BOTANY - SECTION A

1 Cytokinin promotes the growth of
1. vascular cambium
2. shoots
3. lateral buds
4. roots

2 The pineapple which under natural conditions is difficult to blossom has been made to produce fruits throughout the year by application of:
1. NAA, 2, 4- D
2. Phenylacetic acid
3. Cytokinin
4. IAA, IBA

3 In the C4 pathway, which of the following molecules combines with carbon dioxide?
1. glyceraldehyde phosphate
2. ribulose biphosphate
3. phosphoenol pyruvic acid
4. citric acid

4 Consider the two statements:

I:	The water-splitting complex is located on the inner side of the thylakoid membrane
II:	The NADP reductase enzyme is located on the stromal side of the thylakoid membrane

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

5 Match List - I with List - II

	List - I		List - II
(A)	Chlorophyll a	(I)	Yellow to yellow orange
(B)	Chlorophyll b	(II)	Yellow green
(C)	Xanthophyll	(III)	Blue green
(D)	Carotenoids	(IV)	Yellow

Choose the correct answer from the options given below:

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

6 Removal of apical dominance by decapitation is utilised for:
1. Suppressing the activity of intercalary meristem
2. Early senescence
3. Hedge making
4. Preparing weed-free lawns

7 Given below are two statements:

Assertion (A):	Water stress can reduce the CO_2 availability.
Reason (R):	Water stress caused the stomata to close.

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

8 Given below are two statements:

Assertion (A):	Auxins are widely used for plant propagation.
Reason (R):	Auxins help to inhibit rooting in stem cutting.

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

9 Given below are two statements:

Assertion (A):	We generally measure some quantity that is more or less proportional to the protoplasm of a cell.
Reason (R):	The increase in protoplasm is difficult to measure directly.

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

10 Which hormone promotes internode/petiole elongation in deep water rice?

1.	2, 4-D	2.	GA_3
3.	Kinetin	4.	Ethylene

11 Which of the following characteristics out of I, II and III are exhibited by C_4 plants?

I.	Kranz anatomy.
II.	The product of photosynthesis is oxaloacetic acid.
III.	Both PEP carboxylase and ribulose-bisphosphate carboxylase act as carboxylating enzymes.

Choose the correct option.
1. I and II, but not III
2. II and III, but not I
3. I and III, but not II
4. All of these

12 Given below are two statements:

Assertion (A):	In green plants, H_2O is hydrogen donor and oxidised to O_2.
Reason (R):	Splitting of water molecules take place on the outer side of the thylakoid membrane.

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

13 Developmental and environmental heterophylly are exhibited by _A_ and _B_, respectively.
1. A-Coriander, B-Cotton
2. A-Cotton, B-Buttercup
3. A-Buttercup, B-Coriander
4. A-Cotton, B-Larkspur

14 In the experiment conducted by T.W. Engelmann aerobic bacteria were used.

1.	To determine the action spectrum
2.	To determine the absorption spectrum of chlorophyll.
3.	To detect the sites of oxygen (O_2) evolution.
4.	To detect the oxidizing species in the photosynthetic reactants.

15 Juvenile conifers are sprayed with GAs by the farmers to hasten the maturity period. This effect can be reversed by the application of:
1. Auxin
2. Cytokinin
3. Ethylene
4. ABA

16 The correct sequence of flow of electron during light dependent reactions in plants is:
1. P680 → P700 → water → NADP+
2. water → P700 → NADP+→ P680
3. P700 → P680 → NADP+→ water
4. water → P680 → P700 → $NADP^+$

17 In non-cyclic photo-phosphorylation:

1.	only PS I is functional
2.	both photosystems work in series, first PS I and then PS II
3.	only ATP synthesis takes place and NADPH is not synthesized
4.	both ATP and NADPH are synthesized

18 Select the incorrect statement

1.	2, 4-D is a synthetic auxin.
2.	Gibberellins can elongate internode enormously in rosette habit plants.
3.	Cytokinin was discovered by E. Kurosawa.
4.	Ethylene promotes the abscission of leaves and flowers.

19 Given below are two statements:

Assertion (A):	In PS I, the reaction centre chlorophyll 'a' has an absorption peak at 700 nm.
Reason (R):	PS II reaction centre is called P 680.

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

20 The living differentiated cells, that lost the capacity to divide anymore, can regain the capacity of division under certain conditions. This phenomenon is termed as:

1.	Redifferentiation	2.	Maturation
3.	Differentiation	4.	Dedifferentiation

21 Given below are two statements:

Assertion (A):	Gibberellins extend the market period of apple
Reason (R):	Gibberellins delay senescence.

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

22 In photorespiration, ATP and sugars are not synthesized and RuBP is converted to:

1.	Two molecules of PGA
2.	One molecule of G3P and one molecule of DHAP
3.	One molecule of phosphoglycerate and one molecule of phosphoglycolate
4.	Two molecules of pyruvate

23 Which one of the following generally acts as an antagonist to Gibberellins?

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

24 Given below are two statements:

Assertion (A):	At any point, the rate of photosynthesis will be determined by the factor available at sub-optimal levels.
Reason (R):	During photosynthesis, usually one factor affecting CO_2 fixation is the major cause that limits its rate.

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

25 Given below are two statements:

Assertion (A):	Protons are transported across the thylakoid membrane when electrons move through the photosystems.
Reason (R):	The primary acceptor of electron, located towards the outer side of thylakoid membrane & transfers its electrons to an H carrier.

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

26 The initial carboxylation reaction:

1.	occurs in mesophyll cells in C_3 plants and in bundle sheath cells in C_4 plants
2.	occurs in bundle sheath cells in C_3 plants and in mesophyll cells in C_4 plants
3.	occurs in mesophyll cells in both C_3 plants and in C_4 plants
4.	occurs in bundle sheath cells in both C_3 plants and in C_4 plants

27

Which of the following is *not* a product of light reaction of photosynthesis?

1.	ATP	2.	NADH
3.	NADPH	4.	Oxygen

28 Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A):	Cyclic photophosphorylation results in the synthesis of ATP but not of NADPH + H+.
Reason (R):	The excited electron does not pass on to NADP+ but is cycled back to the PS I complex through the electron transport chain.

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

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

29 Given below are two statements:

Assertion (A):	Plant growth is open and indeterminate.
Reason (R):	Plants retain the capacity for unlimited growth throughout their life.

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

30 Given below are two statements:

Assertion (A):	Carboxylation is the most crucial step of Calvin cycle.
Reason (R):	This reaction is catalysed by the enzyme RuBP carboxylase which results in the formation of two molecules of 3-PGA

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

31 Which of the following are special features of the C_4 plants?

I:	They have a special type of leaf anatomy.
II:	They tolerate higher temperatures and show a response to high light intensities.
III:	They lack photorespiration and have greater productivity of biomass.

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

32 Production of Cucumber has increased manifold in recent years. Application of which of the following phytohormones has resulted in this increased yield as the hormone is known to produce female flowers in plants?

1.	Cytokinin	2.	ABA
3.	Gibberellin	4.	Ethylene

33 What is the direct source of energy for the production of ATP by ATP synthase?

1.	the electron transport chain
2.	the proton gradient
3.	substrate-level phosphorylation
4.	the oxidation reactions occurring during respiration

34 In Sorghum:

1.	Calvin cycle takes place in Mesophyll cells
2.	Initial carboxylation reaction occurs in Bundle sheath cells
3.	Number of carbon atoms in the primary carbon dioxide acceptor is 3
4.	PGA is the primary carbon dioxide fixation product

35 Which of the following elements for growth directly aids in increasing the plant size?

1. Temperature
2. Gravity
3. Water
4. Light

BOTANY - SECTION B

36 Given below are two statements:

Assertion (A):	Respiratory pathway has traditionally been considered a catabolic process.
Reason (R):	Respiration involves the breakdown of substrates.

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

37

What is the role of NAD^+ in cellular respiration?

