Botany - Section A

1.

Evolutionarily, the first terrestrial plants to possess vascular tissues are:

1. Bryophytes
2. Pteridophytes
3. Cycades
4. Gnetales

2.

The suffix that denotes the taxonomic category 'Family' in plants would be

1. -ae
2. -aceae
3. -ales
4. -nae

3.

Match each item in Column I with one item in Column II regarding protists and choose your answer from the codes given below.

Column I	Column II
I. Red tides	1. Diatoms
II. Chief producers in the ocean	2. Dinoflagellates
III Pellicle	3. Euglenoids
IV. Plasmodium	4. Slime moulds

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

4.

Fungal cell walls are characteristic in having

1. cellulose
2. hemicellulose
3. chitin
4. pectin

5.

Deuteromycetes are known as fungi imperfect because

1. their zygote undergoes meroblastic and holoblastic cleavage
2. only asexual stages are known
3. they have aseptate mycelium
4. they are autotrophic

6.

Which of the given genera is homosporous?

1. *Cycas*
2. *Pinus*
3. *Selaginella*
4. *Lycopodium*

7.

In *Cycas*

1. ovlule and microsporangia are present in same sporophyll
2. micro and megasporophyllus are present in same cone
3. male cone and megasporophylls are borne on the same plant
4. male cone and megasporophylls are borne on separate individual plants

8.

Which of the following organisms completely lack cell wall, they are the smallest living cells known and can survive without oxygen?

1. Mycoplasma
2. Euglenoids
3. Slime moulds
4. All of these

9.

Systematics does not include-
1. Identification
2. Nomenclature
3. Classification
4. Evolutionary relationships between environment and organisms

10.

Polymoniales includes-
1. Convolvulaceae
2. Solanaceae
3. Both 1 and 2
4. Liliaceae only

11.

Which organisms are responsible for the production of biogas?

1. Archaebacteria
2. Eubacteria
3. Mycoplasma
4. Protists

12.

Which of the following is correct with respect to heterocyst

1. Nostoc, Anabena
2. Only Anabena
3. Nostoc
4. All eubactetia

13.

The flagella in euglenoids are

1. Two, longitudinal and transverse
2. Two, long and short
3. Three, two long and one short
4. Three, two longitudinal and one transverse

14.

Nutrition of fungi-
1. Saprophytic
2. Parasitic
3. Symbiotic
4. All of the above

15.

What is the artificial basis of classification?

1. It is based on vegetative characters only
2. It is based on few vegetative and reproductive characters
3. It is based on only reproductive characters
4. It is based on any random classification

16.

Vegetative reproduction occurs by

1. Fragmentation
2. By zoospores
3. Anisogamous
4. All of these

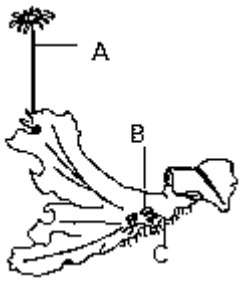
17.

Pyrenoid has

1. Protein+Starch
2. Only Protein
3. Only Starch
4. Fats+ Starch

18.

Identify the statement that most accurately describes the plant shown in the given figure:



1. This the male prothallus of *Marchantia*; A is antheridiophore and B is Gemma cup

2. This the female prothallus of *Marchantia*; A is archegoniophore and B is Gemma cup

3. This the male prothallus of *Sphagnum*; A is antheridiophore and B is Gemma cup

4. This the female prothallus of *Spahgnum*; A is archegoniophore and B is Gemma cup

19.

Which one of the following taxonomical aids is useful in providing information for the actual account of habitat and distribution of plants of a given area?

1 manuals

2 Monographs

3 Flora

4 Couplet

20.

Which of the following set is not correct w.r.t. genus?
1. Potato and Brinjal
2. Lion, leopard and cat
3. Tigris, pardus and leo
4. Nigrum and melongena

21.

Which is wrongly matched?

1. Fungi - Heterotrophic group

2. Prokaryotes- Protista

3. Unicellular+nuclear membrane possessing - Protista

4. Chlamydomonas and amoeba - Protista

22.

Sleeping sickness is caused by

1. Flagellated protozoan

2. Cilliated Protozoan

3. Sporozoan

4. Amoeboid protozoan

23.

Dinoflagellates are characterised by all, except

1. The cell wall has stiff cellulose plates on the outer surface

2. The cell walls form two thin overlapping shells, which fit together as in a soapbox

3. Most of them has one longitudinal and another transverse flagellum

4. Photosynthetic pigments are chlorophyll a, c, and α-carotenes

24.

White spots or rust disease seen on mustard leaves are due to:-

1. *Albugo*

2. *Puccinia*

3. *Rhizopus*

4. *Penicillium*

25.

Which fungi are edible :-

1. Truffles

2. Morels

3. *Agaricus*

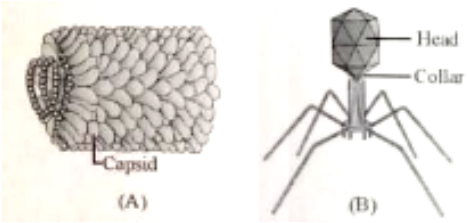
4 All of these

26.

Coralloid roots of gymnosperms are/have
1. Irregular and possess large number of roots hairs.
2. Symbiotic association with Rhizobium.
3. Symbiotic association with N_2 - fixing cyanobacteria.
4. VAM

27.

Which of the statement is not true for given structures?



1. They both are made up of nucleoprotein

2. They both infect plants and bacteria

3. They are obligate intracellular parasites

4. A and B have RNA & DNA as genetics material respectively

28.

Life cycles of *Ectocarpus* and *Polysiphonia* are

1. Haplontic and Diplontic respectively

2. Diplontic and Haplontic respectively

3. Haplodiplontic

4. Diplontic and Haplodiplontic respectively

29.

In gymnosperms, the ovule is naked because

1. Ovary wall is absent

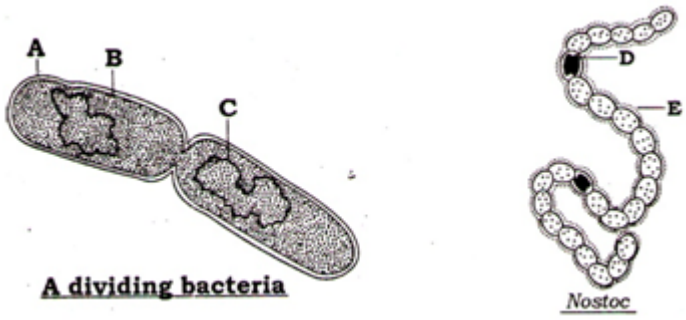
2. Integuments are absent

3. Perianth is absent

4. Nucellus is absent

30.

Identify the blanks in the following figures –



1. A – Cell wall, B – Cell membrane, C – Heterocyst, D – DNA, E – mucilaginous sheath.
2. A – Cell wall, B – Cell membrane, C – DNA, D – Heterocyst, E – Mucilaginous sheath.
3. A – Mucilaginous sheath, B – Cell membrane, C – DNA, D – Heterocyst, E – Cell wall.
4. A – Cell membrane, D – Cell wall, C – DNA, D – Heterocyst, E – Mucilaginous sheath.

31.

Vascular archegoniate with diplontic life cycle are

1 Bryophytes

2 Pteridophytes

3 Gymnosperms

4 More than one option is correct

32.

