Botany - Section A

1.

When a shoot tip transforms into a flower,

1. It is always solitary
2. The flower is always short-lived
3. It is never solitary
4. The flower is always long-lived

2.

What is the net gain of number of ATP molecules produced during aerobic respiration of one molecule of glucose?

1. 30
2. 36
3. 38
4. 40

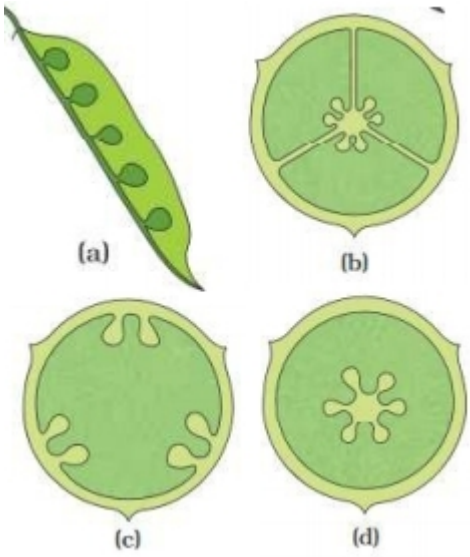
3.

Out of the following examples, how many are belonging to Fabaceae, Solanaceae, Liliaceae?
Aloe, Indigofera, Asparagus, Colchicum, Belladonna, Mulaithi

	Fabaceae	Solanaceae	Liliaceae
1.	3	2	1
2.	2	2	2
3.	2	1	3
4.	4	1	1

4.

Placentations given below in the diagrams are



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

5.

The synthesis of one molecule of glucose during the Calvin cycle requires.

1. 12 molecules of ATP and 18 molecules of $NADPH_2$
2. 6 molecules of ATP and 12 molecules of $NADPH_2$
3. 18 molecules of ATP and 12 molecules of $NADPH_2$
4. 12 molecules of each of ATP and $NADPH_2$

6.

Read the following statements:

(a) F_0 part of ATPase is associated with breakdown of proton gradient

(b) A H-carrier contributes in creation of proton gradient

(c) Movement of electrons in ETS is coupled to pumping of protons into the lumen

(d) Formation of NADPH + H^+ is related with the creation of proton gradient

How many of the above statements are correct?

1. Two
2. One
3. Four
4. Three

7.

What is the net gain in a Krebs cycle?

1. 1 $FADH_2$, 2 $NADH_2$ *and* 1 ATP
2. 2 $FADH_2$, 2 $NADH_2$ *and* 2 ATP
3. 1 $FADH_2$, 3 $NADH_2$ *and* 1 ATP
4. 1 $FADH_2$, 6 $NADH_2$ *and* 2 ATP

8.

Which of the following function can be performed by both parenchyma and collenchyma?

1. Storage.
2. Photosynthesis.
3. Secretion.
4. All.

9.

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

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

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

10.

Match the following columns and select the correct option.

Column-I	Column-II
a. Photolysis of water	(i) C_4 plants
b. Carboxylation of RuBP	(ii) Non-cyclic photophosphorylation
c. Synthesis of ATP only	(iii) Cyclic photophosphorylation
d. Consumption of 5 ATP per CO_2 fixed	(iv) Calvin cycle

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

11.

When tripalmitin is used as substrate in respiration, the value of RQ is found to be less than one because

1. It contains less number of carbon atoms than oxygen atoms.
2. The amount of CO_2 evolved is more than the amount of O_2 consumed.
3. The amount of O_2 consumed is more than the amount of CO_2 evolved.
4. The ratio of the numbers of carbon and hydrogen atoms in this molecule is not 1 : 2.

12.

Consider the given floral characters w.r.t. Fabaceae
(a) Zygomorphic flowers
(b) Vexillary calyx
(c) Marginal placentation
(d) Endospermic seed
(e) Diadelphous stamens

1. b, d & e are incorrect
2. a, c & e are correct
3. b, c & e are incorrect
4. a, b, c, d & e are correct

13.

Which statement is wrong for Krebs' cycle?
1. There are three points in the cycle where NAD^+ is reduced to NADH + H^+
2. There is one point in the cycle where FAD^+ is reduced to $FADH_2$
3. During conversion of succinyl Co-A to succinic acid, a molecule of GTP is synthesised
4. The cycle starts with condensation of acetyl group (acetyl Co-A) with pyruvic acid to yield citric acid

14.

Photosynthetic organ originates from _____ meristem and arranged in _____ order.

1. Lateral, basipetal
2. Root apical, acropetal
3. Shoot apical, acropetal
4. Intercalary, acropetal

15.

During ethyl alcohol or lactic acid fermentation

1. Pyruvic acid produced in glycolysis is oxidised
2. Products contain no energy
3. CO_2 is always produced
4. Coenzyme NAD^+ is regenerated

16.

Which of the following statement is correct?

1. Glycolysis is present in facultative anaerobes, not in obligate anaerobes
2. Usually carbohydrates are oxidised to release energy in cellular respiration
3. Oxidation of one molecule of NADH gives rise to 3 molecules of ATP in anaerobic respiration
4. Fermentation takes place under anaerobic conditions in prokaryotes only

17.

Fatty acids enter the aerobic respiratory pathway after being converted to

1. Pyruvate
2. PGAL
3. Acetyl CoA
4. DHAP

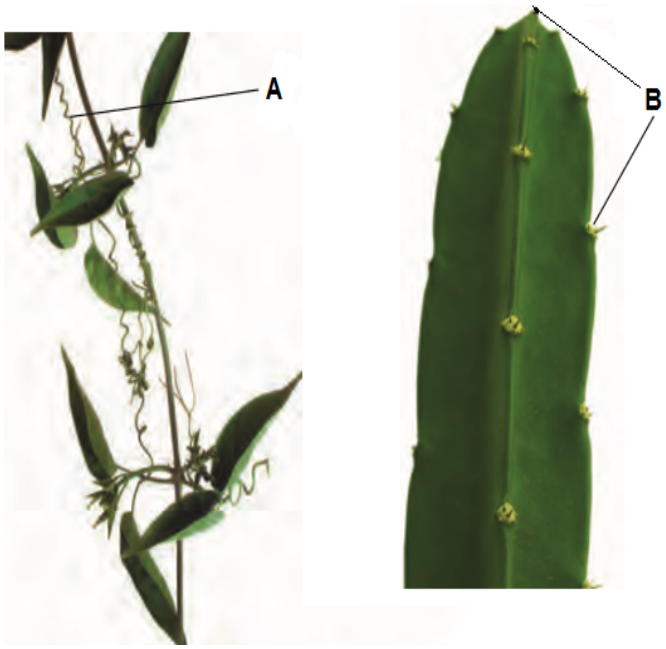
18.

CO_2 is utilized for the carboxylation of RuBP inside the bundle sheath cells of

1. Maize, Sorghum
2. Tomato, Bell pepper
3. Cacti, Sedum
4. Rice, wheat

19.

Below labeled structures (A and B) in the diagram represent a modification of



1. A - Stem B - Leaf
2. A - Bud B - Leaf
3. A - Leaf B - Stem
4. A - Leaf B - Leaf

20.

Select incorrect statement w.r.t. racemose inflorescence

1. The main axis continues to grow
2. Peduncle bears flowers in basipetal/centrifugal manner
3. The main axis is not terminated into flower
4. It is an indeterminate inflorescence

21.

Drupes are also called as stone fruits because

1. The seeds are stone like
2. Endocarp is always hard and stony
3. Pericarp is undifferentiated and sclerified
4. The mesocarp is edible in most fruits

22.