1.	It functions as an enzyme
2.	It functions as an electron carrier
3.	It is a nucleotide source for ATP synthesis
4.	It is the final electron acceptor for anaerobic respiration

38 All of the following are components in the inner mitochondrial membrane associated with passes of protons across the membrane, except

1. NADH dehydrogenase
2. Succinate dehydrogenase
3. Cytochrome bc_1 complex
4. F_0 protein complex

39 Glycolysis is a sequence of _____ reactions involving _____ intermediate compounds:

1. 10, 5
2. 10, 9
3. 10, 10
4. 9, 10

40 What happens to NAD^+ when pyruvic acid is converted to acetyl coenzyme A?

1. It is reduced
2. It is oxidized
3. It is isomerized
4. It is fragmented

41 Identify the intermediate of glycolysis which is a source of the glycerol that combines with fatty acids to form fat:

1. Dihydroxyacetone phosphate
2. Glyceraldehyde 3-phosphate
3. Phosphoenol pyruvate
4. Fructose–6–phosphate

42 The respiratory quotient during cellular respiration would depend on the

1. Nature of enzymes involved
2. Nature of the substrate
3. Amount of carbon dioxide released
4. Amount of oxygen utilized

43 Oxidative phosphorylation is

1.	formation of ATP by transfer of phosphate group from a substrate to ADP
2.	oxidation of phosphate group in ATP
3.	addition of phosphate group to ATP
4.	formation of ATP by energy released from electrons removed during substrate oxidation

44 Cellular respiration is very important for life as it:

1. Utilizes stored glucose
2. Exchanges gases with the environment
3. Synthesizes the energy currency, ATP
4. Helps the body get rid of fats

45 What amount of energy is released from glucose during lactic acid fermentation?

1. Less than 7%
2. Approximately 15%
3. More than 18%
4. About 10%

46 The numbers of FADH2, ATP, Carbon dioxide and NADH molecules produced in a single turn of citric acid cycle respectively are:

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

47 The number of carbon atoms are 3 in all of the following molecules except:

1. Dihydroxyacetone phosphate
2. Glyceraldehyde 3-phosphate
3. Acetyl CoA
4. Pyruvic acid

48 Match List I with List II

	List I		List II
A.	Oxidative decarboxylation	I.	Citrate synthase
B.	Glycolysis	II.	Pyruvate dehydrogenase
C.	Oxidative phosphorylation	III.	Electron transport system
D.	Tricarboxylic acid cycle	IV.	EMP pathway

Choose the correct answer from the options given below:

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

49 All of the following reactions release CO_2 except

1.	Oxidative decarboxylation of pyruvate
2.	Cellular respiration in muscles in an inadequate amount of O_2
3.	Incomplete oxidation of pyruvate in yeast
4.	Tricarboxylic acid cycle

50 Which of the following statements regarding mitochondria is incorrect?

1.	Mitochondrial matrix contains single circular DNA molecule and ribosomes.
2.	Outer membrane is permeable to monomers of carbohydrates, fats, and proteins.
3.	Enzymes of electron transport are embedded in the outer membrane.
4.	Inner membrane is convoluted with infoldings.

ZOOLOGY - SECTION A

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

	Column I		Column II
I.	Influx of sodium	1.	Original establishment of RMP
II.	Efflux of potassium	2.	Repolarization
III.	Na^+/K^+ pump	3.	Depolarization
IV.	Ca^{++}	4.	Plateau in cardiac muscles

Codes :

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

52 Given below are two statements:

Assertion (A):	Osteoporosis is characterised by decreased bone mass and increased chances of fractures.
Reason (R):	Common cause of osteoporosis is increased levels of estrogen.

In the light of the above statements, choose the most appropriate answer from the options given below:

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

53 Given below are two statements:

Assertion (A):	Atrial natriuretic factor (ANF) is secreted by the wall of heart's atria
Reason (R):	ANF is secreted when there is a decrease in blood flow to the heart

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

54 Which of the following statements are correct regarding skeletal muscle?

A.	Muscle bundles are held together by collagenous connective tissue layer called fascicle.
B.	Sarcoplasmic reticulum of muscle fibre is a store house of calcium ions.
C.	Striated appearance of skeletal muscle fibre is due to distribution pattern of actin and myosin proteins.
D.	M line is considered as functional unit of contraction called sarcomere.

Choose the most appropriate answer from the options given below:

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

55 Consider the statements given below and choose the option that correctly states them as true(T) or false (F)

(a)	Locomotion, changes of body postures and heat production are some of the functions of skeletal muscle tissue
(b)	Actin filaments are firmly attached to the Z-line
(c)	The portion of myofibril between non-consecutive 'Z' lines is called sacromere
(d)	Muscles constitute more than 50% of the body weight in an adult human

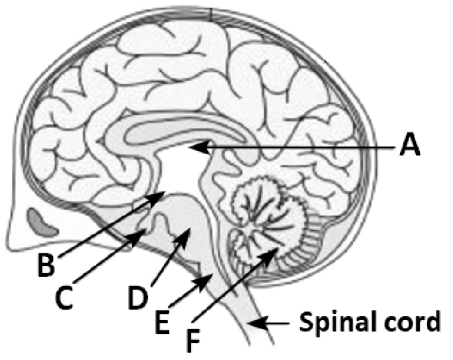
	a	b	c	d
1.	T	T	T	T
2.	T	F	F	T
3.	T	T	F	F
4.	F	T	T	T

56 Arrange the given layers in the order of their occurrence as the doctor cuts through the skull to reach the brain:

a. Pia mater
b. Dura mater
c. Arachnoid mater

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

57 A major coordinating center for sensory and motor signaling in the human brain is shown in the given sagittal section by the letter:



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

58 Hormone 'X' acts mainly on hepatocytes and adipocytes and stimulates the rapid movement of glucose from blood to hepatocytes and adipocytes. This hormone is antagonistic to the hormone 'Y' which is secreted by:

1. α-cells of pancreas
2. Follicular cells of thyroid
3. β-cells of pancreas
4. Interstitial cells of testes

59 Given below are two statements:

Assertion (A):	Hormone receptors can be present inside the cell or on the cell membrane
Reason (R):	Receptors for different hormones may be present on the same cell

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

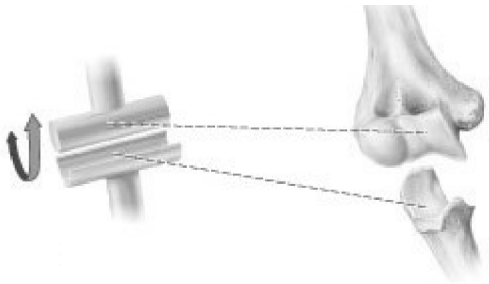
60 Consider the following statements:

I:	The resting axonal membrane is nearly impermeable to sodium ions.
II:	Depolarization of the axonal membrane is due to the 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

61 Hormones secreted by kidney and gastrointestinal tract are:
A. Erythropoietin
B. Insulin like growth factors
C. Secretin
D. Renin
E. Angiotensinogen
Choose the correct answer from the options given below:
1. A, C, and D only
2. B, C, and D only
3. D and E only
4. A and E only

62 The type of synovial joint shown below [between lower end of humerus and ulna] is a:



1. Ball and socket joint
2. Pivot joint
3. Saddle joint
4. Hinge joint

63 Match List I with List II

	List I (Type of Joint)		List II (Found between)
A.	Cartilaginous Joint	I.	Between flat skull bones
B.	Ball and Socket Joint	II.	Between adjacent vertebrae in vertebral column
C.	Fibrous Joint	III.	Between carpal and metacarpal of thumb
D.	Saddle Joint	IV.	Between Humerus and Pectoral girdle

Choose the correct answer from the options given below:

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

64 Mrs. 'Y' is a woman of 45 years she is suffering from osteoporosis. Which of the following hormone can be given to her in order to improve her condition?
1. Parathyroid hormone
2. Progesterone
3. Triiodothyronine
4. Thyrocalcitonin

65 Given below are two statements:

Assertion (A):	Hypothalamus is connected to the posterior lobe of the pituitary by hypophyseal portal veins
Reason (R):	The hypophyseal portal arteries carry blood from the hypothalamus to the neurohypophysis

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

66 Identify the correct statement:

1.	Unmyelinated neurons in PNS are not surrounded by Schwann cell
2.	Electrical synapses, being faster, are more common in the human body
3.	Pia mater is in contact with the brain tissue
4.	The entire hindbrain and the midbrain constitute the brain stem

