BOTANY - SECTION A

1 Which of the following statements is incorrect?

1.	Yeasts have filamentous bodies with long thread-like hyphae.
2.	Morels and truffles are edible delicacies.
3.	*Claviceps* is a source of many alkaloids and LSD.
4.	Conidia are produced exogenously and ascospores endogenously.

2 Given below are two statements:

Assertion (A):	The cell walls of diatoms are indestructible
Reason (R):	In diatoms, cell walls are embedded with silica

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.

3 Which one of the following is wrongly matched?

1. *Spirogyra* -Motile gametes
2. *Sargassum* - Chlorophyll C
3. Basidiomycetes - Puffballs
4. *Nostoc*- Water blooms

4 Identify the fungi which do not belong to the group of other fungi among the following

1. Sac-fungi
2. Puffballs
3. Mushrooms
4. Bracket Fungi

5 Identify the incorrect statement regarding green algae?

1. They contain chl a, chl b as well as carotenoids.
2. The chloroplasts may be discoid, plate-like, reticulate, cup-shaped, spiral or ribbon-shaped in different species.
3. Most members have one or more storage bodies called pyrenoids located outside the chloroplasts.
4. They usually have a rigid cell wall made of an inner layer of cellulose and an outer layer of pectose.

6 Consider the following statements regarding brown algae:

I.	The pigments are chl a, c and xanthophylls, fucoxanthin
II.	Storage food is laminarin and mannitol
III.	The cellulosic cell wall is covered with algin
IV.	They have a centrally located vacuole
V.	Their photosynthetic organs are called as fronds - leaf like structures
VI.	They have pear shaped biflagellate zoospores
VII.	They have two unequal laterally attached flagella.

The number of correct statements is

1. 5
2. 6
3. 7
4. 4

7 Though Cycas has two cotyledons, it is not included in the dicot because they

1. have a naked ovule
2. have megaspore
3. appear as palm tree
4. have compound leaves

8 How many of the following statements regarding fungi are true?

I.	Asexual reproduction is common by the formation of spores.
II.	Their bodies consist of hyphae that many be interconnected to form mycelium.
III.	They secrete digestive enzymes onto organic matter and then absorb the products of the digestion.
IV.	Fungi can break down almost any carbon containing product.
V.	Fungi do not enter symbiotic relationships.

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

9 Organisms with soap box like body

(a) Are chief producers in the ocean
(b) Have silica impregnated cell membrane
(c) Are called flagellated golden protists
(d) Lack chlorophyll a

Choose the incorrect ones

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

10 Select the *wrong* statement:

1.	Cell wall is present in members of Fungi and Plantae.
2.	Mushrooms belong to Basidiomycetes.
3.	Pseudopodia are locomotory and feeding structures in Sporozoans.
4.	Mitochondria are the powerhouse of the cell in all kingdoms except Monera.

11 Which of the following statement is true about the difference between *Cycas* and *Pinus*?

1.	*Pinus* has coralloid roots associated with N_2-fixing cyanobacteria, whereas *Cycas* has roots with fungal association in the form of mycorrhiza
2.	*Cycas* is heterosporous, whereas *Pinus* is homosporous
3.	Male cones and female megasporophylls are borne on different trees in *Cycas*, whereas they are borne on the same tree in *Pinus*
4.	Stems of *Cycas* are branched, whereas *Pinus* has unbranched stems

12 Given below are two statements:

Assertion (A):	Ascomycetes are commonly known as sac-fungi
Reason (R):	Sexual spores of ascomycetes are produced endogenously in sac-like asci

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.

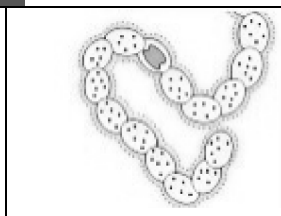
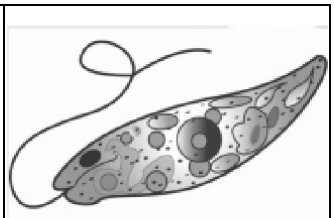
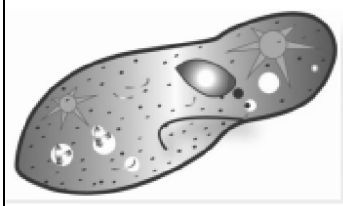
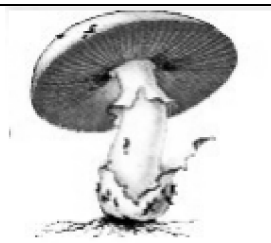
13 Kingdom Protista was proposed by Ernst Haeckel in 1866 as 'the kingdom of primitive forms'. This kingdom forms a link between the kingdom Fungi, Plantae, and Animalia. Select the option which is incorrectly matched for slime moulds and their plant, animal or fungi like features:

1. Naked plasmodium-Animal like feature
2. Spore with true wall - Plant like feature
3. Formation of fruiting body-Fungi like feature
4. Formation of plasmodium-Protozoan like feature

14 The terms that can be applied to all gymnosperms include:

1.	Naked seeds, Homosporous, Dominant independent sporophyte
2.	Seeds enclosed in ovary wall, Heterosporous, Dominant independent sporophyte
3.	Naked seeds, Heterosporous, Dominant independent sporophyte
4.	Naked seeds, Heterosporous, Dominant independent gametophyte

15 Identify the diagram with heterocyst:

1.		2.	
3.		4.	

16 Read the following five statements (I to V) and select the option with all correct statements.

I.	Mosses and lichens are the first organisms to colonise bare rock.
II.	*Selaginella* is a homosporous pteridophyte.
III.	Coralloid roots in *Cycas* have VAM.
IV.	Main plant body in bryophytes is gametophytic, whereas in pteridophytes it is sporophytic.
V.	In gymnosperms, male and female gametophytes are present within sporangia located on sporophytes.

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

17 Fungus used in genetic studies is

1. *Rhizopus*
2. *Mucor*
3. *Neurospora*
4. *Claviceps*

18 Match the organisms in column I with habitats in column II.

Column I		Column II	
(a)	Halophiles	(i)	Hot springs
(b)	Thermoacidophiles	(ii)	Aquatic environment
(c)	Methanogens	(iii)	Guts of ruminants
(d)	Cyanobacteria	(iv)	Salty areas

Select the correct answer from the options given below:

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

19 All the following statements regarding Basidiomycetes are correct except:
1. The mycelium is branched and septate
2. Asexual spores and vegetative reproduction are generally not found
3. Sex organs are absent
4. Basidiospores are exogenously produced on the basidium

20 In all the classes of fungi, common feature will be:
1. Morphology of the mycelium
2. Mode of spore formation
3. Fruiting bodies
4. Mode of nutrition

21 Identify the organism which causes white spots seen on mustard leaves and select the statement not true for it:

1.	Dikaryophase is the dominant phase of its life
2.	Asexually reproduce by endogenously produced spores
3.	Cell wall is made up of chitin and polysaccharides
4.	It produces sexual spores

22 Consider the following statements about the different classes of algae:

I:	The members of Chlorophyceae have a rigid cell wall made of an inner layer of cellulose and an outer layer of pectose
II:	The members of Rhodophyceae do not have a flagellum
III:	Members of Phaeophyceae store food as floridean starch which is very similar to amylopectin and glycogen in structure

1.	Only I and III are correct
2.	Only I and II are correct
3.	Only II and III are correct
4.	All I, II and III are correct

23 In which of the following class of fungi, sex organs are absent and plasmogamy is brought about by fusion of two vegetative or somatic cells of different strains or genotypes?
1. Ascomycetes
2. Phycomycetes
3. Basidiomycetes
4. Deuteromycetes

24 Kingdom Protista has brought together *Chlamydomonas*, *Chlorella* with *Paramoecium* and *Amoeba*. On what basis were these organisms separated under previous classification systems?
1. Cell wall
2. Cell type
3. Body organisation
4. Mode of nutrition

25 Select the incorrect statement about artificial system of classification of Linnaeus

1.	It is called artificial system because it is based on only one or two characters
2.	It was based on androecium structure
3.	It is also called sexual system as he chiefly used characters of stamens
4.	It divides flowering and non-flowering plants into two categories

26 Bryophytes depend on water as it is required for

1. vegetative propagation
2. filling archegonium for fertilization
3. transfer of male gamete during fertilization
4. fertilization of homosporous plants

27 If you are asked to classify the various algae into distinct groups, which of the following character would you choose?