Select incorrect statement w.r.t. anatomical features of monocot root.

1. Pericycle produces lateral roots and part of vascular cambium
2. Exodermis is present in older roots
3. Conjunctive parenchyma does not produce cambium
4. Well developed pith is present

23.

In which character an isobilateral leaf differs from the dorsiventral leaf?

1. Scattered vascular bundles
2. Undifferentiated mesophylls
3. Absence of stomata with guard cells
4. Conjoint, collateral, and closed vascular bundle

24.

Tissue which provides mechanical strength and flexibility to young dicot stem is present in

1. Pith
2. Endodermis
3. Hypodermis
4. Cortex

25.

Which of the following is correct w.r.t. lenticels?

a. Phellogen forms parenchymatous cells on the outer side

b. It is a lens-shaped opening

c. Helps in exchange of gases

d. Present mostly in woody trees

1. a & b correct
2. c & d correct
3. b, c, & d correct
4. All are correct

26.

The element which cannot be placed along with micronutrients ?

1. Boron
2. Copper
3. Nickel
4. Calcium

27.

Phosphorylation of glucose during glycolysis is catalysed by

1. Phosphoglucomutase
2. Phoshoglucoisomerase
3. Hexokinase
4. Phosphorylase

28.

Identify the option having correct match of hormones with their respective function

a. Apical dominance

b. Xylem differentiation

c. Increased malt yield

d. Delayed ripening

1. a and c – Cytokinin
2. b and c – Gibberellins
3. c and d – ABA
4. a and b – Auxin

29.

Which of the given bacteria is autotrophic, free-living as well as symbiotic nitrogen fixer?

1. Rhizobium
2. Frankia
3. Anabaena
4. Azotobacter

30.

The reduction of one molecule of atmospheric nitrogen (N_2) into two molecules of ammonia by nitrogenase enzyme requires

1. $4e^-$, $4H^+$, and 8ATP
2. $4e^-$, $4H^+$, and 16ATP
3. $8e^-$, $8H^+$, and 8ATP
4. $8e^-$, $8H^+$, and 16ATP

31.

In C_4 plants, PEP carboxylase and RuBisCO enzymes are present respectively in

1. Stroma and Grana
2. Thylakoid and Stroma
3. Cytosol and Stroma
4. Stroma and Cytosol

32.

Prop roots and stilt roots are found respectively in

1. Rhizophora and turnip
2. Banyan and maize
3. Potato and zaminkand
4. Pistia and Eichhornia

33.

Which of the given hormone is an adenine derivative?

1. IAA
2. GA_3
3. Zeatin
4. ABA

34.

Match the following columns and select the correct option

Column-I	Column-II
(a) Abscisic acid	(i) Sex expression
(b) Ethylene	(ii) Closure of stomata
(c) Cytokinin	(iii) Stem elongation in rosette plants
(d) Gibberellin	(iv) Counteracts the apical dominance

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

35.

Guttation is the result of :
1. Root pressure
2. Diffusion
3. Transpiration
4. Osmosis

Botany - Section B

36.

According to the chemiosmotic hypothesis, there is a basic difference between respiration and photosynthesis. This is _____

1. In chloroplast, H+ accumulation takes place in the lumen of thylakoid but in mitochondria, this takes place in perimitochondrial space.

2. Accumulation of H+ in chloroplast takes place in matrix i.e., stroma and in mitochondria, this takes place in cristae.

3. In both the mitochondria and chloroplast the accumulation of H+ takes place in inter-membranous space but with a high rate in mitochondria

4. Both 1 and 3 are correct.

37.

Veins of leaf in addition to acting as channels of transport of water, minerals and food materials also

1. Determine extent of incision of lamina

2. Provide rigidity to the leaf blade

3. Hold the leaf blade to light

4. Flutter the leaf in wind thus, helping in cooling of leaf and bringing fresh air.

38.

Which one of the given reaction does not involve decarboxylation?

1. $\alpha-$ketoglutarate $\rightarrow$ Succinyl CoA

2. Fumarate $\rightarrow$ Malate

3. Oxalo-succinate $\rightarrow \alpha-$ketoglutarate

4. Pyruvate $\rightarrow$ Acetly CoA

39.

Modified aerial stem with the branching of unlimited growth as the photosynthetic structure is

1. Flattened in Opuntia and Euphorbia
2. Fleshy and cylindrical in Euphorbia
3. Cylindrical in Opuntia
4. Cylindrical in Euphorbia and Opuntia

40.

Select incorrectly matched pair.

1. Inferior ovary – Guava

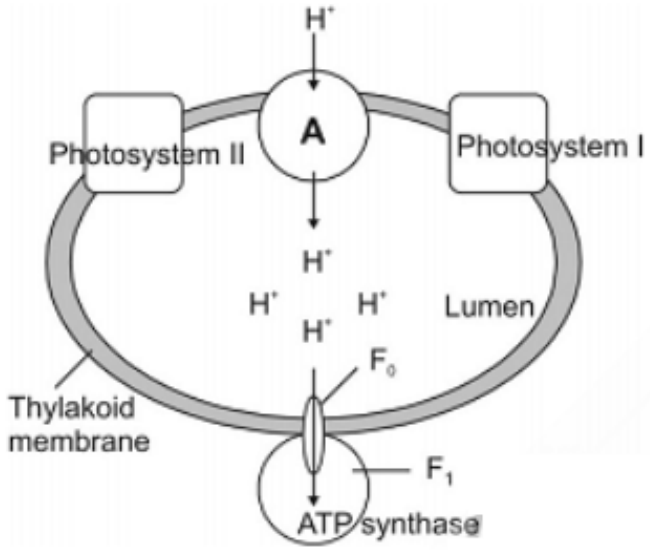
2. Aestivation with unequal petals– Cotton sized petals

3. Polyadelphous condition – Citrus

4. Irregular flower – Canna

41.

Identify 'A' w.r.t. ATP synthesis through chemiosmosis.



1. Cytochromes b and f
2. Cytochrome a and a_3
3. Cytochrome bc_1
4. NADP reductase

42.

Which among the following plants has these characteristics-actinomorphic flower, hypogynous, syncarpous and parietal placentation?

1. China rose
2. Marigold
3. Brinjal
4. Mustard

43.

Identify the wrong statement in the context of cork cambium

1. Cork cambium is also called phellogen
2. Cork cambium is usually developed from the secondary xylem
3. Outer cells of phellogen differentiate into cork
4. Inner part of phellogen leads to the formation of phelloderm

44.

Nitrate assimilation is the process in plant in which

1. N_2 is converted into NH_3
2. NH_3 is converted into N_2
3. NO_2^- is converted into NO_3^-
4. NO_3^- is converted into NO_2^-

45.

Cyclic photophosphorylation is different from non-cyclic photophosphorylation as the former

1. Is performed by a collaboration of both PS-II and PS-I
2. Does not require any external source of electrons
3. Is connected with photolysis of water
4. Is connected with ATP and NADPH production

46.

Select the **incorrect** match

1. Low level of Mo, S, N – delay in flowering
2. Inhibition of cell division – due to lack of Mo, S, N, K
3. Death of tissue – due to deficiency of S, N, Cl
4. Chlorosis – due to deficiency of N, K, Mg, Fe, Mn

47.

Select the incorrect match from the following

1. One Calvin cycle – Requires 3 ATP and 2 NADPH
2. C_4 plant – Shows slower process of carbon fixation
3. C_3 plants – 20-25°C is optimum for photosynthesis
4. Hatch and Slack – Primary CO_2 acceptor pathway is phosphoenolpyruvate

48.