67 Which of the following is present between the adjacent bones of the vertebral column?
1. Smooth muscle
2. Intercalated discs
3. Cartilage
4. Areolar tissue

68 The sensory neuron enters the spinal cord through:
1. The dorsal root of the spinal nerve
2. The ventral root of the spinal nerve
3. Either dorsal or ventral root depending on the point of origin
4. Both dorsal and ventral roots of the spinal nerves

69 Which of the following pairs incorrectly matches a hormone with its chemical nature?
1. Epinephrine - Steroid
2. Parathyroid - Peptide
3. Cortisol - Steroid
4. Thymosin - peptide

70 Erythropoietin, hormone which stimulates R.B.C. formation, is produced by:
1. The cells of bone marrow
2. Juxtaglomerular cells of the kidney
3. Alpha cells of the pancreas
4. The cells of the rostral adenohypophysis

71 The innermost layer of the adrenal cortex is called as:
1. Adrenal medulla
2. Zona glomerulosa
3. Zona fasciculata
4. Zona reticularis

72 Identify the incorrectly matched pair:

1.	Pubic symphysis	Hyaline cartilage
2.	Floating ribs	No attachment ventrally
3.	Spine of scapula	Acromion
4.	Atlas	Articulates with occipital condyles

73 Select the correct option.

1.	There are seven pairs of vertebrosternal, three pairs of vertebrochondral and two pairs of vertebral ribs.
2.	8^{th}, 9^{th} and 10^{th} pairs of ribs articulate directly with the sternum.
3.	11^{th} and 12^{th} pairs of ribs are connected to the sternum with the help of hyaline cartilage.
4.	Each rib is a flat thin bone and all the ribs are connected dorsally to the thoracic vertebrae and ventrally to the sternum.

74 Consider the following statements with respect to mechanism of muscle contraction

(a)	Binding of calcium with the subunit of tropomyosin removes the masking of active sites for myosin
(b)	Z-lines move towards the centre of 'H' zone
(c)	Cross bridge is formed by utilising the energy from hydrolysis of ATP
(d)	H-zone disappears when a muscle fibre is maximally contracted

Select the option with the correct statement
1. a and c only
2. b and d only
3. a, c and d
4. b, c and d

75 Select the correct statement.
1. Glucagon is associated with hypoglycemia.
2. Insulin acts on pancreatic cells and adipocytes.
3. Insulin is associated with hyperglycemia.
4. Glucocorticoids stimulate gluconeogenesis.

76 Mr. 'X' is about to face an interview. During five minutes before the interview he experiences sweating increased heart beat and goosebumps
The hormones responsible for this perform all the given functions, except
1. Pupillary dilation
2. Stimulate glycogenolysis
3. Increase the rate of respiration
4. Stimulate lipogenesis

77 Identify the hormone with its correct matching of source and function:

1.	Oxytocin- posterior pituitary, growth and maintenance of mammary glands.
2.	Melatonin- pineal gland, regulates the normal rhythm of sleep-wake cycle.
3.	Progesterone- corpus-luteum, stimulation of growth and activities of female secondary sex organs.
4.	Atrial natriuretic factor- ventricular wall increases blood pressure.

78 The functional unit of contractile system in striated muscle is:

1.	cross-bridge	2.	myofibril
3.	sarcomere	4.	Z-band

79 Identify the incorrectly matched pair:

1.	Limbic system	Behaviour
2.	Medulla oblongata	Gastric secretions
3.	Hypothalamus	Thermoregulation
4.	Corpus callosum	Connects cerebellum with rest of the brain

80 Match each item in Column I with one in COLUMN II and select the correct match from the codes given:

	COLUMN I		COLUMN II
A	Insulin	P	Increases blood glucose levels
B	Glucagon	Q	Decreases blood glucose levels
C	Parathyroid hormone	R	Increases blood calcium levels
D	Thyrocalcitonin	S	Decreases blood calcium levels

Codes

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

81 The spine of the scapula bone is located on its:

1.	lateral border	2.	medial border
3.	ventral surface	4.	dorsal surface

82 Which of the following is not a cranial bone?

1.	Zygomatic	2.	Sphenoid
3.	Ethmoid	4.	Parietal

83
Calcium is important in skeletal muscle contraction because it:-

1.	binds to troponin to remove the masking of active sites on actin for myosin.
2.	activates the myosin ATPase by binding to it.
3.	detaches the myosin head from the actin filament.
4.	prevents the formation of bonds between the myosin cross bridges and the actin filament.

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

85 The pre-excitation potential difference between the outside and inside of a neuron is called:
1. Reaction potential
2. Resting potential
3. Spike potential
4. Action potential

ZOOLOGY - SECTION B

86 Given below are three statements (a-c) each with one or two blanks. Select the option which correctly fills up the blanks in two statements.

(a)	A canal called the _____(i)_____ passes through the midbrain.
(b)	The cerebrum wraps around a structure called _____(i)_____ , which is a major coordinating centre for sensory and motor _____(ii)_____ .
(c)	The (i) portion of the midbrain consists mainly of four round lobes called _____(ii)_____.

Options:

1.	(c)-(i) ventral (ii) corpora quadrigemina (a)-(i) ventricle
2.	(b)-(i) pons (ii) impulses (a)-(i) aqueduct
3.	(a)-(i) aqueduct of Sylvius (b)-(i) amygdala (ii) association
4.	(a)-(i) cerebral aqueduct (c)-(i) dorsal (ii) corpora quadrigemina

87 Which part of the limbic system converts information from short term to long-term memory, essential in learning?
1. Amygdala
2. Basal ganglia
3. Hippocampus
4. Hypothalamus

88 All the statements regarding testosterone are correct except
1. Stimulates growth of facial and axillary hair
2. Influences the male libido
3. Stimulates muscular growth
4. Causes catabolic effects on protein and carbohydrate metabolism

89 Given below are two statements:

Assertion (A):	Cerebral cortex contains motor areas, sensory areas as well as association areas
Reason (R):	Cerebrum wraps around thalamus, which is a major coordinating centre for sensory and motor signaling

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

90 Choose odd one w.r.t parasympathetic branch of ANS
1. Increased secretion of gastric juice
2. Decreased secretion of pancreatic juice
3. Enhanced secretion of saliva
4. Increased secretion of bile

91 Which of the following can be used as descriptors for the secretions of ductless glands?
(a) Chemical messengers
(b) Nutrients enriched chemicals
(c) Produced in extremely minute amounts
(d) The production of any hormone in a healthy individual is almost equal to the amount of blood in the body
(e) Non-nutrient chemicals
Select the correct option:
1. (b), (d), (e) only
2. (a), (b), (c) only
3. (a), (c), (e) only
4. (b), (c), (d) only

92 Which of the following statements is correct in relation to the endocrine system?

1.	Adenohypophysis is under direct neural regulation of the hypothalamus
2.	Organs in the body like the gastrointestinal tract, heart, kidney, and liver do not produce any hormones
3.	non-nutrient chemicals produced by the body in trace amount that acts as an intercellular messenger are known as hormones
4.	Releasing and inhibitory hormones are produced by the pituitary gland

93 Hypothalamus forms an important link between
1. Digestive system and nervous system
2. Nervous system and respiratory system
3. Nervous system and endocrine system
4. Integumentary system and reproductive system

94 Parts A and B make up the CNS. Select the option that correctly identifies A and B.

	A	B
1.	Brain	Spinal cord
2.	Brain	Somatic neural system
3.	Spinal cord	PNS
4.	Visceral nervous system	Cerebrum

95 Hormones stored and released from neurohypophysis are:
1. Thyroid-stimulating hormone and Oxytocin
2. Oxytocin and Vasopressin
3. Follicle-stimulating hormone and luteinizing hormone
4. Prolactin and Vasopressin

96 Select the answer which correctly matches the endocrine gland with the hormone it secretes and its function/deficiency symptom :

