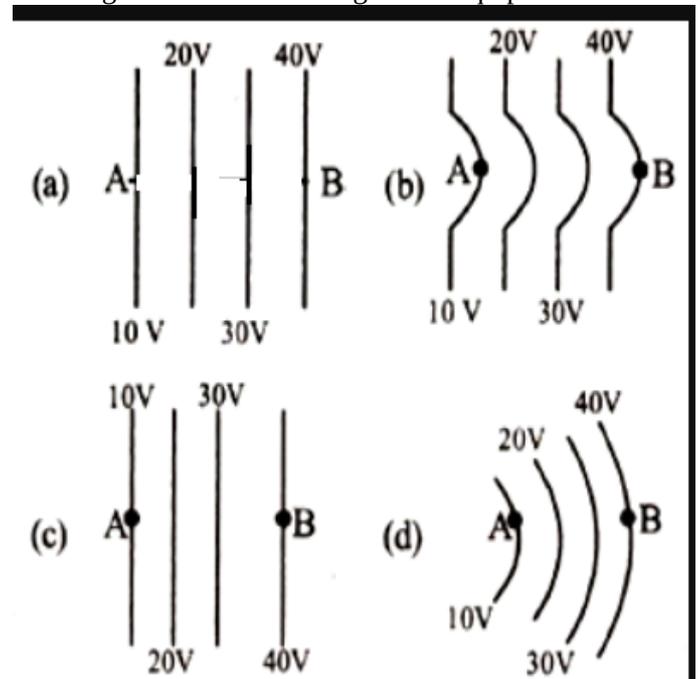
161.

Radioactive material 'A' has decay constant ' $8\lambda$ ' and material 'B' has a decay constant ' $\lambda$ '. Initially, they have the same number of nuclei. After what time the ratio of the number of nuclei of material 'A' to that of 'B' will be  $\frac{1}{e}$ ?

1.  $\frac{1}{7\lambda}$
2.  $\frac{1}{8\lambda}$
3.  $\frac{1}{9\lambda}$
4.  $\frac{1}{\lambda}$

162.

The diagrams below show regions of equipotential.



A positive charge is moved from A to B in each diagram.

1. In all the four cases , the work done is the same
2. Minimum work is required to move q in figure (a)
3. Maximum work is required to move q in figure (b)
4. Maximum work is required to move q in figure (c)

163.

Two astronauts are floating in gravitational free space after having lost contact with their spaceship. The two will:

1. move towards each other.
2. move away from each other.
3. become stationary.
4. keep floating at the same distance between them.

164.

The x and y coordinates of the particle at any time are  $x = 5t - 2t^2$  and  $y = 10t$  respectively, where x and y are in meters and t in seconds. The acceleration of the particle at  $t = 2$  sec is:

1.  $5 \text{ m/s}^2$
2.  $-4 \text{ m/s}^2$
3.  $-8 \text{ m/s}^2$
4. 0

165.

One end of the string of length 'l' is connected to a particle of mass 'm' and the other end is connected to a small peg on a smooth horizontal table. If the particle moves in a circle with speed 'v', the net force on the particle (directed towards the centre) will be: (T represents the tension in the string)

1.  $T + \frac{mv^2}{l}$
2.  $T - \frac{mv^2}{l}$
3. Zero
4. T

166.

A particle executes linear simple harmonic motion with amplitude of 3 cm. When the particle is at 2 cm from the mean position, the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is:-

1.  $\frac{\sqrt{5}}{2\pi}$
2.  $\frac{4\pi}{\sqrt{5}}$
3.  $\frac{4\pi}{\sqrt{3}}$
4.  $\frac{\sqrt{5}}{\pi}$

167.

Two polaroids  $P_1$  and  $P_2$  are placed with their axis perpendicular to each other. Unpolarised light of intensity  $I_0$  is incident on  $P_1$ . A third polaroid  $P_3$  is kept in between  $P_1$  and  $P_2$  such that its axis makes an angle  $45^\circ$  with that of  $P_1$ . The intensity of transmitted light through  $P_2$  is:-

1.  $\frac{I_0}{4}$
2.  $\frac{I_0}{8}$
3.  $\frac{I_0}{16}$
4.  $\frac{I_0}{2}$

168.

The bulk modulus of a spherical object is 'B'. If it is subjected to uniform pressure 'P', the fractional decrease in radius is:

1.  $\frac{B}{3P}$
2.  $\frac{3P}{B}$
3.  $\frac{P}{3B}$
4.  $\frac{P}{B}$

169.

In an electromagnetic wave in free space the root mean square value of the electric field is  $E_{\text{rms}} = 6 \text{ V/m}$ . The peak value of the magnetic field is:-

1.  $2.83 \times 10^{-8} \text{ T}$
2.  $0.70 \times 10^{-8} \text{ T}$
3.  $4.23 \times 10^{-8} \text{ T}$
4.  $1.41 \times 10^{-8} \text{ T}$

170.

A rope is wound around a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force of 30 N?