Function of companion cells is :

1. Loading of sucrose into sieve elements
2. Providing energy to sieve elements for active transport
3. Providing water to phloem
4. Loading of sucrose into sieve elements by passive transport

49.

The movement of ions against the concentration gradient will be :

1. Active transport
2. Osmosis
3. Diffusion
4. All of the above

50.

Opening and closing of stomata is due to the : -

1. Hormonal change in guard cells
2. Change in Turgor pressure of guard cells
3. Gaseous exchange
4. Respiration

Zoology - Section A

51.

The human skull has 22 bones with .....cranial bones and ..... facial bones

1. 10,12
2. 14,8
3. 12,10
4. 8,14

52.

Which of the following glands secretes the hormone melatonin?
1. anterior pituitary gland.
2. melanocytes.
3. pineal gland.
4. suprachiasmatic nucleus of hypothalamus

53.

The ATPase activity of the myosin head is dependent on:

1. Magnesium ions
2. Manganese ions
3. Calcium ions
4. Ferric ions

54.

What is true about the white muscle fibers?

1. Myoglobin content is high
2. They have a large number of mitochondria
3. They depend on anaerobic process for energy
4. They are adapted for slow sustained activities

55.

The human ribs are termed as bicephalic because:

1. They have two articulations surfaces on their ventral end
2. They have two articulations surfaces on their dorsal end
3. They have two articulations surfaces on their ventral end and two on dorsal end
4. They have two articulations surfaces on their ventral end and one on dorsal end

56.

Glucocorticoids do not:
1. Stimulate gluconeogenesis
2. Cause lipolysis
3. Cause proteolysis
4. Stimulate cellular uptake and utilization of amino acids

57.

The development of secondary sexual characters in females is primarily controlled by:
1. Estrogen
2. Progesterone
3. LH
4. FSH

58.

Which of the following endocrine glands is under the direct neural regulation of the hypothalamus?
1. Pineal
2. Thymus
3. Posterior pitutary
4. Adrenal medulla

59.

All the following are secreted by the anterior pituitary except:-

1. Prolactin

2. Somatotropin

3. Vasopressin

4. Gonadotropins

60.

Identify the incorrect statement:
1. In males FSH regulates spermatogenesis
2. Thyroid gland produces T3 and thyroxine (T4) hormones
3. ACTH stimulates secretion of glucocorticoids
4. PTH is a hyperglycemic hormone

61.

Hormones that act by interacting with intracellular include all the following except:
1. Thyroxin
2. Estrogen
3. Epinephrine
4. Cortisol

62.

Androgenic steroids in females are secreted by:
1. pineal gland
2. Testes
3. Adrenal cortex
4. Hypothalamus

63.

A person passes a lot of dilute urine and drinks a lot of water but does not have glycosuria. He is most likely suffering from :

1. Type 1 diabetes mellitus

2. Type 2 diabetes mellitus

3. Pituitary diabetes

4. Diabetes insipidus

64.

Consider the following statements:

I. Myasthenia gravis is an autoimmune disorder affecting neuromuscular junction

II. Muscular dystrophy is a progressive degeneration of skeletal muscles mostly due to genetic disorder

III. Tetany is rapid spasms in muscle due to high Ca^{++} in body fluid.

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

65.

Which of the following statements about cross-bridges is false?

1. They are composed of myosin
2. They bind to ATP after they attach to actin
3. They contain an ATPase
4. They split ATP before they attach to actin

66.

The longest bone of the body is

1. Phalanges

2. Tarsal

3. Femur

4. Metatarsal

67.

Which of the following muscles act involuntarily?

(a) Striated muscles

(b) Smooth muscles

(c) Cardiac muscles

(d) Skeletal muscles

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

68.

Read the following statements (A-D):-
(A) A neural signal reaching the neural muscular junction releases adrenalin.
(B) Many monomeric proteins called meromyosin constitute one thin filament.
(C) A complex protein troponin is distributed at irregular intervals on the tropomyosin.
(D) During shortening of muscle, the I-bands get reduced.

How many of the above statements are true?

1. Four
2. One
3. Three
4. Two

69.

Match the following:-

(i) Fibrous Joint — (a) Between two adjacent vertebrae.
(ii) Cartilaginous Joint — (b) Between humerus and pectoral girdle.
(iii) Pivot Joint — (c) Sutures.
(iv) Ball and Socket Joint — (d) Between atlas and axis.

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

70.

The blood calcium level is lowered by the deficiency of
1. parathormone
2. thyroxine
3. calcitonin
4. Both 1. and 3.

71.

The hormone that reduces the destruction of bones it also enhances deposition of Ca^{+2} in bones thus making them in solid and strong. This hormone is:-

1. Collips hormone
2. Thyrocalcitonin
3. Thyroxine
4. Vasopressin

72.

Which of the following includes non-muscular movement?

(a) Protoplasmic streaming

(b) Pseudopodial movements

(c) Flagellar movements

(d) Ciliary movement

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

73.

Acromion process is related to

1. Scapula
2. Humerus
3. Femur
4. Tibia

74.

Consider the following statements:

I. Somatic neural system relays impulses from CNS to skeletal muscles.

II. Autonomic neural system transmits impulses from CNS to involuntary organs and smooth muscles

III. Unmyelinated nerve fibres are commonly found in spinal and cranial nerves

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

75.

Consider the following statements:

I. The resting axonal membrane is nearly impermeable to sodium ions.

II. Depolarization of the axonal membrane is due to influx of sodium ions.

III. The size of the action potential, if produced, does not depend on the strength of the stimulus.

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

76.

Consider the following statements

I. Acetylcholine is released at the electric synapse.

II. Electric synapse are faster

III. It is more difficult to regulate an electric synapse w.r.t. a chemical synapse

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

77.

Vestibular apparatus is a composed of

I. Semi-circular canals.

II. Otolith organs.

III. Organ of Corti.

IV. Crista and macula.

1. I, II, III & IV

2. I, II only

3. IV only

4. II only

78.

In cochlea, the auditory receptors are:

1. Organ of Corti

2. Ampulla

3. Macula

4. Hair cells

79.

Consider the characters of a certain part of the human brain:
I. It contains neurosecretory cells.
II. It is an important part of the limbic system.
III. It is a part of the diencephalons.

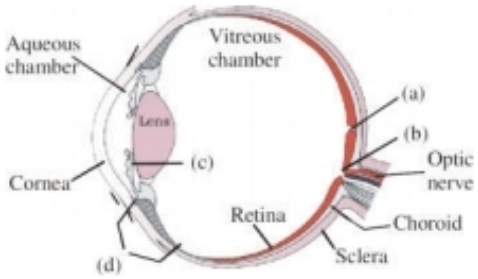
This part of the human brain is:

1. Hypothalamus
2. Medulla oblongata
3. Cerebellum
4. Amygdala

80.

'Retinal' is present in
1. Rods.
2. Cones.
3. Both 1 and 2.
4. All the retinal layer

81.

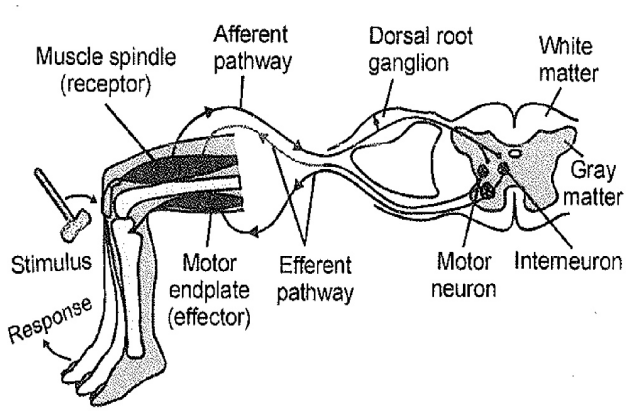


For the given diagram which labeling and function is correctly matched/described?