1. Types of pigments present in the cell
2. Nature of stored food material in the cell
3. Structural organization of thallus
4. Chemical composition of the cell wall

28 Given below are two statements:

Assertion (A):	Vegetative reproduction by fragmentation is common in basidiomycetes
Reason (R):	In club fungi, sexual spores are not formed during sexual reproduction

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.

29 Pick up the wrong statement.

1.	Cell wall is absent in Animalia.
2.	Protista have photosynthetic and heterotrophic modes of nutrition
3.	Some fungi are edible
4.	Nuclear membrane is present in Monera.

30 Identify the incorrect statement regarding algae:

1.	At least a half of the total carbon dioxide fixation on earth is carried out by algae through photosynthesis.
2.	Around 70 species of freshwater algae can be used as food.
3.	Certain marine brown and red algae produce large amounts of hydrocolloids (water holding substances), e.g., algin (brown algae) and carrageen (red algae) which are used commercially.
4.	Agar, obtained from *Gelidium* and *Gracilaria* are used to grow microbes and in preparations of ice-creams and jellies.

31 Identify the incorrectly matched pair:

1.	Chlamydomonas:	Microscopic unicellular algae
2.	Volvox:	Colonial algae
3.	Ulothrix:	Filamentous algae
4.	Fucus:	Isogamous algae

32 Unlike plants, the cell walls of most fungi contains

1.	Chitin	2.	Peptidoglycans
3.	Teichoic acid	4.	Cellulose

33 Given below are two statements:

Assertion (A):	Main plant body of bryophyte is called gametophyte
Reason (R):	Bryophyte possess root like, leaf like and stem like structures

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.

34 Which of the following is true regarding the classes of Bryophytes?

1.	The thallus of mosses is dorsiventral and closely appressed to the surface
2.	In the life cycle of liverworts, the predominant gametophytic stage is divided into two stages - the protonema and the leafy stage
3.	The sporophyte in liverworts is more elaborate than in mosses
4.	Asexual reproduction in liverworts takes place by fragmentation of thalli, or by the formation of specialised structures called gemmae

35 Which one of the following matches is correct?

(a)Phytophthora	Aseptate Mycelium	Basidiomycetes
(b) *Alternaria*	Sexual reproduction Absent	Deuteromycetes
(c) *Mucor*	Reproduction by conjugation	Ascomycetes
(d) *Agaricus*	Parasitic fungus	Basidiomycetes

1.	a	2.	b
3.	c	4.	d

Botany - Section B

36 The subviral agent discovered by T.O. Diener

1. has low molecular weight RNA
2. contains wrongly folded proteins
3. is infectious to animals only
4. has ds DNA and proteins

37 Scientific naming of an organism is only possible when

1. It shows evolutionary relation to other organisms
2. It is already given a common name
3. It is identified correctly
4. It exhibits all the characteristics of living beings

38 The given diagram shows:

1. An alga that lacks flagellated cells
2. A liverwort
3. A heterosporous pteridophyte
4. A gymnosperm with non-motile sperms

39

Given below are two statements:

Assertion (A):	The problem of classification becomes more complex at higher category
Reason (R):	Higher the category, greater is the difficulty of determining the relationship to other taxa at the same level

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.

40 Given below are two statements:

Assertion (A):	Water is required for transfer of male gametes to archegonium in ferns
Reason (R):	Ferns bear sporangia on gametophytes which in turn bear diploid sex organs

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.

41 Consider the following statements:

I. Pteridophytes are the first terrestrial plants to possess vascular bundles.
II. Main plant body in pteridophytes is sporophyte which is differentiated into true stem and leaves.
III. Genera like *Selaginella* and *Salvinia* are heterosporous.
Which of the above statements are true?

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

42 Which of the following statements is correct?

1. Lichens do not grow in polluted areas.
2. Algal component of lichens is called mycobiont.
3. Fungal component of lichens is called phycobiont.
4. Lichens are not good pollution indicators.

43 Select the wrong statement:

1.	The viroids were discovered by D.J lvanowsky.
2.	W.M. Stanley showed that viruses could be crystallized.
3.	The term 'contagium vivum fluidum' was coined by MW Beijerinck.
4.	Mosaic disease in tobacco and AIDS in human beings are caused by viruses.

44 Which statement is wrong for viruses?

1.	All are parasites
2.	All of them have helical symmetry
3.	They have the ability to synthesize nucleic acids and proteins
4.	Antibiotics have no effect on them

45 The lowest category of plants that is characterised on the basis of both vegetative and reproductive features is
1. Genus
2. Species
3. Class
4. Family

46 Mad cow disease in cattle and Cr Jacob disease in humans are due to infection by_____ .
1. Bacterium
2. Virus
3. Viroid
4. Prion

47 Cr-Jacob disease (CJD) in humans is caused by:

1.	An agent which consists of abnormally folded protein and is smaller in size to viruses
2.	An agent having DNA
3.	An agent which consists of abnormally folded protein and is similar in size to viruses
4.	The same agent which causes potato spindle tuber disease

48 Given below are two statements:

Assertion (A):	Sporozoans lack locomotory structures
Reason (R):	Sporozoans are parasites

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.

49 The biological names are generally in ____(i)____ and printed in italics to indicate their _____(ii)_____ origin.
Select the correct option to fill in the blanks (i) and (ii)

	(i)	(ii)
1.	English	Latin
2.	Latin	Latin
3.	Greek	Greek
4.	Latin	Greek

50 Which of the following is not a feature of red algae?
1. presence of flagella and centrioles
2. floridean starch as a storage product and the storage of starch in the cytoplasm
3. phycoerythrin, phycocyanin, and allophycocyanin as accessory pigments
4. unstacked thylakoids in plastids

ZOOLOGY - SECTION A

51 The branch of biology that deals with the relationships of different groups of organisms and examines their natural variation and relationships is known as:

1.	Cladistics	2.	Systematics
3.	Taxonomy	4.	Identification

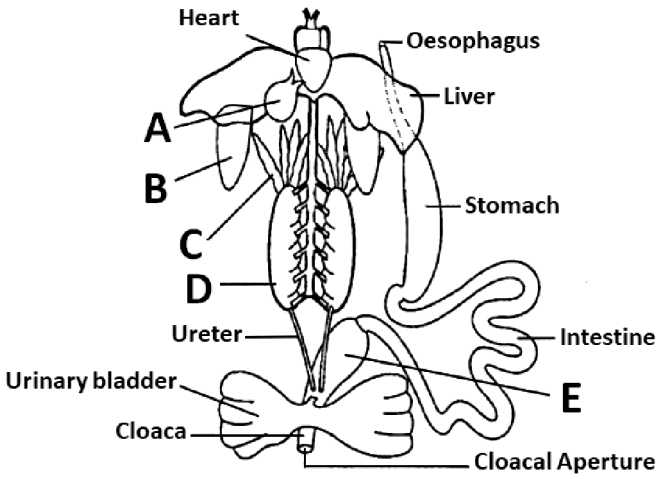
52 Which of the following can be used to distinguish a roundworm from an earthworm?
a. Type of body cavity
b. Number of muscle layers in the body wall
c. Segmentation
d. Number of embryonic tissue layers
e. Shape of worms in cross-sectional view
Select the correct option:
1. a only
2. b and d
3. a, b, c and e
4. a, b, c, d and e

53 Which of the following options correctly represent the characteristic features of phylum Annelida?

1.	Triploblastic, unsegmented body, and bilaterally symmetrical.
2.	Triploblastic, a segmented body, and bilaterally symmetrical.
3.	Triploblastic, flattened body, and acoelomate condition.
4.	Diploblastic, mostly marine and radially symmetrical.