1.  $0.25 \text{ rad/s}^2$
2.  $25 \text{ rad/s}^2$
3.  $5 \text{ m/s}^2$
4.  $25 \text{ m/s}^2$

171.

Two discs of the same moment of inertia are rotating about their regular axis passing through centre and perpendicular to the plane of disc with angular velocities  $\omega_1$  and  $\omega_2$ . They are brought into contact face to face with their axis of rotation coinciding. The expression for loss of energy during this process is:-

1.  $\frac{1}{4}I(\omega_1 - \omega_2)^2$
2.  $I(\omega_1 - \omega_2)^2$
3.  $\frac{1}{8}I(\omega_1 - \omega_2)^2$
4.  $\frac{1}{2}I(\omega_1 - \omega_2)^2$

172.

The photoelectric threshold wavelength of silver is  $3250 \times 10^{-10}$  m. The velocity of the electron ejected from a silver surface by the ultraviolet light of wavelength  $2536 \times 10^{-10}$  m is :

(Given  $h = 4.14 \times 10^{-15}$  eVs and  $c = 3 \times 10^8$  ms $^{-1}$ )

1.  $\approx 0.6 \times 10^6$  ms $^{-1}$
2.  $\approx 61 \times 10^3$  ms $^{-1}$
3.  $\approx 0.3 \times 10^6$  ms $^{-1}$
4.  $\approx 0.3 \times 10^5$  ms $^{-1}$

173.

A 250-Turn rectangular coil of length 2.1 cm and width 1.25 cm carries a current of 85  $\mu$ A and subjected to the magnetic field of strength 0.85 T. Work done for rotating the coil by  $180^\circ$  against the torque is:

1. 4.55  $\mu$ J
2. 2.3  $\mu$ J
3. 1.15  $\mu$ J
4. 9.8  $\mu$ J

174.

The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is:-

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

175.

A Carnot engine having an efficiency of  $\frac{1}{10}$  a heat engine is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at a lower temperature is:

1. 90 J
2. 99 J
3. 100 J
4. 1 J

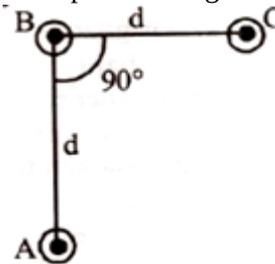
176.

A gas mixture consists of 2 moles of O $_2$  and 4 moles of Ar at temperature T. Neglecting all vibrational modes, the total internal energy of the system is:-

1. 15 RT
2. 9 RT
3. 11 RT
4. 4 RT

177.

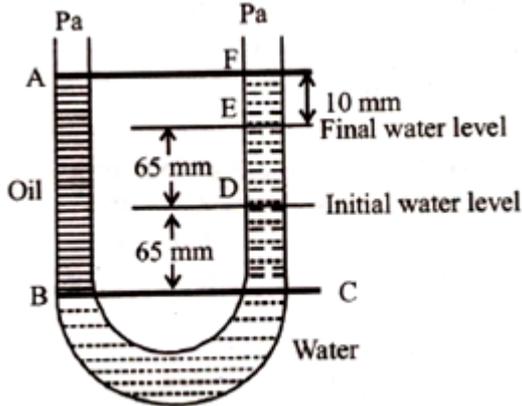
An arrangement of three parallel straight wires placed perpendicular to plane of paper carrying same current 'I' along the same direction is shown in fig. Magnitude of force per unit length on the middle wire 'B' is given by:-



- (a)  $\frac{\mu_0 i^2}{2\pi d}$
- (b)  $\frac{2\mu_0 i^2}{\pi d}$
- (c)  $\frac{\sqrt{2}\mu_0 i^2}{\pi d}$
- (d)  $\frac{\mu_0 i^2}{\sqrt{2}\pi d}$

178.

A U-tube with both ends open to the atmosphere is partially filled with water. Oil, which is immiscible with water, is poured into one side until it stands at a distance of 10 mm above the water level on the other side. Meanwhile, the water rises by 65 mm from its original level (see diagram). The density of the oil is:



1.  $425 \text{ kg m}^{-3}$
2.  $800 \text{ Kg m}^{-3}$
3.  $928 \text{ Kg m}^{-3}$
4.  $650 \text{ Kg m}^{-3}$

179.

Which of the following statements are correct?

- (a) Centre of mass of a body always coincides with the centre of gravity of the body
- (b) Centre of gravity of a body is the point about which the total gravitational torque on the body is zero
- (c) A couple on a body produce both translational and rotation motion in a body
- (d) Mechanical advantage greater than one means that small effort can be used to lift a large load

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

180.

The de-Broglie wavelength of a neutron in thermal equilibrium with heavy water at a temperature  $T$  (kelvin) and mass  $m$ , is:

1.  $\frac{h}{\sqrt{mkT}}$
2.  $\frac{h}{\sqrt{3mkT}}$
3.  $\frac{2h}{\sqrt{3mkT}}$
4.  $\frac{2h}{\sqrt{mkT}}$

**Fill OMR Sheet**