1. (a) → Fovea → Rods are densely packed.
2. (b) → Blindspot → No image formed.
3. (c) → Choroid → Coloured part of the eye which regulates diameter of pupil.
4. (d) → Ciliary body → No role in accommodation

82.

Which type of reflex is represented by the following diagram when the doctor taps the knee with rubber headed hammer? Which of the following is absent in this reflex (Muscle spindle, Interneuron, Afferent pathway, Efferent pathway)?



1. Simple reflex, muscle spindle
2. knee jerk reflex, interneuron
3. Monosynaptic reflex, muscle spindle
4. Polysynaptic, interneuron

83.

Mark the part of brain where neural impulses transmitted by optic nerve are analysed and image formed on the retina is recognized based on earlier memory and experience

1. Optocoel
2. Optic lobe
3. Visual cortex area
4. Frontal lobe in occipital lobe

84.

The cell body of a neuron contains certain granular bodies involved in protein synthesis that are called

1. Perikaryon
2. Nissl's granules
3. Schwann cells
4. Glial cells

85.

Parts A, B, C and D of the human ear are shown in the diagram. Select the option which gives incorrect identification along with its functions /characteristics

1.	A : External ear	-	Collects the vibrations in the air
2.	B : Eustachian tube	-	Connects the middle ear cavity with the pharynx
3.	C : Malleus	-	Increase the efficiency of transmission of sound waves
4.	D : Cochlear nerve	-	Carry sensory impulses to the auditory cortex of the brain

Zoology - Section B

86.

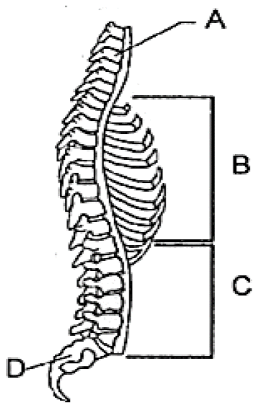
Which hormone causes dilation of blood vessels, increased oxygen consumption and gluconeogenesis ?
1. ACTH
2. Insulin
3. Adrenalin
4. Glucagon

87.

Which one of the following four glands is correctly matched with the accompanying description?
1. Thyroid - hyperactivity in young children causes cretinism
2. Thymus - starts undergoing atrophy after puberty
3. Parathyroid - secrete parathormone which promotes movement of calcium ions from blood into bones during calcification
4. Pancreas - Delta cells of the Islets of Langerhans secrete a hormone which stimulates glycolysis

88.

Given below is a diagrammatic representation of vertebral column



Which of the labelled structure forms thoracic cage?

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

89.

Follicle-stimulating hormone interact with ?

1. Intracellular receptor
2. Cell membrane receptor
3. Direct act on gene
4. Direct act on enzyme

90.

Consider the following four statement (a-d). and select the option which includes all the correct ones only.

(a) Pineal gland is situated on the ventral side of forebrain.

(b) Corpus luteum is formed after ovulation and its formation is induced by LH.

(c) In female, oxytocin stimulates contraction of uterus at the time of childbirth and milk ejection from mammary body.

(d) Pituitary gland is located in a bony cavity called sella turcica

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

91.

Find out the correct match for the following table.

Column-l	Column-ll	Column-lll
(i) Pituitary gland	Growth hormone	Acromegaly
(ii) Thyroid gland	Thyroxine	Exophthalmic goitre
(iii) Pituitary gland	ADH	Diabetes mellitus

1. (i) only
2. (i) and (ii)
3. (i) and (iii)
4. (ii) and (iii)

92.

Find out the correct match from the following table

	Column-I	Column-II	Column-III
(i)	Heart	Atrial natriuretic factor	Decreases blood pressure
(ii)	Kidney	Erythropoietin	Formation of RBC
(iii)	Gastro-intestinal tract	Gastrin	Induces gastric secretion

1. (ii) and (iii)
2. (i) and (iii)
3. (i) and (ii)
4. (i), (ii), and (iii)

93.

Glucagon is a

1. Hypoglycemic hormone
2. Hyperglycemic hormone
3. Hypocalcemic hormone
4. Hypercalcemic hormone

94.

Unit of contraction in a muscle fiber is

1. Sarcomere
2. Muscle fiber
3. Actin
4. None

95.

The transduction of sound waves to action potentials taken place

1. Within the tectorial membrane as it is stimulated by the hair cells.

2. When hair cells are bent against the tectorial membrane causing them to depolarize and release neurotransmitter molecule that stimulate sensory neurous.

3. As the basilar membrane becomes more permeable to sodium ions and depolarizes, initiating an action potential in a sensory neurons.

4. With in the middle ear as the vibration are amplified by malleus, incus and stapes

96.

Read all statements carefully and find out how many statement's are correct ?

(a) Neural system provides an organised network of point to point connection's for a quick co-ordination.

(b) Impulse transmission across a chemical synapse is always faster than that across a electrical synapse.

(c) Cerebral aqueduct passes through the mid-brain.

(d) The hypothalamus contain centre's which control respiration and gastric secretions.

1. One

2. Two

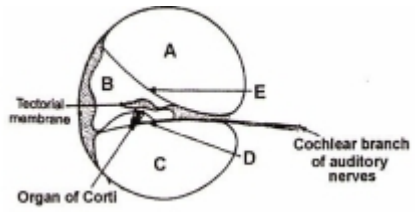
3. Three

4. Four

97.

In chemical synapse, postsynaptic membrane receptor binds with
1. Excitatory neurotransmitter.
2. Inhibitory neurotransmitter.
3. Ca^{++} ions.
4. Both 1 and 2

98.



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

1. A – Scala vestibule, B – Scala media, C – Scala tympani, D – Basilar membrane, E – Reissner's membrane

2. A – Scala media, B – Scala vestibule, C – Scala tympani, D – Basilar membrane, E – Reissner's membrane

3. A – Scala tympani, B – Scala media, C – Scala vestibule, D – Basilar membrane, E – Reissner's membrane

4. A – Scala vestibule, B – Scala media, C – Scala tympani, D – Reissner's membrane, E – Basilar membrane

99.

The contraction of which of the following muscles will cause constriction of pupil in the presence of bright light?

1. Radial iris muscles

2. Circular iris muscles

3. Suspensory ligaments

4. Superior rectus

100.

Find out the **incorrectly** matched pair w.r.t. structure and its function as mentioned below

1. Eustachian tube - Maintains air pressure in tympanic cavity

2. Cornea - Controls amount of light entering into eyeball, called the diaphragm of eye

3. Cristae in ampulla - Detect rotational motion

4. Semicircular canals - Help in maintaining dynamic equilibrium, not in hearing

Chemistry - Section A

101.

Redox reaction among the following is -

1. $NaCl + KNO_3 \rightarrow NaNO_3 + KCl$

2. $CaC_2O_4 + 2HCl \rightarrow CaCl_2 + H_2C_2O_4$

3. $Mg(OH)_2 + 2NH_4Cl \rightarrow MgCl_2 + 2NH_4OH$

4. $Zn + 2AgCN \rightarrow 2Ag + Zn(CN)_2$

102.

