BOTANY - SECTION A

1 Match List I with List II:

List I		List II	
A.	Scar of ovule	I.	Stalk of seed
B.	Outer integument	II.	Tegmen
C.	Funiculus	III.	Hilum
D.	Inner integument	IV.	Testa

Choose the correct answer from the options given below:

	A	B	C	D
1.	I	II	IV	III
2.	II	III	I	IV
3.	III	IV	I	II
4.	IV	I	III	II

2 (a) Thalloid
(b) Autotrophic
(c) Haplodiplontic life cycle
The above features are seen in:
1. Fucus
2. Volvox
3. Marchantia
4. Funaria

3 Which of the following is not a modification of the root?
A. Turnip
B. Potato
C. Carrot
D. Sweet potato
E. Zaminkand
Choose the correct answer from the option given below:
1. A & C only
2. B, D & E only
3. B & E only
4. D & E only

4 Identify the group that is not matched correctly to all the characters shown:

	Group	Cell Type	Cell Wall	Nuclear Membrane	Body Organization
1.	Monera	Prokaryotic	Absent	Absent	Cellular
2.	Protista	Eukaryotic	Present in some	Present	Cellular
3.	Fungi	Eukaryotic	Present	Present	Multicellular / loose tissue
4.	Plantae	Eukaryotic	Present	Present	Tissue / organ

5 Read the following statements:
(i) Agar-agar is used to grow microbes and in the preparation of ice creams and jellies.
(ii) *Chlorella* and *Spirulina* are unicellular algae, rich in proteins, and are used as food supplements by space travellers.
(iii) *Porphyra*, *Laminaria*, and *Sargassum* are poisonous.
(iv) Algae are photosynthetic.
(v) *Spirogyra* is a filamentous fungi.
How many of the above statements are incorrect?
1. Five
2. Three
3. Four
4. Two

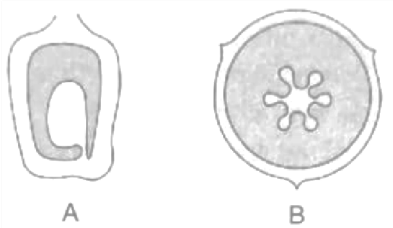
6 a. Annual rings are bands of secondary phloem and medullary rays.
b. The wood of *Cycas* has vessels.
c. Conjoint vascular bundles are found in the leaves of sunflowers and maize.
Which of the above statement(s) is/are correct?
1. a & b are correct
2. b & c are correct
3. Only a is correct
4. Only c is correct

7 Consider the following statements and find the correct one
a. Living organisms are self-replicating, evolving and self-regulating interactive systems capable of responding to external stimuli.
b. Wheat, monocots, and plants represent taxa of the same level.
c. Higher the category, the greater is the difficulty of determining the relation to other taxa of the same level.
d. Lower the taxa, the more the characteristics that the members within the taxon share.
1 All are correct, except 'b'
2 All are correct
3 All are correct, except 'c'
4 All are correct, except 'd'

8 Some plants are mentioned below:
Sesbania, Lupinus Cicer, *Gloriosa*, Colchicum, *Aloe*
How many of the above plants possess vexillary aestivation (A), endospermic seeds (B), and perianth (C)?
1. A = 4, B = 2, C = 1
2. A = 2, B = 2, C = 2
3. A = 4, B = 1, C = 1
4. A = 3, B = 3, C = 3

9 Bryophytes are also called amphibians of the plant kingdom because:
1 Sporophyte is dependent on gametophyte.
2 Zygote does not undergo meiosis immediately.
3 Produce biflagellate male gametes.
4 Can live in soil but depend on water for fertilization.

10 What is true for the (A) and (B) types of placentation given below:



1. A = Found in sunflower, B = Found in pea
2. A = Found in marigold, B = Found in *Dianthus* and *Primrose*
3. A = Found in pea, B = Found in sunflower
4. A = Found in *Dianthus* and *Primrose*, B = Found in marigold

11 Match each item in Column I with one in Column II and select your answer from the codes given below:

	Column I		**Column II**
A.	Diatoms	a.	Protein-rich layer of pellicle
B.	Dinoflagellates	b.	Cell wall embedded with silica
C.	Euglenoids	c.	Spores with true walls
D.	Slime moulds	d.	Cellulose plates in the cell wall

Codes:

	A	B	C	D
1.	b	a	c	d
2.	b	d	a	C
3.	b	c	a	d
4.	b	a	d	c

12 Given below are three statements each with one blank. Select the option which **correctly** fills in the blanks in two statements.
(A) _____systems gave equal weightage to vegetative and sexual characteristics.
(B) Numbers and codes are assigned to all the characters and the data are then processed in _____taxonomy.
(C) _____systems assume that organisms belonging to the same taxa have a common ancestor.

	A	B	C
1.	Artificial		Natural
2.		Phenetics	Artificial
3.	Artificial	Chemotaxonomy	
4.	Artificial		Phylogenetic

13 Match the items given in Column I with those in Column II and select the *correct* option given below:

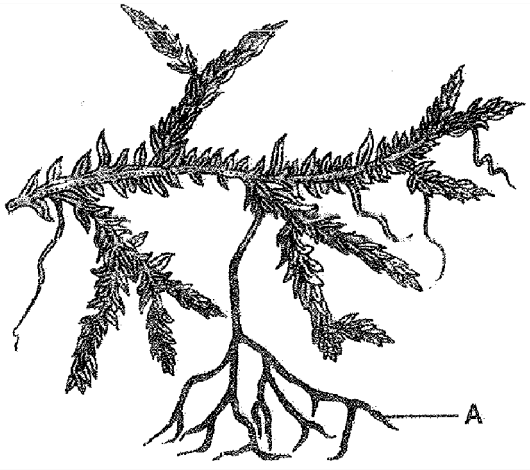
Column I		Column II	
a.	Herbarium	i.	It is a place having a collection of preserved plants and animals.
b.	Key	ii.	A list that enumerates methodically all the species found in an area with a brief description aiding identification.
c.	Museum	iii.	Is a place where dried and pressed plant specimens mounted on sheets are kept.
d.	Catalogue	iv.	A booklet containing a list of characters and their alternates which are helpful in the identification of various taxa.

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

14 Which one of the following statements is correct?
1. In Tomato, fruit is a capsule.
2. Seeds of Orchids have oil-rich endosperm.
3. Placentation in *Primrose* is basal.
4. Flower of Tulip is a modified shoot.

15 Identify the incorrect statement regarding bacteria:
(1) Bacteria are the most abundant microorganisms.
(2) Bacteria live in extreme habitats where very few other life forms can survive.
(3) Bacteria as a group show the most extensive metabolic diversity.
(4) They are obligate intracellular parasites.

16 Identify the plant in the figure given below and the structure labeled A:



1 *Equisetum*; A - Root
2 *Selaginella*; A - Rhizine
3 *Salvinia*; A - Modified leaf
4 *Selaginella*; A - Rhizophore

17 Match the columns and select the correct option:

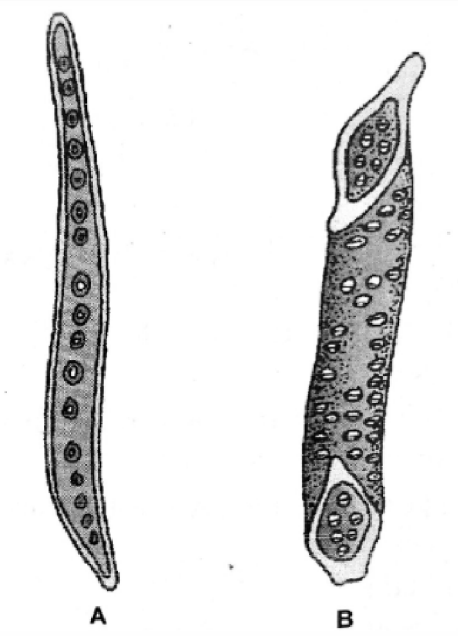
	Column I		Column II
a.	Mycoplasma	(i)	Spore producing eukaryote
b.	Nostoc	(ii)	Wall-less prokaryote
c.	Euglena	(iii)	Oxygenic photoautotroph
d.	Slime mould	(iv)	Wall-less autotroph

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

18 The protozoans that cause malaria in humans are :
1. Radiolarians
2. Dinoflagellates
3. Chrysophytes
4. Sporozoans

19 Which of the following is an incorrect statement regarding fungi?
1. Wheat rust causing agent is *Puccinia*.
2.*Penicillium* is a source of antibiotic.
3. The cell walls of fungi are composed of peptidoglycans.
4. Fungi prefer to grow in warm and humid places.

20 What is true for the structures marked as A and B?



1. A is evolutionarily more advanced than B.
2. A possess pits but B lack pit formation.
3. A is devoid of protoplasm whereas B possesses it.
4. A transports water and minerals and B also transports water and minerals.

21 Match the following columns:

Column I	**Column II**
A. Meristem	i. Photosynthesis, storage
B. Parenchyma	ii. Mechanical support
C. Collenchyma cells	iii. Actively dividing
D. Sclerenchyma	iv. Stomata
E. Epidermal tissue	v. Sclereids

Codes:

	A	B	C	D	E
1.	i	iii	v	ii	iv
2.	iii	i	ii	v	iv
3.	ii	iv	v	i	iii
4.	v	iv	iii	ii	i

22 Phyllotaxy is:
1. Pattern of arrangement of leaves on the stem or branch.
2. Pattern of arrangement of petals on the stem or branch.
3. Pattern of arrangement of sepals on the flower.
4. Pattern of arrangement of perianth on the flower.

23 A flower can be said of a member of Fabaceae if:

1. It shows epipetalous stamens
2. it shows twisted petals
3. It shows standard, keel, and wings
4. It shows valvate petals

24 State true (T) or false (F) to the following statements and select the correct option.

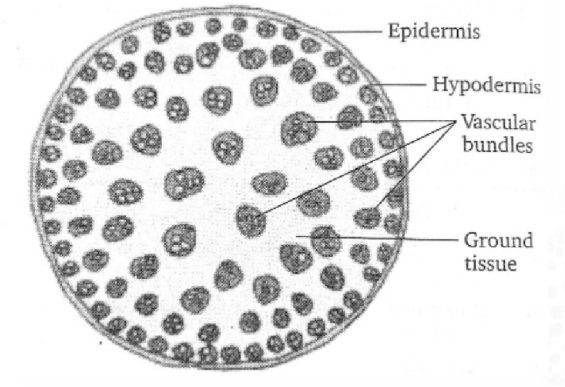
A. Sexual reproduction is absent in Alternaria and Agaricus.