54 Consider the following characters:
I. Air bladder
II. Operculum
III. Viviparity
The characters present in bony fishes include:
1. I, II and III
2. I and III only
3. I and II only
4. II and III only

55



The above figure is associated with diagrammatic representation of internal organs of frog. Identify A to E

	A	B	C	D	E
1.	Gall bladder	Lung	Ovary	Testis	Rectum
2.	Gall bladder	Lung	Fat bodies	Testis	Rectum
3.	Gall bladder	Lung	Testis	Kidney	Rectum
4.	Gall bladder	Lung	Fat bodies	Kidney	Rectum

56 Which of the following is exclusively marine?

1. Cnidaria
2. Echinodermata
3. Annelida
4. Porifera

57 Choose the correctly matched pair:

1. Tendon-Specialized connective tissue
2. Adipose tissue-Dense connective tissue
3. Areolar tissue- Loose connective tissue
4. Cartilage- Loose connective tissue

58 Which type of tissue is correctly matched with its location?

	Tissue	Location
1.	Areolar tissue	Tendons
2.	Transitional epithelium	Tip of nose
3.	Cuboidal epithelium	Lining of stomach
4.	Smooth muscle	Wall of intestine

59 Choose the correct statements :

a. Bones support and protect softer tissues and organs
b. Weight bearing function is served by limb bones
c. Ligament is the site of production of blood cells.
d. Adipose tissue is specialised to store fats.
e. Tendons attach one bone to another.

Choose the most appropriate answer from the options given below :

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

60 Read the following statements carefully and choose the option with only incorrect statements.

a.	All multicellular animals exhibit the same pattern of organisation of cells.
b.	Organ level of organisation is exhibited by members of Platyhelminthes and other higher phyla where tissues are grouped together to form organs.
c.	Organ systems in different groups of animals exhibit various patterns of complexities.
d.	In all multicellular animals which have organ level of body organisation, a complete digestive system has two opening, mouth and anus.

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

61 Read the following statements A and B (about chordates) and choose the correct answer from the given options:

A:	Protochordates are exclusively marine and have notochord present only in larval tail.
B:	In all vertebrates, notochord is replaced by a bony vertebral column in the adult.

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

62 If a teacher wants to demonstrate that some invertebrates possess a closed circulatory system, the teacher should dissect a

1. Asterias
2. Pheretima
3. Pinctada
4. Aplysia

63 Match the following diseases with the causative organism and select the correct option:

Column I	Column II
Gregarious, polyphagous pest	*Asterias*
Adult with radial symmetry and larva with bilateral symmetry	Scorpion
Book lungs	*Ctenoplana*
Bioluminescence	*Locusta*

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

64 A marine cartilaginous fish that can produce electric current is:
1. *Pristis*
2. Torpedo
3. *Trygon*
4. *Scoliodon*

65 Which of the following statements is not true about a frog?
1. The body colour offers it protective colouration
2. Summer sleep of frog is called aestivation
3. Tail is present in the lifecycle of frog
4. Mouth is bounded by a pair of lips

66 Which insect is useful for us?
1. Periplaneta
2. Musca
3. Bombyx
4. Mosquitoes

67 Match the following columns and select the correct option.

Column I		Column II	
(a)	6 - 15 pairs of gill slits	(i)	*Trygono*
(b)	Heterocercal caudal fin	(ii)	Cyclostomes
(c)	Air Bladder	(iii)	Chondrichthyes
(d)	Poison sting	(iv)	Osteichthyes

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

68 Like other animals with bilateral symmetry, flatworms have:
1. an internal body cavity
2. segmented bodies
3. three germ layers
4. specialized circulatory and respiratory organs

69 Which one of the following animals is correctly matched with its one characteristic and the taxon?

	Animal	Characteristic	Taxon
1.	Millipede	Ventral nerve cord	Arachnids
2.	Sea Anemone	Triploblastic	Cnidaria
3.	Silverfish	Pectoral and pelvic fins	Chordata
4.	Duckbilled platypus	Oviparous	Mammalian

70 The structure present in all adult vertebrates is:
1. Notochord
2. Dorsal tubular nerve cord
3. Pharyngeal gill slits
4. All of the above

71 Monkey, gorilla, gibbon, tiger, cat and dog do not belong to the same:

1.	Phylum	2.	Order
3.	Class	4.	Kingdom

72
Given below are two statements:

Assertion (A):	Frog is a ureotelic animal.
Reason (R):	They excrete nitrogenous waste in form of urea.

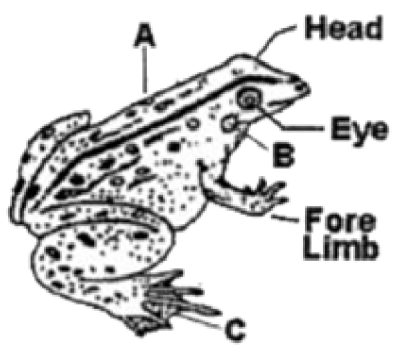
1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

73 For female frog, which of the following is false?

I.	One pair ovaries is situated near kidneys
II.	Ovary has functional connection with kidney
III.	Convoluted, tubular, ciliated and glandular oviduct arises from ovary and opens into cloaca
IV.	Oviduct and ureter open separately into the cloaca
V.	A female frog can lay 2500-3000 ova at a time

1.	I and II	2.	only II
3.	I and IV	4.	IV and V

74 Identify A, B and C respectively -



1. Trunk, Tympanum, Web
2. Neck, Brown eye spot, Web
3. Trunk, Tympanum, Hind limb
4. Neck, Tympanum, Hindlimb

75

Given below are two statements:

Assertion (A):	All vertebrates possess notochord during embryonic period only.
Reason (R):	In all adult vertebrates, notochord is replaced by bony vertebral column.

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.

76 Identify the correct statements regarding the members of Phylum Aschelminthes:

I. Their body is circular in cross-section

II. Alimentary canal is complete

III. Males, are often, longer than females

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

77 The larvae in echinoderms are:

I. Radially symmetrical	II. Free swimming

1.	Only I	2.	Only II
3.	Both I and II	4.	Neither I nor II

78 Select the Taxon mentioned that represents both marine and freshwater species:

1. Echinoderms
2. Ctenophora
3. Cephalochordata
4. Cnidaria

79 What do you see in the given picture?

1.	Tube sponges
2.	Cnidarian polyps connected by calcium carbonate
3.	Echinoderm anthozoans
4.	Comb jellies

80 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

81 Given below are two statements:

Assertion (A):	Frog maintain ecological balances.
Reason (R):	Frog serves as an important link of food chain and food web in ecosystem.

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.