Green chemistry means such reactions that-

1. Produce colour during reactions.

2. Reduce the use and production of hazardous chemicals.

3. Are related to the depletion of the ozone layer.

4. Study the reactions in plants.

103.

In which of the following compounds, nitrogen exhibits highest oxidation state?

1. N_2H_4

2. NH_3

3. N_3H

4. NH_2OH

104.

Hydracids have no action on litmus when they are –

1. In contact with water

2. Dry

3. Fused with each other

4. Mixed together and dissolved in water

105.

Which of the following is the most powerful oxidizing agent ?

1. F_2

2. Cl_2

3. Br_2

4. I_2

106.

Equal volumes of 10% (V/V) of HCl is mixed with 10% (V/V) NaOH solution. If the density of pure NaOH is 1.5 times that of pure HCl then the resultant solution be-

1. Basic

2. Neutral

3. Acidic

4. Can't be predicted

107.

The standard reduction potential for Cu^{2+} / Cu is 0.34 V. The reduction potential at pH =14 for the above couple $\left(K_{sp}\left[Cu(OH)_2\right] = 1 \times 10^{-19}\right)$ is -

1. -0.22 V

2. +0.22 V

3. -0.34 V

4. +0.34 V

108.

The most harmful air pollutant produced by automobiles is-

1. HNO_2

2. NO

3. SO_2

4. CO

109.

Among the given oxoacids, the acid having highest K_a value is-

1 $HClO_3$

2 $HBrO_3$

3 HlO_3

4 All have equal K_a

110.

The concentration of $[H^+]$ ion in a solution containing 0.1M HCN and 0.2 M NaCN is -

(K_a for HCN = 6.2×10^{-10})

1. 3.1×10^{10}

2. 6.2×10^{5}

3. 6.2×10^{-10}

4. 3.1×10^{-10}

111.

If the molar concentration of $SnCl_4$ is 1.5×10^{-3} mol L^{-1}, the concentration of chloride ions is -

1. 3.0×10^{-3}

2. 6.0×10^{-3}

3. 0.3×10^{-3}

4. 0.6×10^{-6}

112.

Among the following, identify the species with an atom in +6 oxidation state-

1. MnO_4^-

2. $Cr(CN)_6^{3-}$

3. NiF_6^{2-}

4. CrO_2Cl_2

113.

1cc N_2O at STP contains -

1. $\frac{1.32}{224} \times 10^{23}$ electrons

2. $\frac{6.02}{22400} \times 10^{23}$ molecules

3. $\frac{1.8}{224} \times 10^{22}$ atoms

4. All of the above

114.

If 0.50 mole of $BaCl_2$ is mixed with 0.20 mole of Na_3PO_4, the maximum number of moles of $Ba_3(PO_4)_2$ that can be formed is -

1. 0.10

2. 0.20

3. 0.30

4. 0.40

115.

At STP the density of CCl_4 vapor in g/L will be nearest to -

1. 8.67

2. 6.87

3. 3.67

4. 4.26

116.

The weight of $1x10^{23}$ molecules of $CuSO_4.5H_2O$ is -

1. 34.42 g

2. 41.42 g

3. 54.44 g

4. 68.94 g

117.

The volume of carbon dioxide gas evolved at STP by heating 7.3 g of $Mg(HCO_3)_2$ will be -

1. 1000 mL
2. 1120 mL
3. 2230 mL
4. 3240 mL

118.

The volume of CO_2 released at STP on heating 9.85 g of $BaCO_3$ on complete decomposition (atomic mass, Ba=137) will be -

1. 1.12 L
2. 4.84 L
3. 2.12 L
4. 2.06 L

119.

The ratio of $\frac{K_p}{K_c}$ for the reaction

$CO\left(g\right) + \frac{1}{2}O_2\left(g\right) \rightleftharpoons CO_2\left(g\right)$ is-

1. $(RT)^{1/2}$
2. $(RT)^{-1/2}$
3. RT
4. 1

120.

Among the following pairs, the pair that represents a buffer solution is-

1. HNO_3 and NH_4NO_3
2. HCl and KCl
3. HNO_2 and $NaNO_2$
4. NaOH and NaCl

121.

The pH of 0.1 M solution of the following salts increases in the order of -

1. $NaCl < NH_4Cl < NaCN < HCl$
2. $HCl < NH_4Cl < NaCl < NaCN$
3. $NaCN < NH_4Cl < NaCl < HCl$
4. $HCl < NaCl < NaCN < NH_4Cl$

122.

An amphiprotic (can accept and give proton) ion is-

1. HPO_3^-
2. $H_2PO_2^-$
3. H_3PO_4
4. $H_2PO_4^-$

123.

The oxidation state of sodium in sodium amalgam is -

1. -1
2. +1
3. +2
4. 0

124.

One mole of carbon atom weighs 12 g, the number of atoms in it is equal to -

1. 1.2×10^{23}
2. 6.022×10^{22}
3. 1.2×10^{22}
4. 6.022×10^{23}

125.

The oxidation state of two S-atoms in $Na_2S_2O_3$ is -

1. +2 and +4
2. +3 and -2
3. +4 and -2
4. +6 and -2

126.

Given the reaction $2HI_{(g)} \rightleftharpoons H_{2(g)} + I_{2(g)}$

A sample of $HI_{(g)}$ is placed in a flask at a pressure of 0.2 atm. At equilibrium, the partial pressure of $HI_{(g)}$ is 0.04 atm. The K_P for the given equilibrium would be -

1. 2.0
2. 3.5
3. 4.0
4. 2.6

127.

Among the following, the mixture will produce a buffer solution when mixed in equal volumes is-

1. 0.1 mol dm^{-3} NH_4OH and 0.1 mol dm^{-3} HCl
2. 0.05 mol dm^{-3} NH_4OH and 0.1 mol dm^{-3} HCl
3. 0.1 mol dm^{-3} NH_4OH and 0.05 mol dm^{-3} HCl
4. 0.1 mol dm^{-3} CH_3COONa and 0.1 mol dm^{-3} NaOH

128.

The value of pH of 0.01 mol dm^{-3} CH_3COOH $\left(K_a = 1.74 \times 10^{-5}\right)$ is-

1. 3.4
2. 3.6
3. 3.9
4. 3.0

129.

K_a for CH_3COOH is 1.8×10^{-5} and K_b for NH_4OH is 1.8×10^{-5}. The pH of ammonium acetate will be -

1. 7.005
2. 4.75
3. 7.0
4. Between 6 and 7

130.

At 500 K, equilibrium constant, K_c, for the following reaction is 5.

$\frac{1}{2}H_2\left(g\right) + \frac{1}{2}I_2\left(g\right) \rightleftharpoons HI\left(g\right)$

What would be the equilibrium constant K_c for the reaction?

$2\,HI(g) \rightleftharpoons H_2(g) + I_2(g)$

1. 0.04
2. 0.4
3. 25
4. 2.5

131.

Addition of small amount of argon at constant volume will not affect the equilibrium among the following-

1. $H_2(g) + I_2(g) \rightleftharpoons 2\,HI(g)$
2. $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
3. $N_2(g) + 3H_2(g) \rightleftharpoons 2\,NH_3(g)$
4. The equilibrium will remain unaffected in all the three cases

132.

Burning a small sample of welding gas (constituted of C and H only) in oxygen gives 3.38 g carbon dioxide, 0.690 g of water, and no other products. A volume of 10.0 L (measured at STP) of this welding gas is found to weigh 11.6 g. Molecular formula of welding gas would be -

1. C_2H_2

2. C_2H_6

3. CH

4. C_2H_4

133.