B. Few plants are partially heterotrophic.

C. Morels and truffles are club fungi.

	A	B	C
1.	T	F	T
2.	T	T	T
3.	T	T	F
4.	F	T	F

25 What is true for the diagram given below?



1. Vascular bundles are present in the form of a ring.
2. Pith is distinct.
3. Hypodermis is collenchymatous.
4. Epidermis lack trichomes.

26 Which one of the following statements is wrong?

1. *Laminaria* and *Sargassum* are used as food.
2. Algae increase the level of dissolved oxygen in the immediate environment.
3. Algin is obtained from red algae and carrageenan from brown algae.
4. Agar-agar is obtained from *Gelidium*. and *Gracilaria*.

27 Study the four statements (I-IV) given below and select the two correct ones out of them :

I. Definition of biological species was given by Ernst Mayr.

II. Photoperiod does not affect reproduction in plants.

III. Binomial nomenclature system was given by RH Whittaker.

IV. In unicellular organisms, reproduction is synonymous with growth.

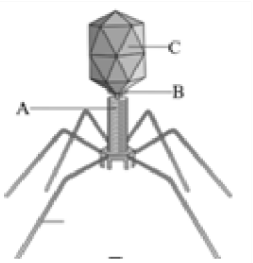
The two correct statements are

1. II and I
2. III and IV
3. I and IV
4. I and II

28 Which of the following statements are true for Heterotrophic bacteria?

1. They fix nitrogen in legume roots.
2. The majority are important decomposers.
3. Helpful in making curd from milk and production of antibiotics.
4. All of these.

29 Identify A, B, and C in the given diagram:



	A	**B**	**C**
1	Sheath	Head	Collar
2	Collar	Head	Sheath
3	Sheath	Collar	Head
4	Head	Collar	Sheath

30 How many of the following statements are correct?

a. Venus fly trap and Cuscuta are insectivorous plants.

b. The viruses are non-cellular organisms with inert crystalline structures.

c. Bacterial viruses usually have ssDNA as genetic material.

d. Viroids lack protein coat.

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

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

Column I		Column II	
(a)	A_{2+4}	(i)	Tomato
(b)	Epiphyllous androecium	(ii)	Lily
(c)	Ovary inferior	(iii)	Mustard
(d)	Gamosepalous	(iv)	Epigynous flower

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

32 Select incorrectly matched pair:

1.	Inferior ovary	Guava
2.	Aestivation with unequal petals	Cotton sized petals
3.	Polyadelphous condition	*Citrus*
4.	Irregular flower	Canna

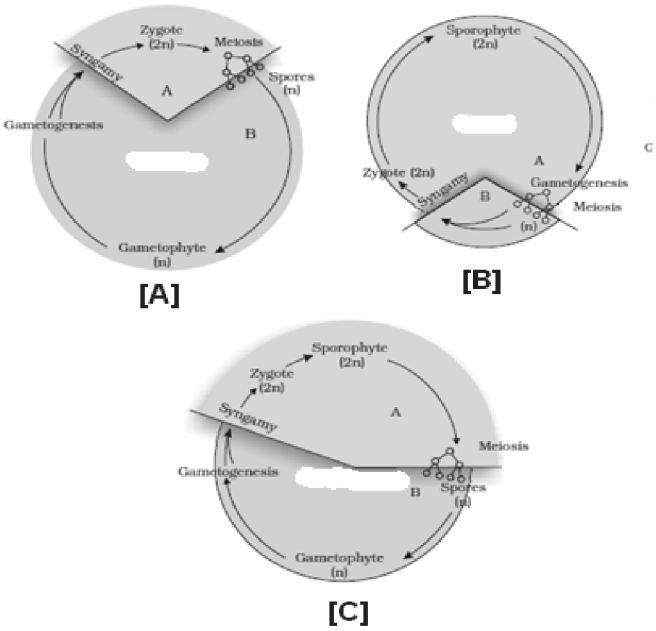
33 Select the correct statement w.r.t. taxonomic key:

1 It is used for identification of plants only.
2 Each statement in the key is called a couplet.
3 It is based on similarities and dissimilarities.
4 Similar taxonomic keys are required for each taxonomic category such as family, genus, and species.

34 Select correct statement w.r.t. systematics:

1 It is the study of different kinds of organisms without their evolutionary relationships.
2 The word systematics is derived from the Greek word System.
3 It includes taxonomy as well as phylogeny.
4 It is a part of the overall taxonomic arrangement that includes identification only.

35 Which among the following is/are the life cycle pattern of colonial algae *Volvox*?



1. A
2. B
3. C
4. All of these

BOTANY - SECTION B

36 Which of the following characters is/are related to isobilateral leaf?
(a) Stomata are present on both surfaces.
(b) Mesophyll is differentiated into palisade and spongy parenchyma.
(c) Sub-stomatal cavity is present below the stoma of the abaxial epidermis.
1. Only (a)
2. Only (c)
3. Only (a) and (c)
4. (a), (b), and (c)

37 Given below is lit. How many of the following have an Adventitious root system?
Mustard, wheat, Grass, Monstera, Banyan.
(1) One
(2) Three
(3) Four
(4) Two

38 More than two leaves arise at each node in:
(a) *Alstonia* (b) Sunflower
(c) Mustard (d) Nerium
The correct example(s) is/are:
1. (a) & (d)
2. (a), (b) & (c)
3. (d) only
4. (a) only

39 *Bougainvillea* and *Citrus* plants are protected from browsing animals as:
1. Adventitious buds get modified into thorns.
2. Axillary buds get modified into spines.
3. Lateral buds get modified into pointed structures.
4. Apical buds get modified into thorns.

40 Read the following statements:

(i)	The outer lining of the ovary which bears an ovule is called the placenta.
(ii)	Lotus and roses possess apocarpous ovaries.
(iii)	Mustard and tomato possess apocarpous ovary
(iv)	After fertilization, the ovules develop into fruit and the ovary matures into a seed.
(v)	Stigma is present at the tip of the style of a carpel.

How many of the above statements are correct?
1. One
2. Three
3. Four
4. Two

41 Read the following statements w.r.t. interstellar secondary growth in dicot stems:
(i) Autumn wood and spring wood appear as alternate concentric rings and constitute an annual ring.
(ii) Late wood possesses vessels of narrow diameter relative to early wood.
(iii) Annual rings seen in cut stems give an estimate of the age of the tree and this method is called a dendrogram.
(iv) Cambium is more active during the spring season than the winter season.
(v) Growth rings or annual rings are very prominent in the trees growing near sea shores.
How many of the above statements are correct?
1. Three
2. Four
3. Five
4. Two

42 Read the following statements (w.r.t. angiosperms):
(a) Embryo sac formation is preceded by meiosis.
(b) Pollen grains germinate on the ovule and the resulting pollen tube grows through the tissues of stigma and style.
(c) A large group of plants occurring in a wide range of habitats.
(d) Synergids, antipodals, and PEN degenerate after fertilization.
How many of the above statement(s) is/are **wrong**?
(1) Two
(2) Three
(3) Four
(4) One

43 **A:** The secondary xylem is derived from procambium during secondary growth.
R: The amount of secondary xylem is almost equal to the amount of secondary phloem.
1. If both Assertion & Reason are true and the reason is the correct explanation of the assertion.
2. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion.
3. If the Assertion is a true statement but the reason is false.
4. If both Assertion and Reason are false statements.

44 Identify the wrong match:
1. Agaricus – Edible ascocarp
2. Gonyaulax – Flagellated protist
3. Colletotrichum – Lack of sexual spores
4. Slime mould – Phagotrophic

45 **A:** Long-distance flow of photoassimilates in plants occurs through sieve tubes.
R: Mature sieve tubes have parietal cytoplasm and perforated sieve plates. 1. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).
2. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).
3. If the Assertion is true statement but the Reason is false, then mark (3).
4. If both Assertion and Reason are false statements, then mark (4).

46 Read the following statements about pteridophytes:
(i) The main plant body is the sporophyte.
(ii) The sporophyte is differentiated into true roots, stems, and leaves.
(iii) Their gametophyte lacks vascular bundle.
(iv) Microphylls are found in *Selaginella* and macrophytes in the ferns like *Dryopteris.*
(v) Strobili or cones are found in *Selaginella* and *Equisetum.*
How many of the above statements are correct?
1. Four
2. Five
3. Two
4. Three

47 Match List I with List II:

List I	List II
A. Isogamous	I. Cycas
B. Heterosporous	II. Spirogyra
C. Gemmae	III. Selaginella
D. Coralloid root	IV. Marchantia

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

48 The causal agent of scrapie disease:
1. Is a proteinaceous particle
2. Has ss RNA
3. Is composed of protein and DNA
4. Is non-infectious to humans

49 Read the following statements:

(i)	Pneumatophores help the plant root to take air or oxygen.
(ii)	Floating hydrophytes possess well-developed root caps.
(iii)	The edible part of Zingiber is an underground stem.
(iv)	Prop roots contain root caps.
(v)	Cladodes are green stems of limited growth which have taken over the function of photosynthesis from leaves.

How many of the above statements are incorrect?
1. Four
2. Two
3. One
4. Three

50 Read the following statements:
(i) Epidermal cells have a lower number of chloroplasts or lack them completely, except for the guard cells.
(ii) Epidermis is mostly single-layered except in the leaves of Ficus and Peperomia.
(iii) Epidermis lack intercellular spaces.
(iv) Root epidermis lack cuticle.
(v) In plants with secondary growth, the epidermis of roots and stems is usually replaced by a periderm through the action of cork cambium or phellogen.
How many of the above statements are correct?
1. One
2. Two
3. Four
4. Five

ZOOLOGY - SECTION A

51 Match List I with List II:

List I	List II
A. Coelomates	I. Aschelminthes
B. Pseudocoelomates	II. Platyhelminthes
C. Acoelomates	III. Annelids
D. Diploblastic	IV. Coelenterates

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

52 Match column I with column II and select the correct option:

	Column I		Column II
a.	Striated muscles	(i)	Assist in the transportation of food through the digestive tract
b.	Visceral muscles	(ii)	Primarily involved in changes in body postures
c.	Cardiac muscles	(iii)	Fibers are branched and involuntary

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

53 Select the mismatch among the following:

1. Bungarus - Epidermal scales
2. Pteropus - Feathery wings
3. Columba - Pneumatic bones
4. Rana - Tympanum

54 Read the given statements and select the correct option

Statement A: All smooth muscle fibres are involuntary muscle fibres are not smooth muscle fibres.

