BOTANY - SECTION A

1 Assertion: Growth can not be taken as a defining property of living organisms
Reason: Non-living objects also grow if we take increase in body mass as a criterion for growth
1. If both assertion and reason are true and the reason is the correct explanation of the assertion
2. If both assertion and reason are true but the reason is not the correct explanation of the assertion
3. If assertion is true but reason is false
4. If both assertion and reason are false

2 Paramecium and *Amoeba* are placed in kingdom protista with
1. *Anabaena* and *Colletotrichum*
2. *Anabaena* and *Chlorella*
3. *Chlamydomonas* and *Colletotrichum*
4. *Chlorella* and *Chlamydomonas*

3 Addition of more solutes in a given solution will:
1. not affect the water potential at all
2. raise its water potential
3. lower its water potential
4. make its water potential zero

4 Given below are two statements:
Statement I: Chlorophyceae store food in the form of oil droplets and have a rigid cell wall made up of an inner layer of cellulose and outer layer of pectose
Statement II: Phaeophyceae store food in the form of mannitol and cells have a cellular wall usually covered on the outside by algin
In the light of the above statements, choose the most appropriate answer from the options given below
1. Both Statement I and Statement II are correct
2. Both Statement I and Statement II are incorrect
3. Statement I is correct but Statement II is incorrect
4. Statement I is incorrect but Statement II is correct

5 How many of the following statements are correct about lipids?
a. Trihydroxy propane is an example of a simple lipid.
b. Fatty acids with one or more C = C double bonds are said to be saturated.
c. Palmitic acid has 16 carbons excluding the carboxyl carbon.
d. Lecithin is an example of a phospholipid.
Select the correct option from the following.
1. Four
2. Three
3. Two
4. One

6

$$\text{Pyruvic acid} + \text{CoA} + \text{NaD}^{+} \xrightarrow{\text{A}} \text{B} + \text{CO}_2 + \text{NADH}^{+} + \text{H}^{+}$$

in the above given reaction of respiration what can be placed at the place of A and B respectively?
1. Iron and Citric acid.
2. Magnesium and Citric acid.
3. Dehydrogenase and Acetyl CoA.
4. Iron and Acetyl CoA

7 Select the incorrect statement for lipids for plasma membrane.
1. Heads are polar situated towards outer side
2. Mainly consist of phosphoglycerides
3. Nonpolar tails are situated towards inner side
4. Tails are hydrophilic in nature

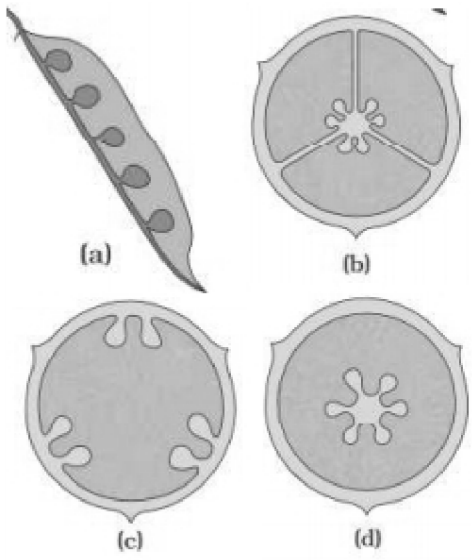
8 Which one of the following plants shows vexillary aestivation and diadelphous stamens ?
1. Solanum nigrum
2. *Colchicum autumnale*
3. Pisum sativum
4. Allium cepa

9 Read the following statements with respect to red algae:
(i) Majority of the red algae are marine, mostly found in warmer sea
(ii) They occur in both well lighted regions close to the surface of water and also at great depths in ocean where relatively less light penetrates
(iii) These lack chlorophyll-d
(iv) These are mostly unicellular
(v) These lack vegetative propagation
How many of the above statements are incorrect?
1. One
2. Three
3. Four
4. Five

10 Mark the wrong statement about *Cycas*
1. Stem unbranched
2. Pinnate leaves persist for few years
3. Roots associated with cyanobacteria
4. Male and female reproductive structure on same plant

11 Prophase of the mitotic division is
1 Longer and more complex than prophase-l of meiosis
2 Shorter and less complex than prophase-l of meiosis
3 Longer and less complex than prophase-l of meiosis
4 Shorter and more complex than prophase-l of meiosis

12 Placentations given below in the diagrams are



1. a - Basal, b- Axile, c- Free central, d - Parietal
2. a - Marginal, b- Axile, c- Basal, d - Superfecial
3. a - Marginal, b- Free central, c- Basal, d - Axile
4. a - Marginal, b- Axile, c- Parietal, d - Free central

13 Select the incorrect statement with respect to imbibition
1. It is diffusion process.
2. Affinity between the adsorbent and the liquid is not a pre-requisite.
3. It involves both capillary action and adsorption
4. Phycocolloids are best imbibants.

14 Match the columns:

	Column-I		Column-II
A.	Chemotaxonomy	(i)	Cytological information
B.	Numerical taxonomy	(ii)	Nuclear information
C.	Cytotaxonomy	(iii)	RNA sequencing
D.	Karyotaxonomy	(iv)	Computers

1. A = (iii), B = (iv), C = (i), D = (ii)
2. A = (iii), B = (iv), C = (ii), D = (i)
3. A = (i), B = (ii), C = (iii), D = (iv)
4. A = (ii), B = (iv), C = (i), D = (iii)

15 Match the following concerning essential elements and their functions in plants:

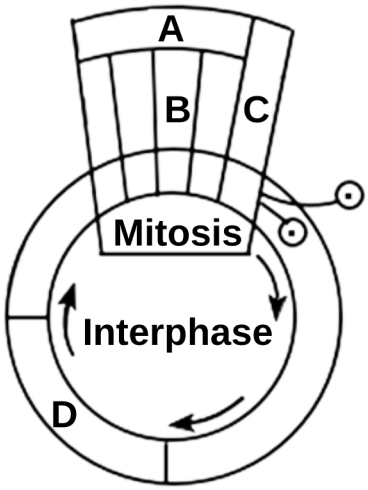
Column I		Column II	
(a)	Iron	(i)	Photolysis of water
(b)	Zinc	(ii)	Pollen germination
(c)	Boron	(iii)	Required for chlorophyll biosynthesis
(d)	Manganese	(iv)	IAA biosynthesis

Select the correct option:

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

16 Organisms responsible for causing ‘red tide’ are also
characterized by
1. Presence of stiff cellulosic plates.
2. Obligate saprophyte.
3. Presence of two longitudinal flagella.
4. Filamentous body made up of trichomes.

17 Given below is a schematic break-up of the phases/stages of cell cycle



Which one of the following is the correct indication of the stage/phase in the cell cycle?
1. B-Metaphase
2. C-Karyokinesis
3. D-Synthetic phase
4. A-Cytokinesis

18 The four elements making 99 % of living system are:
1. CHOS
1. CHOP
3. CHON
4. CNOP

19 Find out the incorrect statement
1. Middle lamella is mainly made up of Ca-pectate
2. Cell wall is formed from inner side therefore secondary wall formed before primary wall
3. Middle lamella glues the different neighbouringcells together
4. Pits are present in secondary wall

20 Which one of the following process is responsible for the release of N_2 in the atmosphere?
1. Industrial Nitrogen fixation
2. Ammonification
3. Denitrification
4. Biological nitrogen fixation

21 Select the correct match
1 Auxin - Parthenocarpy in tomatoes
2 GA_3 - Overcoming apical dominance
3 Cytokinin - Bolting in cabbage
4 Ethylene - Richmond Lang effect

22 When tripalmitin is used as substrate in respiration, the value of RQ is found to be less than one because
1. It contains less number of carbon atoms than oxygen atoms.
2. The amount of CO_2 evolved is more than the amount of O_2 consumed.
3. The amount of O_2 consumed is more than the amount of CO_2 evolved.
4. The ratio of the numbers of carbon and hydrogen atoms in this molecule is not 1 : 2.

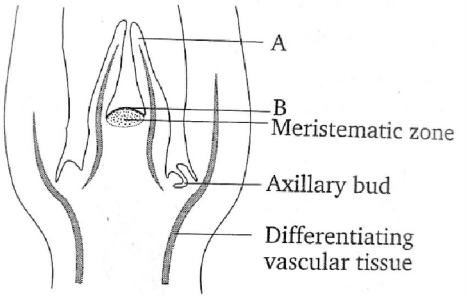
23 Functions related to Golgi complex is/are
a. Polymerisation of amino acids
b. Formation of glycoproteins
c. Modification of proteins
1. a only
2. b and c only
3. All a, b and c
4. b only

24 Glycogen is a polymer of:
(1) Galactose
(2) Glucose
(3) Fructose
(4) Sucrose

25 Consider the given statements stating them true (T) or false (F) and select the correct option
A. When only PS-I is functional, the electron is circulated within the photosystem and phosphorylation occurs due to cyclic flow of electrons
B. Cyclic photophosphorylation occurs when only light of wavelength beyond 680 nm is available for excitation
C. The process is called cyclic photo-phosphorylation when two photosystems work in a series, first PS-II and then the PS-I
1. A-T, B-T, C- F
2. A-T, B-F, C- T
3. A-F, B-F, C- T
4. A-T, B-T, C- T

26 Identify the amino acid with hydroxymethyl as its R group:
1. Glycine
2. Alanine
3. Serine
4. Phenylalanine

27 Identify the type of apical meristem and structures marked as A and B in the diagram given below:



1. Root apical meristem, A = root apex, B = leaf primordium
2. Root apical meristem, A = leaf primordium, B = shoot apex
3. Shoot apical meristem, A = shoot apex, B = leaf primordium
4. Shoot apical meristem, A = leaf primordium, B = shoot apex

28 Select the incorrect statement regarding facilitated diffusion:-
1. It is a very specific process
2. It is a passive process
3. It helps the hydrophilic substances to be transported across the membrane
4. It is faster than active process

29 Morels and *Agaricus* have edible fruiting bodies and
belong to their respective class as.
1. Ascomycetes and Basidiomycetes.
2. Basidiomycetes and Ascomycetes.
3. Ascomycetes and Phycomycetes.
4. Basidiomycetes only

30 Select the correct pair of statements.
A. In Lactic acid fermentation CO_2 is released
B. Enzymes for TCA cycle are present in mitochondrial matrix.
C. Succinate dehydrogenase is found in cytosol
D. Cytochromes are found in cristae of mitochondria
1. A & B
2. A & C
3. B & D
4. B & C

31 Which pigment acts directly to convert light energy to chemical energy?
1. Chlorophyll a.
2. Chlorophyll b.
3. Xanthophyll.
4. Carotenoid.