Given a galvanic cell with the following reaction

$Zn_{(s)} + 2Ag^{+}{}_{(aq)} \rightarrow Zn^{+2}{}_{(aq)} + Ag_{(s)}$

The negatively charged electrode will be-

1. Zn

2. Ag

3. Both

4. None of the above

134.

In the reaction Al + Fe_3O_4 $\rightarrow$$Al_2O_3$ + Fe, The total number of electrons transferred are -

1. 6

2. 8

3. 8/3

4. 24

135.

The wrong statement about photochemical smog is-

1. Photochemical smog causes irritation in eyes.

2. It has a low concentration of oxidizing agents

3. It can be controlled by controlling the release of NO_2, hydrocarbon, ozone, etc.

4. Plantation of some plants helps in controlling photochemical smog.

Chemistry - Section B

136.

A gas that is not common component of photochemical smog is-

1. Ozone

2. Acrolein

3. Peroxyacetyl nitrate

4. Chlorofluorocarbons

137.

The phenomenon in which atmospheric gases trap the heat radiations from the sun, near the earth's surface and keeps it warm is known as-

1. Natural greenhouse effect

2. Tyndall effect

3. Heating effect

4. Joule's effect

138.

The oxidation number of phosphorus in $Ba(H_2PO_2)_2$ is-

1. -1

2. +1

3. +2

4. +3

139.

B.O.D is connected with-

1. Organic matter

2. Microbes

3. Both (1) and (2)

4. None of the above.

140.

Ozone depletion occurs in :

1. Tropospheric pollution.
2. Stratospheric pollution.
3. Air pollution.
4. Photochemical smog.

141.

Major component of acid rain is :

1. HNO_3
2. H_2SO_4
3. HCl
4. H_2CO_3

142.

Smog is essentially caused by the presence of -

1. O_2, O_3
2. O_2 , N_2
3. Oxide of N and S
4. O_3, N_2

143.

When 0.1 mole of CH_3NH_2 (ionization constant $K_b = 5 \times 10^{-4}$) is mixed with 0.08 mol HCl and the volume is made up of 1 litre. The $[H^+]$ of resulting solution is -

1. 8×10^{-2}
2. 2×10^{-11}
3. 1.23×10^{-4}
4. 8×10^{-11}

144.

Among the following solutions, the solution will have a pH value close to 1.0 is-

1. 100 ml of (M/10) HCl + 100 ml of (M/10) NaOH
2. 55 ml of (M/10) HCl + 45 ml of (M/10) NaOH
3. 10 ml of (M/10) HCl + 90 ml of (M/10) NaOH
4. 85 ml of (M/10) HCl + 15 ml of (M/10) NaOH

145.

The pH of 0.01 M NaOH (aq) solution will be-

1. 7.01
2. 2
3. 12
4. 9

146.

The value of Δn for the following reaction will be -

$NH_4Cl(s) \rightleftharpoons NH_3(g) + HCl(g)$

1. 1
2. 0.5
3. 1.5
4. 2

147.

For the reaction: $FeO_{(s)} + CO_{(g)} \rightleftharpoons Fe_{(s)} + CO_{2(g)}$, $K_p = 0.265$ at 1050K. If the initial partial pressures are: p_{CO}= 1.4 atm and p_{CO_2}= 0.80 atm, the partial pressure of CO_2 at equilibrium at 1050 K would be -

1. 4.61 atm
2. 1.74 atm
3. 0.46 atm
4. 0.17 atm

148.

Soil erosion can be prevented by -

1. Overgrazing
2. Removal of vegetation
3. Afforestation (Plantation)
4. Increasing bird population

149.

4 gm of NaOH is dissolved in 1000 ml of water. The H^+ ion concentration will be -

1. 10^{-1} M
2. 10^{-13} M
3. 10^{-4} M
4. 10^{-10} M

150.

The reaction quotient (Q) for the reaction :

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

is given by $Q = \frac{[NH_3]^2}{[N_2][H_2]^3}$. The reaction will proceed from right to left if :

1. $Q = K_C$
2. $Q < K_C$
3. $Q > K_C$
4. $Q = 0$

(where K_C is the equilibrium constant)

Physics - Section A

151.

The pressure at the bottom of a tank of water is 3P, where P is atmospheric pressure. If the water is drawn out until the level of water is lowered by one fifth, then the pressure at the bottom of the tank is :

1. 2P
2. 13P/5
3. 8P/5
4. 4P/5

152.

Three masses are placed on the x-axis: 300 g at origin, 500 g at x= 40 cm and 400 g at x=70 cm. The distance of the center of mass from the origin is:

1. 40 cm
2. 45 cm
3. 50 cm
4. 30 cm

153.

The coefficient of viscosity η of a liquid is defined as the tangential force on a layer in that liquid per unit area per unit velocity gradient across it. Then a sphere of radius 'a', moving through it under viscous force F attains a constant velocity 'v' given by - (where K is a numerical constant)

1. $KFa\eta$
2. $K\frac{F}{a}\eta$
3. $K\frac{F}{a\eta}$
4. $K\eta\frac{a}{F}$

154.

A capillary tube of radius 0.20 mm is dipped vertically in the water. The height of the water column raised in the tube will be (surface tension of water= 0.075 N/m and density of water= 1000 kg/m^3. Taking g=10m/s^2 and contact angle 0°).

1. 7.5 cm.
2. 6 cm
3. 5 cm
4. 3 cm

155.

A body of mass 2 kg moving with a velocity $\left(\hat{\mathrm{i}}+2\hat{\mathrm{j}}-3\widehat{\mathrm{k}}\right)$ ms^{-1} collides with another body of mass 3 kg moving with a velocity $\left(2\hat{\mathrm{i}}+\hat{\mathrm{j}}+\widehat{\mathrm{k}}\right)$ ms^{-1}. If they stick together, the velocity in ms^{-1} of the composite body is :

1. $\frac{1}{5}\left(8\hat{i}+7\hat{j}-3\hat{k}\right)$
2. $\frac{1}{5}\left(-4\hat{i}+\hat{j}-3\hat{k}\right)$
3. $\frac{1}{5}\left(8\hat{i}+\hat{\mathrm{j}}-\widehat{\mathrm{k}}\right)$
4. $\frac{1}{5}\left(-4\hat{i}+7\hat{j}-3\hat{k}\right)$

156.

A body of density 0.7 gm/cm^3 floats on a lake of water. The fraction of the body which is outside water is-

1. 30%
2. 70%
3. 25%
4. 50%

157.

A couple produces:

1. Purely linear motion
2. Purely rotational motion
3. Linear and rotational motion
4. No motion

158.

A body having initial kinetic energy 2 J collides with the identical body at rest. The maximum loss of kinetic energy in the collision is-

1. 2 J
2. Zero
3. 1 J
4. 1.5 J

159.

Three masses m, 2m, and 3m are thrown from the top of a tower such that m is thrown vertically upward with 10m/s, 2m is thrown horizontally with 15m/s and 3m is thrown vertically downward with 5m/s. The acceleration of centre of mass of the three-body system will be-

1. $2\sqrt{2}g$
2. g
3. $\sqrt{2}g$
4. Zero

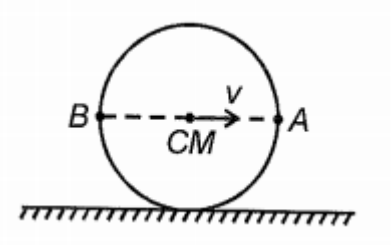
160.