	Endocrine gland	**Hormone**	**Function/deficiency symptoms**
1.	Anterior pituitary	Oxytocin	Stimulates uterus contraction during child birth
2.	Posterior pituitary	Growth Hormone (GH)	Oversecretion stimulates abnormal growth
3.	Thyroid gland	Thyroxine	Lack of iodine in diet results in goitre
4.	Corpus luteum	Testosterone	Stimulates spermatogenesis

97 A chemical synapse is formed by

1.	Only synaptic cleft
2.	Only presynaptic membrane and synaptic knob
3.	Connection through gap junctions between presynaptic knob and postsynaptic membrane
4.	Presynaptic membrane, synaptic cleft and postsynaptic membrane

98 Select the correct match between the bones in humans listed in column I with their corresponding number in column II

	Column I		Column II
1.	Facial bones	-	14
2.	Bones in axial skeleton	-	206
3.	Zygomatic bone	-	1
4.	Mandible	-	2

99 Given below are two statements:

Assertion (A):	All the organs in our body work in a synchronised function
Reason (R):	Neural and endocrine systems jointly coordinate and integrate all the activities of organs

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

100

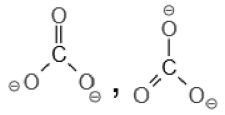
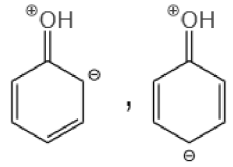
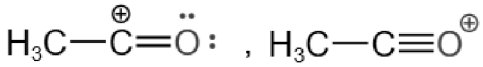
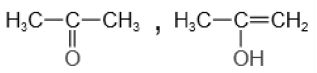
Given below are two statements:

Assertion (A):	Vasopressin is also known as anti-diuretic hormone
Reason (R):	Vasopressin stimulates the reabsorption of water by distal tubules of nephron and prevents diuresis

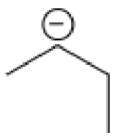
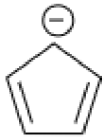
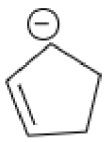
1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

CHEMISTRY - SECTION A

101 Which of the following is not a pair of resonating structures?

1.	
2.	
3.	
4.	

102 The order of stability of the following carbanions is-

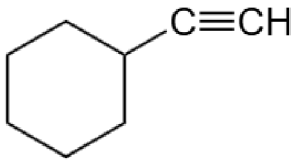
$R\bar{C}H_2$			
I	II	III	IV

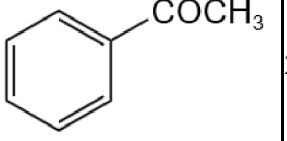
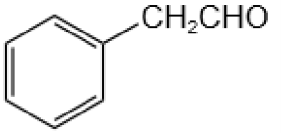
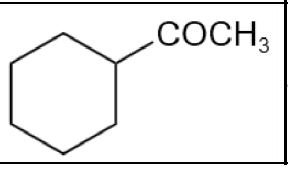
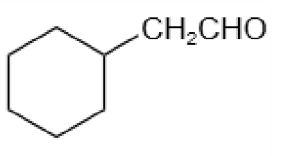
1. I>II>III>IV	2. I>III>II>IV
3. IV>III>II>I	4. III>IV>I>II

103 Ethane cannot be obtained by which of the following methods?

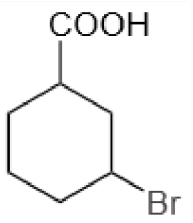
1. Heating methyl iodide with sodium metal in ether.
2. Hydrogenation of ethene.
3. Sodium acetate on Kolbe's electrolysis.
4. Hydrolysis of CaC_2.

104 Hydration of the given below compound in the presence of $H_2SO_4/HgSO_4, and/H_2O$ gives-



1.		2.	
3.		4.	

105 The IUPAC name of the compound given below is:



1. 1-Bromocyclohexanecarboxylic acid
2. 3-Bromocyclohexanoic acid
3. 3-Bromoheptanoic acid
4. 3-Bromocyclohexane-1-carboxylic acid

106 For the heterolytic cleavage of the given reaction:

$CH_3CH_2Cu \rightarrow$ A and B

'A' and 'B', respectively, are:

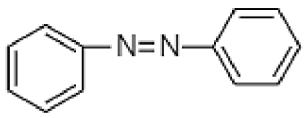
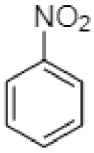
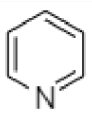
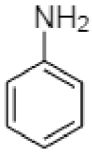
1. $^{-}CH_2CH_3$ *and* ^{-}Cu
2. $^{+}CH_2CH_3$ *and* ^{-}Cu
3. $^{-}CH_2CH_3$ *and* ^{+}Cu
4. ^{+}Cu *and* ^{-}Cu

107 The number of sigma (σ) and pi (π) bonds in the following structure are:

$$(CH_3)_2CH-CH=CH-CH_2-CH=CH-\underset{\displaystyle C_2H_5}{\underset{|}{CH}}-CH_3$$

1. σ bonds -33 and π bonds -2
2. σ bonds -22 and π bonds -2
3. σ bonds -42 and π bonds -2
4. σ bonds -40 and π bonds -3

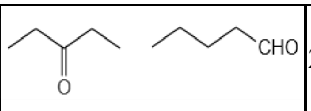
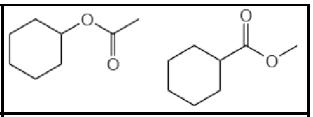
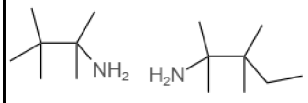
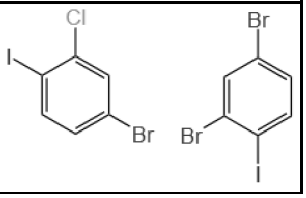
108 The Kjeldahl's method for the estimation of nitrogen can be used to estimate the amount of nitrogen in which one of the following compounds?

1.		2.	
3.		4.	

109 Which of the following does not show geometrical isomerism?

1. 1, 2-dichloro-1-pentene
2. 1, 3-dichloro-2-pentene
3. 1, 1-dichloro-1-pentene
4. 1, 4-dichloro-2-pentene

110 Which of the following is a pair of metamers?

1.		2.	
3.		4.	

111

Assertion (A):	The order of stability of carbanion is $(C_6H_5)_3C^-$ > $C_6H_5CH_2^-$ > CH_3^- > $(CH_3)_2CH^-$.
Reason (R):	The stability of carbanions is influenced by both resonance and inductive effects.

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

112 In Duma's method for estimation of nitrogen, 0.25 g of an organic compound gave 40 mL of nitrogen collected at 300 K temperature and 725 mm pressure. If the aqueous tension at 300 K is 25 mm, the percentage of nitrogen in the compound is:

1.	17.36	2.	18.20
3.	16.76	4.	15.76

113 Nitrogen detection in an organic compound is carried out by Lassaigne's test. The blue colour formed corresponds to which of the following formulae:

1. $Fe_3[Fe(CN)_6]_2$
2. $Fe_4[Fe(CN)_6]_3$
3. $Fe_4[Fe(CN)_6]_2$
4. $Fe_3[Fe(CN)_6]_3$

114 Which of the following is a controlled oxidation reaction?

A: $CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(l)}$

B: $CH_{4(g)} + O_{2(g)} \xrightarrow{Mo_2O_3} HCHO + H_2O_{(l)}$

C: $CH_{4(g)} + O_{2(g)} \xrightarrow{Cu/523K/100atm} 2CH_3OH_{(l)}$

1. Only A
2. Both B and C
3. A, and B only
4. Only C

115 Which of the following pairs of structural formulae represent(s) structural isomers?

(A)	CH_3CH_2OH and CH_3OCH_3
(B)	$CH_3CH(CH_3)CH_2CH_2CH_3$ and $CH_3CH_2CH_2CH(CH_3)CH_3$
(C)	$CH(OH)=CHCH_2OH$ and CH_3CH_2COOH

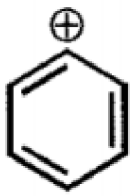
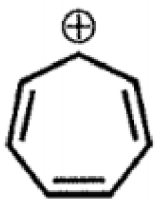
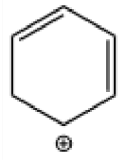
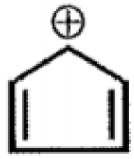
1. A only
2. A, B, and C
3. A and C only
4. B and C only

116 Find out the correct statement.

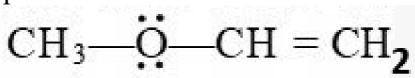
A.	The number of possible theoretical conformations of ethane is 6.
B.	In the conformations of ethane, the staggered form has the least torsional strain, and the eclipsed form has the maximum torsional strain.
C.	Hückel Rule: The presence of (4n + 2) π electrons in the ring where n is an integer (n = 1, 2, ...).