All given statements stand true w.r.t. Lichens, except

1. These are indicators of SO_2 pollution, as shown by there abundance in these areas

2. Breathing pores help in gas exchange, these are found on the lower surface of the thallus

3. This association is also termed as helotism

4. Crustose lichens are pioneers of rock succession

33.

Select incorrect statements w.r.t. living beings

1. Growth cannot be taken as a defining property of living organisms

2. Growth can be easily observed in vitro culture

3. Metabolic reactions cannot be demonstrated outside the body in cell-free system

4. All organisms, from the prokaryotes to the most complex eukaryotes can sense and respond to environmental cues

34.

The asexual spores are generally not found in:-

1. *Neurospora*

2. *Claviceps*

3. *Trichoderma*

4. *Ustilago*

35.

Identify the following statements as true (T) or false (F) and select the option accordingly

(A) Members of Rhodophyceae asexually reproduce by motile spores
(B) Members of Phaeophyceae do not show isogamous type of sexual reproduction
(C) In some green algae, food is stored in the form of oil droplets

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

Botany - Section B

36.

In numerical taxonomy

1. All the characters are given equal importance

2. All the characters are given unequal importance

3. And at the same time, hundreds of characters can be considered

4. Both 1 and 3

37.

Which of the following has non flagellated male and female gametes?

1. Fucus

2. Spirogyra

3. Ulothrix

4. Volvox

38.

Sexual reproduction in chlorophyceae is of

1. Isogamous type

2. Anisogamous type

3. Oogamous type

4. All of these

39.

Select the correctly written scientific name of Mango which was first described by Carolus Linnaeus :

1. Mangifera Indica
2. Mangifera indica Car. Linn.
3. *Mangifera indica* Linn.
4. Mangifera indica

40.

Single-celled eukaryotes are included in
1. Fungi
2. Archaea
3. Monera
4. Protista

41.

What kind of similarities are not targeted for evolving better classification system?

1. Morphological
2. Physiological
3. Phylogenetic
4. Behavioral

42.

Which of the following shows the coordinated movement of cilia?

1. Trypanosoma
2. Entamoeba
3. Paramoecium
4. Plasmodium

43.

In the five-kingdom classification, *Chlamydomonas* and *Chlorella* have been included in
1. Algae
2. Plantae
3. Monera
4. Protista

44.

Chlamydomonas, Chlorella, Volvox, Ulothrix, Fucus, Dictyota, Polysiphonia, Gelidium, Spirogyra, Laminaria. Out of these 10 organisms, how many organisms belong to the class Chlorophyceae, Phaeophyceae and Rhodophyceae respectively?

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

45.

Maximum nutritional diversity is found in the group.
1. Fungi
2. Animalia
3. Monera
4. Plantae

46.

Animals differ from plants in

1. Being multicellular
2. Having cell wall
3. Being heterotrophic
4. Being eukaryotic

47.

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

48.

Choose the odd one out w.r.t. slime moulds

1. Spores possess true cellulosic walls

2. The body moves along decaying twigs and leaves engulfing organic material

3. Can grow and spread over several feets

4. Spores are dispersed by water currents

49.

The Indian Botanical Garden and the National Botanical Research Institute are located respectively at:

1. Pune and Howrah

2. Howrah and Lucknow

3. Darjeeling and Lucknow

4. Shimla and Dehradun

50.

Which of the following statements is correct?

1. Organisms that depend on living plants are called saprophytes.

2. Some of the organisms can fix atmospheric nitrogen in specialized cells called sheath cells.

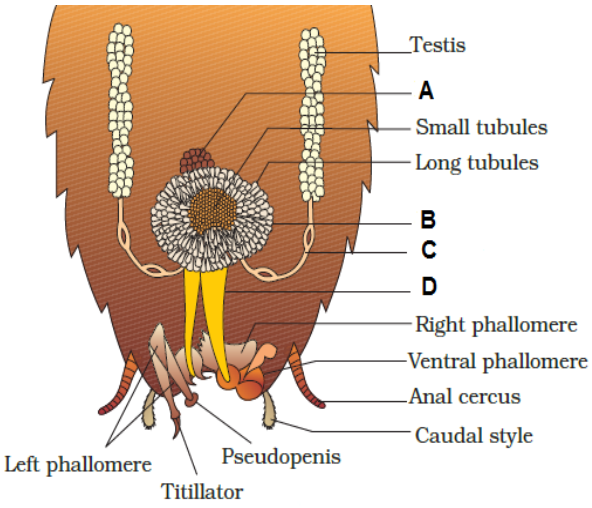
3. The fusion of two cells is called Karyogamy.

4. Fusion of protoplasms between two motile on non-motile gametes is called plasmogamy.

Zoology - Section A

51.

Sperms are stored in?



1. A

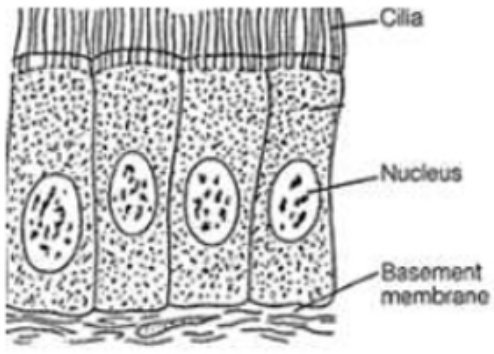
2. B

3. C

4. D

52.

The epithelium shown in the given diagram is found in :



1. Proximal convoluted Tubule

2. Small intestine

3. Fallopian tube

4. Thyroid follicle cells

53.

Which type of tissue correctly matches 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

54.

Which phylum consists of worm-like animals with proboscis, collar and trunk?

1. Echinodermata
2. Hemichordata
3. Mollusca
4. Platyhelminthes

55.

In which animals are the cells performing the same function are arranged into tissues i.e., tissue level of organisation is present?

1. Sponges
2. Ctenophora
3. Coelenterata
4. Both 2 and 3

56.

Which of the following is a jawless vertebrate?

1. Petromyzon
2. Hagfish
3. Myxine
4. All of the above

57.

Fibres of muscle tissue are composed of :

1. Chondrocytes
2. Myofibrils
3. Fibroblasts
4. lacunae

58.

The sclerites in exoskeleton of cockroach are joined to each other by :

1. Tergites
2. Arthrodial membrane
3. Mesothorax
4. Tegmina

59.

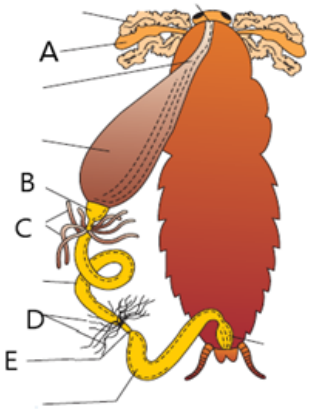
Match the structure (i), (ii), (iii), (iv) with their correct location respectively:

	Structure		Abdominal segment
(i)	Testes	(1)	II to VI
(ii)	Ovaries	(2)	VI-VII
(iii)	Spermatheca	(3)	VI
(iv)	Mushroom gland	(4)	IV to VI

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

60.

In the following diagram, A, B, C, D and E respectively are:



1. Salivary ducts, crop, gizzard, malpighian tubules, ileum

2. Salivary reservoir, gizzard, hepatic caeca, malpighian tubules, ileum

3. Salivary reservoir, gizzard, ileum, malpighian tubules, hepatic caeca

4. Salivary duct, midgut, hepatic caeca, malpighian tubules, ileum

61.