Statement B: In nearly all animal tissues, specialised junctions provide both structural and functional links between its individual cells.

1. Only statement A is correct
2. Only statement B is correct
3. Both statement A and B are incorrect
4. Both statements A and B are correct

55 Which of the following matching pair is WRONG?

1. Mollusca - Calcareous ossicles
2. Cnidaria - Polyp and Medusa
3. Echinodermata - Water vascular system
4. Porifera - Water canal system

56 Recognize the tissue which has the following characteristics:

a. Nutrients that are not used immediately are stored in this tissue after conversion to fats.

b. It is located mainly beneath the skin.

c. It has cells and fibres loosely arranged in a semi-fluid ground substance.

Choose the correct option from the following:

1. Tendons
2. Dense irregular tissue
3. Adipose tissue
4. Blood

57 Which one of the following are the unique characteristics of an insect?

1. Four pairs of legs, book lungs, antennae
2. Cephalothorax, Malpighian tubules, compound eyes
3. Three pairs of legs, antennae, and tracheal system
4. Gills, Non-chitinous exoskeleton, Ommatidia

58 Read the given statements and select the correct option

Statement-A: If the head of the cockroach is removed, it will still live for as long as one week because the nervous system of the cockroach is present in the head region.

Statement-B: Each Malpighian tubule in Periplaneta is lined by glandular and ciliated cells.

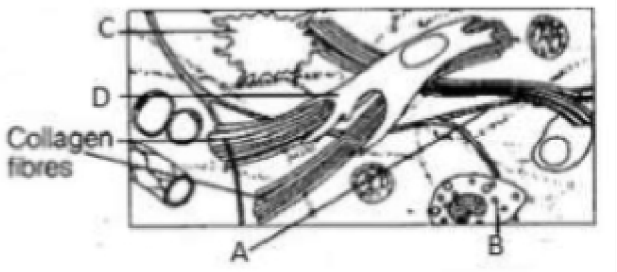
1. Both statements A and B are incorrect.
2. Both statements A and B are correct.
3. Only statement A is correct.
4. Only statement B is correct.

59 Match Column-I with Column-II and select the correct option:

	Column- I		Column-II
a.	Pennatula	(i)	Sea-lily
b.	Gorgonia	(ii)	Sea-hare
c.	Antedon	(iii)	Sea-pen
d.	Aplysia	(iv)	Sea-fan
		(v)	Sea-urchin

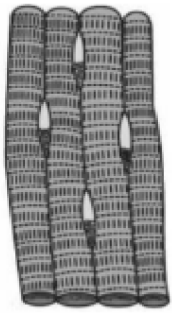
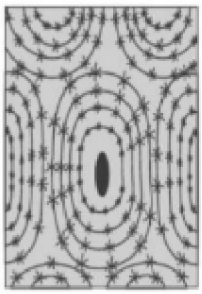
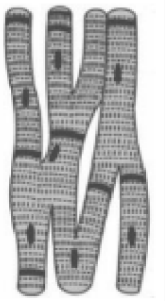
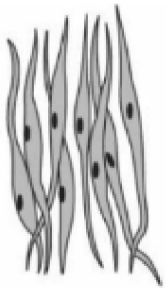
1. a(iv), b(iii), c(i), d(ii)
2. a(ii), b(i), c(iii), d(v)
3. a(iii), b(iv), c(i), d(ii)
4. a(iii), b(iv), c(v), d(ii)

60 In the given diagram of areolar tissue, identify a phagocytic cell :



1. A
2. B
3. C
4. D

61 The process of defecation is a voluntary process and is carried out by a mass peristaltic movement. 'Peristalsis' mentioned in the above statement is associated with which tissue from the options given below?

1.		2.	
3.		4.	

62 Match List I with List II:

List I	List II
A. Bilaterally symmetrical, triploblastic acoelomate animal with flame cells	I. Limulus
B. Bilaterally symmetrical animal with calcareous shell and mantle cavity	II. Pleurobrachia
C. Radically symmetrical animal with ciliated comb plates and exclusively marine	III. Fasciola hepatica
D. Bilaterally symmetrical, triploblastic, coelomate animals with a chitinous exoskeleton	IV. Dentalium

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

63 Which one of the following sets of items in the options is correctly categorized with one exception in it?

	Items	Category	Exception
1.	Protista, Fungi and Plantae	Nuclear membrane present	Protista
2.	Reptiles, Birds, and Mammals	Homoiotherms	Reptiles
3.	Fish, Frog, and Snake	Three chambered heart	Snake
4.	Pristis, Labeo, Trygon	Operculum present	Trygon

64 Which of the following is not a characteristic of *Periplaneta americana*?
1. Uricotelism
2. Mosaic vision
3. Dioecious
4. Holometabolous development

65 Read the following statements A and B and choose the correct answer.
Statement A: The most unique mammalian characteristic is the presence of milk-producing mammary glands.
Statement B: Mammals have one pair of limbs, adapted for walking, running, climbing, burrowing swimming, or flying.
1. Both statements A and B are correct.
2. Only statement A is incorrect.
3. Both statements A and B are incorrect.
4. Only statement B is incorrect.

66 Read the following statements (A) and (B) w.r.t. bony fishes and choose the correct answer from the following given options.
Statement (A): Osteichthyes includes both marine and freshwater fishes with a bony endoskeleton.
Statement (B): Their body is streamlined and their mouth is ventral in position.
1. Both statements (A) and (B) are correct.
2. Only statement (A) is incorrect.
3. Both statements (A) and (B) are incorrect.
4. Only statement (B) is incorrect.

67 Which one of the following statements among all the four i.e., Sycon, Hirudinaria, Delphinus and Psittacula is correct?
1. All are bilaterally symmetrical.
2. Psittacula is homeothermic whereas Sycon, Hirudinaria and Delphinus are poikilothermic.
3. Hirudinaria is a fresh water form whereas all other are marine.
4. Sycon has special collared cells called choanocytes, not found in the remaining three.

68 Complete the analogy by choosing the correct option:
Squamous epithelium: Air sacs of lungs:: Ciliated epithelium: _____
1. PCT of nephrons in the kidney
2. Stomach
3. Bronchioles
4. Walls of blood vessels

69 Read the following statements and choose the correct option.
Statement A: Reptiles have a 3-chambered heart, except crocodiles which have a 2-chambered heart.
Statement B: Superclass Pisces shows single circulation as opposed to class Aves which shows double circulation.
1. Both statements are incorrect.
2. Only statement A is correct.
3. Only statement B is correct.
4. Both statements are correct.

70 Exclusively marine, radially symmetrical, and the diploblastic organism is:
1. Pila
2. Neries
3. Pleurobrachia
4. Asterias

71 Dense irregular connective tissue is present in:
1. Skin
2. Tendons
3. Ligaments
4. Bone marrow

72 Choose the incorrect statement w.r.t. compound epithelium:
1. It covers the dry surface of the buccal cavity, trachea, moist surface of skin, pharynx etc.
2. It is made up of more than one layer of cells.
3. Protecting against chemical and mechanical stresses is its main function.
4. It plays a limited role in absorption and secretion.

73 Asterias lacks specific locomotory, respiratory, and food capturing organs but it can carry these functions through a unique system of:
1. Syconoid canal system
2. Water vascular system
3. Metamerism
4. Segmentation

74 Consider the features given below:
(a) 6-15 pairs of gill slits
(b) Closed circulatory system
(c) Cartilaginous cranium and vertebral column
The mentioned features are characteristics of:
1. Labeo
2. Petromyzon
3. Bufo
4. Carcharodon

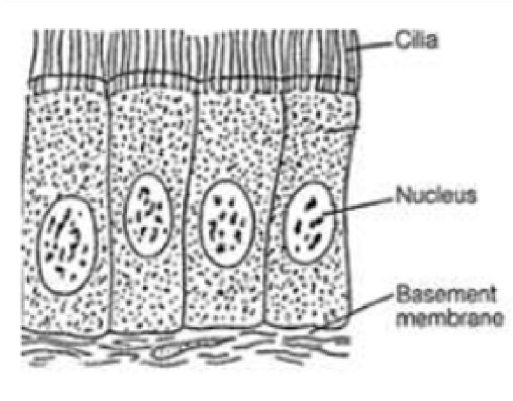
75 Read the following statements carefully w.r.t Periplaneta and select the incorrect one:
1. If the head of the cockroach is cut off, it will still live for as long as one week.
2. Each Malpighian tubule is lined by glandular and ciliated epithelium.
3. The midgut is broader than the hindgut.
4. 13 chambered heart along mid-dorsal line of thorax and abdomen.

76 Select the incorrect match:

1.	Porifers	Body with pores and canals in walls
2.	Coelenterates	Presence of cnidoblasts
3.	Platyhelminthes	Flat body and suckers
4.	Arthropods	Chitinous exoskeleton, comb plates

77 Choose the correct match:
1. Balanoglossus – Stomochord
2. Cucumaria – Water canal system
3. Chaetopleura – Chitinous exoskeleton
4. Octopus – Dorsal hollow nerve cord

78 The epithelium shown in the given diagram is found in :



1. Proximal convoluted Tubule
2. Small intestine
3. Fallopian tube
4. Thyroid follicle cells

79 Match each item in Column I with one in Column II and choose your answer from the codes given below:

Tissue		**Location**	
(a)	Simple Squamous	(i)	Blood vessels epithelium
(b)	Cuboidal brush	(ii)	PCT of nephron-bordered epithelium
(c)	Dense irregular	(iii)	In the skin connective
(d)	Areolar	(iv)	Beneath the skin

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

80 In Amphibia:

I. Skin is moist without scales
II. A tympanum represents the ear
III. Fertilization is external
1. Only I and II are correct.
2. Only I and III are correct.
3. Only II and III are correct.
4. I, II, and III are correct.