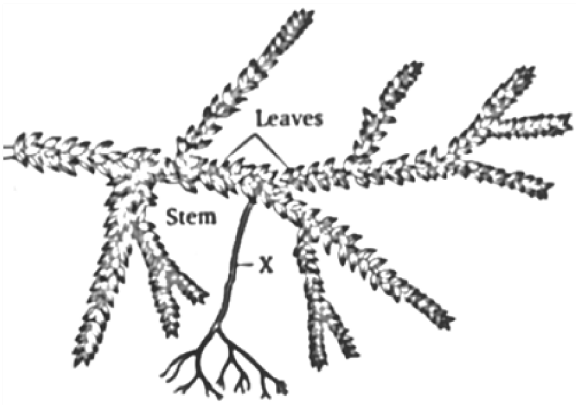
32 Identify the wrong statement about meiosis
1. Pairing of homologous chromosomes
2. Four haploid cells are formed
3. At the end of meiosis the number of chromosomes are reducedto half
4. Two cycle of DNA replication occurs

33 Half-leaf experiment, where a part of leaf is enclosed in a test tube containing KOH is performed to show that :-
1. H_2O is required for photosynthesis.
2. CO_2 is required for photosynthesis.
3. Light is required for photosynthesis .
4. H_2O is source of O_2 released during photosynthesis.

34 Select the incorrect option with respect to the modified structural name, modified organ and examples

	Modified plant organ	**Modified structures**	**Examples**
1.	Tendril	Axillary bud	Gourds
2.	Thorn	Axillary bud	*Citrus*
3.	Phylloclade	Stem	*Opuntia*
4.	Cladode	Stem	Australian *Acacia*

35 Identify the pteridophyte and the structure marked as X:



1. *Salvinia*, X = Stem
2. *Lycopodium*, X = Stem
3. *Selaginella*, X = Rhizophore
4. *Selaginella*, X = Stem

BOTANY - SECTION B

36 Photosynthesis in C_4 plants is relatively less limited by atmospheric CO_2 levels because
1. The primary fixation of CO_2 is mediated via PEP carboxylase
2. Effective pumping of CO_2 into bundle sheath cells
3. Four carbon acids are the primary initial CO_2 fixation products.
4. Rubisco in C_4 plants has a higher affinity for CO_2

37 The gaseous plant growth regulator is used in plants to:
1. kill dicotyledonous weeds in the fields
2. speed up the malting process
3. promote root growth and root hair formation to increase the absorption surface
4. help overcome apical dominance

38 Ubiquinone carries electron from
1. Complex III to complex IV
2. Complex I to complex II
3. Complex II to complex III
4. Complex I or II to complex III

39 Read the following statements about the vascular bundles:
(a) In roots, xylem and phloem in a vascular bundle are arranged in an alternate manner along the different radii
(b) Conjoint closed vascular bundles do not possess cambium
(c) In open vascular bundles, cambium is present in between xylem and phloem
(d) The vascular bundles of dicotyledonous stem possess endarch protoxylem
(e) In monocotyledonous root, usually there are more than six xylem bundles present
Choose the correct answer from the options given below:
1. (a), (c), (d) and (e) only
2. (a), (b) and (d) only
3. (b), (c), (d) and (e) only
4. (a), (b), (c) and (d) only

40 The chief sink for the mineral elements in plants are all, except
1. Young leaves
2. Storage organs
3. Lateral meristems
4. Senescing parts

41 Which of the following occurs first during secondary growth in dicot root?
1. Primary meristem becomes active present below phloem
2. Cambium strips are formed form conjunctive tissue lying just below each phloem strand
3. Cambium strips develop from pericycle opposite to protoxylem
4. A wavy ring of cambium develops

42 The phenomenon by which the undividing parenchyma cells start to divide mitotically during plant tissue culture is called as :
1. Differentiation
2. Dedifferentiation
3. Redifferentiation
4. Secondary growth

43 Which of the following is correct with respect to lenticels?
a. Phellogen forms parenchymatous cells on the outer side
b. It is a lens-shaped opening
c. Helps in exchange of gases
d. Present mostly in woody trees
1. a & b correct
2. c & d correct
3. b, c, & d correct
4. All are correct

44 Calvin cycle (C_3 cycle)
1. Is a feature of all chloroplast containing cells in plants
2. Is the main sugar-producing cycle in C_3, C_4, and CAM plants
3. Has both oxidative and reductive reactions
4. Occurs in darkness only

45 The ascent of xylem sap in plants is mainly accomplished by the :
1. size of the stomatal aperture
2. distribution of stomata on the upper and lower epidermis
3. cohesion and adhesion between water molecules
4. root pressure

46 Identify the correctly matched row:

	Class	Mycelium	Spores
I.	Phycomycetes	Aseptate and coenocytic	Exogenous on sporangium
II.	Ascomycetes	Branched and septate	Endogenously in asci
III.	Basidiomycetes	Branched and septate	Exogenously on basidium

1. Only I
2. Only II
3. Only III
4. Both II and III

47 When the co-factor is removed from the enzyme, its catalytic activity:
1. remains same
2. is increased
3. is greatly reduced
4. is lost

48 Among bitter gourd, mustard, brinjal, pumpkin, China rose, lupin, cucumber, sunnhemp, gram, guava, bean, chili, plum, *Petunia*, tomato, rose, *Withania*, potato, onion, aloe and tulip, how many plants have hypogynous flower?
(1) Six
(2) Ten
(3) Fifteen
(4) Eighteen

49 Secondary protonema of moss
1. Helps in propagation by fragmentation.
2. Helps in propagation by budding.
3. Have leafy stage as lateral bud.
4. All the above

50 The number of time(s) decarboxylation of isocitrate occurs during single TCA cycle is :
1. One
2. Two
3. Three
4. Four

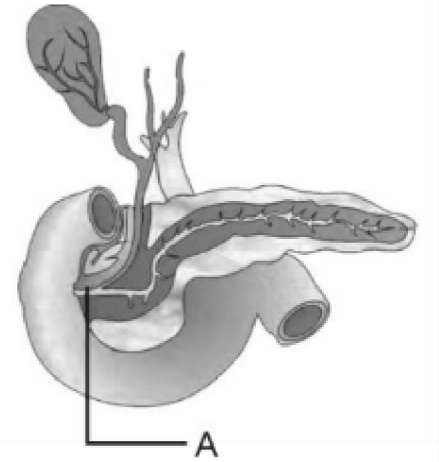
ZOOLOGY - SECTION A

51 Select the incorrect statement from the following with respect to the structural and functional unit of neural system.
1. Unmyelinated nerve fibres are commonly found in autonomous neural system.
2. Nissl's granules are present in the cell body of the neuron.
3. Neurons with cyton and one axon only are usually found in the embryonic stage.
4. Only myelinated nerve fibres are enveloped with Schwann cells.

52 Which of the following group of animals are ammonotelic in nature?
1. Many bony fishes, amphibians, Insects.
2. Marine Fishes, amphibians, aquatic insects.
3. Mammals, birds, Reptiles.
4. Many bony fishes, aquatic amphibians, aquatic insects.

53 Select the correct match
1. Lysozyme - Anti-bacterial agent
2. Stomach - Chemical digestion of starch starts
3. Renin - Lipolytic enzyme
4. Gall bladder - Produces bile

54 Observe the labelling in the given figure and select the sphincter which guards this duct.



1. Sphincter of Boyden
2. Sphincter of Oddi
3. Cardiac sphincter
4. Ileocecal sphincter

55 A peptide hormone which causes dilation of blood vessels and decreases blood pressure is
1. Aldosterone
2. Adrenaline
3. Vasopressin
4. Atrial Natriuretic factor

56 Select the event among the following that is responsible for depolarisation of a nerve fibre.

1. Activation of Na^+- K^+ pump
2. Opening of voltage-gated Na^+ and K^+ channels simultaneously
3. Opening of voltage-gated Na^+ channels that leads to rapid influx of Na^+ into the neuron
4. Opening of voltage-gated K^+ channels that leads to rapid movement of K^+ from axoplasm to ECF

57 Which of the following statements is not correct?

1. An action potential in an axon does not move backward because the segment behind is in a refractory phase.
2. Depolarization of hair cells of cochlea results in the opening of the mechanically gated Potassium- ion channels.
3. Rods are very sensitive and contribute to daylight vision.
4. In the knee-jerk reflex, stimulus is the stretching of muscle and response is its contraction.