Yellow coloured thin filamentous rings present at the junction of midgut and hindgut which help in excretion are how many in number ?

1. 100-150

2. 200

3. 9-10

4. 50-100

62.

Which of the following is not the product of endocrine gland?

1. Milk

2. Hormone

3. Intercellular messenger

4. Non-nutrient chemical

63.

The central cavity of the sponges is known as

1.spongocoel

2.Ostia

3.Osculum

4.Gastro-vascular cavity

64.

Which of the following cell is present on the tentacles and body of the Cnidarians

1.Nematocysts

2.Choanocytes

3.Cnidocytes

4.Both 2 and 3

65.

Members of the Platyhelminthes are called Flatworms because of

1.Triploblastic body plan

2.Bilateral symmetry

3.Organ level of organisation

4.Flattened body

66.

Round worm is

1.Pseudo-coelomate

2.True Coelomate

3.Acoelomate

4.having incomplete Alimentary canal

67.

If there are 900 animals are present on Earth, then how many of them are supposed to be Arthropods

1.300

2.600

3.450

4.700

68.

How many of the following is not the member of Mollusca?

Sea hare, Sea cucumber, Sea lily, Sea urchin, Sea-pen, Sea fan, Sea anemone

1. 7

2. 6

3. 1

4. 4

69.

A marine cartilaginous fish that can produce electric current is :-

1. Pristis

2. Torpedo

3. Trygon

4. Scoliodon

70.

The……. of the cells vary according to their……..

1. Functions, Structures

2. Sizes, Structures

3. Structures, Functions

4. Sizes, Functions

71.

Osteocytes are present in…….while chondrocytes are present in…….

1. Lacunae, cavities

2. Cavities, lacunae

3. Sinuses, lacunae

4. Lacunae, holes

72.

Find the wrong statement with respect to neural tissue.

1. Neuroglia make nearly half the volume of neural tissue

2. Neuroglia protect and support neurons

3. Neural tissue controls the body's responsiveness to changing conditions

4. Stimulation of neurons cause the electrical disturbance in plasma membrane.

73.

Select the correct match

Column-I	**Column-II**
a. Ciliated epithelium	(i) Protection
b. Compound epithelium	(ii) Secretion and absorption
c. Columnar epithelium	(iii) To maintain a flow of mucus or liquid in one direction

1. a(ii), b(iii), c(i)

2. a(ii), b(i), c(iii)

3. a(i), b(iii), c(ii)

4. a(iii), b(i), c(ii)

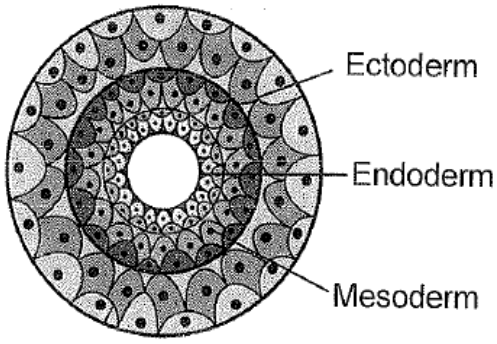
74.

Which of the following is a worm like, limbless amphibian with scales embedded into skin and eyes covered by an opaque skin cover?

1. *Proteus*
2. *Ichthyophis*
3. *Alytes*
4. *Bombinator*

75.

Cross-section of the body plan of an invertebrate is given below. Identify the animal which exhibits this body plan.



1. *Fasciola*
2. Ascaris
3. *Periplaneta*
4. *Euspongia*

76.

Characters of an organism are given below

a. Four chambered heart

b. Tympanum represents ear

c. Poikilothermal

d. Fertilization is internal and development is direct and is oviparous

Which of the following organism has the above characters?

1. *Columba*
2. *Calotes*
3. *Crocodilus*
4. *Bangarus*

77.

From the given statements which of the following statement(s) is/are incorrect for annelida?

a. Pseudometameric segmentation present.

b. Coelomic fluid acts as hydrostatic skeleton.

c. They possess longitudinal and circular muscles which help in locomotion.

d. Neural system consist paired ganglia connected by lateral nerves to a single ventral nerve chord

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

78.

Choose the **incorrect** statement.

1. Metamerism is a serial repetition of similar body segments along the longitudinal axis of the body

2. Differentiation of head end is called cephalization and is found in bilaterally symmetrical animals

3. All bilaterally symmetrical animals have a circulatory system for the transport of nutrients, wastes, hormones, etc.

4. The gill arches were cartilaginous/bony supporters for gill slits which transformed into jaws in some vertebrates

79.

Select the incorrect match w.r.t. genus name, its two characters and phylum

	Genus	Characters	Phylum
1.	Octopus	Closed circulatory system Presence of mantle cavity	Mollusca
2.	*Nereis*	Metamerism Possess lateral appendages	Annelida
3.	*Sycon*	Water canal system Hermaphrodite	Porifera
4.	*Balanoglossus*	Closed circulatory system Proboscis gland for respiration	Hemichordata

80.

Chondrichthyes differ from osteichthyes as former possess

1. Operculum

2. Air bladder

3. Placoid scales

4. Two-chambered heart

81.

Opening of spiracles is regulated by the

1. Ostia

2. Bristles

3. Sphincters

4. Valves

82.

Mark the false statement w.r.t. cockroach

1. Excretion is performed by Malpighian tubules which occur at the junction of midgut and hindgut

2. Cockroach is uricotelic

3. Blood vascular system of cockroach is closed type

4. Respiratory system consists of a network of trachea, that open through 10 pairs of spiracles

83.

Vision of cockroach is

1. Mosaic

2. Having more resolution

3. Diurnal

4. Superposition

84.

What is true about *Nereis*, scorpion, cockroach and silver fish ?
1. They all possess dorsal heart
2. None of them is aquatic
3. They all belong to the same phylum
4. They all have jointed paired appendages

85.

Which of the following statement is incorrect w.r.t. vertebrates?
1. Vertebrates possess notochord during the embryonic period
2. Notochord is replaced by a cartilaginous or bony vertebral column in the adult
3. All vertebrates are chordates but all chordates are not vertebrates
4. Vertebrates have a dorsal muscular heart with two, three, or four chambers

Zoology - Section B

86.

If the head of a cockroach is cut off, it will still live for as long as one week because :

1. It has four ganglia in the thorax, and six in the abdomen.

2. The head holds a bit of a nervous system while the rest is situated along the ventral part of its body.

3. The head holds most of the nervous system while the rest is situated along its belly-side.

4. In the head region, the brain is represented by lower-oesophageal ganglion which supplies nerves to compound eyes.

87.

In Cnidarians the digestion is

1.Intracellular

2.Extracellular

3.Intercellular

4.Both 1 and 2

88.

Which is not correct about Ctenophora

1.Exclusive marine

2.Comb plates are present

3.Bioluminescent organism

4.Internal fertilisation present

89.

Which of the following flatworm is having high regeneration capacity?

1.Hydra

2.Tapeworm

3.Liverfluke

4.*Planaria*

90.

Sponges need a continuous current of water flowing through their bodies for

a. Respiration

b. Locomotion

c. Nutrition

d. Excretion

e. Reproduction

1. a, b & c

2. a, b & d

3. a, c & d

4. b, c & e

91.