81 What is not true regarding Cnidarians?

(1) Body is made up of distinct tissues but true organs have not evolved
(2) They are carnivores
(3) They may have two body forms – polyps and medusa
(4) The digestion is completely intra-cellular

82 Gnathostomata has two _____A_____ , _____B_____ and Tetrapoda. Classes Chondrichthyes and _____C_____ bear fins for locomotion and are grouped under _____D_____ . Choose the option which fills the blanks A, B, C, and D correctly.

	A	B	C	D
1.	Classes	Pisces	Cyclostomata	Tetrapoda
2.	Superclasses	Pisces	Osteichthyes	Pisces
3.	Superclasses	Vertebrata	Osteichthyes	Tetrapoda
4.	Classes	Pisces	Osteichthyes	Gnathostomata

83 Radial symmetry is found in:

1. Sponges, Coelenterates, Ctenophores
2. Annelids, Porifera, Platyhelminthes
3. Coelenterates, Ctenophores, Echinoderms
4. Coelenterates, Ctenophores, Platyhelminthes

84 Identify the incorrect statement regarding Class Cyclostomata:

1. All are ectoparasites on some fishes.
2. They have sucking and circular mouths without jaws.
3. Their body is devoid of scaled and paired fins.
4. The circulatory system is of open type.

85 Which of the following would be a characteristic of the animal shown in the given diagram?

1. Excretory organ is the probosci's gland.
2. They migrate for spawning to fresh water.
3. Notochord is present only in the larval tail.
4. Parapodia are present for swimming.

ZOOLOGY - SECTION B

86 Identify phyla A and B from the following set of features in the box given below:

	Features	Phylum A	Phylum B
a.	Presence of 3 germ layers	Absent	Present
b.	Hermaphroditism	Present	Present
c.	Regeneration	Present	Present in some members
d.	Digestive System	Absent	Incomplete

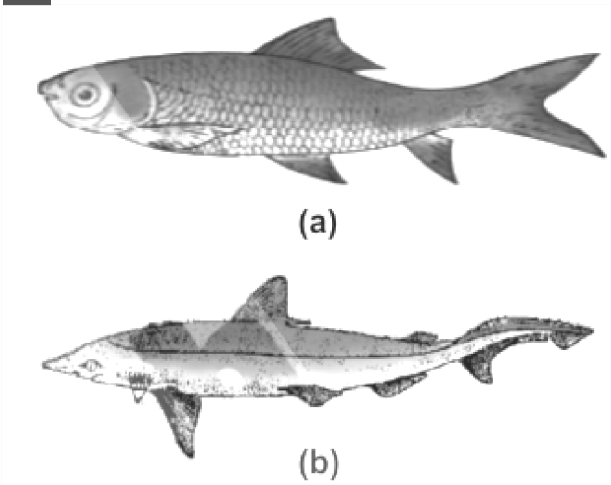
Select the correct option:

	A	B
1.	Platyhelminthes	Arthropoda
2.	Porifera	Platyhelminthes
3.	Cnidaria	Aschelminthes
4.	Ctenophora	Annelida

87 Dense irregular connective tissue is present in:
1. Tendons
2. Ligaments
3. Skin
4. Cartilage

88 The presence of anal styles distinguishes male cockroaches from females. It is present on :
1. Ninth tergite
2. Ninth sternite
3. Tenth tergite
4. Tenth sternite

89 Organism (a) differs from (b) in having:



1. Presence of one auricle and one ventricle
2. External fertilisation
3. Separate sexes
4. Lack of capacity to regulate body temperature

90 Which of the following connects the cytoplasm of adjoining epithelial cells?
1. Tight junctions
2. Adhering junctions
3. Gap junctions
4. All of these

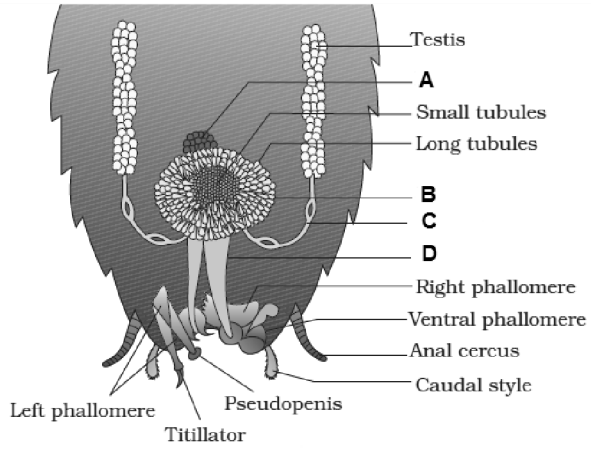
91 Which of the following statements is not true about Nematodes?
1. They are bilaterally symmetrical, un-segmented worms.
2. They are covered with a flexible, thick cuticle that is molted four times as they grow.
3. They possess cilia or flagella on their reproductive cells.
4. They possess a hydrostatic skeleton.

92 The number of correct statements, regarding cockroaches, among the given statements is:
I. Dorsal sclerites are called as sternites and ventral sclerites are called tergites.
II. While the labrum is the upper lip and the labium is the lower lip, the hypopharynx acts as the tongue.
III. Anal cerci are seen in both sexes but anal styles are found in male cockroaches only.
IV. Each thoracic segment bears a pair of walking legs.
V. Forewings called tegmina are used in flight while the hind wings are opaque, dark, and leathery.
1. 2
2. 3
3. 4
4. 5

93 Consider the following sets of some animals. The set that consists of all animals belonging to the same phylum is:
1. *Pinctada, Aplysia, Chaetopleura*
2. *Dentallium, Pila, Echinus*
3. *Asterias, Antedon, Ascidia*
4. *Adamsia, Gorgonia, Pleurobrachia*

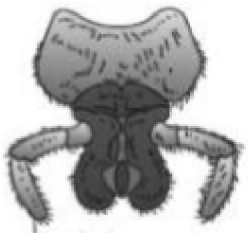
94 Choose the correct option to complete the analogy:
Sawfish: Gill slits are present: : _____: Gill slits are absent.
1. Dogfish
2. Devilfish
3. Stingray
4. Angelfish

95 Sperms are stored in?



1. A
2. B
3. C
4. D

96 The mouth part of the cockroach shown in the given diagram acts as a/an:



1. Upper lip
2. Tongue
3. Lower lip
4. Uvula

97 Mark the incorrect match related to the cockroach:
1. Gizzard → Grinding the food particle.
2. Malpighian tubule → Absorb uric acid from haemolymph and excreted out through the hindgut.
3. Tegmina → Opaque, dark and leathery structure and cover the hind wing when at rest.
4. Collateral gland → Formation of ootheca after fertilization in female genital pouch.

98 Identify the incorrectly matched pair:

	Animals	Feature present in both
1.	*Balanoglossus* and *Pinctada*	Open circulatory system
2.	*Branchiostoma* and *Ascidia*	Persistent notochord
3.	*Aplysia* and *Pheretima*	True coelom
4.	*Gorgonia* and *Pennatula*	Cnidoblasts

99 The number of correct statements amongst the given statements is:
I. The digestive system in Platyhelminthes is incomplete.
II. Coelenterates, Ctenophores, and Echinoderm larvae are radially symmetrical.
III. Bilateral symmetry is seen in annelids and arthropods but not in mollusks.
IV. Notochord is a mesodermally derived structure formed on the dorsal side in some animals.
V. Aschelminthes are pseudocoelomates
1. 2
2. 3
3. 4
4. 5

100 Identify the incorrectly matched pair:

1.	*Ornithorhynchus*:	Oviparous mammal
2.	*Macropus:*	Marsupial mammal
3.	*Balaenoptera*:	Largest land mammal
4.	*Pteropus*:	Flying mammal

CHEMISTRY - SECTION A

101 For the heterolytic cleavage of the given reaction:
$CH_3CH_2Cu \rightarrow$ A and B
'A' and 'B', respectively, are :
1. $^{-}CH_2CH_3 \ and \ ^{-}Cu$
2. $^{+}CH_2CH_3 \ and \ ^{-}Cu$
3. $^{-}CH_2CH_3 \ and \ ^{+}Cu$
4. $^{+}Cu \ and \ ^{-}Cu$

102 The increasing order of stability of the following free radicals is:

1. $(CH_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C}$
2. $(C_6H_5)_3\dot{C} < (C_6H_5)_2\dot{C}H < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$
3. $(C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C} < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$
4. $(CHI_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_3\dot{C} < (C_6H_5)_2\dot{C}H$

103 Statement-I: 2-Methylbutane and 2,2-Dimethylpropane are chain isomers.
Statement-II: Metamerism arises due to different alkyl chains on either side of the polyvalent functional group in a molecule.
In the light of the above statements, choose the correct answer :

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

104 Compounds A, B, C, D, E, and F are the following :

A.	$CH_2 = CH - CHO$
B.	$(CH_3)_2C = C(CH_3)_2$
C.	$CH_3CH = CH - CH_3$
D.	$CH_3C \equiv C - CH_2 - CH_3$
E.	$CH_3 - CH = CH_2$
F.	$CH_3 - C \equiv C - CH_3,$

Which of the above compounds, upon ozonolysis, can give aldehyde(s)?