58 In how many organisms from the box given below, the heart pumps out deoxygenated blood which is oxygenated by gills and supplied to the body parts?
Carcharodon, Pterophyllum, Silver fish, Balaenoptera, Aptenodytes, Star fish
1. Two
2. Three
3. Four
4. Five

59 Which of the following animals exhibit all these characters – bilateral symmetry, triploblastic, segmented and eucoelomate?
1. Echinoderms
2. Roundworms
3. Molluscs
4. Annelids

60 Transverse section of gut shows four layers of the wall i.e. serosa, muscularis, submucosa and mucosa. Which of the following statements is not correct regarding its arrangement and modifications?
1. Serosa is the outermost layer which is made of thin mesothelium
2. Oblique muscle layer is present in stomach
3. All the four layers show modifications in different parts of alimentary canal
4. Villi and rugae are modified mucosal and submucosal layers respectively

61 Homeothermy is exhibited by:
1. All amniotes
2. Birds and Mammals
3. All deuterostomes
4. Reptiles and Mammals

62 What is true for molluscs?
1. Segmented body with a distinct head and muscular foot
2. A soft spongy layer of skin called mantle below visceral hump
3. Oviparous with indirect development
4. Habitat is exclusively marine

63 The parts of nephron situated in cortical region of kidney are
1. Loop of Henle, PCT, and collecting duct
2. Collecting duct, PCT, and malpighian corpuscle
3. PCT, DCT, and Loop of Henle
4. PCT, DCT and Malpighian corpuscle

64 The most important primary factor in determining the percent saturation of haemoglobin with oxygen is
1. Partial pressure of oxygen
2. Acidity
3. Partial pressure of carbon dioxide
4. Temperature

65 The number of correct statements amongst the given statements is:
I. Cardiac muscles are striated and involuntary.
II. Myosin head is an active ATPase enzyme.
III. The neurotransmitter released at the neuromuscular junction is acetylcholine.
IV. White muscle fibers depend on anaerobic process for energy.
V. Functional unit of muscle contraction is the sarcomere.
1. 2
2. 3
3. 4
4. 5

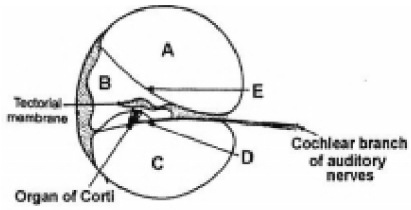
66 How many of the given statements are correct with respect to human urinary system?
(a) In humans, ammonia produced by metabolism is converted into urea in the kidneys and then excreted out by them.
(b) The outer layer of kidney is a tough capsule.
(c) Inside the kidney, there are two zones, an outer medulla and an inner cortex.
(d) The cortex extends in between the medullary pyramids as renal columns called columns of Bertini.
(e) In kidney, there is a broad funnel-shaped space called the renal pelvis with projections called calyces.
1. Five
2. Three
3. Four
4. Two

67 If your blood group is not agglutinated with monoclonal anti-A and anti-B while testing in a lab to determine your blood group, which of the following reasons is correct?
1. No antigens - A & B is present
2. Only antigen - A is present
3. Antigen - B is present
4. Both antigens - A & B are present

68 Which of the following hormones is responsible for both the milk ejection reflex and the foetal ejection reflex?
1. Estrogen
2. Prolactin
3. Oxytocin
4. Relaxin

69 Which substances when present in high level can activate the chemosensitive area present adjacent to rhythm centre?
1. CO_2 *and* O_2
2. HCO_3^- *ions and* O_2
3. CO_2 *and* H^+ *ions*
4. H^+ *ions and* HCO_3^-

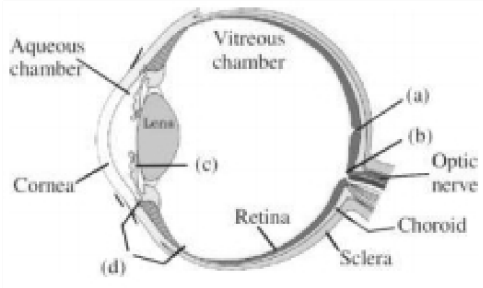
70



Go through the above sectional view of Cochlea. Identify A to E

Options:	A	B	C	D	
1.	Scala vestibule	Scala media	Scala tympani	Basilar membrane	Reissner's membrane
2.	Scala media	Scala vestibule	Scala tympani	Basilar membrane	Reissner's membrane
3.	Scala tympani	Scala media	Scala vestibule	Basilar membrane	Reissner's membrane
4.	Scala vestibule	Scala media	Scala tympani	Reissner's membrane	Basilar membrane

71



For the given diagram which labeling and function is correctly matched/described?
1. (a) → Fovea → Rods are densely packed.
2. (b) → Blindspot → No image formed.
3. (c) → Choroid → Coloured part of the eye which regulates diameter of pupil.
4. (d) → Ciliary body → No role in accommodation

72 T-wave in electrocardiogram represents
1. The return of ventricles from excited to normal state.
2. Depolarisation of ventricles from normal to excited state.
3. Onset of atrial systole.
4. Onset of atrial diastole.

73 Consider the characters of a particular type of joint:
I. It is a type of synovial joint
II. It enables the bone to move in a 360° angle.
III. It is exemplified by joint between humerus and pectoral girdle
What is this type of joint called?
1. Hinge
2. Ball and socket
3. Pivot
4. Saddle

74 Select the wrong statement.
1. Bacterial cell wall is made up of peptidoglycan
2. Pili and fimbriae are mainly involved in motility of bacterial cells
3. Cyanobacteria lack flagellated cells
4. Mycoplasma is a wall-less microorganism

75 Cortisol is secreted from
1. pancreas
2. thyroid
3. adrenal
4. thymus

76 During muscular contraction, which of the following events do not occur?
a. 'H' zone decreases in length and disappears on full relaxation
b. A band remains unchanged
c. I band gets reduced in length due to decrease in length of actin filaments
d. Myosin hydrolyses ATP, releasing ADP and P1
e. Z- lines move away from each other
Choose the correct answer from the options given below.
1. (a), (b), (c) and (d)
2. (a), (b), (d) and (e)
3. (a), (c) and (e)
4. (b) and (d)

77 Hepatic portal system connect
1. Liver and heart.
2. Liver and Kidney.
3. Liver and digestive tract.
4. Liver and spleen.

78 Complete the analogy and choose the correct option.
Choanocytes: Sycon:: Cnidocytes: _____
1. Physalia
2. Pleurobrachia
3. Ctenoplana
4. Spongilla

79 Match List I with List II.

List I	List II
A. Blood	I. Adipose tissue
B. Glial cells	II. Connective tissue
C. Air sacs and lungs	III. Nervous tissue
D. Skin	IV. Squamous epithelium

Choose the correct answer from the options given below:
1. A - (III); B - (I); C- (IV); D - (II)
2. A - (II); B - (III); C- (IV); D - (I)
3. A - (II); B - (III); C- (I); D - (IV)
4. A - (III); B - (I); C- (II); D - (IV)

80 Low intelligence quotient abnormal skin and deaf-mutism is related to
1. Low secretion of growth hormone.
2. Hypothyroidism.
3. Hyperparathyroidism.
4. Hypo secretion of adrenal cortex hormone

81 Consider the statements given below with respect to locomotion and movement.
(a) Cytoskeletal elements like microfilaments are involved in ciliary movements in poriferans.
(b) Passage of ova in female reproductive tract is facilitated by ciliary movement of ova.
(c) Amoeboid movement of macrophages is effected by pseudopodia formed by streaming of protoplasm.
Select the option that contains incorrect statements.
1. a and b only
2. b and c only
3. a and c only
4. a, b and c

82 Consider the following statements and select the correct option
Statement A: Impulse transmission across a chemical synapse is always faster than that across an electrical synapse.
Statement B: Electrical synapses are rare in our body.
1. Both statements A and B are correct
2. Both statements A and B are incorrect
3. Only statement A is correct
4. Only statement B is correct

83 Compound epithelia is present in -
1. Dry surface of the skin.
2. Moist surface of buccal cavity.
3. Inner lining of ducts of salivary gland.
4. All of these

84 Artificial light, extended work-time and reduced sleep-time disrupt the activity of
1. Thymus gland
2. Pineal gland
3. Adrenal gland
4. Posterior pituitary gland

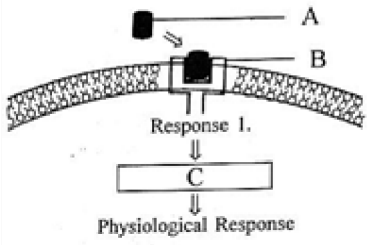
85 How many hormones given in the box are produced by pars distalis?
FSH, TSH, Birth hormone, ACTH, ADH, MSH
1. Two
2. Three
3. Four
4. Six

ZOOLOGY - SECTION B

86 Which of the following is a correct statement?
1. Mycoplasma have DNA, Ribosome and cell wall.
2. Cyanobacteria are a group of autotrophic organisms classified under Kingdom Monera.
3. Bacteria are exclusively heterotrophic organisms.
4. Slime moulds are saprophytic organisms classified under Kingdom Monera.