The moment of inertia of a uniform disc of mass M and radius R about an axis passing through its edge and perpendicular to its plane is l. Its moment of inertia about its diameter will be:

1. l
2. $\frac{I}{2}$
3. $\frac{I}{4}$
4. $\frac{I}{6}$

161.

A solid sphere is rolling without slipping such that velocity of its centre of mass is v. Ratio of speed of points A & B at horizontal extremes is-



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

162.

Centre of mass of a system of particles

1. Depends on frame of reference
2. Does not depend on frame of reference
3. May change due to internal forces
4. All of these

163.

Five particles of mass 2 kg each are attached to the circumference of a circular disc of the radius of 0.1 m and negligible mass. Moment of inertia of the system about the axis passing through the centre of disc and perpendicular to its plane is:

1. 1 kg-m^2
2. 0.1 kg-m^2
3. 2 kg-m^2
4. 0.2 kg-m^2

164.

A mass of 2 kg is moving on a circular path of the radius of 2 m with 30 revolutions per minute. The kinetic energy of the mass (in joule) is:

1. π^2
2. $2\pi^2$
3. $4\pi^2$
4. $8\pi^2$

165.

On a rough horizontal surface(coefficient of friction μ), a cubical block of side 'a' and mass m is projected horizontally. The torque on the block about its centre of mass till the block stops is equal to:

1. zero
2. $\frac{1}{2}\mu mga$
3. μmga
4. mga

166.

A rigid body is rolling without slipping. If the ratio of translational kinetic energy and rotational kinetic energy is 2 : 1, the body maybe

1. A solid sphere
2. A ring
3. A hollow cylinder
4. A solid cylinder

167.

The surface tension of the soap solution is 2×10^{-2} N/m. If a soap bubble of radii 4 cm is blown, then the amount of work done is:

1. $4\pi \times 10^{-6}$ J
2. $2.56\pi \times 10^{-4}$ J
3. $16\pi \times 10^{-5}$ J
4. $16\pi \times 10^{-6}$ J

168.

A block weighs 5 N in air, 4.5 N in a liquid of specific gravity 0.5. Its weight in water will be:

1. 3.5 N
2. 4.0 N
3. 2.5 N
4. 3.0 N

169.

A liquid is poured in three vessels of the same base area to equal heights as shown in the figure, then:

1. Maximum force on the base will be for vessel C
2. Maximum force on the base will be for vessel B
3. Maximum force on the base will be for vessel A
4. Force on the base will be equal for all the vessels

170.

The radius of an air bubble is double that of another. The ratio of the excess pressure in the bubbles will be

1. 1: $\sqrt{2}$
2. 1: 2
3. 1: 4
4. 1: 8

171.

Liquid disturbed by stirring comes to rest after some time due to:

1. Surface tension
2. Viscosity
3. Buoyancy
4. Stability

172.

When a large liquid drop breaks into several smaller liquid drops, then the temperature of smaller drops is relatively:

1. Same
2. More
3. Less
4. Maybe less or more

173.

The work done to break a spherical drop of radius R into n drops of equal size is equal to:

1. $\frac{4\pi R^2 T}{n^{2/3}-1}$
2. $\left(\frac{1}{n^{1/3}}-1\right)4\pi R^2 T$
3. $\left(n^{1/3}-1\right)4\pi R^2 T$
4. $\left(n^{4/3}-1\right)4\pi R^2 T$

174.

A ring and a disc have the same mass and roll without slipping with the same linear velocity v. If the total kinetic energy of the ring is 8 J, the total kinetic energy of disc is:-

1. 8 J
2. 6 J
3. 16 J
4. 4 J

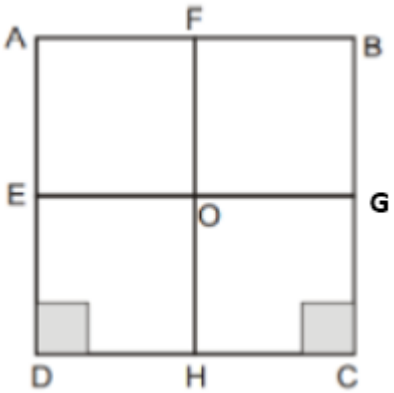
175.

Two discs, each having moment of inertia 5 kg-m^2 about their central axis, rotating with speed 10 rad s^{-1} and 20 rad s^{-2} in the same direction, are brought in contact face to face with their axes of rotation coinciding. The loss of kinetic energy in the process is:-

1. 2 J
2. 5 J
3. 125 J
4. 0 J

176.

A uniform square plate ABCD has a mass of 10 kg. If two points masses of 5 kg each are placed at the corners C and D as shown in the adjoining figure, then the centre of mass shifts to the mid-point of:



1. OH
2. DH
3. OG
4. OF

177.

A raft of wood (density 600 kg $/m^3$) of mass 120 kg floats in water. How much weight can be put on the raft to make it just sink?

1. 120 kg
2. 200 kg
3. 40 kg
4. 80 kg

178.

A particle is moving with a constant velocity along a line parallel to positive X-axis. The magnitude of its angular momentum with respect to the origin is

1. zero
2. increasing with x
3. decreasing with x
4. remaining constant

179.

A rigid body rotates with an angular momentum L. If its kinetic energy is halved, the angular momentum becomes,

1. L
2. L/2
3. 2L
4. L/$\sqrt{2}$

180.

A small sphere of radius 2 cm falls from rest in a viscous liquid. Heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity is proportional to-

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

181.

With an increase in temperature, the viscosity of liquid and gas, respectively will:

1. increase and increase
2. increase and decrease
3. decrease and increase
4. decrease and decrease

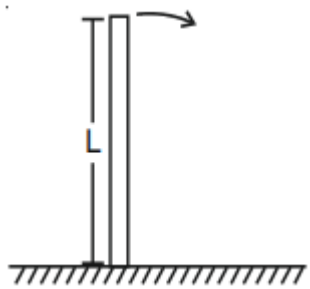
182.

In a horizontal pipe of non-uniform cross section, water flows with a velocity of 1 m s^{-1} at a point where the diameter of the pipe is 20 cm. The velocity of water (m s^{-1}) at a point where the diameter of the pipe is 5 cm is-

1. 8
2. 16
3. 24
4. 32

183.

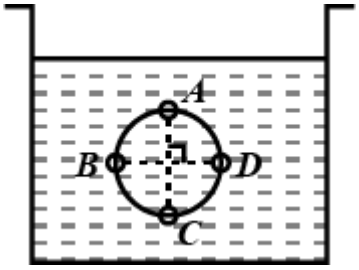
A rod is standing vertically on a smooth surface, if the rod is slightly disturbed and it falls towards the right, then



1. The center of mass moves vertically downward
2. The center of mass moves towards the right
3. The center of mass moves towards the left
4. The center of mass does not move

184.

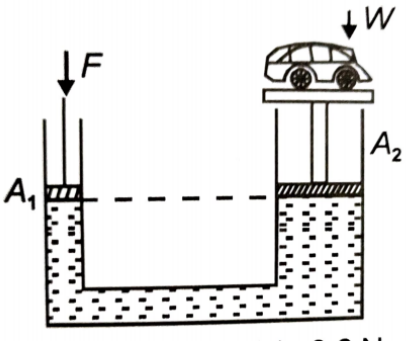
Figure shows a container filled with a liquid of density ρ. Four points A, B, C and D lie on the diametrically opposite points of a circle as shown. Points A and C lie on vertical line and points B and D lie on horizontal line. The incorrect statement is (p_A, p_B, p_C, p_D are absolute pressure at the respective points)



1. $p_D = p_B$
2. $p_A < p_B = p_D < p_C$
3. $p_D = p_B = \frac{p_C - p_A}{2}$
4. $p_D = p_B = \frac{p_C + p_A}{2}$

185.