1. A, B, D and F
2. A, C and E
3. B, D and E
4. A only

105 How many atoms of hydrogen are there in 3.0 kg of ethane?
[relative atomic mass: H=1, C=12; Avagadro constant= 6.0×10^{23} per mol]

1. 3.6×10^{26}
2. 3.9×10^{26}
3. 6.0×10^{25}
4. 3.6×10^{23}

106 IUPAC name of the given compound is

1. 1-Ethyl-4,4-dimethylcyclopentane
2. 3-Ethyl-1,1-dimethylcyclopentane
3. 1-Ethyl-3,3-dimethylcyclopentane
4. 4-Ethyl-1,1-dimethylcyclopentane

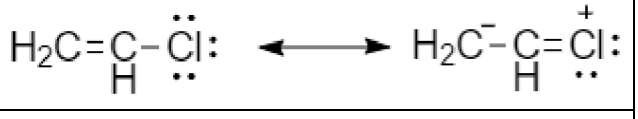
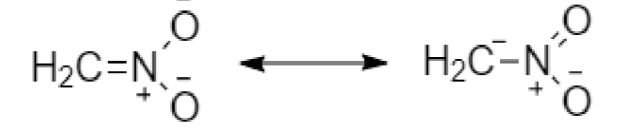
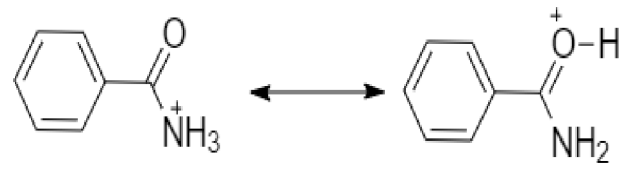
107 For the following molecules/intermediates/species:
A - BH_3; B - SiH_4; C - PCl_3; D - :CH_2; E - NH_3
Which of the above are electrophiles?

1. A, B, C and D only.
2. A, B and C only.
3. A only.
4. A and D only.

108 In an estimation of bomine by Carius method, 1.6g of an organic compound gave 1.88g of AgBr. The mass percentage of bromine in the compound is -
[Atomic mass, Ag=108, Br=80 g mol^{-1}]

1. 50 %
2. 55.5%
3. 60 %
4. 70 %

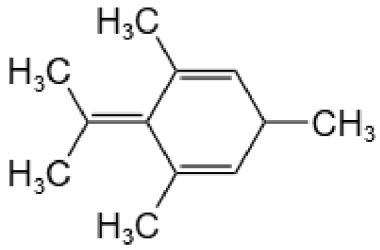
109 Which of the following pairs does not represent resonance structures?

1.	
2.	
3.	
4.	

110 Which among the following is meta directing group towards aromatic electrophilic substitution reaction?
1. $-NHCOCH_3$
2. $-CH_3$
3. $-Cl$
4. $-COR$

111 How many hydrogens are involved in hyperconjugation in the given organic compound A?

A -



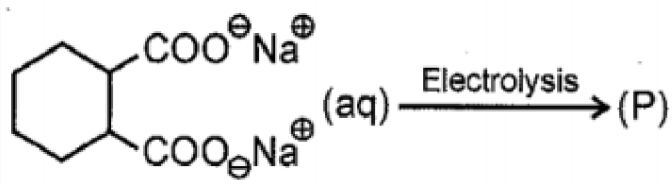
1. 12
2. 13
3. 15
4. 16

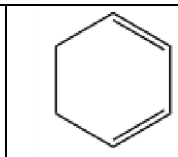
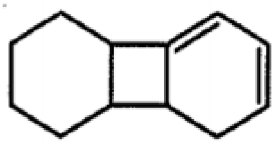
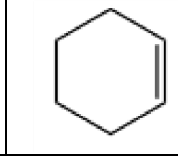
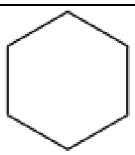
112 With respect to the conformers of ethane, which of the following statements is true?
1. Bond angle changes but bond length remains the same
2. Both bond angle and bond length change
3. Both bond angle and bond length remain the same
4. Bond angle remains the same but bond length changes

113 The number of lone pairs of electrons on the central atom in XeF_5^+ , SO_2 and XeF_4 , respectively, are
1. 2, 1, 2
2. 1, 1, 1
3. 1, 0, 2
4. 1, 1, 2

114 Geometrical isomerism is not shown by :
1. 1,1-Dichloro-1-pentene
2. 1,2-Dichloro-1-pentene
3. 1,3-Dichloro-2-pentene
4. 1,4-Dichloro-2-pentene

115 The major product (P), in the reaction given below, is:



1.		2.	
3.		4.	

116 Statement I: Inductive effect and resonance are permanent effect
Statement II: The energy of actual structure of the molecule (the resonance hybrid) is higher than that of any of the canonical structures.
In light of the above statements, choose the correct option :
1. Statement I is correct but statement II is incorrect
2. Both statement I and statement II are correct
3. Both statement I and statement II are incorrect
4. Statement I is incorrect but statement II is correct

117 The following compounds are :

1. geometrical isomers
2. positional isomers
3. optical isomers
4. functional group isomers

118 An atom has an atomic number x and a mass number of 2x + 6. How many neutrons are in the nucleus of this atom?
1. 6
2. x - 6
3. x + 3
4. x + 6

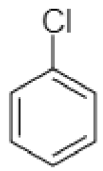
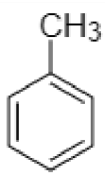
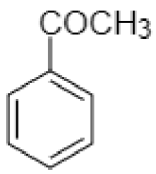
119 The organic compound which can be purified by steam distillation is:
1. acetone
2. aniline
3. glucose
4. ethanol

120 Iodination of a hydrocarbon (C-H → C-I) with molecular iodine is a slow and reversible reaction. However, it can be carried out in the presence of an oxidizing agent such as
1. H_3BO_3
2. HIO_3
3. H_3PO_4
4. CH_3CO_2H

121 Assertion: Amines are pyramidal in shape.

Reason: N-atom is sp^3 hybridized.
1. Both Assertion & Reason are true and the reason is the correct explanation of the assertion.
2. Both Assertion & Reason are true but the reason is not the correct explanation of the assertion.
3. Assertion is true statement but Reason is false.
4. Both Assertion and Reason are false statements.

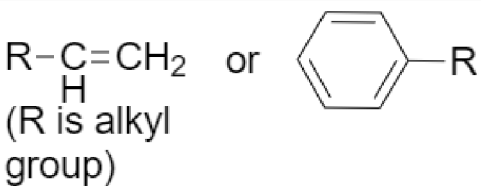
122 The increasing order of the reactivity of the following compounds toward electrophilic aromatic substitution reactions (EASR) is :

		
(I)	(II)	(III)

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

123 A molecule that has 1°, 2° and 3° carbon atoms is:
1. 2,3,4-trimethylpentane
2. chlorocyclohexane
3. 1,1-dimethyl cyclohexane
4. methylcyclohexane

124 In the following benzyl/allyl system

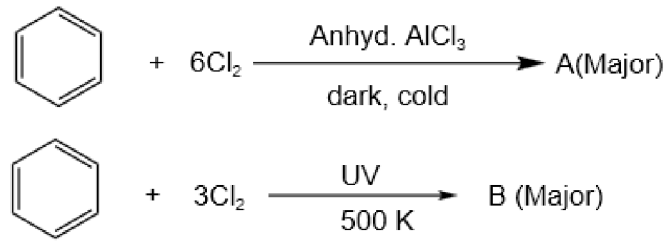


the decreasing order of inductive effect is-
1. $(CH_3)_3C$- > $(CH_3)_2CH$- > CH_3CH_2-
2. CH_3CH_2- > $(CH_3)_2CH$- > $(CH_3)_3C$-
3. $(CH_3)_2CH$- > CH_3CH_2- > $(CH_3)_3C$-
4. $(CH_3)_3C$- > CH_3CH_2- > $(CH_3)_2CH$-

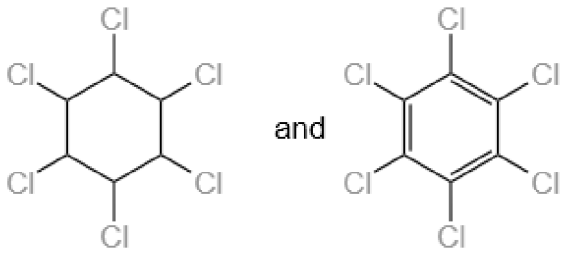
125 Among (a)-column chromatography; (b)-paper chromatography and (c)-thin layer chromatography, an example of partition chromatography is:
1. a and b only
2. b and c only
3. b only
4. c only

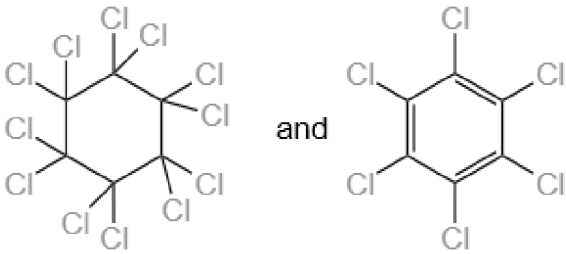
126 Ammonium molybdate is the reagent used to detect:
1. Nitrogen as nitrate
2. Phosphorous as phosphate
3. Sulphur as sulfate
4. Iodine as iodate

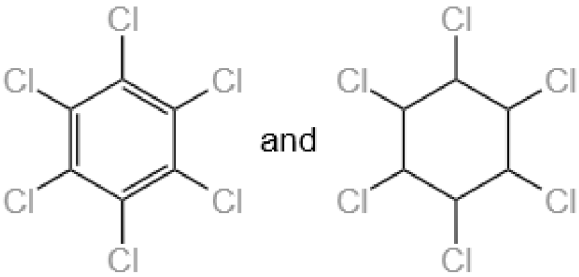
127 Consider the following reactions

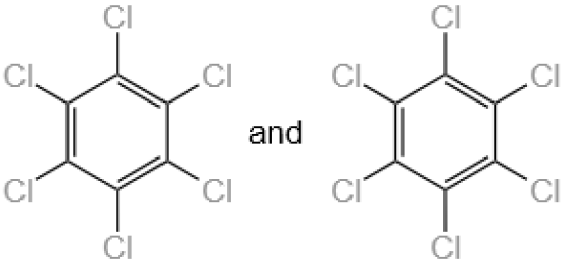


Major products A and B respectively are-

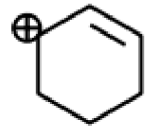
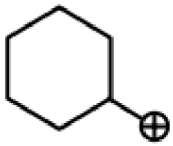
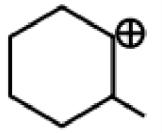
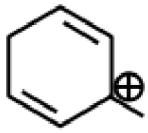
1. 

2. 

3. 

4. 

128 Which of the following is the most stable carbocation?

1. 
2. 
3. 
4. 