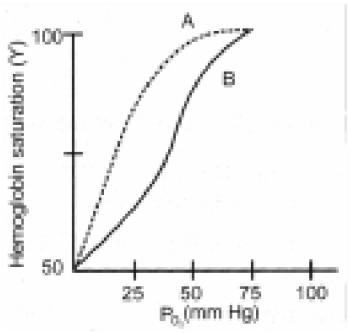
87 Tick mark of the false statement with respect to Periplaneta,
Americana.
1. Mandible help in incising and grinding.
2. Malpighian tubules are present at the juction of midgut and ileum.
3. Hepatic caeca are present at the juction of crop and gizzard.
4. Mushroom gland is present in 6-7th abdominal segments and funtions as an accessory reproductive gland in males.

88 Identify A, B and C in the diagrammatic representation of the mechanism of hormone action.



Select the correct option from the following:
1. A = Steroid Hormone; B = Hormone receptor Complex; C = Protein
2. A = Protein Hormone; B = Receptor; C = Cyclic AMP
3. A = Steroid Hormone; B = Receptor; C = Second Messenger
4. A = Protein Hormone; B = Cyclic AMP; C = Hormone-receptor Complex

89 Oxygen haemoglobin dissociation curves are represented as A and B. Select the incorrect interpretation



1. Curve B has increased ability to unload O_2 in tissues, with respect to curve A.
2. The shift in a curve from B to A is associated with decreased P50 value.
3. At elevated temperature the curve will shift from B to A.
4. Shift in a curve from A to B is associated with decreased O_2 carrying capacity of haemoglobin.

90 Which of the following structures or regions is incorrectly paired with its function?
1. limbic system—screening of information between the spinal cord and the brain; regulates arousal and sleep
2. medulla oblongata—homeostatic control center
3. cerebellum—unconscious coordination of movement and balance
4. corpus callosum—band of fibers connecting left and right cerebral hemispheres

91 Which area actually secretes renin into the blood?
(1) macula densa
(2) juxtaglomerular apparatus
(3) juxtaglomerular cells
(4) cortical nephron

92 During ventricular diastole, which of the following event take place earliest?
1. Closure of semilunar valve
2. Opening of cuspid valve
3. 'Lub' sound appears
4. Both 1 and 3

93 Breathing is best described as
1. Utilisation of O_2 by the cells for catabolic reaction.
2. Transport of gases by the blood.
3. The movement of air into and out of the lungs.
4. Diffusion of gases across alveolar membrane

94 Normal activities of the human heart are regulated:
1. Intrinsically
2. By the autonomic nervous system
3. y the somatic neural system
4. By the adrenal medullary hormones

95 Read the following statements:-
(a) Human liver is the largest endocrine gland of the body having two lobes.
(b) Hepatic lobules are the structural and functional units of the liver and contain hepatocytes which are arranged in a chord-like manner.
(c) Glisson's capsule is covering of each lobule and is made up of connective tissue.
(d) Bile juice is formed and secreted by hepatocytes and is stored in a liver sinusoid.
Out of these which statements are correct and incorrect?
1. Statements a and b are correct while c & d are incorrect.
2. Statements a and d are correct while b & c are incorrect.
3. Statements b & c are correct while a & d are incorrect.
4. Statements b and d are correct while a & c are incorrect.

96 Identify the chordates in which the notochord persists in the adult?
(1) Tunicates
(2) Lancelets
(3) Cyclostomata
(4) Bony fishes

97 Which of the following structures or substances is incorectly paired with a tissue ?
1. Haversian system—bone
2. platelets—blood
3. fibroblasts—skeletal muscle
4. chondroitin sulfate—cartilage

98 Which of the following is not a cranial bone?
1. Zygomatic
2. Sphenoid
3. Ethmoid
4. Parietal

99 Histamine in the blood is secreted by:

1. Mast cells	2. Macrophages
3. Eosinophils	4. Basophils

100 Which of the following process of urine formation takes place all along the renal tubule and collecting duct?
1. Ultrafiltration and tubular reabsorption
2. Ultrafiltration and tubular secretion
3. Tubular reabsorption and secretion
4. Anti-current mechanism and reabsorption

CHEMISTRY - SECTION A

101 Find the number of molecules of product formed when 100 atoms of A and 100 atoms of B are allowed to react with each other:
$A(g) + B_2(g) \rightarrow AB_2(g)$
1. 100
2. 50
3. 40
4. 66

102 Pollution can be controlled by-
1. Sewage treatment.
2. Checking atomic blasts.
3. Manufacturing electrically operated vehicles.
4. All of the above.

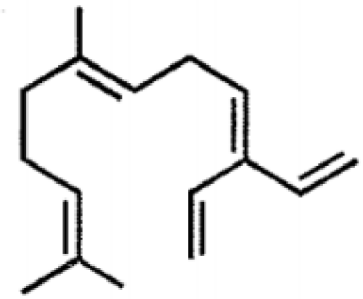
103 The compressibility factor (Z) for an ideal gas is-
1. 1
2. 0
3. >1
4. <1

104 The molar solubility of $Cd(OH)_2$ is 1.84×10^{-5} M in water. The expected solubility of $Cd(OH)_2$ in a buffer solution of pH = 12 is:
1. $2.49 \times 10^{-10}\ M$
2. $1.84 \times 10^{-9}\ M$
3. $6.23 \times 10^{-11}\ M$
4. $1.49 \times 10^{-9}\ M$

105 Identify the correct statement regarding SF_4:

1.	It has one lone pair at the equatorial position with two lone pair-bond pair repulsion at 90°.
2.	It has one lone pair at the axial position with two lone pair-bond pair repulsion at 90°.
3.	It has one lone pair at the equatorial position with three lone pair-bond pair repulsion at 90°
4.	It has one lone pair at the axial position with three lone pair-bond pair repulsion at 90°

106 How many moles of H_2 would be required to produce saturated hydrocarbon from a given compound?



1. 1
2. 4
3. 8
4. 5

107 Which of the following is the correct sequence of increasing first ionisation energy?
1. $Pb < Sn < C < Si$
2. $Pb < C < Si < Sn$
3. $Sn < Pb < Si < C$
4. $Sn < C < Si < Pb$

108 Standard entropy of X_2, Y_2 and XY_3 are $60, 40$ and $50 JK^{-1} mol^{-1}$, respectively. For the reaction, $\frac{1}{2} X_2 + \frac{3}{2} Y_2 \rightarrow XY_3\ \Delta H = -30$ kJ, to be at equilibrium, the temperature will be
1. 500 K
2. 750 K
3. 1000 K
4. 1250 K

109 The presence of ozone in the troposphere-
1. Protects us from UV radiation.
2. Protects us from X-ray radiation.
3. Protects us from the greenhouse effect.
4. Generates photochemical smog.

110 1 gram of a carbonate (M_2CO_3) on treatment with excess HCl produces 0.01186 moles of CO_2. The molar mass of M_2CO_3 in g mol^{-1} is -

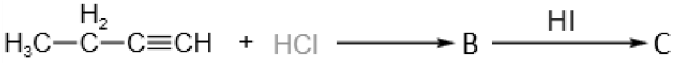
1. 118.6
2. 11.86
3. 88.6
4. 84.3

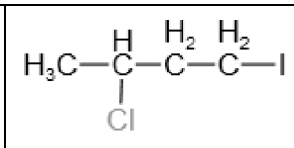
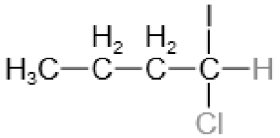
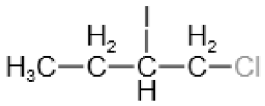
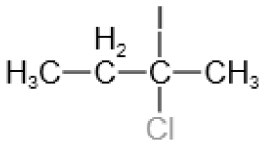
111 Among the following transformations, the hybridization of the central atom remains unchanged in:

1. $CO_2 \rightarrow HCOOH$
2. $BF_3 \rightarrow BF_4^-$
3. $NH_3 \rightarrow NH_4^+$
4. $PCl_3 \rightarrow PCl_5$

112

The product *C* obtained in the following reaction is:



1.		2.	
3.		4.	

113

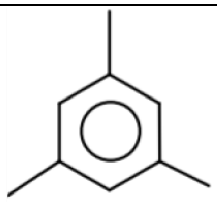
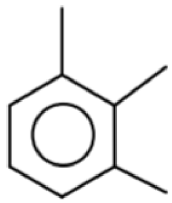
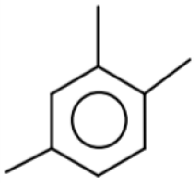
Assertion (A):	B_2 molecule is diamagnetic.
Reason (R):	The highest occupied molecular orbital is of $\sigma-$type.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

114 Among the given halides, which one is the least covalent?

1. $SbCl_5$
2. $SnCl_2$
3. $SnCl_4$
4. $PbCl_4$

115 Propyne on passing through a red hot iron tube gives:

1.		2.	
3.		4.	None of these

116 What is the change in the oxidation state of Hg in the following reaction?

$2HgCl_2(aq.) + SnCl_2(aq.) \rightarrow Hg_2Cl_2(s) + SnCl_4(aq.)$

1. +2 to 0
2. +2 to +1
3. +1 to +2
4. +4 to +2

117 Which of the following can act as Bronsted base but not as Bronsted acid?

1. HCO_3^-
2. HSO_4^-
3. $H_2PO_2^-$
4. $H_2PO_4^-$

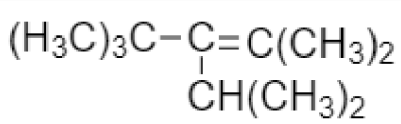
118 Match List - I with List - II.