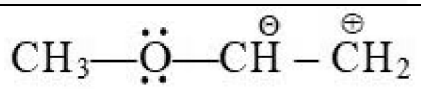
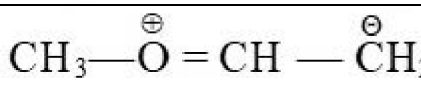
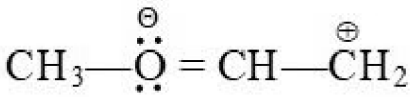
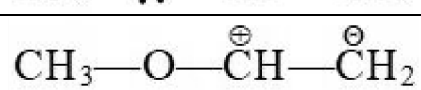
1. Only B is correct.
2. A and C.
3. B and C.
4. Only A is correct.

117 The most stable carbocation in the following compounds is:

1.		2.	
3.		4.	

118 The most stable resonating structure of the given below compound is:



1.	
2.	
3.	
4.	

119 Consider the given two statements:

Assertion:	Heterolytic fission results in the formation of charged species.
Reason:	Both the electrons of the covalent bond are taken away by the more electronegative atom.

1.	Assertion is true, Reason is false.
2.	Both Assertion and Reason are true and Reason correctly explains Assertion.
3.	Both Assertion and Reason are true but Reason does not correctly explain Assertion.
4.	Both Assertion and Reason are false.

120 Which of the following will give positive Lassaigne's test?

1. NH_4OH
2. NH_4Cl
3. N_2H_4
4. $CH_3 - NH_2$

121 Match list-I with list-II:

	List-I		List-II
(a)	Separation of aniline-water mixture	(i)	Fractional distillation
(b)	Separation of aniline-chloroform mixture	(ii)	Distillation under reduced pressure
(c)	Separation of glycerol from spent-lye	(iii)	Distillation
(d)	Separation of different fractions of crude oil	(iv)	Steam distillation

Choose the correct answer from the options given below:

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

122 Consider the following compounds,

A. n-Butane
B. 2-Methylbutane
C. n-Pentane
D. 2, 2-Dimethylpropane

The correct decreasing order of their boiling points is-

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

123 In sulphur estimation, 0.157 g of an organic compound gave 0.4813 g of barium sulphate. The percentage of sulphur in the compound is-

1. 39.10 %
2. 48.13 %
3. 42.10 %
4. 52. 43 %

124 The Lassaigne's extract is boiled with conc. HNO_3 while testing for halogens, because it-

1.	Helps in the precipitation of AgCl
2.	Increases the solubility product of AgCl
3.	Increases the concentration of NO_3^- ions
4.	Decomposes Na_2S and NaCN, if formed.

125 Which method is used to find halogen in organic compounds?

1. Duma's method
2. Liebig's method
3. Kjeldahl method
4. Carius method

126

Statement I:	Inductive effect and resonance are permanent effects.
Statement II:	The energy of the actual structure of the molecule (the resonance hybrid) is higher than that of any of the canonical structures.

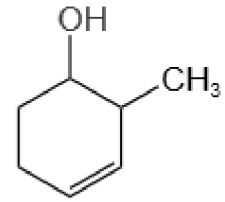
In light of the above statements, choose the correct option :

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

127 The correct order of –I effect is:

1. $-NR_3^+ > -OR > -F$
2. $-F > -NR_3^+ > -OR$
3. $-NR_3^+ > -F > -OR$
4. $-OR > -NR_3^+ > -F$

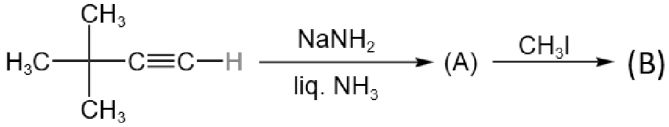
128 The IUPAC name of the below-given compound is:



1. 4-Hydroxy-3-methyl cyclohexene
2. 2-Methyl cyclohex-3-en-1-ol
3. 3-Hydroxy-2-methyl cyclohexene
4. 1-Hydroxy-3-methyl cyclohexene

129

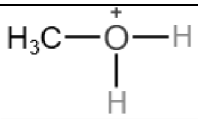
In the given reaction,



How many electron-donating groups are attached to the carbon atom of the unsaturated part of the product 'B'?

1. Two
2. Three
3. Four
4. None of the above.

130 Which of the following is not a nucleophile?

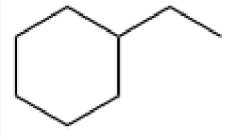
1.	CH_3O^-	2.	H_2O
3.	$CH_3{-}OCH_3$	4.	

131

Assertion (A):	Trans-but-2-ene has a higher boiling point than cis-but-2-ene.
Reason (R):	Trans-but-2-ene is more polar than cis-but-2-ene.

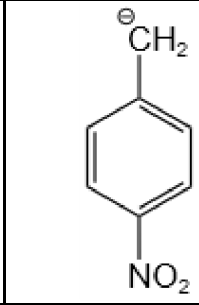
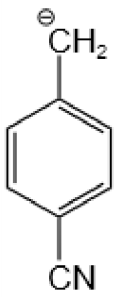
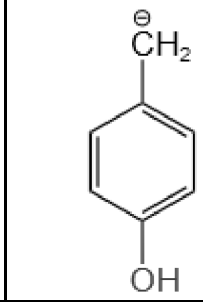
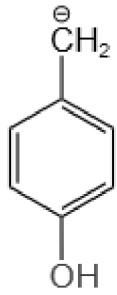
1.	Both (A) and (R) are true and (R) is the correct explanation of (A).
2.	Both (A) and (R) are true but (R) is not the correct explanation of (A).
3.	(A) is true but (R) is false.
4.	Both (A) and (R) are false.

132 How many products are formed from the monochlorination of ethyl cyclohexane?
(Note: Ignore stereoisomers)



1. 6
2. 8
3. 5
4. 9

133 Which of the following carbanion is most stable?

1.		2.	
3.		4.	

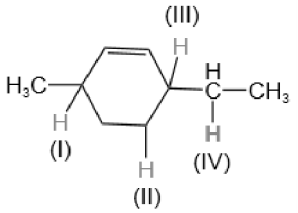
134 Match Column I with Column II.

Column I	Column II
A. Dumas method	1. $AgNO_3$
B. Kjeldahl's method	2. Silica gel
C. Carius method	3. Nitrogen gel
D. Chromatography	4. Ammonium sulphate

Codes

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

135 In the given compound, the most reactive hydrogen towards free radical substitution is:



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

CHEMISTRY - SECTION B

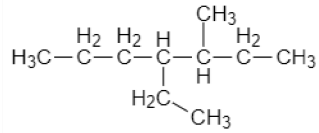
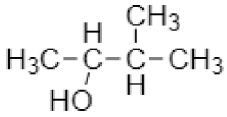
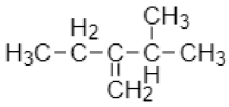
136 The compound having a maximum number of 1° carbon atoms is-
1. 2,2-dimethylpropane
2. 2,2,3,3-tetramethyl butane
3. 2,2,3,3,4-pentamethylpentane
4. 1-propylcyclohexane

137 The stationary and mobile phases used in paper chromatography are mainly:
1. Solid and liquid respectively.
2. Liquid and liquid respectively.
3. Liquid and gas respectively.
4. Solid and gas respectively.