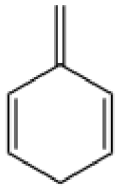
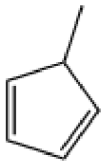
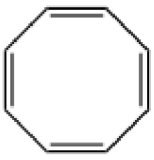
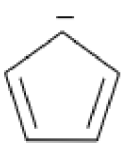
129 In which of the following arrangements the order is not according to the property indicated against it?

1.	Li < Na < K < Rb : Increasing metallic radius
2.	I < Br < F < Cl : Increasing electron gain enthalpy (with negative sign)
3.	B < C < N < O : Increasing first ionisation enthalpy
4.	$Al^{3+} < Mg^{2+} < Na^{+} < F^{-}$: Increasing ionic size

130 Which of the following statement is correct?

1. Alkyne is more reactive towards electrophilic addition than alkene
2. Addition of HBr to an unsymmetrical alkene takes place according to anti-Markownikoff's rule
3. $CH_3\overset{+}{C}HCH_3$ is more stable than $CH_3CH_2\overset{+}{C}HCH_3$
4. All of the above

131 Which of the following compounds is aromatic?

1. 
2. 
3. 
4. 

132 Consider the following reactions

(i)	$CH_4 + O_2 \xrightarrow[\Delta]{Mo_2O_3} A$(major)
(ii)	$(CH_3)_3CH \xrightarrow{KMnO_4} B$(major)

Major products (A) and (B) respectively are
1. Methanol and acetone
2. Methanal and Acetaldehyde
3. Methanal and 2-Methylpropan-2-ol
4. Methanol and 2-methylpropan-2-ol

133 Statement-I: In the Lassaigne test, an organic compound with both N and S, responds to the test of SCN^-.
Statement-II: In the Lassaigne test, if Na is taken in excess, it destroys SCN^- and forms Na_2S and NaCN.
1. Statement-I is correct only.
2. Statement-II is correct only.
3. Both statement-I & II are correct.
4. None of the statement is correct.

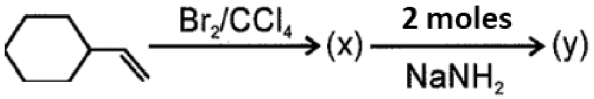
134 0.102 g of an organic compound X was oxidized with fuming nitric acid. The resulting solution, after reaction with an excess of aqueous $BaCl_2$, produced 0.233 g of $BaSO_4$ as a precipitate. The percentage of sulphur in the compound is :
[Given: Atomic wt. of Ba = 137]
1. 31.4 %
2. 37.2 %
3. 42.1 %
4. 26.4 %

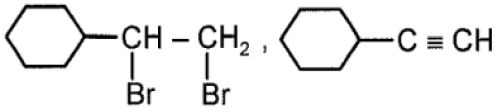
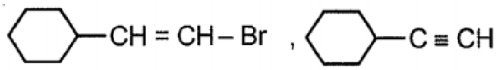
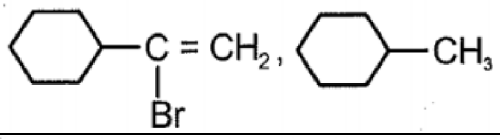
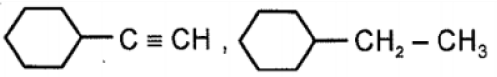
135 Which of the following compounds reacts with a dilute, aqueous solution of potassium permanganate to give a corresponding alcohol?
1. Propane
2. 2-Methylpropane
3. Ethane
4. Cyclohexene

CHEMISTRY - SECTION B

136 Which of the following pairs of structural formulae represent(s) structural isomers?
(A) CH_3CH_2OH and CH_3OCH_3
(B) $CH_3CH(CH_3)CH_2CH_2CH_3$ and $CH_3CH_2CH_2CH(CH_3)CH_3$
(C) $CH(OH)=CHCH_2OH$ and CH_3CH_2COOH
1. A only
2. A, B, and C
3. A and C only
4. B and C only

137



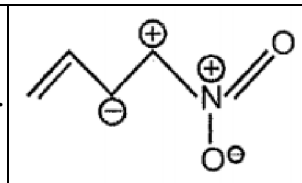
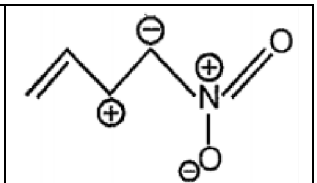
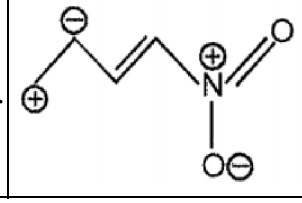
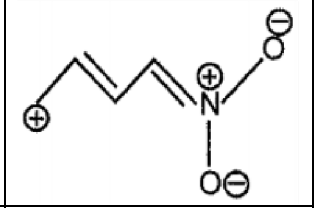
1.	
2.	
3.	
4.	

138 C – H bond length is minimum in
1. Ethene
2. Ethyne
3. Ethane
4. Methane

139 In Mendeleev's periodic table, a number of series and groups are X and Y respectively. X and Y are-
1. X=12, Y=9
2. X=8, Y=9
3. X=8, Y=8
4. X=12, Y=8

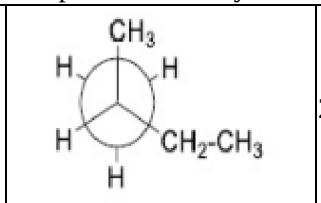
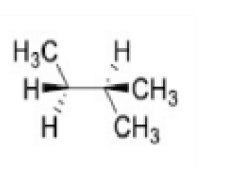
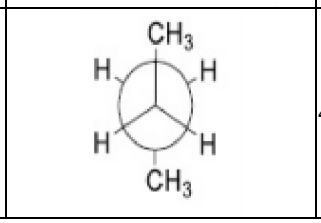
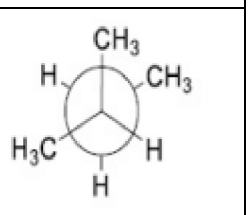
140 Arrange them in order of increasing the energies of the orbitals
A. n=3. l=2
B. n=4, l=1
C. n=5. l=0
D. n=4. l=0
Choose the correct answer from the options given below
1. A < B < D < C
2. A < D < B < C
3. D < A < B < C
4. D < A < C < B

141 Among the following, the least stable resonance structure is:

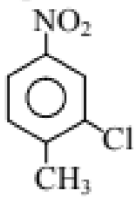
1. 
2. 
3. 
4. 

142 Atoms X and Y form an ionic compound with formula XY_2.
Which option below could give the correct atomic numbers for X and Y?
1. X = 11; Y = 16
2. X = 3; Y = 17
3. X = 12; Y = 9
4. X = 6; Y = 16

143 Among the following, the structure which does NOT represent 2-methyl butane is

1. 
2. 
3. 
4. 

144 The correct IUPAC name of the following compound is :



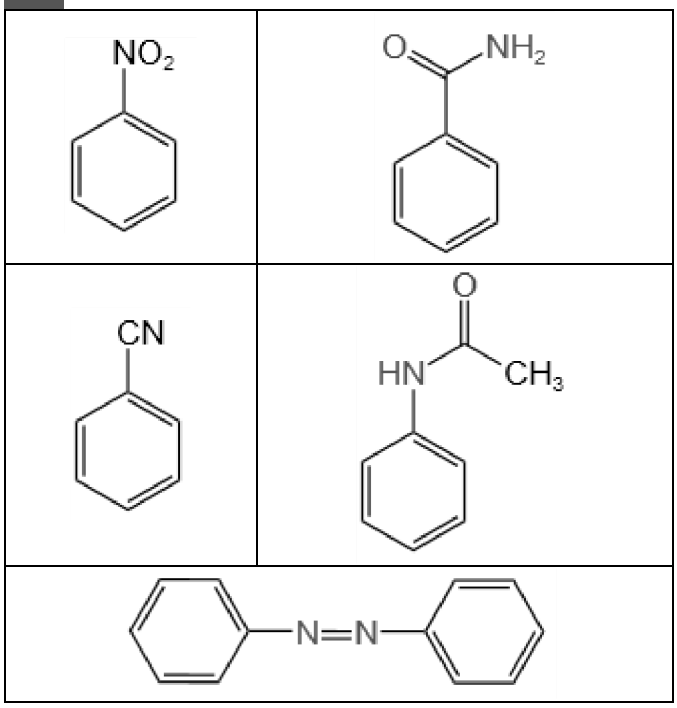
1. 5-chloro-4-methyl-1-nitrobenzene
2. 2-chloro-1-methyl-4-nitrobenzene
3. 2-methyl-5-nitro-1-chlorobenzene
4. 3-chloro-4-methyl-1- nitrobenzene

145 Select the correct statement:
1. cis-But-2-ene has a higher boiling point than trans-But-2-ene.
2. cis-But-2-ene has lower boiling point than trans-But-2-ene.
3. cis-But-2-ene has a lower dipole point than trans-But-2-ene.
4. cis-But-2-ene is non-polar.

146 According to Fajan's rule polarization is more with:
1. Small cation and large anion
2. Small cation and small anion
3. Large cation and large anion
4. Large cation and small anion

147 The molality of 20% (mass/mass) aqueous solution of KI is-
(molar mass of KI = 166 g mol^{-1})
1. 1.51
2. 1.35
3. 1.08
4. 1.48

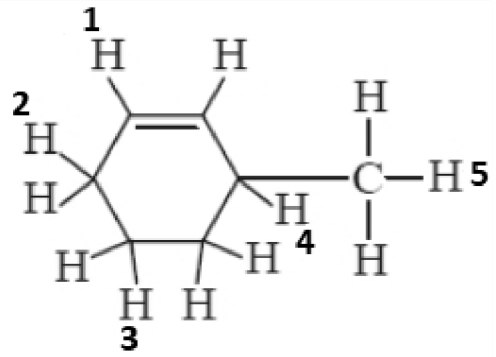
148 Consider the following compounds:



In how many compounds, Kjeldahl method is not applicable for estimation of nitrogen?
1. 5
2. 3
3. 2
4. 4

149 Assertion(A): Addition reaction of water to but-1-ene in acidic medium yields butan-1-ol.
Reason(R): Addition of water in acidic medium proceeds through the formation of primary carbocation.
1. Both Assertion & Reason are true and the reason is the correct explanation of the assertion.
2. Both Assertion & Reason are true but the reason is not the correct explanation of the assertion.
3. Assertion is true statement but Reason is false.
4. Both Assertion and Reason are false statements.