	List-I (Hydrides)		List - II (Nature)
(a)	MgH_2	(i)	Electron precise
(b)	GeH_4	(ii)	Electron deficient
(c)	B_2H_6	(iii)	Electron rich
(d)	HF	(iv)	Ionic

Choose the correct answer from the options given below:

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

119



The IUPAC name of the above-given compound is-
1. 2,3,4-Trimethyl-3-(1-Methyl ethyl)pent-2-ene
2. 2,3,3-Trimethyl-3-(1-Methylpropyl)pent-2-ene
3. 2,3,4-Trimethyl-2-(1-Methyl ethyl)pent-2-ene
4. 2,4,4-Trimethyl-3-(1-Methyl ethyl)pent-2-ene

120 pH of 0.005M calcium acetate (pk_a of CH_3COOH = 4.74) is:
1. 7.04
2. 9.37
3. 9.26
4. 8.37

121 The solubility of alkaline earth metal carbonates in water increases the order of:

1.	$MgCO_3 < SrCO_3 < CaCO_3 < BaCO_3$
2.	$BaCO_3 < SrCO_3 < CaCO_3 < MgCO_3$
3.	$MgCO_3 < CaCO_3 < SrCO_3 < BaCO_3$
4.	$BaCO_3 < CaCO_3 < SrCO_3 < MgCO_3$

122 Consider the elements Mg, Al, S, P, and Si, the correct increasing order of their first ionization enthalpy is-
1. Mg < Al < Si < S < P
2. Al < Mg < Si < S < P
3. Mg < Al < Si < P < S
4. Al < Mg < S < Si < P

123 The role of hydrogen peroxide in the below reactions is:

$I.\ 4H_2O_2 + 2MnO_4^- + 6H^+ \rightarrow 2Mn^{2+} + 5O_2 + 8H_2O$

$II.\ H_2O_2 + Ag_2O \rightarrow 2Ag + H_2O + O_2$

1. Oxidising in I and reducing in II
2. Reducing in I and oxidizing in II
3. Reducing in I as well as in II
4. Oxidising in I as well as in II

124 The technique in which the liquid boils, when the sum of vapor pressure due to organic liquid (P_1) and that due to water (P_2) becomes equal to the atmospheric pressure (P), is:

1. Sublimation
2. Fractional distillation
3. Steam distillation
4. Evaporation

125 The strongest *ortho*/*para* directing group is:
1. $-NH_2$
2. $-CH_3$
3. $-Cl$
4. $-C_2H_5$

126

Assertion (A):	The gas phase reaction $PCl_3(g) + Cl_2(g) \rightleftharpoons PCl_5(g)$ shifts to the right on increasing pressure.
Reason (R):	When pressure increases, the equilibrium shifts towards more number of moles.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	**(A)** is false but **(R)** is true.

127 If at 298 K the bond energies of C-H , C-C , C = C and H-H bonds are respectively 414, 347, 615, and 435 kJ mol^{-1} , the value of enthalpy change for the reaction at 298 K will be:

$H_2C = CH_2(g) + H_2(g) \longrightarrow H_3C - CH_3(g)$

1. + 250 kJ
2. -250 kJ
3. +125 kJ
4. -125 kJ

128 If the enthalpy of the formation of diamond and fullerene respectively are 1.90 and 38.1 kJ mol^{-1} then the enthalpy change for the conversion of diamond to fullerene will be:

1. 19 kJ mol^{-1}
2. 36.2 kJ mol^{-1}
3. 40 kJ mol^{-1}
4. 57.1 kJ mol^{-1}

129 An organic compound 'A' is oxidized with Na_2O_2 followed by boiling with HNO_3. The resultant solution is then treated with ammonium molybdate to yield a yellow precipitate. Based on the above observation, the element present in the given compound is:

1. Fluorine
2. Phosphorus
3. Nitrogen
4. Sulphur

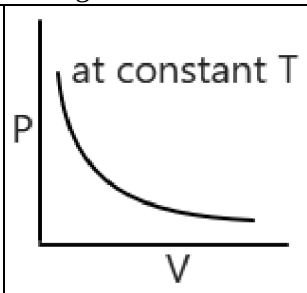
130 5 moles of AB_2 weight 125×10^{-3} kg and 10 moles A_2B_2 weight 300×10^{-3} kg. The molar mass of A (M_A) and molar mass of B (M_B) in kg mol are:

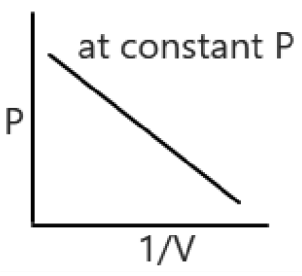
1.	$M_A = 10\times10^{-3}$ and $M_B = 5\times10^{-3}$
2.	$M_A = 25\times10^{-3}$ and $M_B = 50\times10^{-3}$
3.	$M_A = 5\times10^{-3}$ and $M_B = 10\times10^{-3}$
4.	$M_A = 50\times10^{-3}$ and $M_B = 25\times10^{-3}$

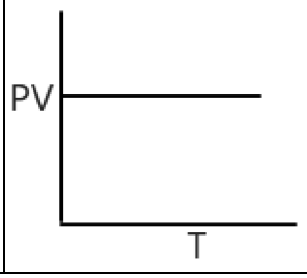
131 Which of the following contains ionic, covalent, and coordinate bonds?

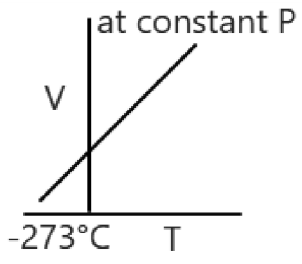
1. $NaCN$
2. PH_4Cl
3. CH_3COONa
4. N_3H

132 The graph that does not represent the behavior of an ideal gas is:

a. 

b. 

c. 

d. 

1. Only a
2. Both a and b
3. Both b and c
4. Only c and d

133 The correct order of decreasing thermal stability is given by

1. $BaCO_3 > MgCO_3 > CaCO_3 > BeCO_3$
2. $BeCO_3 > MgCO_3 > BaCO_3 > CaCO_3$
3. $BeCO_3 > MgCO_3 > CaCO_3 > BaCO_3$
4. $BaCO_3 > CaCO_3 > MgCO_3 > BeCO_3$

134 The maximum number of electrons that can be accommodated in the subshell with azimuthal quantum number l = 4, is:

1. 10
2. 8
3. 16
4. 18

135

Assertion (A):	Cyclopentadienyl anion is much more stable than allyl anion.
Reason (R):	Cyclopentadienyl anion is aromatic in character.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

CHEMISTRY - SECTION B

136 The degree of hydrolysis (h) for the salt of a weak acid with a strong base is given by:
(K_a = acid dissociation constant)

1. $\sqrt{\frac{K_w}{C}}$
2. $\sqrt{\frac{K_w}{K_a}}$
3. $\sqrt{\frac{K_w}{K_a.C}}$
4. $\sqrt{\frac{K_w.C}{K_a}}$

137 An alkene on reductive ozonolysis gives 2-molecules of $CH_2(CHO)_2$. The alkene is-

1. 2,4-Hexadiene
2. 1,3-Cyclohexadiene
3. 1,4-Cyclohexadiene
4. 1-Methyl-1, 3-cyclopentadiene

138 Which one of the following statements is incorrect about H_2O_2?

1.	It is used as a hair bleach and as a mild disinfectant.
2.	It is sold in the market as PERHYDROL.
3.	It is used in pollution control treatment of domestic and industrial effluents.
4.	It is highly explosive when mixed with water.

139 Among Al_2O_3, SiO_2, P_2O_3 and SO_2 the correct order of acid strength is:

1. $SO_2 < P_2O_3 < SiO_2 < Al_2O_3$
2. $SiO_2 < SO_2 < Al_2O_3 < P_2O_3$
3. $Al_2O_3 < SiO_2 < SO_2 < P_2O_3$
4. $Al_2O_3 < SiO_2 < P_2O_3 < SO_2$

140 How many hydrogen atoms are there in 0.420 g of cyclohexane?
$[\text{Atomic mass : H} = 1;\ \text{C} = 12]$
The Avogadro constant is 6.0×10^{23} mol^{-1}

1. 1.8×10^{23}
2. 3.6×10^{22}
3. 3.0×10^{21}
4. 1.8×10^{22}

141 Which of the following halide does not exist?

1. $[SiF_6]^{-2}$
2. $[GeF_6]^{-2}$
3. $[SnCl_6]^{-2}$
4. $[CCl_6]^{-2}$

142
$2PbO + 4HNO_3 \rightarrow 2Pb(NO_3)_2 + 2H_2O$
The above reaction is an example of:

1. Combination reaction
2. Redox reaction
3. Acid-base reaction
4. Disproportion reaction

143

Assertion (A):	NO_3^- is planar while NH_3 is pyramidal.
Reason (R):	N in NO_3^- is sp^2 hybridized with no lone pair but NH_3 is sp^3 hybridized with one lone pair electron.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