Muscular pharynx is the feature of

1. *Leucosolenia*

2. *Taenia*

3. *Ascaris*

4. *Fasciola*

92.

Tactile organ of cockroach is :-

1. Labrum
2. fenestrae
3. Antennae
4. Anal cerci

93.

Cell junctions commonly found in :-

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

94.

Presence of Radula is characteristic of:-

1. Arthropoda
2. Annelida
3. Echinodermata
4. Mollusca

95.

Which of the following is wrong match w.r.t. cockroach?

1. Head - Hypognathous
2. Heart - 13 chambered
3. Anal styles - Female cockroach
4. Excretion - Malpighian tubules

96.

In contrast to Annelids, the Platyhelminths show

1. Absence of body cavity
2. Presence of pseudocoel
3. Radial symmetry
4. Bilateral symmetry

97.

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. *Dentalium, Pila, Echinus*
3. *Asterias, Antedon, Ascidia*
4. *Adamsia, Gorgonia, Pleurobrachia*

98.

When any plane of section passing through the central axis of body, divides the organism into identical halves, it is called

1. Radial symmetry
2. Biradial symmetry
3. Bilateral symmetry
4. Spherical symmetry

99.

Identify the option where all the columns are not correctly matched:

	Animal	Phylum	Features
1.	*Pleurobrachia*	Ctenophora	Comb plates, Only sexual reproduction
2.	*Loligo*	Mollusca	Radula, Dioecious
3.	*Balanoglossus*	Hemichordata	Respiration by gills, Proboscis gland
4.	*Ascidia*	Chordata	Marine, Notochord persistent throughout life

100.

Which one of the following organisms bears hollow and pneumatic long bones?

1. *Macropus*
2. *Ornithorhynchus*
3. *Neophron*
4. *Hemidactylus*

Chemistry - Section A

101.

In a regular octahedral molecule MX_6, the number of X-M-X bonds at 180° is-

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

102.

The maximum volume at STP is occupied by

1. 12.8g of SO_2
2. 6.02×10^{22} molecules of CH_4
3. 0.5 mol of NO_2
4. 1 gm-molecule of CO_2

103.

Select the correct statement regarding XeO_2F_2 among the folowing.

a. Xe is sp^3d hybridised.

b. 4 bond pairs and 1 lone pair are present around Xe.

c. Shape of XeO_2F_2 is square pyramidal.

d. Contains d$\pi - p\pi$ bonds.

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

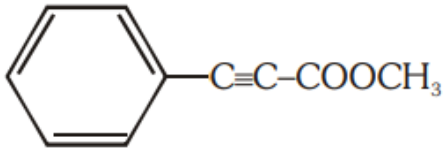
104.

The bond order of a species is 2.5 and the number of electrons in its bonding molecular orbital is formed to be 8. The number of electrons in its antibonding molecular orbital is-

1. Three
2. Four
3. Zero
4. Cannot be calculated from the given information.

105.

The number of (i) sp^2 hybridized carbon atoms and (ii) π bonds are present in the following compound are-



1. 7, 5
2. 8, 6
3. 7, 6
4. 8, 5

106.

The molality of the solution containing 18.25 g of HCl gas in 500 g of water is -

1. 0.1 m
2. 1 M
3. 0.5 m
4. 1 m

107.

Two atoms are said to be isobars if-

1. They have a same atomic number but the different mass number

2. They have same number of electrons but different number of neutrons

3. They have same number of neutrons but different numbers of electrons

4. Sum of the number of protons and neutrons is the same but the number of protons is different

108.

Chlorine exists in two isotopic forms. Cl-37 and Cl-35 but its atomic mass are 35.5. This indicates the ratio of Cl-37 and Cl-35 is approximately-

1. 1:2

2. 1:1

3. 1:3

4. 3:1

109.

For the electrons of an oxygen atom. The correct statement among the following is-

1. Z_{eff} for an electron in a 2s orbital is the same as Z_{eff} for an electron in a 2p orbital.

2. An electron in the 2s orbital has the same energy as an electron in the 2p orbital.

3. Z_{eff} for an electron in 1s orbital is the same as Z_{eff} for an electron in a 2s orbital

4. The two electrons present in the 2s orbital have same spin quantum numbers m_s but of opposite sign

110.

Among the following, the correct order of energies of molecular orbitals of N_2 is-

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

2. $(\pi 2p_y) > (\sigma 2p_z) > (\pi^* 2p_x) \approx (\pi^* 2p_y)$

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

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

111.

The correct order of dissociation energy of N_2 and N_2^+ is-

1. $N_2 > N_2^+$

2. $N_2 = N_2^+$

3. $N_2^+ > N_2$

4. None of the above

112.

The dipole moment of compound AB is 10.92 D and that of compound CD is 12.45 D. The bond length AB is 2.72 A^o and that of CD is 2.56 A^o then for these compound true statement is :

1. More ionic nature in AB
2. More ionic nature in CD
3. Equal in both
4. Cannot be predicted

113.

The correct order of increasing ionic character in the molecules: LiF, K_2O, N_2, SO_2 and ClF_3 is -

1. $N_2 < ClF_3 < SO_2 < K_2O < LiF$

2. $N_2 < ClF_3 < LiF < SO_2 < K_2O$

3. $SO_2 < K_2O < ClF_3 < LiF < N_2$

4. $N_2 < SO_2 < ClF_3 < K_2O < LiF$

114.

The axial bonds are longer as compared to equatorial bonds in PCl_5 because -

1. Axial bond pairs suffer more repulsion from the equatorial bond pairs

2. Equatorial bond pairs suffer more repulsion from the axial bond pairs

3. Both 1, and 2

4. None of the above

115.

The ionic radii vary in-

(a) Inverse proportion to the effective nuclear charge

(b) Inverse proportion to the square of effective nuclear charge

(c) Direct proportion to the screening effect

(d) Direct proportion to the square of screening effect

Choose the correct option

1. (a), (c)

2. (b), (c)

3. (c), (d)

4. (b), (d)

116.

The element having a greatest difference between its first and second ionization energies, is-

1. Ca

2. Sc

3. K

4. Ba

117.

In general, the property (magnitudes only) that shows an opposite trend in comparison to other properties

across a period is-

1. Electronegativity

2. Electron gain enthalpy

3. Ionization enthalpy

4. Atomic radius

118.

Three elements X, Y and Z are in the 3rd period of the periodic table. The oxides of X, Y and Z, respectively, are basic, amphoteric and acidic. The correct order of the atomic numbers of X, Y and Z is :

1. Z < Y < X

2. X < Z < Y

3. X < Y < Z

4. Y < X < Z

119.

The number of subshells associated with n = 4 and m = – 2 quantum numbers is-

1. 4

2. 8

3. 16

4. 2

120.

The molecular geometry of SF_6 is octahedral. The geometry of SF_4 (including lone pair(s) of electrons, is-

1. Trigonal bipyramidal

2. Square planar

3. Tetrahedral

4. Pyramidal

121.

The work function of sodium metal is 4.41×10^{-19} J. If the photons of wavelength 300 nm are incident on the metal, the kinetic energy of the ejected electrons will be-

($h = 6.63 \times 10^{-34}$ Js ; $c = 3 \times 10^{8}$ m/s)

1. 111×10^{-21}
2. 333×10^{-21}
3. 222×10^{-21}
4. 555×10^{-21}

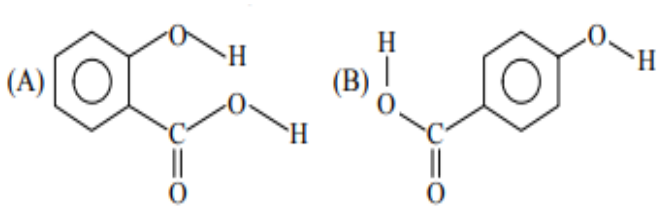
122.