150



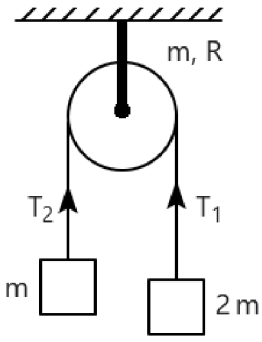
The correct order of abstraction of hydrogen towards homolytic fission is
1. 2>4>3>5>1
2. 4>2>5>3>1
3. 4>2>3>5>1
4. 4>3>2>5>1

PHYSICS - SECTION A

151 The moment of inertia for a uniform square sheet about an axis passing through its centre and lying in the plane, is:

1.	maximum about its diagonal axis.
2.	minimum about axis which is perpendicular to sides of square.
3.	both (1) and (2).
4.	same for all axes.

152 Two blocks of mass m and $2m$ are connected with a string which is passing over a pulley (disc) of mass m and radius R as shown in the figure. If the system is released from rest then acceleration of the block will be:

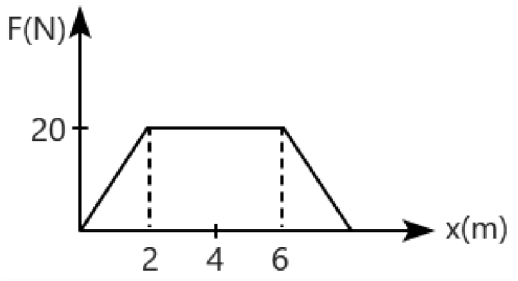


1. $g/5$
2. $2g/7$
3. $g/3$
4. $2g/3$

153 A batsman hits a ball with a speed of $14\sqrt{2}$ ms^{-1} in a direction 45° above the horizontal. The maximum height attained by the ball will be:
1. 20.0 m
2. 10.0 m
3. $\frac{\sqrt{2}}{0.7}$ m
4. $14\sqrt{2}$ m

154 In the uniform circular motion of a particle that keeps changing is:
1. angular velocity
2. angular momentum
3. kinetic energy
4. acceleration

155 A particle of mass 1 kg starts from origin under the force as shown by the graph. The velocity of the particle at $x = 2$ m is:



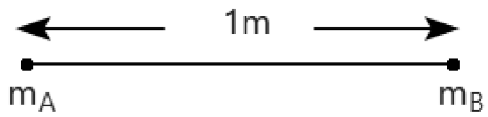
1. $\sqrt{40}$ m/s
2. $\sqrt{20}$ m/s
3. $\sqrt{10}$ m/s
4. 40 m/s

156 Work done by force of friction is:

1.	always zero
2.	always negative
3.	always positive
4.	may be zero, positive or negative

157 A uniform rod of length 5 m has mass of 10 kg. It is fixed about one end and rotated in horizontal plane with angular speed of 2 rad/s. The tension in the rod at 3 m from the fixed pivoted end is:
1. 32 N
2. 48 N
3. 96 N
4. 64 N

158 Two points masses with masses $m_A = 2$ g and $m_B = 3$ g are connected by a massless rod of length 1 m (see figure below). The center of mass of the system will lie at a distance of:



1. 0.4 m from m_A
2. 0.6 m from m_A
3. 0.5 m from m_A
4. 0.7 m from m_A

159 Given below are two statements:

Statement I:	The magnitude of the momentum of a body is directly proportional to its kinetic energy.
Statement II:	Kinetic energy increases whenever an external force acts on a moving body.

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.

160 Two vectors $\vec{A}$ and $\vec{B}$ are acting at an angle θ on an object. If the magnitude of their vector product is $\sqrt{3}$ times their scalar product, the angle θ between them is:
1. 30°
2. 45°
3. 60°
4. 90°

161 The escape velocity of a body from the surface of a planet is v_e. A particle starts from rest at large distance from the planet, reaches the planet only under gravitational attraction, and passes through a smooth tunnel through its centre. Its speed at the surface of the planet will be:
1. $\sqrt{1.5}v_e$
2. $\frac{v_e}{\sqrt{2}}$
3. v_e
4. zero

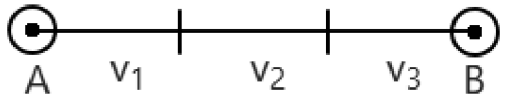
162 A force is applied to a hollow spherical shell so that it acts through its centre. It causes an acceleration of 3 m/s^2. If the same force is applied to the spherical shell, acting tangent to its surface, the acceleration will be: (Assuming no friction is available.)

1. 3 m/s^2
2. 2 m/s^2
3. zero
4. 1 m/s^2

163 An instrument with small least count will have, definitely:

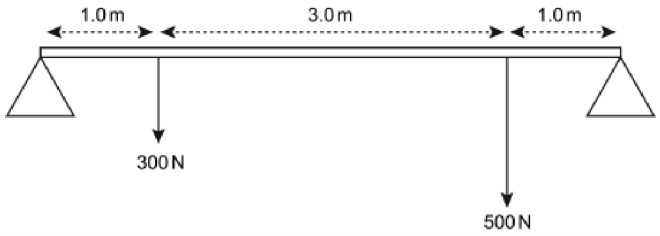
1. high accuracy and high precision
2. low accuracy and low precision
3. high accuracy
4. high precision

164 A car covers AB distance with first one-third at velocity v_1 m/s, second one-third at v_2 m/s and last one-third at v_3 m/s. If $v_3 = 3v_1$, $v_2 = 2v_1$ and $v_1 = 11$ m/s then the average velocity of the car is:



1. 12 m/s
2. 18 m/s
3. 16 m/s
4. 11 m/s

165 The diagram shows a uniform horizontal beam of negligible mass, 5.0 m long, placed on two supports, one at each end. It has a 300 N weight placed 1.0 m from one end and a 500 N weight placed 1.0 m from the other end. Both weights act vertically on the beam as shown in the diagram.



What are the upward forces from the two supports acting on the beam?

1. 340 N and 460 N
2. 300 N and 500 N
3. 240 N and 560 N
4. 400 N and 400 N

166 A uniform rod of mass m and length l is in uniform translational motion. If one of its ends is suddenly hinged then (hinge is smooth):

1.	it will continue its translational motion.
2.	it will now be in pure rotational motion about the hinged end.
3.	it will now have combined translational and rotational motion.
4.	it will stop.

167 An object is thrown vertically upwards. At its maximum height, which of the following quantity becomes zero?

1. momentum
2. potential energy
3. acceleration
4. force

168 Given below are two statements:

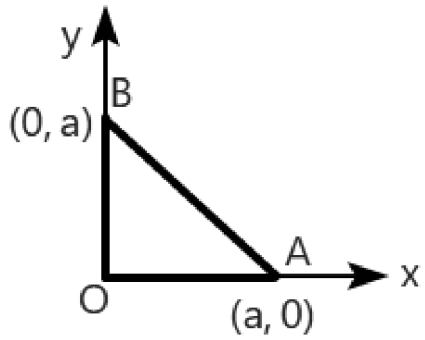
Statement I:	The kinetic energy of a planet is maximum when it is closest to the sun.
Statement II:	The time taken by a planet to move from the closest position (perihelion) to the farthest position (aphelion) is larger for a planet that is farther from the sun.

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.

169 A man standing on a still boat jumps out horizontally with speed of 20 m/s with respect to boat. If mass of man is 70 kg and that of boat is 210 kg. Speed of boat after man jumps will be:

1. 20 m/s
2. 6.67 m/s
3. 5 m/s
4. 15 m/s

170 Three rods of the same mass are placed as shown in the figure. What will be the coordinates of the center-of-mass of the system?



1. $(a/2, a/2)$
2. $(a/\sqrt{2}, a/\sqrt{2})$
3. $\left(\frac{\sqrt{2}a}{3}, \frac{\sqrt{2}a}{3}\right)$
4. $\left(\frac{a}{3}, \frac{a}{3}\right)$

171 In the case of rifle shooting, the kick will be maximum when:

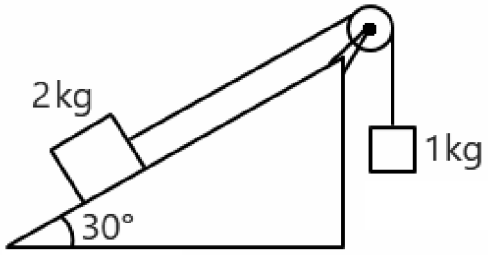
1.	a light rifle is held loosely against shoulder.
2.	a light rifle is held tightly against shoulder.
3.	a heavy rifle is held loosely against shoulder.
4.	a heavy rifle is held tightly against shoulder.

172 If the error in the measurement of momentum of a particle is $(+100\%)$ then the error in the measurement of kinetic energy is:
1. 100%
2. 200%
3. 300%
4. 400%

173 The distance of the Sun from Earth is 1.5×10^{11} m and its angular diameter is (2000) s when observed from the earth. The diameter of the Sun will be:
1. 2.45×10^{10} m
2. 1.45×10^{10} m
3. 1.45×10^{9} m
4. 0.14×10^{9} m

174 A wheel is subjected to uniform angular acceleration 2 rad/s^2 about its axis. Initially its angular velocity is 10 rad/s. In the first 2 sec, it rotates through an angle θ_1, in the next 2 sec it rotates through an additional angle θ_2. The ratio of $\frac{\theta_2}{\theta_1}$ is:
1. $1/2$
2. $3/5$
3. $3/4$
4. $4/3$

175 In the following figure if the inclined plane is smooth. What will be the acceleration of 1 kg block?



1. $g/3$ downwards
2. $g/3$ upwards
3. $g/6$ downwards
4. will be in equilibrium

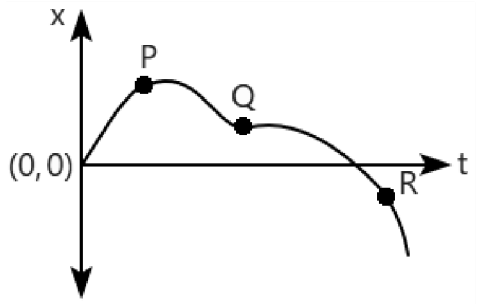
176 The number of significant figures in the physical quantity 2.56×10^5 kg is:
1. 1
2. 2
3. 3
4. 5

177 If the axis of rotation of the earth were extended into space then it would pass close to:

1.	the moon.
2.	the sun.
3.	the pole star.
4.	the centre of mass of all the planets in the solar system.