In a hydraulic jack as shown, the mass of the car, W=800 kg, $A_1 = 10\ cm^2$, $A_2 = 10\ m^2$. The minimum force F required to lift the car is:



1. 1 N
2. 0.8 N
3. 8 N
4. 16 N

Physics - Section B

186.

A particle of mass 2 kg located at the position $\left(\hat{i}+\hat{j}\right)$m has a velocity of $2\left(\hat{i}-\hat{j}+\hat{k}\right)$ m/s. Its angular momentum about z-axis in kg-m^2/s is :

1. Zero
2. +8
3. 12
4. -8

187.

The linear speed of a uniform spherical shell after rolling down an inclined plane of vertical height h from rest is:

1. $\sqrt{\frac{10\,gh}{7}}$
2. $\sqrt{\frac{4\,gh}{5}}$
3. $\sqrt{\frac{6\,gh}{5}}$
4. $\sqrt{2\,gh}$

188.

A raindrop of radius r has a terminal velocity v m/s in air. The viscosity of air is η poise. The viscous force on it is F. If the radius of the drop be 2r and the drop falls with terminal velocity in the same air, the viscous force on it will be:

1. F
2. F/2
3. 4F
4. 8F

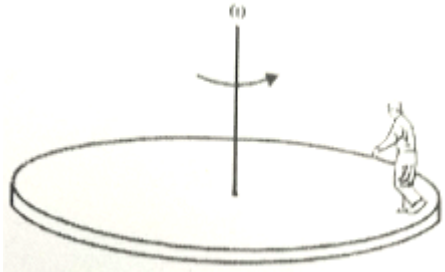
189.

A sphere rolls down without slipping on an inclined plane from a point at vertical height h. The speed of the centre of mass of the sphere when it reaches the bottom is:

1. $\sqrt{\frac{10\ gh}{3}}$
2. $\sqrt{\frac{10\ gh}{7}}$
3. $\sqrt{\frac{7\ gh}{4}}$
4. $\sqrt{\frac{5\ gh}{7}}$

190.

A child is standing on the edge of a merry-go-round that has the shape of a disk as shown in the figure. The mass of the child is 40 kilograms. The merry-go-round has a mass of 200 kilograms and a radius of 2.5 meters, and it is rotating with an angular velocity of $\omega = 2.0$ radians per second. The child then walks slowly towards the center of the merry-go-round. When the child reaches the center, what is the angular velocity of the disc? (The size of the child can be neglected.)



1. 2.0 rad/s
2. 2.2 rad/s
3. 2.4 rad/s
4. 2.8 rad/s

191.

A rigid body rotates about a fixed axis with a variable angular velocity equal to $\alpha - \beta t$, at the time t, where α, β are constants. The angle through which it rotates before its stops

1. $\frac{\alpha^2}{2\beta}$
2. $\frac{\alpha^2-\beta^2}{2\alpha}$
3. $\frac{\alpha^2-\beta^2}{2\beta}$
4. $\frac{(\alpha-\beta)\alpha}{2}$

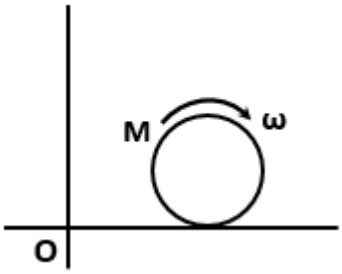
192.

A solid sphere of mass m and radius R is released from the top of an inclined plane such that it rolls down without slipping. If the coefficient of friction is μ and the angle of inclination is θ with the horizontal, then the force of friction acting on the body is:

1. $\mu \text{mgcos}\theta$
2. $\text{mgsin}\theta$
3. $\frac{\text{mgsin}\theta}{3}$
4. $\frac{2\text{mgsin}\theta}{7}$

193.

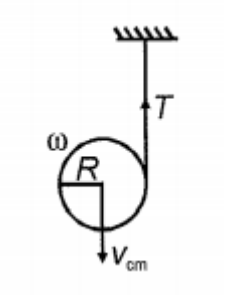
A ring of mass M and radius R is rolling with angular speed ω on a horizontal plane as shown in the figure. The magnitude of angular momentum of the ring about origin O is:



1. $MR^2\omega$
2. $2MR^2\omega$
3. $\frac{2}{5}MR^2\omega$
4. $\frac{5}{2}MR^2\omega$

194.

A disc of mass *M* and radius *R* starts falling down as shown in the figure. The string unwinds without slipping on the disc. The instantaneous power developed by the tension is:



1. T x $R\omega$
2. $\frac{T \times R\omega}{2}$
3. 2T x $R\omega$
4. Zero

195.

A thin uniform rod has moment of inertia *l* about an axis parallel to its length at a certain distance. If on heating, its length increases by 2%, then moment of inertia of rod will change by

1. 0%
2. 1%
3. $\frac{1}{2}\%$
4. 4%

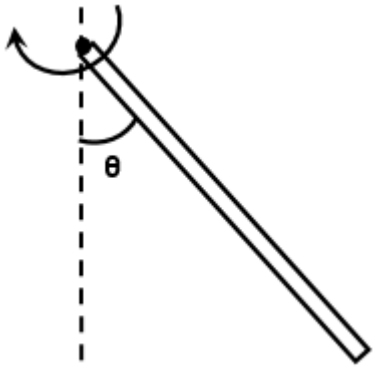
196.

Moment of inertia I of a non-uniform ring of mass M and radius R about an axis through the centre and normal to its plane is:

1. $I > MR^2$
2. $I < MR^2$
3. $I = MR^2$
4. $I \leq MR^2$

197.

A uniform rod having length *l* is hinged at one end and is free to rotate in the vertical plane. The rod is released from the position making an angle θ with the vertical. The acceleration of the free end of the rod at the instant it is released is:



1. $\frac{3g\sin\theta}{4}$
2. $\frac{3g\cos\theta}{2}$
3. $\frac{3g\sin\theta}{2}$
4. $\frac{3g\cos\theta}{4}$

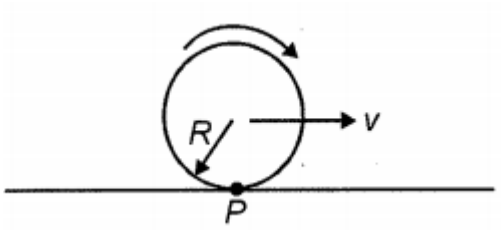
198.

The coefficient of friction between a solid cylinder and a rough inclined plane is just sufficient for the pure rolling of the cylinder. Which of the following bodies can move with pure rolling on the inclined plained?

1. Hollow cylinder
2. Solid sphere
3. Hollow sphere
4. Ring

199.

A disc is performing pure rolling with constant angular velocity on a smooth stationary surface. Then at any instant, for point of contact P of the disc-



1. Velocity is v, acceleration is zero
2. Velocity is zero, acceleration is $\frac{v^2}{R}$
3. Velocity is zero, acceleration is zero
4. Velocity is v, acceleration is $\frac{v^2}{R}$

200.

There is an orifice at some depth of the water tank. Absolute pressure at the level of the orifice in the water tank is 4 atmospheric pressure. The density of water is 10^3 kg $/m^3$ and 1 atm pressure = 10^5 N/m^2. The speed of water coming out of the orifice is:

1. 10 m/s
2. 20 m/s
3. $10\sqrt{6}$ m/s
4. $10\sqrt{2}$ m/s

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