The mass of ammonia in grams produced when 2.8 kg of dinitrogen quantitatively reacts with 1 kg of dihydrogen is- .

1. 3600 g
2. 3000 g
3. 3400 g
4. 4000 g

123.

Consider the following molecules and statements related to them :



(I) (B) is more likely to be crystalline than (A)
(II) (B) has a higher boiling point than (A)
(III) (B) dissolves more readily than (A) in water
Identify the correct option from below :
1. (I) and (II) are false
2. Only (III) are true
3. Only (I) is true
4. (I), (II) and (III) are true

124.

The five successive ionization enthalpies of an element are 800, 2427, 3658, 25024, and 32824 kJ mol^{-1}. The number of valence electrons in the element is -

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

125.

Complex A has a composition of $H_{12}O_6Cl_3Cr$. If the complex on treatment with concentrated H_2SO_4 losses 13.5% of its original mass, the correct molecular formula of A is :
[Given: atomic mass of Cr = 52 amu and Cl =35 amu]

1. $[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$
2. $[Cr(H_2O)_6]Cl_3$
3. $[Cr(H_2O)_3Cl_3] \cdot 3H_2O$
4. $[Cr(H_2O)_4Cl_2]Cl \cdot 2H_2O$

126.

6.023×10^{22} molecules are present in 10 g of substance ‘x’. The molarity of a solution containing 5 g of substance ‘x’ in 2L solution is-

1. 0.00025
2. 2.5
3. 0.025
4. 25

127.

Electromagnetic radiation of wavelength 663 nm is just sufficient to ionize the atom of metal A. The ionization energy of metal A in kJ mol^{-1} is -

(Rounded-off to the nearest integer) [h = 6.63×10^{-34} Js, c = 3.00×10^{8} ms^{-1} , $N_A = 6.02 \times 10^{23}$ mol^{-1}]

1. 189
2. 175
3. 181
4. 185

128.

Consider the elements Mg, Al, S, P and Si, the correct increasing order of their first ionization enthalpy is-

1. Mg < Al < Si < S < P
2. Al < Mg < Si < S < P
3. Mg < Al < Si < P < S
4. Al < Mg < S < Si < P

129.

Consider the following compound

BeO, BaO, $Be(OH)_2$, $Sr(OH)_2$

The amphoteric compound(s) are-

1. BeO, BaO
2. BaO, $Be(OH)_2$
3. $Be(OH)_2$, BeO
4. $Sr(OH)_2$, $Be(OH)_2$

130.

The correct shape and I–I–I bond angles respectively in I_3^- ion are -

1. Distorted trigonal planar; 135° and 90°
2. T-shaped; 180° and 90
3. Trigonal planar; 120°
4. Linear; 180°

131.

The set that contains atomic numbers of only transition elements is-

1. 21, 32, 53, 64
2. 9, 17, 34, 38
3. 21, 25, 42, 72
4. 37, 42, 50, 64

132.

The orbital having two radial as well as two angular nodes is -

1. 3p
2. 4f
3. 4d
4. 5d

133.

The number of significant figures in 50000.020×10^{-3} is-

1. 11
2. 5
3. 8
4. 4

134.

The $NaNO_3$ weighed out to make 50 mL of an aqueous solution containing 70.0 mg Na^+ per mL is-

(Rounded off to the nearest integer) [Given: Atomic weight in g mol^{-1} – Na: 23; N: 14; O: 16]

1. 13 g
2. 26 g
3. 18 g
4. 22 g

135.

A ball weighing 10 g is moving with a velocity of 90 ms^{-1}. If the uncertainty in its velocity is 5%, then the uncertainty in its position is $X \times 10^{-33}$ m. The value of X will be -

[Given : h = 6.63×10^{-34} Js]

1. 1.17
2. 1.37
3. 1.67
4. 1.97

Chemistry - Section B

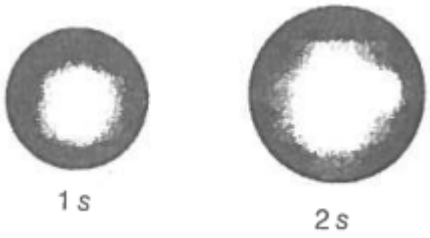
136.

Which of the following options does not represent ground state electronic configuration of an atom?

1. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$
2. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9 4s^2$
3. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$
4. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

137.

The probability density plots of 1s and 2s orbitals diagrams are given below



The density of dots in a region represents the probability density of finding electrons in the region.

On the basis of the above diagram which of the following statements is incorrect?

1. 1s and 2s orbitals are spherical in shape
2. The probability of finding the electron is maximum near the nucleus
3. The probability of finding the electron at a given distance is equal in all directions
4. The probability density of electrons for 2s orbital decreases uniformly as the distance from the nucleus increases

138.

Which of the following statement is not correct about the characteristics of cathode rays?

1.They start from the cathode and move towards the anode

2. They travel in straight line in the absence of an external electrical or magnetic field

3. Characteristics of cathode rays do not depend upon the material of electrodes in cathode ray tube

4. Characteristics of cathode rays depend upon the nature of gas present in the cathode ray tube

139.

The formation of oxide ion $O^{2-}(g)$, from oxygen atom, requires first an exothermic and then an endothermic step as shown below

$$O(g) + e^- \rightarrow O^-(g);\ \Delta H^\ominus = -141\ kJ\ mol^{-1}$$

$$O^-(g) + e^- \rightarrow O^2(g);\ \Delta H^\ominus = +780\ kJ\ mol^{-1}$$

Thus, the process of formation of O^{2-} in the gas phase is unfavourable even though O^{2-} is isoelectronic with neon. It is due to the fact that

1. Oxygen is more electronegative

2. Addition of electron in oxygen results in a larger size of the ion

3. Electron repulsion outweighs the stability gained by achieving noble gas configuration

4. O^- ion has comparatively smaller size than oxygen atom

140.

A mole ratio of H_2 and O_2 gas is 8. The ratio of weight is-

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

141.

One mole of oxygen gas at STP is equal to -

a. 6.022×10^{23} molecules of oxygen

b. 6.022×10^{23} atoms of oxygen

c. 16 g of oxygen molecule

d. 32 g of oxygen

1. (a), (b)

2. (a), (c)

3. (a), (d)

4. (c), (d)

142.

16 g of oxygen has the same number of molecules as in-

(a) 16 g of CO

(b) 28 g of N_2

(c) 14 g of N_2

(d) 1.0 g of H_2

1. (a), (b)

2. (b), (c)

3. (c), (d)

4. (b), (d)

143.

Out of the following pairs of electrons, identify the pairs of electrons present in degenerate orbitals.