178 A piece of wood of mass 60 g is dropped from the top of a 100 m high building. At the same time, a bullet of mass 30 g fired vertically upward, with a velocity of 100 m/s from the ground. If the bullet gets embedded in the wood then the maximum height (from the ground) to which the combined system reaches, will be: (Take $g = 10$ m/s^2)
1. 27.22 m
2. 78.55 m
3. 84.55 m
4. 122.22 m

179 In the following displacement (x) versus time (t) graph, at which among the points P, Q, and R is the object's speed increasing?



1. R only
2. P only
3. Q and R only
4. P, Q, R

180 The body of mass 1.5 kg rotating about an axis with angular velocity of 0.3 rad s^{-1} has the angular momentum of 1.8 kg m^{2}s^{-1}. The radius of gyration of the body about the axis is:
1. 2 m
2. 1.2 m
3. 0.2 m
4. 1.6 m

181 A body weighs 72 N on the surface of the earth. What is the gravitational force on it due to earth at a height equal to half the radius of the earth from the surface?
1. 72 N
2. 32 N
3. 28 N
4. 16 N

182 Given below are two statements:

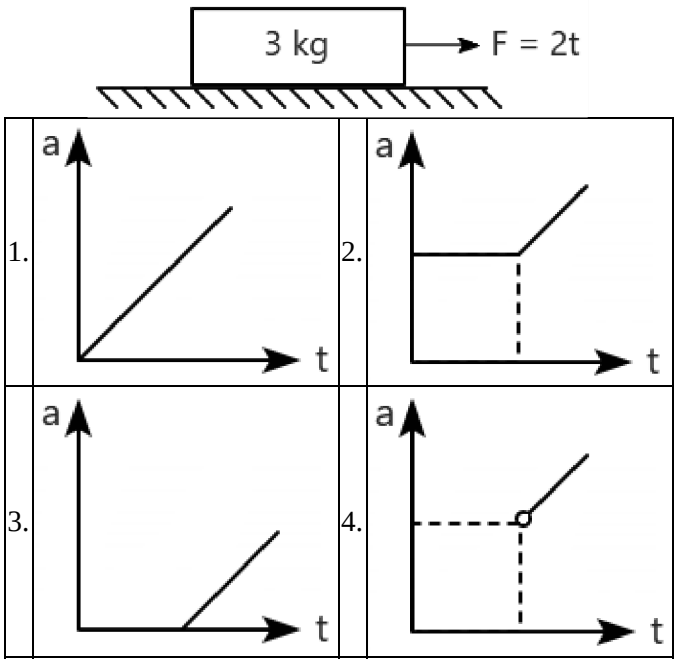
Assertion (A):	Axis of rotation of a rigid body cannot lie outside the body.
Reason (R):	It must pass through a material particle of the body.

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.

183 An astronaut of mass m is inside the earth satellite. The pseudo force on the astronaut in the frame of the satellite will be (consider satellite is near to earth surface).
1. mg
2. $\frac{mg}{2}$
3. $2mg$
4. zero

184 A particle of mass m starts from rest at large distance from the planet of mass M, reaches the planet only under gravitational attraction and passes through smooth tunnel through its centre.The gravitational potential energy of the particle at the centre will be: (R is the radius of planet)
1. $-\frac{GMm}{2R}$
2. $-\frac{GMm}{R}$
3. $-\frac{3GMm}{2R}$
4. $-\frac{3GMm}{R}$

185 A block of mass 3 kg is placed on a rough surface $(\mu = 0.2)$ and a variable force acts on it. Variation of acceleration of block with time is correctly shown by the graph:

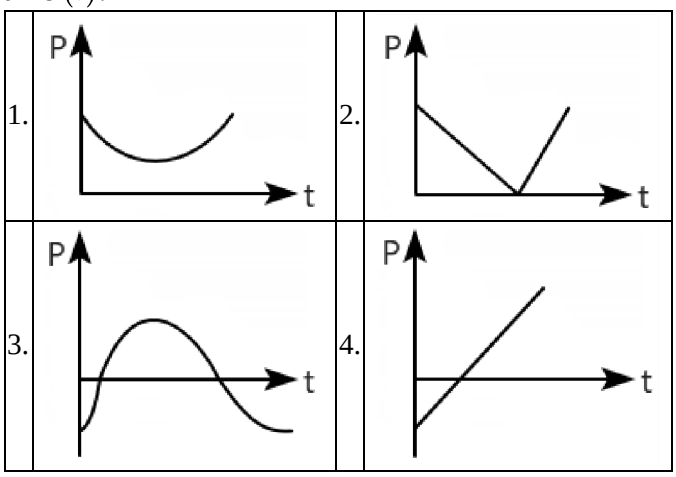


PHYSICS - SECTION B

186 A body of mass 60 g experiences a gravitational force of 3.0 N when placed at a particular point. The magnitude of the gravitational field intensity at that point is:
1. 180 N/kg
2. 0.05 N/kg
3. 50 N/kg
4. 20 N/kg

187 The angular speed of a flywheel moving with uniform angular acceleration changes from 1200 rpm to 3120 rpm in 16 s. The angular acceleration in rad/s² is:
1. 104π
2. 2π
3. 4π
4. 12π

188 A particle is projected at a time $t = 0$ with a speed v_0 and at an angle with the horizontal in a uniform gravitational field. Then which of the following graph represents power delivered by gravitational force against time (t)?



189 Suppose kinetic energy of a body oscillating with amplitude A and at distance x is given by $K = \frac{Bx}{(A^2+x^2)}$. The dimensions of B are same as that of:
1. power
2. work $\times$ distance
3. force
4. work $\times$ time

190 Time taken by a pendulum to complete 10 oscillations is 35.2 seconds. What is the time period of a pendulum in seconds with appropriate significant figures?
1. 3.52 s
2. 3.5 s
3. 3.520 s
4. 3.6 s

191 The study of the motion of objects, without consideration of its cause, is:
1. statics
2. kinematics
3. mechanics
4. dynamics

192 A boat is rowed across a 400 m wide river so that it can reach the opposite bank in a minimum of 10 minutes. No matter which direction the boat is rowed in, it cannot reach a point exactly opposite on the other bank, unless it is rowed at a slightly higher speed. The speed of flow of the river is:

1. 2.4 km/h
2. 4.8 km/h
3. $2.4\sqrt{2}$ km/h
4. $\frac{2.4}{\sqrt{2}}$ km/h

193 The gravitational potential energy of a particle of mass m increases by mgh, when it is raised through a height h in a uniform gravitational field "g". If a particle of mass m is raised through a height h in the earth's gravitational field (g: the field on the earth's surface) then the increase in gravitational potential energy is U. Then,

1.	$U > mgh$
2.	$U < mgh$
3.	$U = mgh$
4.	any of the above may be true depending on the value of h, considered relative to the radius of the earth.

194

The instantaneous angular position of a point on a rotating wheel is given by the equation,

$\theta(t) = 2t^3 - 6t^2$

The torque on the wheel becomes zero at:

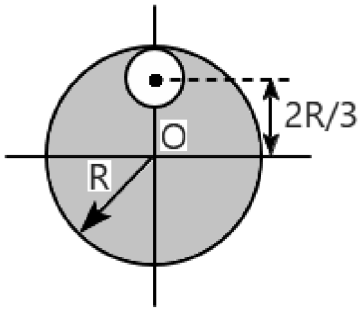
1. $t = 0.5$ s
2. $t = 0.25$ s
3. $t = 2$ s
4. $t = 1$ s

195 Consider that force F acting on a body as function of position (x) and time (t) is expressed as $F = A\sin(k_1 x) + B\cos(k_2 t)$. From the given information, match the column I with column II.

	Column I		**Column II**
(A)	Dimensions of A	(P)	$[M^0L^0T^{-1}]$
(B)	Dimensions of k_1	(Q)	$[M^0L^{-1}T^{-1}]$
(C)	Dimensions of k_2	(R)	$[MLT^{-2}]$
(D)	Dimensions of k_1k_2	(S)	$[M^0L^{-1}T^0]$

1.	A → R, B → S, C → P, D → Q
2.	A → P, B → Q, C → R, D → S
3.	A → R, B → P, C → Q, D → S
4.	A → S, B → P, C → Q, D → R

196 From a circular disc of radius R and mass $9M$, a small disc of radius $R/3$ is removed from the disc. The moment of inertia of the remaining disc about an axis perpendicular to the plane of the disc and passing through 'O' is:



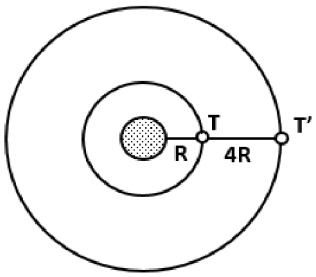
1. $4MR^2$
2. $\frac{40}{9}MR^2$
3. $10MR^2$
4. $\frac{37}{9}MR^2$

197 Given below are two statements:

Assertion (A):	For a given initial and final position the average velocity is single-valued while average speed can have many values.
Reason (R):	Velocity is a vector quantity and speed is a scalar quantity.

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 Two planets are in a circular orbit of radius R and $4R$ about a star. At a specific time, the two planets and the star are in a straight line. If the period of the closest planet is T, then the star and planets will again be in a straight line after a minimum time:



1. $(4)^2T$
2. $(4)^{\frac{1}{3}}T$
3. $2T$
4. $8T$

199 A student measures the time period of 100 oscillations of a simple pendulum four times. That data set is 90 s, 91 s, 95 s and 92 s. If the minimum division in the measuring clock is 1 s, then the reported mean time should be:

1. 92 ± 5.0 s
2. 92 ± 1.8 s
3. 92 ± 3 s
4. 92 ± 2 s

200 A ball is thrown vertically upward and it reaches the highest point in 4 s. Immediately, a second ball is thrown upwards with an initial speed that is twice that of the first. The second ball meets the first after a time:

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

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*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.