144 At 27ºC latent heat of fusion of a compound is 2930 J/mol. Entropy change is :

1. 9.77 J/mol K
2. 10.77 J/mol K
3. 9.07 J/mol K
4. 0.977 J/mol K

145 The compound having a maximum number of 1° carbon atoms is-
1. 2,2-dimethylpropane
2. 2,2,3,3-tetramethyl butane
3. 2,2,3,3,4-pentamethylpentane
4. 1-propylcyclohexane

146 The pH of the mixture of 10 mL of 0.1 M H_2SO_4 and 90 mL of 0.1 M KOH is:
(log 7 = 0.85)
1. 2.85
2. 5.90
3. 8.45
4. 12.85

147 Which of the following is present in a fire extinguisher?
1. Baking Soda
2. Washing soda
3. Caustic Soda
4. Soda ash

148 The correct statement about ICl_5 and ICl_4^- is:

1.	Both are isostructural
2.	ICl_5 is square pyramidal and ICl_4^- is square planar
3.	ICl_5 is trigonal bipyramidal and ICl_4^- is tetrahedral
4.	ICl_5 is square pyramidal and ICl_4^- is tetrahedral

149 If the threshold wavelength (λ_0) for the ejection of an electron from metal is 330 nm, then the work function for the photoelectric emission is:
1. 1.2×10^{-18} J
2. 1.2×10^{-20} J
3. 6×10^{-19} J
4. 6×10^{-12} J

150 The ammonia evolved from the treatment of 0.30 g of an organic compound for the estimation of nitrogen was passed in 100 mL of 0.1 M sulphuric acid. The excess acid required 20 mL of 0.5 M sodium hydroxide solution for complete neutralization. The percentage of nitrogen in the organic compound is:
1. 46.6 %
2. 50.4 %
3. 42.8 %
4. 40.5 %

PHYSICS - SECTION A

151 The wheel of a motor accelerates uniformly from rest. In the first second, it rotates through an angle of 2 radian. What would be the angle through which it rotates in the next second?
1. 2 radian
2. 4 radian
3. 6 radian
4. 8 radian

152 Match the thermodynamic processes taking place in a system with the correct conditions. In the table, ΔQ is the heat supplied, ΔW is the work done and ΔU is the change in internal energy of the system.

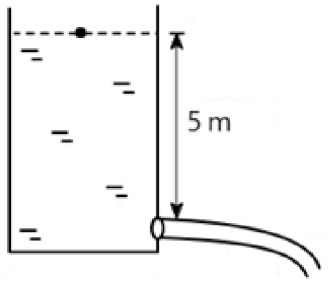
	Process		**Condition**
(I)	Adiabatic	(A)	$\Delta W = 0$
(II)	Isothermal	(B)	$\Delta Q = 0$
(III)	Isochoric	(C)	$\Delta U \neq 0, \Delta W \neq 0, \Delta Q \neq 0$
(IV)	Isobaric	(D)	$\Delta U = 0$

1.	(I) – (B), (II) – (A), (III) – (D), (IV) – (C)
2.	(I) – (A), (II) – (A), (III) – (B), (IV) – (C)
3.	(I) – (A), (II) – (B), (III) – (D), (IV) – (D)
4.	(I) – (B), (II) – (D), (III) – (A), (IV) – (C)

153 The train blowing a whistle of frequency 320 Hz is moving with a velocity of 36 km/h towards a hill from which an echo is heard by the train driver. The frequency of echo will be:
(The velocity of sound in air is 330 m/s.)
1. 430 Hz
2. 340 Hz
3. 120 Hz
4. 220 Hz

154 The position vector of a 1 kg object is $\vec{r} = (3\hat{i} + \hat{j})$ m and its velocity $\vec{v} = (3\hat{j} + k)$ ms^{-1}. If the magnitude of its angular momentum is $\sqrt{x}$ N-m then the value of x will be:
1. 67
2. 91
3. 43
4. 66

155 An open-top tank, filled upto a height of 5 m, has a hole at the bottom. What will be the velocity of water coming out of the hole? (Take $g = 10$ m/s^2)



1. 100 m/s
2. 50 m/s
3. 10 m/s
4. 8 m/s

156 An object flying in the air with velocity $(20\hat{i} + 25\hat{j} - 12\hat{k})$ suddenly breaks into two pieces whose masses are in the ratio of $1 : 5$. The smaller mass flies off with a velocity $(100\hat{i} + 35\hat{j} + 8\hat{k})$. The velocity of the larger piece will be:

1. $4\hat{i} + 23\hat{j} - 16\hat{k}$
2. $-100\hat{i} - 35\hat{j} - 8\hat{k}$
3. $20\hat{i} + 15\hat{j} - 80\hat{k}$
4. $-20\hat{i} - 15\hat{j} - 80\hat{k}$

157 Given below are two statements:

Statement I:	The total energy of a particle falling freely under gravity increases with time.
Statement II:	The law of conservation of mechanical energy does not apply to the motion of a projectile under gravity.

1.	Statement I is incorrect and Statement II is correct.
2.	Both Statement I and Statement II are correct.
3.	Both Statement I and Statement II are incorrect.
4.	Statement I is correct and Statement II is incorrect.

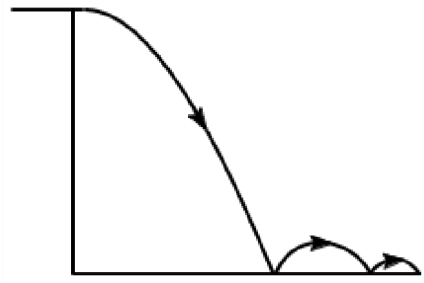
158 The value of acceleration due to gravity on the surface of a planet is $\frac{1}{6}$th that of the earth. The radius of the planet is $\frac{1}{3}$ of earth's radius. What is the escape speed from the surface of the planet?
(Given the escape from the surface of earth is v_e km/s)

1. $\sqrt{\frac{1}{18}}v_e$
2. $\sqrt{\frac{1}{2}}v_e$
3. $\sqrt{\frac{1}{9}}v_e$
4. $\sqrt{\frac{1}{10}}v_e$

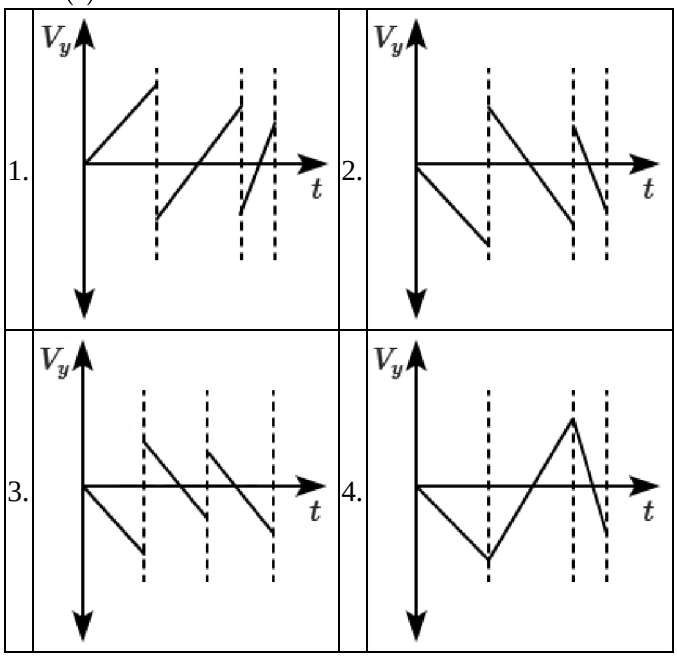
159 A particle moves with a velocity $(6\hat{i} - 4\hat{j} + 3\hat{k})$ m/s under the influence of a constant force $\vec{F} = (20\hat{i} + 15\hat{j} - 5\hat{k})$ N. The instantaneous power applied to the particle is:

1. 45 erg
2. 45 J/s
3. 35 J/s
4. 25 J/s

160 A ball is thrown horizontally from a height with a certain initial velocity at time $t = 0$. The ball bounces repeatedly from the ground with a coefficient of restitution less than 1 as shown.



Neglect air resistance and taking the upward direction as positive, which figure qualitatively depicts the vertical component of the ball's velocity (V_y) as a function of time (t)?



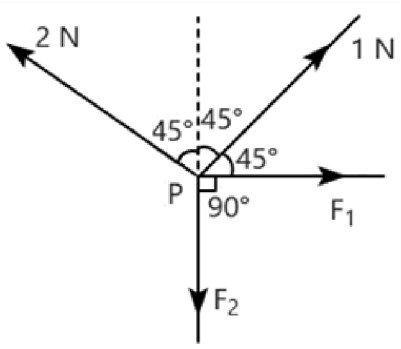
161 A car moves on an inclined plane and covers 10 km path under the action of a horizontal force of 5 N. The work done on the car is 25 kJ. The inclination of the plane to horizontal is:

1. 75°
2. 60°
3. 45°
4. 30°

162 In the wave equation, $y = 0.5 \sin \frac{2\pi}{\lambda}(400t - x)$ m, the velocity of the wave will be:

1. 200 m/s
2. $200\sqrt{2}$ m/s
3. 400 m/s
4. $400\sqrt{2}$ m/s

163 Four forces are acting at a point P in equilibrium as shown in the figure. If the ratio of force F_1 to F_2 is $1 : x$, then the value of x is:



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

164 Two resistances, $R_1 = 60 \pm 6\ \Omega$ and $R_2 = 40 \pm 2\ \Omega$ are connected in series. The equivalent resistance will be:

1. $100 \pm 12\ \Omega$
2. $100 \pm 10\ \Omega$
3. $100 \pm 8\ \Omega$
4. $100 \pm 4\ \Omega$

165 For most liquids, which of the following statement is correct:

1.	viscosity and surface tension decrease with temperature.
2.	viscosity and surface tension increase with temperature.
3.	viscosity decreases while surface tension increases with temperature.
4.	viscosity increases while surface tension decreases with temperature.