82
Which of the following features is not present in the phylum–Arthropoda?
1. Metameric segmentation
2. Parapodia
3. Jointed appendages
4. Chitinous exoskeleton

83 Given below are two statements:

Assertion (A):	Platyhelminthes have two openings to the outside of body that serve as mouth and anus respectively.
Reason (R):	A complete digestive system has two openings to outside of body where anterior opening usually acts as anus.

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.

84 The water vascular system in Antedon:

1.	Functions in locomotion, feeding and gas exchange
2.	Is bilateral in organisation, even though the animal is radially symmetrical
3.	Moves water through the animals body during suspension feeding
4.	Is analogous to the gastrovascular cavity of flatworms

85 Which of the following is a common feature between Pheretima and Ascaris?
1. Presence of true coelom
2. Presence of metameres
3. Absence of pharynx
4. Presence of bilateral symmetry

ZOOLOGY - SECTION B

86 Given below are two statements:

I	Amphibians and reptiles have a 3-chambered heart with two atria and a single ventricle, and are oviparous in nature
II	Crocodiles possess a 4 chambered heart with two ventricles and two atria and are viviparous in nature

Select the most appropriate option:
1. I is correct but II is incorrect.
2. I is incorrect but II is correct.
3. Both I and II are correct.
4. Both I and II are incorrect.

87 Match each item in Column I with one item in Column II regarding taxonomic categories of humans and chose your answer from the codes given below:

Column I	Column II
I. Family	1. Primata
II. Order	2. Hominidae
III. Class	3. Chordata
IV. Phylum	4. Mammalia

Codes:

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

88
Which of the following characteristics is not shared by birds and mammals?
1. Breathing using lungs
2. Viviparity
3. Warm-blooded nature
4. Ossified endoskeleton

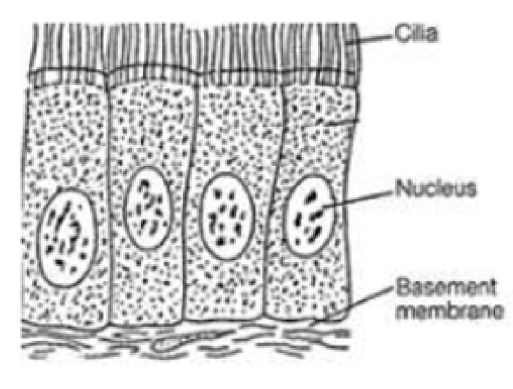
89 Which one of the following categories of animals, is correctly described with no single exception in it?

1.	All bony fishes have four pairs of gills and an operculum on each side
2.	All sponges are marine and have collared cells
3.	All mammals are viviparous and possess a diaphragm for breathing
4.	All reptiles possess scales, have a three-chambered heart, and are cold blood (poikilothermal)

90 Identify the incorrect statement:

1.	Metamerism appeared for the first time in annelida
2.	Arthropods have jointed appendages and chitinous exoskeleton
3.	Reptiles are endotherms
4.	Forelimbs of birds are modifies into wings

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



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

92 The unique mammalian characteristics are:

1. pinna, monocondylic skull and mammary glands
2. hairs, tympanic membrane and mammary glands
3. hairs, pinna and mammary glands
4. hairs, pinna and indirect development

93 The fertilization and development is:

1. internal and indirect in Ctenophora
2. internal and indirect in Porifera
3. external and direct in Aschelminthes
4. external and direct in Echinodermata

94 *Octopus* has:

1. Tetrameric radial symmetry
2. Hexameric radial symmetry
3. Octomeric radial symmetry
4. Bilateral symmetry

95 Which of the following is considered as the most anterior part of Balanoglossus?

1. Proboscis
2. Collar
3. Trunk
4. Stomochord

96 In which of the following animals, the digestive tract has additional chambers like crop and gizzard?

1. *Pavo*, *Psittacula*, *Corvus*
2. *Corvus*, *Columba*, *Chameleon*
3. *Bufo*, *Balaenoptera*, *Bangarus*
4. *Catla*, *Columba*, *Crocodilus*

97 At which of the following categories, number of similar characters amongst the organisms will be less?

1. Division
2. Family
3. Order
4. Genus

98 The characteristics of class Reptilia are:

1.	Body covered with moist skin which is devoid of scales, the ear is represented by a tympanum, alimentary canal, urinary and reproductive tracts open into a common cloaca
2.	Freshwater animals with a bony endoskeleton and air bladder to regulate buoyancy
3.	Marine animals with cartilaginous endoskeletons, bodies covered with placoid scales
4.	Body covered with dry and cornified skin, scales over the body are epidermal, they do not have external ears

99 Which of the following taxonomic categories contains organisms least similar to one another?

1. Class
2. Genus
3. Family
4. Species

100 How many of the animals given in the box below are triploblastic, have a true coelom but lack segmentation?

Antedon, Laccifer, Limulus, Aplysia, Dentalium, Ancylostoma, Hirudinaria, Sepia, Ophiura, Nereis

1. 4
2. 5
3. 6
4. 7

CHEMISTRY - SECTION A

101 What is the molality of Na^+ in a solution containing 3.00 g NaCl (M=58.4), 9.00 g glucose (M=180.0), and 168 g H_2O (M=18.0)?

1. 5.50×10^{-3} m
2. 0.285 m
3. 0.306 m
4. 0.777 m

102 Match List I with List II

	List I(IUPAC Name)		List II(atomic number)
A.	Unnilennium	I.	120
B.	Ununpentium	II.	111
C.	unbinilium	III.	115
D.	Unununnium	IV.	109
		V.	110

Choose the correct answer from the options given below:

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

103 Which of the following statements regarding the ionization energy of gas-phase atoms is correct?

1.	The first ionization energy of a group 1 element is always greater than the first ionization energy of the group 2 element in the same row of the periodic table.
2.	In the second row of the periodic table, the first ionization energy is directly proportional to the atomic radius.
3.	Among the elements from Al (Z = 13) to Ar (Z = 18), the first ionization energy increases monotonically with atomic number.
4.	Among the elements of group 16, the first ionization energy decreases monotonically with atomic number.

104

The correct order of increasing C — O bond length of CO, CO_3^{2-} and CO_2 is:

1. $CO_3^{2-} < CO_2 < CO$
2. $CO_2 < CO_3^{2-} < CO$
3. $CO < CO_3^{2-} < CO_2$
4. $CO < CO_2 < CO_3^{2-}$

105

138 g of ethyl alcohol is mixed with 72 g of water. The ratio of mole fraction of alcohol to water is:

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

106 Consider the electronic configuration of the following elements:

A : $1s^2\ 2s^2\ 2p^6\ 3s^1$

B : $2s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

C : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$

D : $1s^2\ 2s^2\ 2p^5$

The element having a maximum difference between the first and second ionization energy is:

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

107 Which pair of symbols represents nuclei with the same number of neutrons?

1. ^{56}Co and ^{58}Co
2. ^{57}Mn and ^{57}Fe
3. ^{57}Fe and ^{58}Ni
4. ^{57}Co and ^{58}Ni

108 If 28 g of Fe reacts with 24 g of S to produce FeS, what would be the limiting reagent and how many grams of excess reagent would be present in the vessel at the end of the reaction, respectively?

$Fe + S \xrightarrow{\Delta} FeS$

1. Fe and 10 g
2. Fe and 8 g
3. S and 15 g
4. S and 10 g

109
Europium element belongs to:
1. s – block element
2. p – block element
3. d – block element
4. f – block element

110

Assertion (A):	Irrespective of the source, a given compound always contains the same elements in the same proportion.
Reason (R):	This law is referred to as the law of multiple proportions.

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.