(a) (i) $n = 3,\ l = 2,\ m_l = -2,\ m_s = -\frac{1}{2}$ (ii) $n = 3,\ l = 2,\ m_l = -1,\ m_s = -\frac{1}{2}$

(b) (i) $n = 3,\ l = 1,\ m_l = 1,\ m_s = +\frac{1}{2}$ (ii) $n = 3,\ l = 2,\ m_l = 1,\ m_s = +\frac{1}{2}$

(c) (i) $n = 4,\ l = 1,\ m_l = 1,\ m_s = +\frac{1}{2}$ (ii) $n = 3,\ l = 2,\ m_l = 1,\ m_s = +\frac{1}{2}$

(d) (i) $n = 3,\ l = 2,\ m_l = +2,\ m_s = -\frac{1}{2}$ (ii) $n = 3,\ l = 2,\ m_l = +2,\ m_s = +\frac{1}{2}$

1. (a), (d)

2. (b), (c)

3. (c), (d)

4. (b), (d)

144.

CO is isoelectronic with

(a) NO^+

(b) N_2

(c) $SnCl_2$

(d) NO_2^-

Choose the correct option

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

145.

Which of the following species have the same shape?

(a) CO_2

(b) CCl_4

(c) O_3

(d) NO_2^-

Choose the correct option

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

146.

Among the following, the correct statements about CO_3^{2-}

(a) The hybridisation of the central atom is sp^3

(b) Its resonance structure has one C-O single bond and two C=O double bonds

(c) The average formal charge on each oxygen atom is 0.67 units

(d) All C-O bond lengths are equal

Choose the correct option

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

147.

Diamagnetic species are those which contain no unpaired electrons. Among the following, diamagnetic species are

(a) N_2

(b) N_2^{2-}

(c) O_2

(d) O_2^{2-}

Choose the correct option

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

148.

Among the following, the incorrect statements are-

(a) NaCl being an ionic compound is a good conductor of electricity in the solid-state

(b) In canonical structure there is a difference in the arrangement of atoms

(c) Hybrid orbitals form stronger bonds than pure orbitals

(d) VSEPR theory can explain the square planar geometry of XeF_4

Choose the correct option

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

149.

The non-polar nature molecule among the following is-

1. $SbCl_5$
2. NO_2
3. $POCl_3$
4. CH_2O

150.

The process that is not endothermic in nature, is :

1. $Ar_{(g)} + e^- \rightarrow Ar^-_{(g)}$
2. $Na_{(g)} \rightarrow Na^+_{(g)} + e^-$
3. $H_{(g)} + e^- \rightarrow H^-_{(g)}$
4. $O^-_{(g)} + e^- \rightarrow O^{2-}_{(g)}$

Physics - Section A

151.

A particle is thrown from the ground with a speed u at an angle θ above the horizontal. The rate of change of velocity of the particle at the highest point of the path is:

1. $g\sin\theta$
2. $g\cos\theta$
3. g
4. Zero

152.

Time of flight of a body dropped from a height H is T. If another body is projected horizontally with speed v from the same height, then its time of flight will be:

1. T
2. $T + \frac{H}{v}$
3. $T - \frac{H}{v}$
4. $\sqrt{T^2 + \frac{H^2}{v^2}}$

153.

In a two-dimensional motion, instantaneous speed v_0 is a positive constant. Then which of the following are necessarily true?

1. the acceleration of the particle is zero
2. the acceleration of the particle is increasing
3. the acceleration of the particle is necessarily in the plane of motion
4. the particle must be undergoing a uniform circular motion

154.

Two particles having mass 'M' and 'm' are moving in a circular path having radius R & r respectively. If their time periods are the same, then the ratio of angular velocities will be:

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

155.

A cricket ball is thrown at a speed of 28 m/s in a direction 30° above the horizontal. The time taken by the ball to return to the same level is:

1. 2.5 s
2. 2.9 s
3. 3.5 s
4. 3 s

156.

A bullet of mass 0.04 kg moving with a speed of 90 m/s enters a heavy fixed wooden block and is stopped after a distance of 60 cm. The average resistive force exerted by the block on the bullet is:

1. 0 N
2. 270 N
3. 370 N
4. 290 N

157.

If e is the electronic charge, c is the speed of light in free space and h is Planck's constant, the quantity $\frac{1}{4\pi\varepsilon_0}\frac{|e|^2}{hc}$ has dimensions of :

1. $[M^0\ L^0\ T^0]$
2. $[L\ T^{-1}]$
3. $[M\ L\ T^{-1}]$
4. $[M\ L\ T^0]$

158.

The pitch of the screw gauge is 1mm and there are 100 divisions on the circular scale. When nothing is put in between the jaws, the zero of the circular scale lies 8 divisions below the reference line. When a wire is placed between the jaws, the first linear scale division is clearly visible while the 72nd division on a circular scale coincides with the reference line. The radius of the wire is:

1. 1.64 mm
2. 0.82 mm
3. 1.80 mm
4. 0.90 mm

159.

An engine of a train moving with uniform acceleration passes the signal post with velocity u and the last compartment passes the same post with velocity v. The velocity with which the middle point of the train passes the signal post is:

1. $\sqrt{\frac{v^2+u^2}{2}}$
2. $\frac{v-u}{2}$
3. $\frac{u+v}{2}$
4. $\sqrt{\frac{v^2-u^2}{2}}$

160.

Match List-I with List-II :

List-I	List-II
(a) h (Planck's constant)	(i) $[M\ L\ T^{-1}]$
(b) E (kinetic energy)	(ii) $[M\ L^2T^{-1}]$
(c) V (electric potential)	(iii) $[M\ L^2T^{-2}]$
(d) P (linear momentum)	(iv) $[M\ L^2\ I^{-1}T^{-3}]$

Choose the correct answer from the options given below :

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

161.

A person standing on a spring balance inside a stationary lift measures 60 kg. The weight (in N) of that person if the lift descends with the uniform downward acceleration of 1.8 m/s^2 will be:[g = 10 m/s^2]

1. 600 N
2. 500 N
3. 492 N
4. 450 N

162.

A boy pushes a box of mass 2 kg with a force $\vec{F} = \left(20\hat{i} + 10\hat{j}\right)N$ on a frictionless surface. If the box was initially at rest, then displacement along the x-axis after 10 s is:

1. 250 m
2. 400 m
3. 500 m
4. 750 m

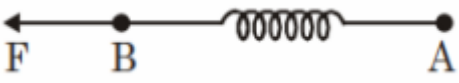
163.

The length of an elastic metallic wire is l_1 when tension in it is T_1. It is l_2 when the tension is T_2. The original length of the wire will be:

1. $\frac{\ell_1+\ell_2}{2}$
2. $\frac{T_2\ell_1+T_1\ell_2}{T_1+T_2}$
3. $\frac{T_2\ell_1-T_1\ell_2}{T_2-T_1}$
4. $\frac{T_1\ell_1-T_2\ell_2}{T_2-T_1}$

164.

Two masses A and B, each of mass M are fixed together by a massless spring. A force acts on the mass B as shown in the figure. If the mass B starts moving away from mass A with acceleration 'a' in the ground frame, then the acceleration of mass A will be:



1. $\frac{Ma-F}{M}$
2. $\frac{MF}{F+Ma}$
3. $\frac{F+Ma}{M}$
4. $\frac{F-Ma}{M}$

165.

A scooter accelerates from rest for time t_1 at constant rate a_1 and then retards at constant rate a_2 for time t_2 and comes to rest. The correct value of $\frac{t_1}{t_2}$ will be :

1. $\frac{a_1+a_2}{a_2}$
2. $\frac{a_2}{a_1}$
3. $\frac{a_1}{a_2}$
4. $\frac{a_1+a_2}{a_1}$

166.