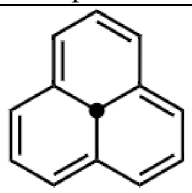
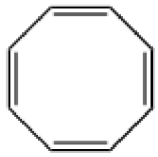
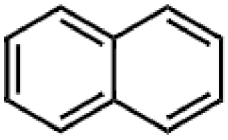
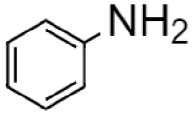
138 The correct order of melting point is:
1. n-pentane > Neopentane > Isopentane
2. Neopentane > n-pentane > isopentane
3. Neopentane > Isopentane > n-pentane
4. Isopentane > Neopentane > n-pentane

139 When a mixture of two alkyl halide reacts with sodium metal in dry ether, a mixture of 2-methyl propane, ethane, and 2,3-dimethyl butane was obtained. The alkyl halides are:
1. 2-chloropropane and chloroethane.
2. Chloromethane and chloroethane.
3. 2-chloropropane and methyl chloride.
4. 1-chloropropane and chloromethane.

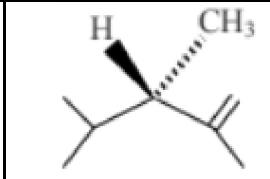
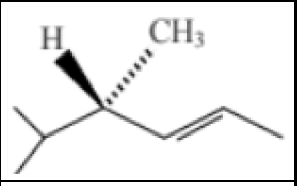
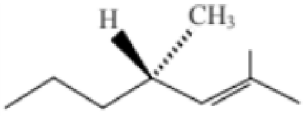
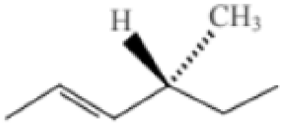
140 IUPAC name of some compounds is given. The incorrect name is:

1.	 : 3-Methyl-4-ethylheptane
2.	 : 3-Methyl-2-butanol
3.	 : 2-Ethyl-3-methylbut-1-ene
4.	$CH_3 - C \equiv C - CH(CH_3)_2$: 4-Methyl-2-pentyne

141 Which of the following is not an example of the benzenoid compound?

1.		2.	
3.		4.	

142 Among the following, the compound that produces an optically inactive compound on hydrogenation is:

1.		2.	
3.		4.	

143 Compound X on reaction with O_3 followed by Zn/H_2O gives formaldehyde and 2-methyl propanal as products. The compound X is :
1. Pent-2-ene
2. 3-Methylbut-1-ene
3. 2-Methylbut-1-ene
4. 2-Methylbut-2-ene

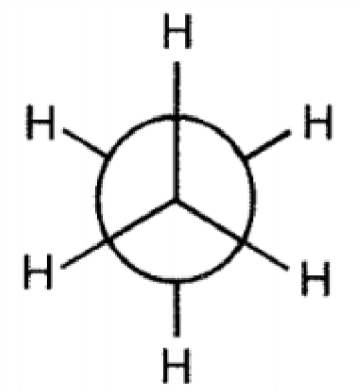
144 When but-2-yne is reacted with H_2 in presence of Lindlar's catalyst, the product formed is

1. Butane
2. But-1-ene
3. Cis-but-2-ene
4. Trans-but-2-ene

145 The compound that is most reactive toward sodium metal is:

1. 1-Propyne
2. Methane
3. Ethyne
4. 1-Butyne

146



If the rear carbon atom is rotated by 180°, then the conformation obtained would be:

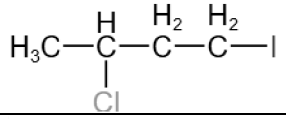
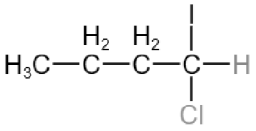
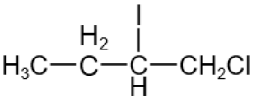
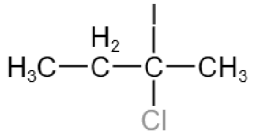
1. Staggered
2. Eclipsed
3. Skew
4. Both (1) & (3)

147 Which of the following is a free radical substitution reaction?

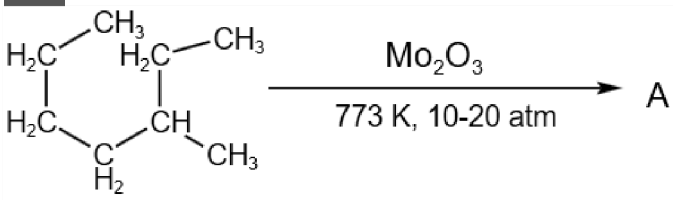
1. Benzene with $Br_2/AlCl_3$
2. Acetylene with HBr
3. Methane with Br_2/hv
4. Propene with $HBr/(C_6H_5COO)_2$

148 Predict the product C obtained in the following reaction of butyne-1.

$$CH_3CH_2 - C \equiv CH + HCl \rightarrow B \xrightarrow{HI} C$$

1.	
2.	
3.	
4.	

149 Given the following reaction:



'A' is:

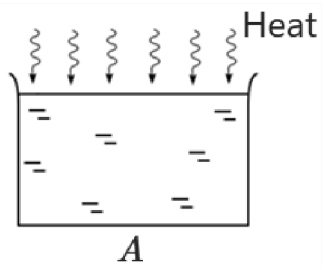
1. o-Xylene
2. Benzene
3. Toluene
4. m-Xylene

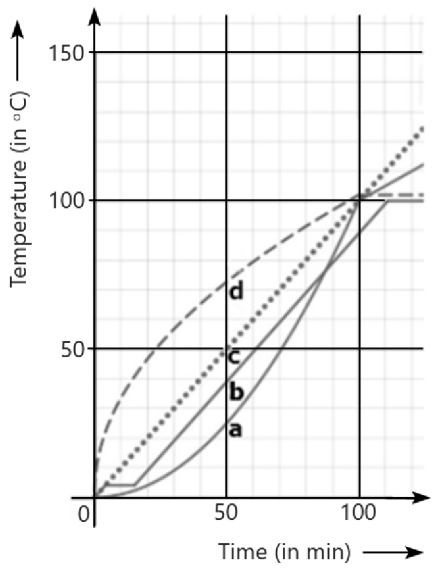
150 Iodination of a hydrocarbon (C-H→C-I) with molecular iodine is a slow and reversible reaction. However, it can be carried out in the presence of an oxidizing agent such as:

1. H_3BO_3
2. HIO_3
3. H_3PO_4
4. CH_3CO_2H

PHYSICS - SECTION A

151 A vessel containing water is heated from the top by means of a heater, just above the water surface. Assume that the temperature of the water was just above $0^{\circ}\mathrm{C}$, in the beginning. The temperature (θ_A) at the bottom is measured as a function of time. Which of the following shows the correct plot?





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

152 One mole of an ideal gas at an initial temperature of T K does $15R$ joules of work adiabatically. If the ratio of specific heats of this gas at constant pressure and at constant volume is $\frac{5}{3}$, the final temperature of the gas will be:

1. $(T + 2.4)$ K
2. $(T - 10)$ K
3. $(T - 4)$ K
4. $(T + 10)$ K

153 A Carnot engine has an efficiency of 50% when its source is at a temperature $327^{\circ}\mathrm{C}$. The temperature of the sink is:

1. $200^{\circ}\mathrm{C}$
2. $27^{\circ}\mathrm{C}$
3. $15^{\circ}\mathrm{C}$
4. $100^{\circ}\mathrm{C}$

154 The ratio $C_P/C_V = 1.5$ for a certain ideal gas. The gas is taken at an initial pressure of 2 kPa and compressed suddenly to $\frac{1}{4}$ of its initial volume. The final pressure is:

1. $\frac{1}{2}$ kPa
2. 4 kPa
3. 8 kPa
4. 16 kPa

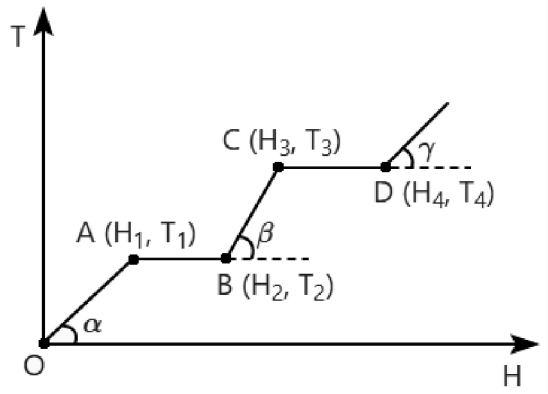
155 The ice-point reading on a thermometer scale is found to be 20°, while the steam point is found to be 70°. When this thermometer reads 100°, the actual temperature is:

1. 80° C
2. 130° C
3. 160° C
4. 200° C

156 A monoatomic ideal gas is taken through a process in which the pressure and the volume vary as $P = KV^a$, where $K =$ constant. What would be the value of a for which the molar specific heat capacity in the process is zero?