166 The work done in stretching a uniform metal wire of cross-section 10^{-6} m^2 and length 2 m through 2 mm is:
(The Young's modulus for the wire is 3×10^{11} N-m^{-2})
1. 0.3 J
2. 0.6 J
3. 1.2 J
4. 0 J

167 A car of mass m moves in a horizontal circular path of radius r metre. At an instant, its speed is v m/s and is increasing at a rate of a m/s^2. Then, the acceleration of the car is:
1. $\frac{v^2}{r}$
2. a
3. $\sqrt{a^2+\left(\frac{v^2}{r}\right)^2}$
4. $\sqrt{a+\frac{v^2}{r}}$

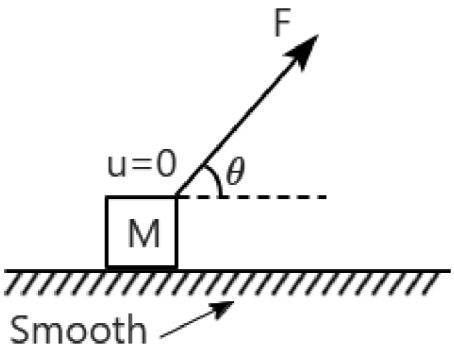
168 When a raindrop of radius r falls through air with given velocity v, the viscous force acting on it will be:
1. proportional to r
2. proportional to r^2
3. proportional to $1/r$
4. independent of r

169 A circular metallic ring of radius R has a small gap of width d. The coefficient of thermal expansion of the metal is α in appropriate units. If we increase the temperature of the ring by an amountΔT, then the width of the gap,

1.	will increase by an amount of $d\alpha\Delta T$
2.	will not change
3.	will increase by an amount $(2\pi R - d)\,\alpha\Delta T$
4.	will decrease by an amount of $d\alpha\Delta T$

170 The ratio of radii of gyration of a circular disc to that of a circular ring, each of the same mass and radius, around their respective axis is:
1. $\sqrt{2} : \sqrt{3}$
2. $\sqrt{3} : \sqrt{2}$
3. $1 : \sqrt{2}$
4. $\sqrt{2} : 1$

171 It is given that the block never loses contact with the smooth horizontal surface, and the force always acts at an angle θ with the horizontal. The speed of the block when it covers a horizontal distance l will be:

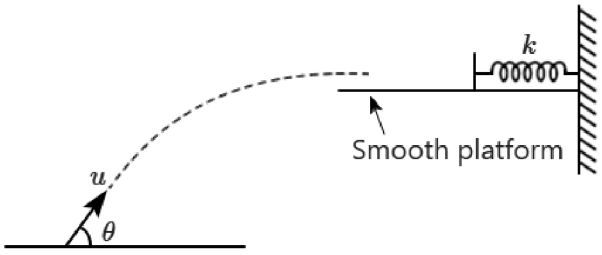


1. $\sqrt{\frac{lF\cos\theta}{m}}$
2. $\frac{2l\ \mathrm{F}\cos\theta}{\mathrm{m}}$
3. $\sqrt{\frac{2l}{m}F\cos\theta}$
4. $\frac{l\ \mathrm{F}\cos\theta}{\mathrm{m}}$

172 Consider a mole of a sample of hydrogen gas at NTP. Then:

1.	the volume of the gas is exactly 2.24×10^{-2} m^3
2.	the volume of the gas is approximately 2.24×10^{-2} m^3
3.	the gas will be in thermal equilibrium with 1 mole of oxygen gas at NTP
4.	the gas will be in thermodynamic equilibrium with 1 mole of oxygen at NTP

173 A ball of mass m is projected with a speed u, at an angle of θ with the horizontal. At its highest point, it moves on a smooth horizontal platform with a spring of spring constant k attached, and the ball compresses the spring. The maximum compression in the spring is x. Then:



1. $\frac{1}{2}mu^2 = \frac{1}{2}kx^2$
2. $\frac{1}{2}mu^2cos^2\theta = \frac{1}{2}kx^2$
3. $\frac{1}{2}mu^2 = \frac{1}{2}kx^2cos^2\theta$
4. $\frac{1}{2}mu^2sin^2\theta = \frac{1}{2}kx^2$

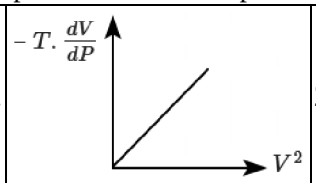
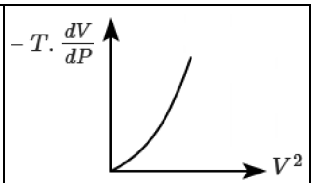
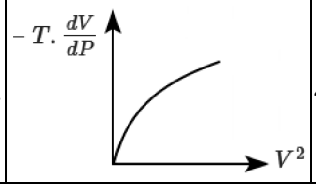
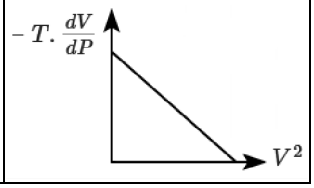
174 Which of the following relations does not give the equation of an adiabatic process, where terms have their usual meaning?

1. $P^{1-\gamma}T^{\gamma}$ = constant
2. PV^{γ} = constant
3. $TV^{\gamma-1}$ = constant
4. $P^{\gamma}T^{1-\gamma}$ = constant

175 In two different experiments, an object of mass 5 kg moving with a speed of 25 ms^{-1} hits two different walls and comes to rest within (i) 3 seconds, and (ii) 5 seconds, respectively.
Choose the correct option out of the following:

1.	impulse and average force acting on the object will be the same for both cases.
2.	impulse will be the same for both cases but the average force will be different.
3.	the average force will be the same for both cases but the impulse will be different.
4.	average force and impulse will be different for both cases.

176 Let P, V and T denote respectively the pressure, volume, and temperature of an ideal gas. The correct graph for an adiabatic process is:

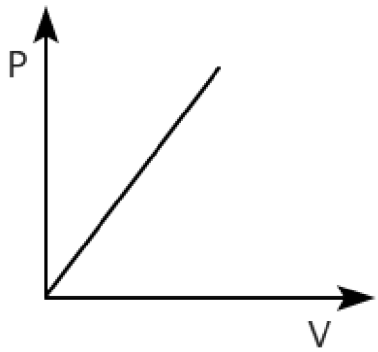
1.		2.	
3.		4.	

177 Given below are two statements:

Assertion (A):	Water in a U-tube executes SHM. The time period for mercury-filled up to the same height in the U-tube is greater than that in the case of water.
Reason (R):	The amplitude of an oscillating pendulum goes on increasing.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

178 The $(P-V)$ graph of an ideal monoatomic gas is as shown. The molar heat capacity of gas will be:



1. $2R$
2. $3R$
3. $5R$
4. $7R$

179 In a given process on an ideal gas, $dW = 0$ and $dQ < 0$. Then for the gas:

1.	the temperature will decrease.
2.	the volume will increase.
3.	the pressure will remain constant.
4.	the temperature will increase.

180 The angles of contact between the capillary tubes and three liquids in three containers A, B, and C are 30°, 90° and 120° respectively. The level of liquid inside the capillary tubes in containers:

1.	falls in B and rises in C.
2.	rises in A and neither rises nor falls in B.
3.	falls in C and rises in B.
4.	falls in A and neither rises nor falls in B.

181 Two projectiles are launched, one at twice the speed of the other; the slower one at 30° and the faster one at 60°. Their horizontal ranges are in the ratio: (slower : faster)

1. $\frac{1}{2}$
2. $\frac{1}{4}$
3. $\frac{1}{6}$
4. $\frac{1}{12}$

182 A car starts at point X. It travels 3.0 km due east, then 4.0 km due south, then 6.0 km due west, and finally 8.0 km due north. How far away is the car from point X when it has reached the end of this journey?
(Assume that all distances moved are on a flat horizontal surface, and that point X is on the equator. You may ignore any curvature of the Earth.)