The least count of the main scale of a vernier callipers is 1 mm. Its vernier scale is divided into 10 divisions and coincides with 9 divisions of the main scale. When jaws are touching each other, the 7^{th} division of the vernier scale coincides with a division of the main scale, and the zero of the vernier scale is lying right side of the zero of the main scale. When this vernier is used to measure the length of a cylinder, the zero of the vernier scale between 3.1 cm and 3.2 cm and 4^{th} VSD coincides with the main scale division. The length of the cylinder is: (VSD is vernier scale division)

1. 3.21 cm
2. 2.99 cm
3. 3.17 cm
4. 3.07 cm

167.

If speed V, area A, and force F are chosen as fundamental units, then the dimension of Young's modulus will be :

1. $FA^{-1}V^{0}$
2. $FA^{2}V^{-1}$
3. $FA^{2}V^{-3}$
4. $FA^{2}V^{-2}$

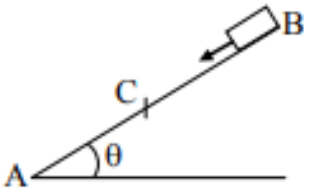
168.

Train A and train B are running on parallel tracks in the opposite directions with speeds of 36 km/hour and 72 km/hour, respectively. A person is walking in train A in the direction opposite to its motion with a speed of 1.8 km/hr. Speed (in ms^{-1}) of this person as observed from train B will be close to: (take the distance between the tracks as negligible)

1. 30.5 ms^{-1}
2. 29.5 ms^{-1}
3. 31.5 ms^{-1}
4. 28.5 ms^{-1}

169.

A small block starts slipping down from a point B on an inclined plane AB, which is making an angle θ with the horizontal Section BC is smooth and the remaining section CA is rough with a coefficient of friction μ. It is found that the block comes to rest as it reaches the bottom (point A) of the inclined plane. If BC = 2AC, the coefficient of friction is given by $\mu = k\tan\theta$. The value of k is:



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

170.

Using a screw gauge of pitch 0.1 cm and 50 divisions on its circular scale, the thickness of an object is measured. It should correctly be recorded as:

1. 2.124 cm
2. 2.121 cm
3. 2.125 cm
4. 2.123 cm

171.

Starting from the origin at time t = 0, with an initial velocity $5\hat{j}\ ms^{-1}$, a particle moves in the x-y plane with a constant acceleration of $\left(10\hat{i}+4\hat{j}\right)\ ms^{-2}$. At time t, its coordinates are (20 m, y_0 m). Then the value of t is:

1. 2 s
2. 4 s
3. 6 s
4. 8 s

172.

Starting from the origin at time t = 0, with an initial velocity $5\hat{j}\ ms^{-1}$, a particle moves in the x-y plane with a constant acceleration of $\left(10\hat{i}+4\hat{j}\right)\ ms^{-2}$. At time t, its coordinates are (20 m, y_0 m). The value of y_0 is:

1. 52 m
2. 25m
3. 18m
4. 24m

173.

A small ball of mass m is thrown upward with velocity u from the ground. The ball experiences a resistive force mkv^2 where v is its speed. Net retardation of the ball at any instant t during the upward journey is:

1. $kv^2\ +\ g$
2. $kv^2\ +2g$
3. $2kv^2\ +\ g$
4. $kv^2\ -\ g$

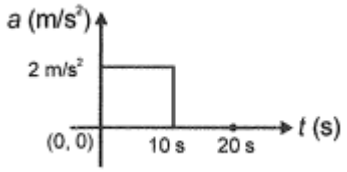
174.

A person pushes a box on a rough horizontal platform surface. He applies a force of 200 N over a distance of 15 m. Thereafter, he gets progressively tired and his applied force reduces linearly with distance to 100 N. The total distance through which the box has been moved is 30 m. What is the force applied by the person on the block during the last 15 m?

1. $200\ +\frac{100}{15}\left(x-15\right)$
2. $200\ -\frac{100}{15}\left(x+15\right)$
3. $200\ -\frac{100}{15}\left(x-15\right)$
4. $100\ -\frac{100}{15}\left(x-15\right)$

175.

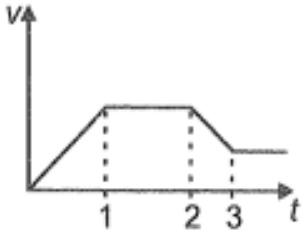
Variation of acceleration (a) with time (t) for a particle starting from rest and moving along the x-axis is shown in the figure. If the particle starts from rest, then the distance covered by the particle in time $t_1 = 10$ s to $t_2 = 20$ s is:

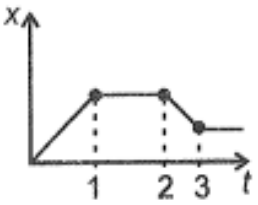


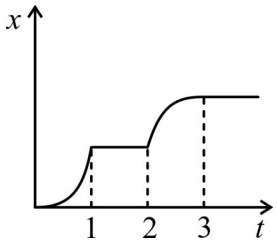
1. 50 m
2. 100 m
3. 150 m
4. 200 m

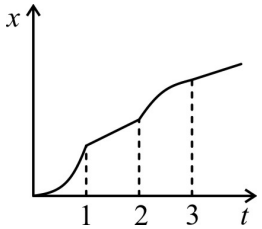
176.

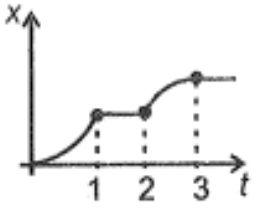
Which of the following position-time (x-t) graphs may be possible corresponding to given velocity-time (v-t) graph?



1.


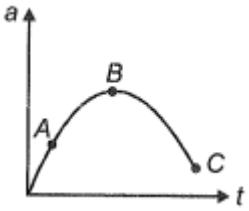
2.


3.


4.


177.

Acceleration (a) versus time (t) graph of a particle starting from rest is as shown in the figure.



At which point, the velocity of the particle is maximum?

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

178.

A man runs along a horizontal road holding his umbrella vertical in order to afford maximum protection from the rain. The rain is actually:

1. falling vertical.
2. coming from the front of the man.
3. coming from the back of the man.
4. either of 1, 2 or 3.

179.

River of width 500 m is flowing at a speed of 10 m/s. A swimmer can swim at a speed of 10 m/s in still water. If he starts swimming at an angle of 120° with the flow direction, then the distance he travels along the river while crossing the river is:

1. 250 m
2. $500\sqrt{3}$ m
3. $\frac{500}{\sqrt{3}}$ m
4. 500 m

180.

An object moves at a constant speed along a circular path in a horizontal XY plane with its centre at the origin. When the object is at x = –2m, its velocity is $-(4\ \text{m/s})\hat{j}$. What is the object's acceleration when it is at y = 2m?

1. $-\left(8\text{m/s}^2\right)\ \hat{j}$
2. $-\left(8\text{m/s}^2\right)\ \hat{i}$
3. $-\left(4\text{m/s}^2\right)\ \hat{j}$
4. $-\left(4\text{m/s}^2\right)\ \hat{i}$

181.

The magnitude of a vector $\vec{A}$ is constant but it is changing its direction continuously. The angle between $\vec{A}$ and $\frac{d\vec{A}}{dt}$ is :

1. 180°
2. 120°
3. 90°
4. 0°

182.