111 The volume of oxygen gas (O_2) needed to completely burn 1 L of propane gas (C_3H_8) (both O_2 & propane measured at 0°C and 1 atm) will be:
1. 7 L
2. 6 L
3. 5 L
4. 10 L

112 Round off 0.1545 upto three significant figures:
1. 0.153
2. 0.154
3. 0.16
4. 0.150

113

Assertion (A):	Angular momentum of the electron in the orbit which has four subshells is $\frac{2h}{\pi}$.
Reason (R):	Angular momentum of the electron is quantized.

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.

114 Which species has the largest ionic radius?
1. S^{2-}
2. Cl^{-}
3. K^{+}
4. Ca^{2+}

115 A monochromatic infrared range finder of power 1mW emits photons with wavelength 1000 nm in 0.1 second. The number of photons emitted in 0.1 second is- (Given: h = $6.626 \times 10^{-34} J\,s$, c = $3 \times 10^{8} m\,s^{-1}$, Avogadro number = 6.022×10^{23})
1. 30×10^{37}
2. 5×10^{14}
3. 30×10^{34}
4. 5×10^{11}

116

Assertion (A):	Removal of the s-electron is relatively more difficult than the removal of the p-electron of the same main shell.
Reason (R):	s-electrons are closer to the nucleus than p-electrons of the same shell and hence, are more strongly attracted by a nucleus.

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.

117
$\psi^2 = 0$ represents:
1. a node
2. an orbital
3. angular wave function
4. wave function

118 Match the types of series given in Column I with the wavelength range given in Column II and choose the correct option.

	Column 1		Column 2
A.	Lyman	1.	Ultraviolet
B.	Paschen	2.	Infrared
C.	Balmer	3.	Visible
D.	p-fund		

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

119

The wavelength of a spectral line emitted by a hydrogen atom in the Lyman series is $\frac{16}{15R}$cm. What is the value of n_2?

(R = Rydberg constant)

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

120 If the concentration of glucose $(C_6H_{12}O_6)$ in the blood is 0.9 g L^{-1}, then the molarity of glucose in the blood is

1. 5 M
2. 50 M
3. 0.005 M
4. 0.05 M

121 The volume occupied by ten molecules of water (density 1g cm^{-3}) is :

1. 18 cm^3
2. 22400 cm^3
3. 6.023×10^{-23} cm^3
4. 3.0×10^{-22} cm^3

122 Which property decreases from left to right across the periodic table and increases from top to bottom?

1. Atomic radius.
2. Electronegativity.
3. Ionization energy.
4. Melting point.

123 Match List-I with List-II:

List-I (quantum number)	List-II (Orbital)
(A) n = 2, ℓ = 1	(I) 2s
(B) n = 3, ℓ = 2	(II) 3s
(C) n = 3, ℓ = 0	(III) 2p
(D) n = 2, ℓ = 0	(IV) 3d

Choose the correct answer from the options given below:

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

124 The mole fraction of NaOH in the aqueous solution is 0.001. The molarity of NaOH solution will be (For dilute solution molality and molarity are approx. same)

1. 0.056 M
2. 55.55 M
3. 0.001 M
4. Data is insufficient

125 The empirical formula of a compound that contains 40.9 percent carbon, 4.58 percent hydrogen, and 54.52 percent oxygen and has a molar mass of 88 g/mol is:

1. C_3H_4O
2. CH_4O_3
3. $C_3H_2O_3$
4. $C_3H_4O_3$

126 Which characteristics of an atomic orbital are most closely associated with the magnetic quantum number m_l?

1. Size
2. Shape
3. Occupancy
4. Orientation

127 The total number of semi-metals among the following is:
Si, Sb, Ge, Ga, As, Sn, Se
1. 5
2. 4
3. 3
4. 2

128 How many H atoms are in 3.4 g of $C_{12}H_{22}O_{11}$?
1. 6.0×10^{23}
2. 1.3×10^{23}
3. 3.8×10^{22}
4. 6.0×10^{21}

129 Which set of quantum numbers (n, l, m_l, m_s) is not permitted by the rules of quantum mechanics?
1. 1, 0, 0, $+\frac{1}{2}$
2. 2, 1, -1, $-\frac{1}{2}$
3. 3, 3, 1,-$-\frac{1}{2}$
4. 4, 3, 2, $+\frac{1}{2}$

130 The ratio of masses of oxygen and nitrogen in a particular gaseous mixture is 1:4. The ratio of a number of their molecule is:
1. 7:32
2. 1:8
3. 3:16
4. 1:4

131 Match the following :

Column I Oxide		Column II Nature	
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al_2O_3	(iii)	Acidic
(d)	Cl_2O_7	(iv)	Amphoteric

Which of the following is the correct option?

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

132 When the atoms: Ba, Cs, Mg, and Na are arranged in order of increasing size, the correct order is:
1. Cs < Na < Mg < Ba
2. Mg < Na < Ba < Cs
3. Mg < Ba < Na < Cs
4. Ba < Mg < Na < Cs

133 How many sulphur atoms are there in 3.00 g of iron pyrite, FeS_2 $(M = 120.0)$?
1. 7.53×10^{21}
2. 1.51×10^{22}
3. 3.01×10^{22}
4. 6.02×10^{23}

134 Helium can be singly ionized by losing one electron to become the cation. Which of the following statements is true concerning this helium cation?

1.	The line spectrum of this helium cation will resemble the line spectrum of a hydrogen atom.
2.	The line spectrum of this helium cation will resemble the line spectrum of a lithium cation.
3.	The line spectrum of this helium cation will remain the same as for unionized helium.
4.	The line spectrum of this helium cation will resemble the line spectrum of a hydrogen ion.

135 Find the incorrect statement.

1.	Valence electron and valency are the same for group 1.
2.	p-block elements are metals, nonmetals, and metalloids.
3.	Noble gases have 8 valence electrons except He.
4.	The smallest atom in the periodic table is Ne.

CHEMISTRY - SECTION B

136 Which of the following compounds has the least tendency to form hydrogen bonds between molecules?
1. NH_3
2. H_2NOH
3. HF
4. CH_3F

137 Which one of the following statements is true about the structure of CO_3^{2-} ion?

1.	It can be explained by considering sp^3 hybridization.
2.	Out of the three C–O bonds, two are longer and one is shorter.
3.	It has three Sigma and three π-bonds.
4.	All three C–O bonds are equal in length with a bond order in between 1 and 2.

138

The pair with similar geometry(shape) is:

1. PCl_3, NH_4^+
2. $BeCl_2$, H_2O
3. CH_4, CCl_4
4. IF_5, PF_5

139 The correct order of stability for the following species is:

1.	$Li_2 < He_2^+ < O_2^+ < C_2$
2.	$C_2 < O_2^+ < Li_2 < He_2^+$
3.	$He_2^+ < Li_2 < C_2 < O_2^+$
4.	$O_2^+ < C_2 < Li_2 < He_2^+$

140 Which of the following is the correct order of dipole moment?

1. $NH_3 < BF_3 < NF_3 < H_2O$
2. $BF_3 < NF_3 < NH_3 < H_2O$
3. $BF_3 < NH_3 < NF_3 < H_2O$
4. $H_2O < NF_3 < NH_3 < BF_3$

141 How many millimoles of methane, CH_4, are present in 6.4 g of this gas?

1. 0.40
2. 4.0
3. 40
4. 4.0 x 10^2

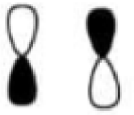
142 Match List I with List II

	List I(Compound)		List II(Hybridization)
A.	PF_5	I.	sp^3d^2
B.	BrF_5	II.	sp^3d
C.	$[Ni(CN)_4]^{2-}$	III.	sp^2
D.	SO_2	IV.	dsp^2

Choose the correct answer from the options given below:

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

143 Which atomic orbital combination would result in a molecular π bond?

1.		2.	
3.		4.	none of the above

144 Given below are two statements

Statement I:	SF_6 and NO are examples of the expanded octet and odd electron molecules respectively.
Statement II:	$BeCl_2$ molecules have hybrid orbitals with 50 % s character as well as a linear geometry.