1. 5.0 km
2. 21.0 km
3. 10.0 km
4. 7.0 km

183 Two sound waves of wavelength 1 m and 1.01 m in a gas produce 9 beats in 3 s. The velocity of sound in the gas is:

1. 360 m/s
2. 303 m/s
3. 337 m/s
4. 330 m/s

184 As per the given figures, two springs of spring constants k and $2k$ are connected to mass m. If the period of oscillation in figure (a) is 3 s, then the period of oscillation in figure (b) will be $\sqrt{x}$ s . The value of x is:

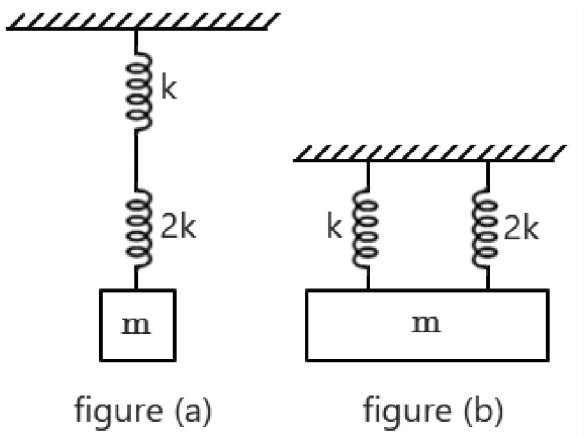


figure (a) figure (b)

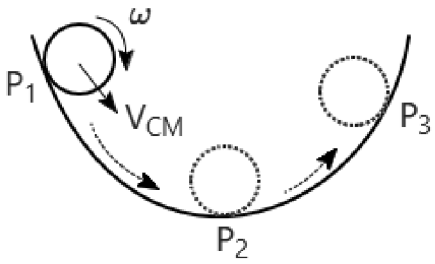
1. 3
2. 4
3. 2
4. 1

185 A uniform heavy rod of mass 20 kg, cross-sectional area of $= 0.4$ m^2 and length of 20 m is hanging from a fixed support. Neglecting the lateral contraction, the elongation in the rod due to its own weight is:
(Given: Young's modulus $Y = 2 \times 10^{11}$ N-m^{-2} and $g = 10$ ms^{-2})

1. 12×10^{-9} m
2. 30×10^{-9} m
3. 25×10^{-9} m
4. 35×10^{-9} m

PHYSICS - SECTION B

186 A small ring is rolling without slipping on the circumference of a large bowl as shown in the figure. The ring is moving down at P_1, comes down to the lowermost point P_2 and is climbing up at P_3. Let $\vec{V}_{CM}$ denote the velocity of the centre of mass of the ring.
Choose the correct statement regarding the frictional force on the ring:

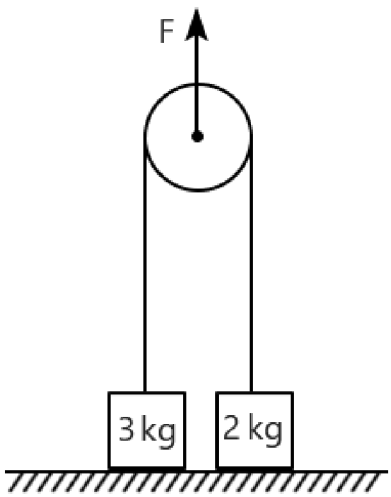


1.	it is opposite to $\vec{V}_{CM}$ at the points P_1, P_2 and P_3.
2.	opposite to $\vec{V}_{CM}$ at P_1 and in the same direction as $\vec{V}_{CM}$ at P_3.
3.	it is in the same direction as $\vec{V}_{CM}$ at P_1 and opposite to $\vec{V}_{CM}$ at P_3.
4.	it is zero at the points P_1, P_2 and P_3.

187 A simple pendulum bob is a hollow sphere full of sand suspended by means of a wire. If all the sand is drained out immediately, then the time period of the pendulum will:
1. increase
2. decrease
3. remain same
4. become erratic

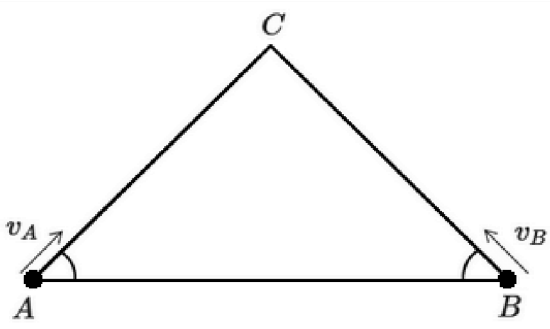
188 In a gravitational field, the gravitational potential is given by, $V = -\frac{K}{x}$ J/kg. The gravitational field intensity at point $(2, 0, 3)$ m is:
1. $+\frac{K}{2}$
2. $-\frac{K}{2}$
3. $-\frac{K}{4}$
4. $+\frac{K}{4}$

189 The two blocks are at rest on a smooth horizontal plane and are connected by strings passing over a smooth light pulley as shown. The strings are vertical while the force F, applied to the pulley is vertical. For what minimum value of F will the 2 kg block be lifted off? ($g = 10$ m/s^2)



1. 20 N
2. 30 N
3. 25 N
4. 40 N

190 Two particles A, B are projected simultaneously from the base of a triangle ABC. Particle A is projected from vertex A along AC, and particle B is projected from vertex B along BC. Their respective velocities are v_A & v_B and they move with uniform velocities.
For the particles to collide:



1. $v_A \cos A = v_B \cos B$
2. $v_A \sin A = v_B \sin B$
3. $\frac{v_A}{\sin A} = \frac{v_B}{\sin B}$
4. $v_A \tan A = v_B \tan B$

191 The kinetic energy of a rolling wheel (uniform disc) of mass m, moving with a speed v equals:

1. $\frac{1}{2}mv^2$
2. mv^2
3. $\frac{1}{4}mv^2$
4. $\frac{3}{4}mv^2$

192 Which of the following equations is dimensionally correct?

$(I)\ v=\sqrt{\frac{P}{\rho}}$ $(II)\ v=\sqrt{\frac{mgl}{I}}$ $(III)\ v=\frac{Pr^2}{2\eta l}$

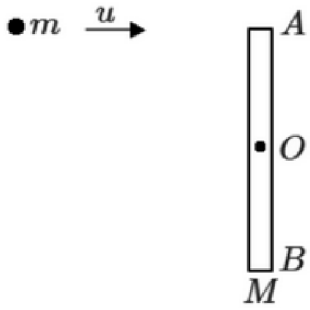
(where $v=$ speed, $P=$ pressure; r, l are lengths; $\rho=$ density, $m=$ mass, $g=$ acceleration due to gravity, $I=$ moment of inertia, and $\eta=$ coefficient of viscosity)

1. $I\ and\ II$
2. $I\ and\ III$
3. $II\ and\ III$
4. $I,\ II\ and\ III$

193 A heater supplying constant power P watts is switched on at time $t=0$ minutes to raise the temperature of a liquid kept in a calorimeter of negligible heat capacity. A student records the temperature of the liquid $T(t)$ at equal time intervals. A graph is plotted with $T(t)$ on the y-axis versus t on the x-axis. Assume that there is no heat loss to the surroundings during heating. Then,

1.	the graph is a straight line parallel to the time axis.
2.	the heat capacity of the liquid is inversely proportional to the slope of the graph.
3.	if some heat were lost at a constant rate to the surroundings during heating, the graph would be a straight line but with a larger slope.
4.	the internal energy of the liquid increases quadratically with time.

194 A uniform rod of mass M and length L lies at rest on a smooth horizontal plane, as shown in the figure. A particle of mass m, moving with an initial velocity u strikes one end (A) of the rod and stops. The initial velocity u is perpendicular to the length (AB) of the rod.



Consider the following statements:

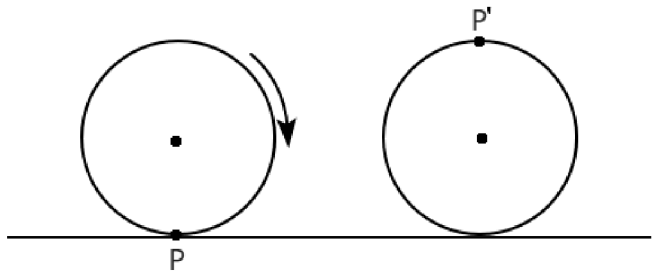
P.	Momentum of the system is conserved.
Q.	Kinetic energy of the system does not change after the collision.
R.	Angular momentum of the system is conserved.

1. P, Q, R are true.
2. P, R are true.
3. Only R is true.
4. Only P is true.

195 For rocket propulsion, the velocity of exhaust gases relative to the rocket is 2 km/s. If the mass of a rocket system is 1000 kg, then the rate of fuel consumption for the rocket to rise up with an acceleration 4.9 m/s^2 will be:

1. 12.25 kg/s
2. 17.5 kg/s
3. 7.35 kg/s
4. 5.2 kg/s

196 The displacement of point P on the wheel (see figure) as the wheel completes half revolution while rolling on the ground is:



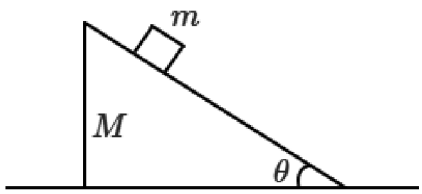
1. $2\pi r$
2. πr
3. $\pi r + 2r$
4. $r\sqrt{\pi^2 + 4}$

197 Given below are two statements:

Assertion (A):	If the average velocity of a particle is zero in a time interval, it is possible that the instantaneous velocity is never zero in the interval.
Reason (R):	If the average velocity of a particle moving on a straight line is zero in a time interval then at least for one moment the instantaneous velocity will also be zero in the interval.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

198 A block of mass m slides down the smooth inclined surface of a wedge of mass M; which is itself on a smooth horizontal surface. The centre-of-mass of the system:



1. is stationary
2. accelerates to the left
3. accelerates to the right
4. accelerates downward

199 Simple harmonic motion is an example of:

1. uniformly accelerated motion
2. uniform motion
3. non-uniform accelerated motion
4. all of these

200 The first overtone of an open organ pipe has the same frequency as the first overtone of a closed pipe of length L. The length of the open organ pipe will be:

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

Fill OMR Sheet*

*If above link doesn't work, please go to test link from where you got the pdf and fill OMR from there. After filling the OMR, you would get answers and explanations for the questions in the test.