A body A is projected vertically upwards. Another body B of the same mass is projected at an angle of 60° with the horizontal. If both the bodies attain the same maximum height, the ratio of the initial kinetic energy of body A to that of body B is:

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

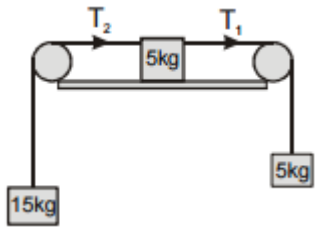
183.

A 40 N block is supported by two ropes. One rope is horizontal and the other makes an angle of 30° 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

184.

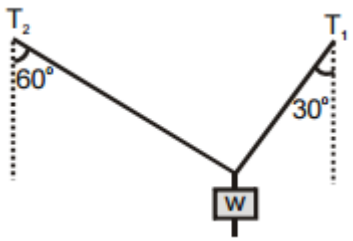
In the figure shown, the friction coefficient between table and block is 0.2. The ratio of tensions in the right and left strings respectively will be:

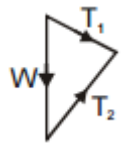


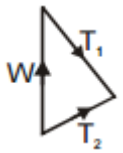
1. 17:24
2. 34:12
3. 2:3
4. 3:2

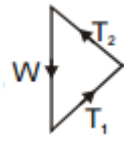
185.

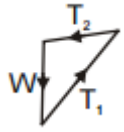
A block of weight W is supported by two strings inclined at 60° and 30° to the vertical. The tensions in the strings are T_1 and T_2 as shown. If these tensions are to be determined in terms of W using a triangle of forces, which of these triangles should you draw? (block is in equilibrium) :



1. 

2. 

3. 

4. 

Physics - Section B

186.

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

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

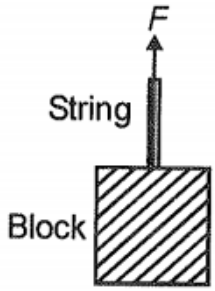
187.

A physical quantity X depends on four measurables a, b, c, and d as $X = \frac{a^2b^3}{c^5d}$. To ensure maximum accuracy in the determination of X, the quantity that should be measured with maximum accuracy is :

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

188.

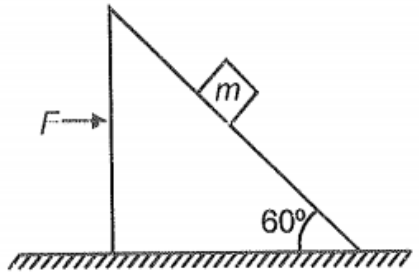
A block of mass m (attached to a light inextensible string) is being pulled vertically upwards by a force F. Breaking strength of the string is three times the weight of the block. Maximum F which can be applied without breaking the string is:



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

189.

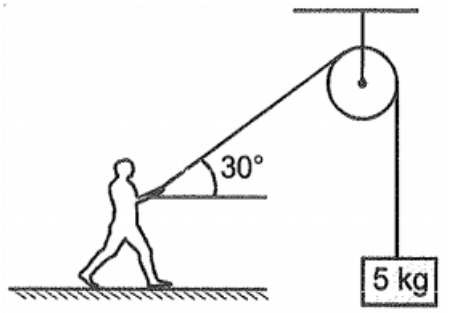
All the surfaces in the system shown in the given figure are smooth. The value of F is such that the block does not slide on the wedge. Normal force acting on the block is:



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

190.

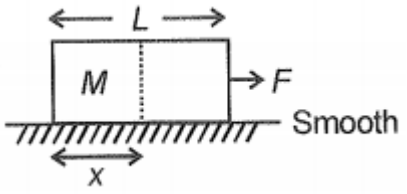
In the given figure a boy of mass 40 kg is just pulling a mass of 5 kg at an angle of 30° with the horizontal. While the boy is standing on a weighing machine, what would be its reading?



1. 37.5 kg
2. 40 kg
3. 42.5 kg
4. 38.5 kg

191.

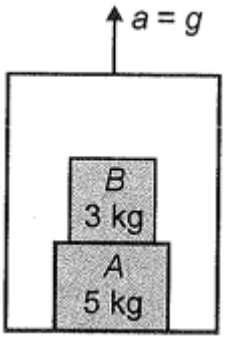
Tension T in the block of mass M at the distance 'x' from left is given by:



1. $T = \frac{Fx}{L}$
2. $T = \frac{FL}{x}$
3. $T = \frac{F(L-x)}{L}$
4. $T = \frac{F(L-x)}{x}$

192.

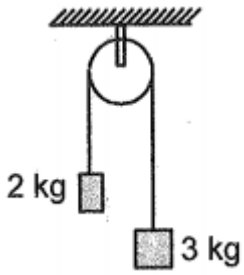
A block B of mass 3 kg is kept on block A of mass 5 kg in a lift accelerating upward with an acceleration g. The reaction by A on B is:



1. 10g
2. 169
3. 4g
4. 6g

193.

Two blocks of mass 2 kg and 3 kg are connected to a massless string passing over an ideal pulley. Tension in the string is: [Take g = 10 m/s^2]



1. 30 N
2. 20 N
3. 24 N
4. 48 N

194.

A body is placed over an inclined plane of angle ($\pi - \theta$). The angle between normal reaction and the weight of the body is:

1. θ
2. More than θ
3. Less than θ
4. Can't say

195.

The radius of a sphere is (5·3 ± 0·1) cm. The percentage error in its volume is:

1. $\frac{0\cdot1}{5\cdot3} \times 100$
2. $3 \times \frac{0\cdot1}{5\cdot3} \times 100$
3. $\frac{0\cdot1\times100}{3\cdot53}$
4. $3 + \frac{0\cdot1}{5\cdot3} \times 100$

196.

Two bodies are thrown simultaneously from a tower with the same initial velocity v_0. One vertically upwards, the other vertically downwards. The distance between the two bodies after time t is:

1. $2v_0t + \frac{1}{2}gt^2$
2. $2v_0t$
3. $v_0t + \frac{1}{2}gt^2$
4. v_0t

197.

The following are four different relations about displacement, velocity, and acceleration for the motion of a particle in general. Choose the incorrect statements (s):

a) $v_{av} = 1/2\ [v(t_1) + v(t_2)]$

b) $v_{av} = r(t_2)\text{-}r(t_1)/t_2\text{-}t_1$

c) $r = 1/2\ [v(t_2)\text{-}v(t_1)](t_2\text{-}t_1)$

d) $a_{av} = v(t_2)\text{-}v(t_1)/t_2\text{-}t_1$

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

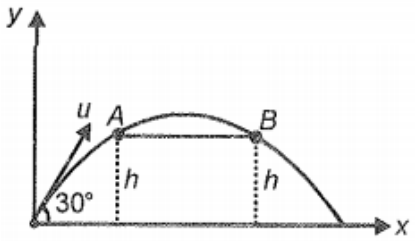
198.

A ball is thrown upward with a certain speed. It passes through the same point at 3 seconds and 7 seconds from the start. The maximum height achieved by the ball is:

1. 500 m
2. 250 m
3. 125 m
4. 450 m

199.

A particle is thrown with a velocity of u m/s. If it passes A and B as shown in the figure at time t_1 = 1 sec and t_2 = 3 sec. The value of h is: (g = 10 m/s^2)



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

200.

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. Then its velocity 4 seconds after the start is:

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