In light of the above statements, choose the correct answer from the options given below

1. Both Statement I and Statement II are true.
2. Both Statement I and Statement II are false.
3. Statement I is true but Statement II is false.
4. Statement I is false but Statement II is true.

145 Among the following compounds, how many contain two lone pairs on central atom?

XeF_4, H_2O, SF_4, CF_4

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

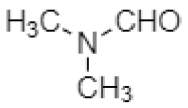
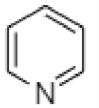
146 Arrange the following elements in increasing order of the metallic character: Si, K, Mg, and Be.

1. Si < Mg < Be < K
2. Be < Mg < Si < K
3. Si < Be < Mg < K
4. K < Mg < Si < Be

147 Among the compounds shown below which one will have a linear structure?

1. NO_2
2. HOCl
3. O_3
4. N_2O

148 The compounds containing sp hybridized carbon atoms are:

i.		ii.	
iii.	H_3C-CN	iv.	$H_2C=C=CHCH_3$

1. i and ii
2. iii and iv
3. ii and iii
4. i and iv

149 Which molecules/ions are most paramagnetic?

1. B_2
2. C_2
3. O_2^+
4. O_2^-

150 The covalent characters of $CaCl_2$, $BaCl_2$, $SrCl_2$ and $MgCl_2$ follow the order :

1. $CaCl_2 < BaCl_2 < SrCl_2 < MgCl_2$
2. $BaCl_2 < SrCl_2 < CaCl_2 < MgCl_2$
3. $CaCl_2 < BaCl_2 < MgCl_2 < SrCl_2$
4. $SrCl_2 < MgCl_2 < CaCl_2 < BaCl_2$

PHYSICS - SECTION A

151 A child riding on a merry-go-round jumps off a wooden horse and starts walking towards the center of the ride. As he moves, the acceleration he feels:

1.	increases, because his tangential speed decreases.
2.	increases, because his radius from the center decreases.
3.	decreases, because his tangential speed increases.
4.	decreases, because his radius from the center decreases.

152 The unit of length, fermi is used for the measurement of:

1.	distance of stars
2.	interatomic dimension
3.	height of mountain
4.	nuclear dimension

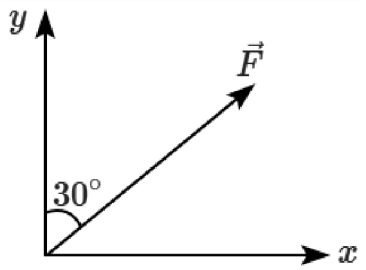
153 A particle is in a uniform circular motion with a time period of 4 s and radius $\sqrt{2}$ m. What is the magnitude of displacement in 3 s?

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

154 A car is moving with speed of 150 km/h and after applying the brake, it will move 27 m before it stops. If the same car is moving with a speed of one-third the reported speed, then it will stop after travelling a distance of:

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

155 If y−component of a force acting in the x − y plane is $2\sqrt{3}$ N. Then the x−component will be:



1.	$2\sqrt{3}$ N	2.	2 N
3.	3 N	4.	$3\sqrt{2}$ N

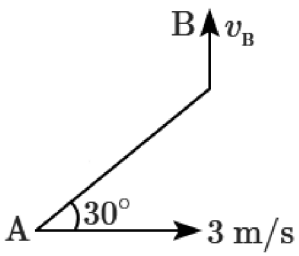
156 A sparrow cruising at 1.5 m/s begins to accelerate at a constant 0.3 m/s^2 for 3 s. What is its change in velocity?

1.	0.9 m/s	2.	1.5 m/s
3.	1.95 m/s	4.	2.4 m/s

157 A projectile launched at an angle θ is observed to move at an angle of 45° with the vertical (upward) at some point on its trajectory. If the launch angle θ was increased, then the horizontal range:

1.	decreases
2.	increases
3.	first increases then decreases
4.	first decreases then increases

158 A thin rod AB is moving in a vertical plane. At a certain instant when the rod is inclined at 30° to the horizontal, point A is moving horizontally with 3 m/s while B is moving in the vertical direction. The velocity of B is:



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

159 Some numbers (values of various quantities) are given in column-I and the number of significant figures of them in column-II. Match column-I with column-II.

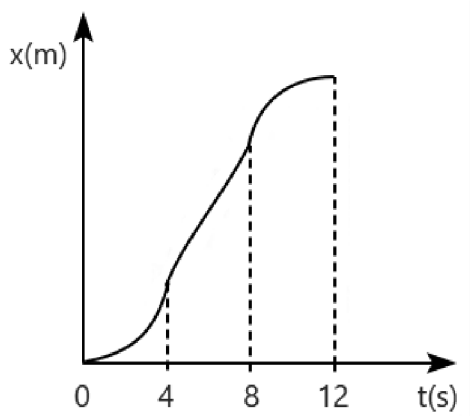
	Column-I		**Column-II**
A.	0.005 m^2	**(P)**	5
B.	0.23480 g/cm^2	**(Q)**	4
C.	0.005020 m^2	**(R)**	1
D.	2.54×10^{24} kg	**(S)**	3

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

160 The fruit juggler, dissatisfied with simply dropping fruit, decides to throw an apricot off a cliff. The apricot leaves the top of the cliff at a speed of 35 m/s and at an angle of 50° above the horizontal. If the cliff is 310 m tall, how far down range is the fruit when it hits the ground?
(Neglect air resistance, and note that the cos50° is 0.643 and the sin50° is 0.766.)
1. 180 m
2. 251 m
3. 390 m
4. 1423 m

161 A throws a ball towards B, who then catches it across the field. B throws the ball back towards A, who then catches it. The angle of the throw is 30° for A, while it is 60° for B's throw. The ratio of their speeds of throw, $v_A : v_B$ is:
1. 3
2. $\frac{1}{3}$
3. $\sqrt{3}$
4. 1

162 The position-time graph of an object is shown below.



Which one of the statements given below is wrong about the motion?

1.	between 0 to 4 s the object is accelerating.
2.	between 4 s to 8 s the object is at rest.
3.	between 8 s to 12 s the object is decelerating.
4.	between 4 s to 8 s the object's acceleration $= 0$.

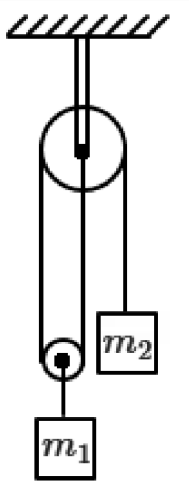
163 An arrow is shot into the air. When the arrow is in the air, what forces are acting on the arrow?
(Ignore air resistance.)

1.	there are no forces.
2.	there is the force of gravity.
3.	there is the force of gravity and an upward normal force.
4.	there is the force of gravity and a forward force.