1. $\frac{-2}{3}$
2. $\frac{-3}{2}$
3. $\frac{-5}{3}$
4. $\frac{-2}{5}$

157 The graph shows the variation of temperature (T) of one kilogram of a material with the heat (H) supplied to it. At O, the substance is in solid state. From the graph, we can conclude that:



1.	CD represents the change of state from solid to liquid.
2.	BC represents the latent heat of vaporization.
3.	AB represents the change of state from solid to liquid.
4.	OA represents the latent heat of fusion.

158 A body loses heat at a rate of 2 W/min when it is at a temperature of $40^{\circ}\mathrm{C}$, but at a rate of 1 W/min when its temperature is $30^{\circ}\mathrm{C}$. The temperature of the surroundings is:

1. $25^{\circ}\mathrm{C}$
2. $20^{\circ}\mathrm{C}$
3. $10^{\circ}\mathrm{C}$
4. $35^{\circ}\mathrm{C}$

159 Let C_v and C_p denote the molar heat capacities of an ideal gas at constant volume and constant pressure, respectively. Which of the following is a universal constant?

1. $\frac{C_p}{C_v}$
2. C_pC_v
3. $C_p - C_v$
4. $C_p + C_v$

160 The moment of inertia of a metallic rod of length L, about an axis passing through its center of mass and perpendicular to the rod, is I_0. When the temperature is raised by $\Delta\theta$, it increases by ΔI_0. The coefficient of linear expansion of the rod's material is:

1. $\left(\frac{\Delta I_0}{I_0}\right)\frac{1}{\Delta\theta}$
2. $\frac{1}{2}\left(\frac{\Delta I_0}{I_0}\right)\frac{1}{\Delta\theta}$
3. $\frac{1}{5}\left(\frac{\Delta I_0}{I_0}\right)\frac{1}{\Delta\theta}$
4. $2\left(\frac{\Delta I_0}{I_0}\right)\frac{1}{\Delta\theta}$

161 For ideal diatomic gases at normal temperature,

Statement I:	Molar heat capacity at constant pressure for all diatomic gases is the same.
Statement II:	The specific heat capacity at constant pressure of all diatomic ideal gases is the same.

Choose the correct statement(s):

1.	only **(I)** is correct
2.	only **(II)** is correct
3.	both **(I)** and **(II)** are correct
4.	none of them are correct

162 Given below are two statements:

Assertion (A):	The ratio C_p/C_v for a diatomic gas is more than that for a monoatomic gas.
Reason (R):	The molecules of a monoatomic gas have more degrees of freedom than those of a diatomic gas.

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

163 The thermodynamic process in which no work is done on or by the gas is:

1.	adiabatic process
2.	cyclic process
3.	isobaric process
4.	isochoric process

164 In the adiabatic compression, the decrease in volume is associated with:

1.	increase in temperature and decrease in pressure
2.	decrease in temperature and increase in pressure
3.	decrease in temperature and decrease in pressure
4.	increase in temperature and increase in pressure

165 The internal energy of a gas is given by $U = \frac{3}{2}PV$. The gas expands in such a way that its internal energy (initially U_0) remains constant throughout the process, but its volume changes from V_0 to $2V_0$. The heat supplied to the gas equals:

1. $U_0 \ln(2)$
2. $\frac{1}{2}U_0 \ln(2)$
3. $\frac{1}{3}U_0 \ln(2)$
4. $\frac{2}{3}U_0 \ln(2)$

166 In an isochoric process on an ideal gas, initial temperature is equal to $27^\circ C$ with an initial pressure being equal to 270 kPa. Now if the final temperature is made equal to $36^\circ C$ then the final pressure is equal to:

1. 298 kPa
2. 270 kPa
3. 360 kPa
4. 278 kPa

167 An ideal gas expands from the initial state of volume V_1 to the final state of volume V_2. Work done is maximum in:

1. isothermal process
2. isobaric process
3. adiabatic process
4. isochoric process

168 The temperature of body drops from $60^\circ C$ to $40^\circ C$ in 7 min. The surrounding temperature is $10^\circ C$. The temperature of body drops from $40^\circ C$ to $T^\circ C$ in 7 min. The value of T is:

1. $16^\circ C$
2. $20^\circ C$
3. $28^\circ C$
4. $36^\circ C$

169 Under the steady-state heat flow condition, the temperature of a rod having a uniform cross-section:

1.	changes with position, but no change with time.
2.	changes with time but no change with position.
3.	changes with both time and position.
4.	no change with time as well as position.

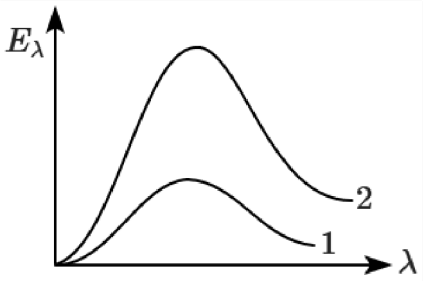
170 A piece of hot copper at $100\ ^\circ C$ is plunged into a pond at $30\ ^\circ C$. The copper cools down to $30\ ^\circ C$ while the pond being huge stays at its initial temperature. Then:

1.	the copper loses some entropy and the pond stays at the same entropy.
2.	the copper loses some entropy and the pond gains exactly the same amount of entropy.
3.	the copper loses entropy and the pond gains more than this amount of entropy.
4.	both copper and the pond gain in entropy.

171 A Carnot engine working between $27^\circ C$ and $127^\circ C$ performs 2 kJ of work. The amount of heat energy rejected is equal to:

1. 4 kJ
2. 6 kJ
3. 8 kJ
4. 12 kJ

172 The area below graphs 1 and 2 showing the variation of spectral emissive power versus wavelength as shown in the figure are A and 81A respectively. If the temperature of 1 is 1000 K, then the temperature of 2 is:



1. 1000 K
2. 2000 K
3. 3000 K
4. 9000 K

173 Given below are two statements:

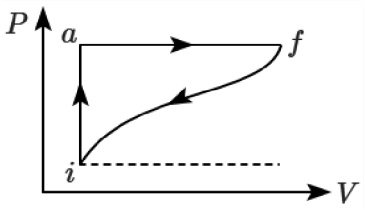
Assertion (A):	We can change the temperature of a system without giving (or taking) heat to (or from) it.
Reason (R):	According to the principle of conservation of energy, total energy of a system should remain conserved.

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

174 When x amount of heat is given to a gas at constant pressure, it performs $\frac{x}{3}$ amount of work. The average number of degrees of freedom per molecule of the gas is:

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

175 When a system is taken from state i to state f along path iaf, $Q = 50$ J and $W = 20$ J. If $W = -13$ J for the curved return path fi, Q in this path is:

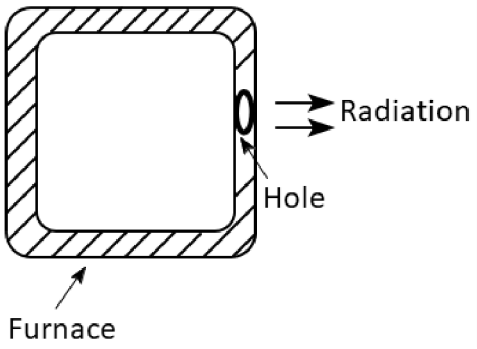


1. 33 J
2. 23 J
3. -7 J
4. -43 J

176 When water is heated from 0°C to 6°C. Its density:

1.	decreases.
2.	first decreases and then increases.
3.	first increases and then decreases.
4.	remains constant.