164 A 2 kg ball at the end of a 1 m string is spun in a vertical circle. The tension in the string is 52 N when the ball is at the bottom of the circle. What is the ball's speed?
1. 4 m/s
2. 5 m/s
3. 6 m/s
4. 7 m/s

165 The number of significant figures in the result of $(7.1 + 7.3 + 9.1)$ is:
1. 1
2. 2
3. 3
4. 4

166 The system shown in the adjacent diagram is in equilibrium. Assuming that the strings and pulleys are ideal, the ratio of the masses, $\frac{m_1}{m_2} =$



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

167 In a projectile motion the velocity,

1.	is always perpendicular to the acceleration
2.	is never perpendicular to the acceleration
3.	is perpendicular to the acceleration for one instant only
4.	is perpendicular to the acceleration for two instants

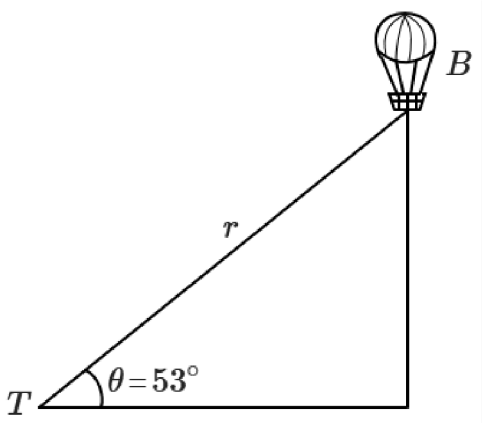
168 A person traveling on a straight line moves with a uniform velocity v_1 for a distance x and with a uniform velocity v_2, for the next equal distance. The average velocity v is given by:
1. $v = \frac{v_1+v_2}{2}$
2. $v = \sqrt{v_1 v_2}$
3. $\frac{2}{v} = \frac{1}{v_1} + \frac{1}{v_2}$
4. $\frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2}$

169 Given below are two statements:

Assertion (A):	A body of mass 1 kg is making 1 rps in a circle of radius 1 m. The centrifugal force acting on it is $4\pi^2$ N.
Reason (R):	Centrifugal force is given by $F = \frac{mv^2}{r}$.

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.

170 A balloon B is moving vertically upward and viewed by a telescope T. At a particular angular position $\theta = 53^\circ$, measured parameters are $r = 1$ km, $\frac{dr}{dt} = 3$ m/s and $\frac{d\theta}{dt} = 0.002$ rad/s. The magnitude of the linear velocity of the balloon at this instant is:



1. 1.2 m/s
2. 2.4 m/s
3. 3.6 m/s
4. 4.8 m/s

171 A 40 N block is supported by two ropes. One rope is horizontal and the other makes an angle of $30^\circ$with the ceiling. The tension in the rope attached to the ceiling is approximately:

1. 80 N
2. 40 N
3. 34.6 N
4. 46.2 N

172 Consider the following statements and select the correct option.

Statement (A):	The dimensional correctness of an equation is verified using the principle of homogeneity.
Statement (B):	All unitless quantities are dimensionless.

1.	Both statements **(A)** and **(B)** are true.
2.	Both statements **(A)** and **(B)** are false.
3.	Only statement **(A)** is true.
4.	Only statement **(B)** is true.

173 A ball of mass 2 kg is dropped from a height of 9.8 m and rebounds to a height of 4.9 m. If it remains in contact with the ground for 0.2 s, the average force on the ball exerted by the ground is:
(Take $g = 9.8$ m/s^2)

1. $98(\sqrt{2}+1)$ N
2. $49(\sqrt{2}+1)$ N
3. $98(\sqrt{2}-1)$ N
4. $49(\sqrt{2}-1)$ N

174 What force is needed to do 100 Joules of work on a box, while pushing it uphill at an angle of 60° with respect to the horizontal ground?

1.	100 N
2.	87 N
3.	50 N
4.	there is insufficient information to determine the work

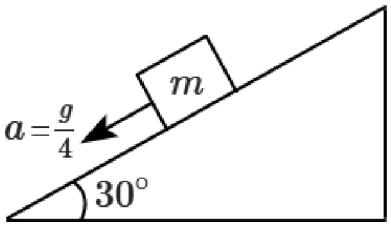
175 A body has an initial velocity of 3 m/s and has an acceleration of 1 m/s^2 normal to the direction of the initial velocity. Its velocity 4 s after the start will be:

1.	7 m/s along the direction of the initial velocity.
2.	7 m/s along the normal to the direction of the initial velocity.
3.	7 m/s midway between the initial direction and the direction normal to the initial direction.
4.	5 m/s at an angle of $\tan^{-1}(4/3)$ with the direction of the initial velocity.

176 A particle sits on the periphery of the wheel of a car, which is being driven along a straight road at a speed v. The radius of the wheel of the car is R. The instantaneous acceleration of the particle, as observed by a passenger, is:

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

177 A block is sliding down an inclined plane of inclination 30°, with an acceleration of $\frac{g}{4}$. The coefficient of friction between the block and incline is:



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

178 The main scale of a vernier caliper has least count of 1 mm. 20 divisions of the vernier scale coincide with 19 divisions of the main scale. The vernier constant of the caliper is:

1. 0.01 cm
2. 0.01 mm
3. 0.005 cm
4. 0.005 mm

179 Two cars having masses m_1 and m_2 move in circles of radii r_1 and r_2 respectively. If they complete the circles in equal time, the ratio of their angular speeds ω_1/ω_2 will be:

1. $\frac{m_1}{m_2}$
2. $\frac{r_1}{r_2}$
3. $\frac{m_1 r_1}{m_2 r_2}$
4. 1

180 Which one of the following ratios of physical quantities has the same dimensions as that of pressure?

1. $\frac{\text{force}}{\text{length}}$
2. $\frac{\text{energy}}{\text{area}}$
3. $\frac{\text{energy}}{\text{volume}}$
4. $\frac{\text{force}}{\text{volume}}$

181 A car is traveling around a curved portion of a flat highway at a constant speed v. The curve has a radius R. What is the minimum coefficient of static friction between the tires and the road necessary for the car to make the curve without skidding?

1. $\mu = \sqrt{Rg}$
2. $\mu = \frac{Rv^2}{mg}$
3. $\mu = \frac{v^2}{Rg}$
4. $\mu = \frac{R^2 g}{v}$

182 Given below are two statements:

Assertion (A):	Parabolic curve of velocity versus time implies that its acceleration varies linearly with time.
Reason (R):	Parabolic curve represent quadratic function and acceleration is the first derivative of velocity so the acceleration versus time graph will be linear.

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 If position vector of a particle is given by $\vec{r}\,(t) = 8t\hat{i} + 5t^2\hat{j} + 6\hat{k}$, then the correct statement about the acceleration of the particle is:

1.	It is along positive y−axis.
2.	It is along positive x−axis.
3.	It is equally inclined to x and y−axes.
4.	It is along positive z−axis.

184 When a vertically oriented spring scale supports a 180 N block, the spring stretches 0.3 m from rest. Neglecting any other masses associated with the scale, what is the value of the spring constant?
1. 30 N/m
2. 294 N/m
3. 600 N/m
4. 5880 N/m

185 Swimming is possible on account of:

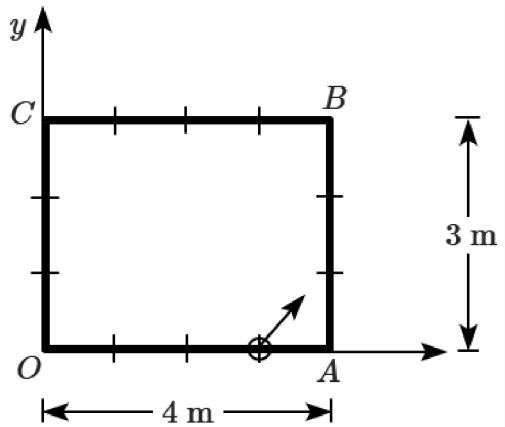
1.	First law of motion
2.	Second law of motion
3.	Third law of motion
4.	Newton's law of gravitation

PHYSICS - SECTION B

186 A ball is dropped by a person from the top of a building, while another person at the bottom observes its motion. Both people:

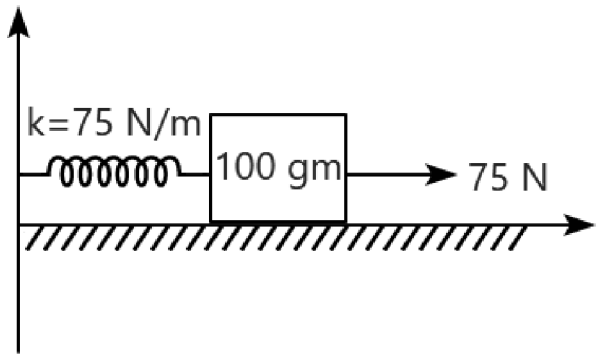
1.	agree on the change in potential energy as well as the kinetic energy of the ball.
2.	agree on the change in potential energy, but disagree on the kinetic energy of the ball.
3.	agree on the kinetic energy of the ball, but disagree on the change in potential energy.
4.	disagree on the kinetic energy of the ball and the change in potential energy.

187 A ball is released with a velocity $(2\hat{\imath} + 2\hat{\jmath})$ m/s on the rectangular pool table from the point $(3, 0)$ m. All the collisions of the ball are elastic.



After 4 seconds of being released, the location of the ball will be:
1. $(2, 2)$ m
2. $(0, 1)$ m
3. $(2, 1)$ m
4. $(3, 2)$ m

188 At equilibrium position, a 75 N force starts is acting on the block attached with the spring as shown in the figure. Maximum extension in the spring is:



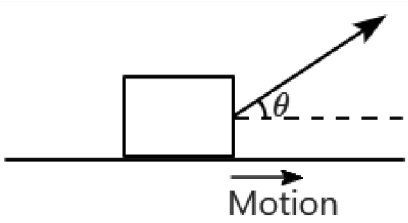
1. 1 m
2. 3 m
3. 4 m
4. 2 m

189 Two balls are lifted. If one ball experiences a greater change in potential energy, then which of the following statements could possibly explain the difference?

I.	The balls have different masses.
II.	The balls are lifted to different heights.
III.	The balls reach their final points by different pathways.

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

190 A block is moved along a horizontal plane by means of a force of constant magnitude of 5 N, but acting at an angle θ which is proportional to the displacement (x): $\theta = \frac{1}{2}x$,
where x is in m and θ is in radians. The work done by this force until the force becomes vertical is:



1. 5 J
2. 10 J
3. 2.5 J
4. 1.25 J

191 Two springs A and B ($k_A = 2k_B$) are stretched by applying forces of equal magnitudes at the four ends. If the energy stored in A is E, that in B is:
1. $\frac{E}{2}$
2. $2E$
3. E
4. $\frac{E}{4}$

192 A force $2x\hat{i} - 3y^2\hat{j}$ acts on a particle when it is at the location (x, y). This force is:

1.	non-conservative
2.	conservative and the potential energy is $(x^2 - y^3)$
3.	conservative and the potential energy is $(y^3 - x^2)$
4.	conservative, but it cannot have a potential energy

193 A northbound cart is moving at 5 m/s when it collides with a southbound cart, moving at 1 m/s. If the northbound cart is twice as heavy as the southbound cart, what is their final velocity after they collide and become stuck together?
1. 2 m/s north
2. 3 m/s north
3. 2 m/s south
4. 3 m/s south

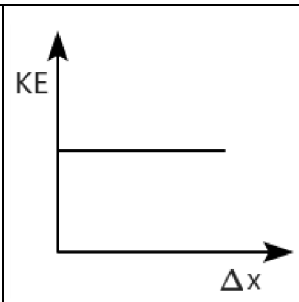
194 If an electrical generator plant increases its daily amount of output energy by 100%, the plant's average output power increases by:
1. 25%
2. 50%
3. 100%
4. 200%

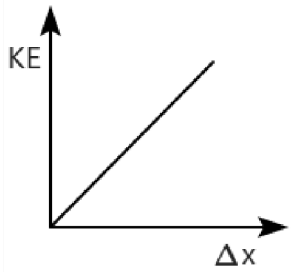
195 Given below are two statements:

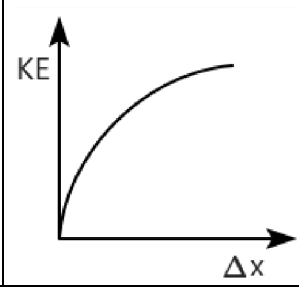
Assertion (A):	The work done on bringing a body down from the top to the base along a frictionless inclined plane is the same as the work done in bringing it down the vertical side.
Reason (R):	The gravitational force on the body along the inclined plane is the same as that along the vertical side.

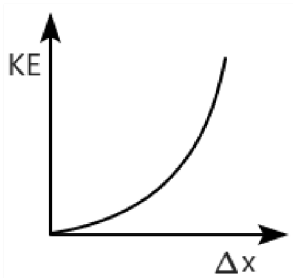
1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

196 A student applies force to a stalled car over a distance Δx to increase its kinetic energy. Which graph best represents the relationship between the kinetic energy(KE) and the pushing distance(Δx)?

1. 

2. 

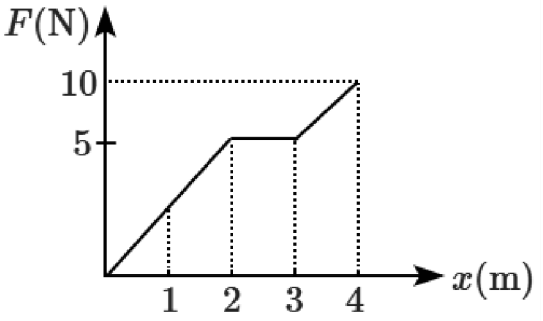
3. 

4. 

197 A variable force $F = 5kx$ N acts on a body moving along x-axis. What will be the work done by this force in displacing the body from $x = 2$ m to $x = 5$ m? (Where k is a constant)

1. $\left(\frac{205}{2}k\right)$ J
2. $\left(\frac{105}{2}k\right)$ J
3. $(52k)$ J
4. $(51k)$ J

198 A body of 10 kg is subjected to a force as shown in the figure. The block moves along a straight line under the influence of this force. The change in kinetic energy when the body moves from $x = 0$ to $x = 4$ m will be:

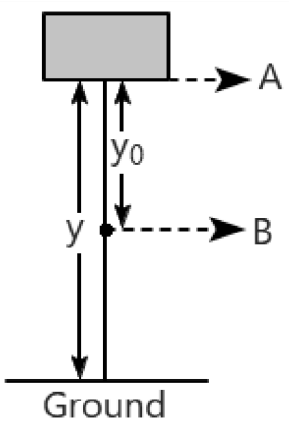


1. 15 J
2. 12.5 J
3. 17.5 J
4. 19.2 J

199 Air flows past a windmill at a constant speed v, the area swept by the blades being A. Assume that the windmill extracts a constant fraction of the energy of the air that flows past it. The power generated by the windmill varies with v as:

1. v^{-1}
2. v^{1}
3. v^{2}
4. v^{3}

200 In the given figure, the block of mass m is dropped from point A. The expression for the kinetic energy of the block when it reaches point B is:



1. $\frac{1}{2}mg_0^2$
2. $\frac{1}{2}mgy^2$
3. $mg\,(y - y_0)$
4. mgy_0

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.