177 The radiation emerging from a furnace (blackbody) is found to have a most probable wavelength λ_m and the gas molecules (air) emerging from it have an rms speed v. As the temperature of the furnace is varied:

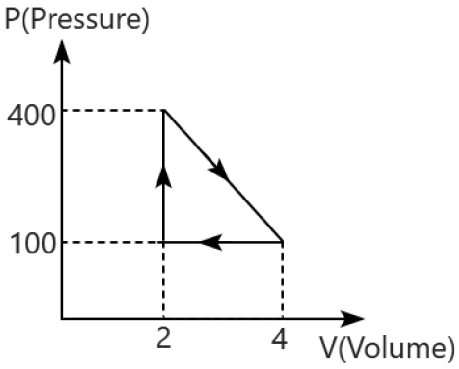


1. $\lambda_m \propto v$
2. $\lambda_m \propto \frac{1}{v}$
3. $\lambda_m \propto v^2$
4. $\lambda_m \propto \frac{1}{v^2}$

178 A piece of alloy of mass 250 g (specific heat capacity $= 0.1\times$ that of water) is placed in a furnace and then put into a calorimeter containing 240 g of water at 20°C. The water equivalent of the calorimeter is 10 g. The final temperature of the mixture is 50°C. The temperature of the furnace is (nearly):

1. 250°C
2. 350°C
3. 600°C
4. 800°C

179 Calculate the work done by the cyclic process given in the indicator diagram.
(Assume all values in SI units.)



1. 300 units
2. -300 units
3. 600 units
4. -600 units

180 If Carnot engines work between the freezing point and boiling point of water, then the efficiency of a Carnot engine is:

1. 35%
2. 27%
3. 22%
4. 17%

181 A diatomic gas, having $C_p = \frac{7}{2}R$ and $C_v = \frac{5}{2}R$ is heated at constant pressure. The ratio
$dU : dQ : dW$ is:

1. 5 : 7 : 3
2. 5 : 7 : 2
3. 3 : 7 : 2
4. 3 : 5 : 2

182 A rod A has a coefficient of thermal expansion (α_A) which is twice of that of rod B (α_B). The two rods have length l_A, l_B where $l_A = 2l_B$. If the two rods were joined end-to-end, the average coefficient of thermal expansion is:

1. α_A
2. $\frac{2\alpha_A}{6}$
3. $\frac{4\alpha_A}{6}$
4. $\frac{5\alpha_A}{6}$

183 Monoatomic, diatomic, and nonlinear triatomic gases whose initial pressure and volume are the same are compressed until their final volume is one-fourth of the initial volume, if the process is:

1.	isothermal, their final pressures will be different.
2.	adiabatic, final pressures will be same.
3.	adiabatic, then triatomic gas will have maximum final pressure.
4.	adiabatic, then monatomic gas will have maximum final pressure.

184 For an ideal monoatomic gas, the universal gas constant R is n times the molar heat capacity at constant pressure C_p. Here n is:

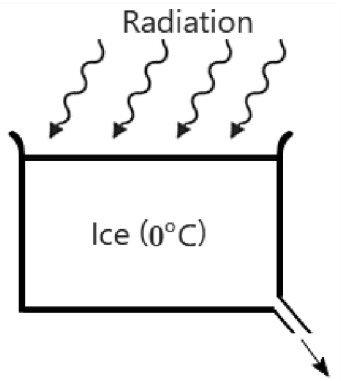
1. 0.67
2. 1.4
3. 0.4
4. 1.67

185 A box (thermally insulated) has two chambers separated by a membrane. One of volume V contains an ideal gas at temperature T. The other of volume $\frac{V}{2}$ is evacuated. If the membrane breaks down, the gas temperature will be:

1. $\frac{3}{2}T$
2. $\frac{2T}{3}$
3. T
4. none of these

PHYSICS - SECTION B

186 Ice (0°C) is kept in an insulated reservoir with an opening that is covered at the top with a cloth. When a black cloth (B) is placed at the top, the ice melts at 2 g/3 min. When an ordinary cloth (G) is placed, the rate of melting is 2 g /5 min. The emissivity of G is: (assuming that B behaves as a blackbody)



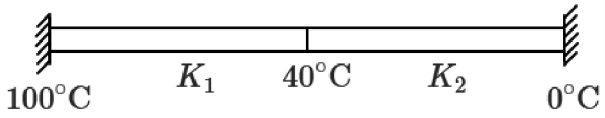
1.	0.6	2.	0.3
3.	0.4	4.	0.5

187 Given below are two statements:

Assertion (A):	In human body uniformity of temperature is maintained by facilitating heat transfer by forced convection.
Reason (R):	Heat from metabolic reactions is carried from the hotter parts to the colder by circulating blood, pumped by the heart.

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

188 Two rods of identical dimensions are joined end-to-end, and the ends of the composite rod are kept at 0°C and 100°C (as shown in the diagram). The temperature of the joint is found to be 40°C. Assuming no loss of heat through the sides of the rods, the ratio of the conductivities of the rods K_1/K_2 is:



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

189 The root mean square speed of an ideal gas at constant pressure varies with density (d) as:

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

190 Consider the following statements. The internal energy of an ideal monoatomic gas may have contributions from:

(1)	translational kinetic energy of its molecules
(2)	vibrational kinetic energy of its molecules
(3)	rotational kinetic energy of its molecules
(4)	potential energy corresponding to molecular forces

Which of the statements given above is/are correct?

1.	(2) and (3)
2.	(1) and (4)
3.	(1) only
4.	(1), (2), (3) and (4)

191 At ordinary temperatures, the molecules of a diatomic gas have only translational and rotational kinetic energies. At high temperatures, they may also have vibrational energy. As a result of this compared to lower temperatures, a diatomic gas at higher temperatures will have:

1.	lower molar heat capacity.
2.	higher molar heat capacity.
3.	lower isothermal compressibility.
4.	higher isothermal compressibility.

192 The pressure of an ideal gas is written as $P = \frac{2E}{3V}$. Here E refers to:

1.	translational kinetic energy
2.	rotational kinetic energy
3.	vibrational kinetic energy
4.	total kinetic energy

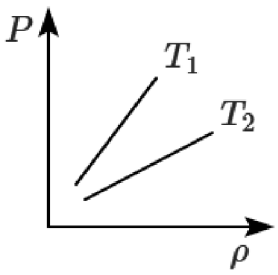
193 One mole of an ideal monoatomic gas is heated at a consant pressure of one atmosphere from 0°C to 100°C. Then, change in the internal energy is:

1. 6.56 J
2. 8.32×10^2 J
3. 12.48×10^2 J
4. 20.80×10^2 J

194 The rms speed of oxygen molecules in a gas is v. If the temperature is doubled and the oxygen molecules dissociate into oxygen atoms, the rms speed will become:

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

195 The following figure shows graphs of pressure versus density for an ideal gas at two temperatures T_1 and T_2.



Then:

1.	$T_1 > T_2$
2.	$T_1 = T_2$
3.	$T_1 < T_2$
4.	any of the three is possible

196 The mean square speed of the molecules of a gas at absolute temperature T is proportional to:

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

197 In a mixture 0.5 moles of O_2 and 4 moles of Ne gas are taken at temperature T. The internal energy of the system is equal to:

1. $\left(\frac{13}{2}\right) RT$
2. $\left(\frac{11}{4}\right) RT$
3. $\left(\frac{29}{4}\right) RT$
4. $\left(\frac{13}{4}\right) RT$

198 The temperature of a gas is -50°C. To what temperature the gas should be heated so that the rms speed is increased by 3 times?

1. 223 K
2. 669°C
3. 3295°C
4. 3097 K

199 Suppose a container is evacuated to leave just one molecule of a gas in it. Let v_a and v_{rms} represent the average speed and the rms speed of the gas.

1.	$v_a > v_{rms}$
2.	$v_a < v_{rms}$
3.	$v_a = v_{rms}$
4.	v_{rms} is undefined

200 A tank used for filling helium balloons has volume of 0.3 m^3 and contains 2.0 moles of helium gas at 27°C. Assuming that helium behaves like an ideal gas, the total translational kinetic energy of the molecules of the gas is:

1. 7.48 kJ
2. 5.32 kJ
3. 12.46 kJ
4. 17.45 kJ

Fill OMR Sheet*

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