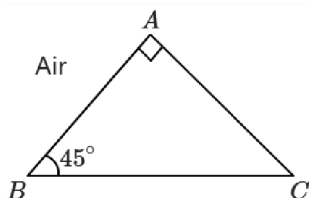


PHYSICS - SECTION A

- 1** Light is incident onto the surface AB of a right-angled ($\angle A = 90^\circ$) isosceles prism, kept in air.



What should be the maximum refractive index of the material of the prism, if a ray incident normally on AB does not undergo total internal reflection on the base BC ?

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

- 2** Which, of the following instruments, cannot show chromatic aberration (as a defect)?

1. A reflecting telescope	2. A refracting telescope
3. A binocular	4. A magnifying glass

- 3** A ray of light is incident onto the x - y plane from above, and part of the light gets reflected and a part gets refracted. The incoming ray of light is given by a vector along: $\hat{i} - \hat{k}$. The normal to the surface is along:

1.	\hat{i}	2.	\hat{j}
3.	\hat{k}	4.	$\hat{i} + \hat{j}$

- 4** A spherical mirror has a focal length of 36 cm in air. Its focal length, when immersed in water (refractive index = $4/3$) will be:

1.	36 cm	2.	48 cm
3.	27 cm	4.	12 cm

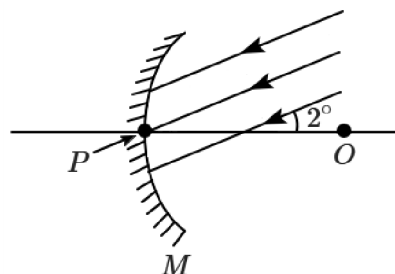
- 5** If two plane mirrors are placed facing each other, a distance d apart, and a point object is placed exactly midway between the mirrors – images are formed in the mirrors. The distance between the first images formed by the mirrors is:

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

- 6** In Young's double-slit experiment, the separation between the two slits is doubled while the slit-screen separation is also doubled. The fringe-width:

1.	is doubled	2.	is four times
3.	remains same	4.	is halved

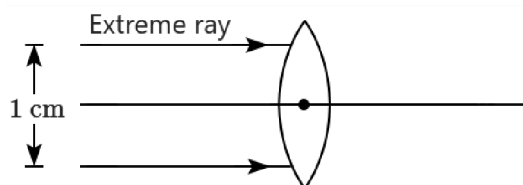
- 7** A narrow parallel beam of light is incident onto a spherical mirror, as shown; the beam making an angle of 2° with the principal axis (PO). The radius, PO , of the mirror is 30 cm.



The reflected beam of light is:

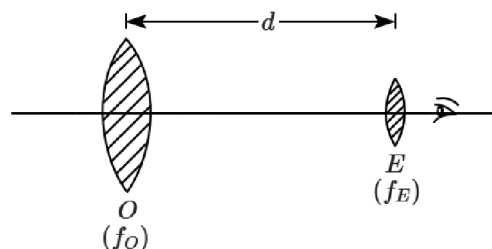
1.	convergent	2.	divergent
3.	parallel	4.	diffuse

- 8** A parallel beam of light falls onto a convex lens of focal length 50 cm, parallel to its principal axis. The width of the beam is 1 cm and the central ray passes through the optical centre undeviated. The extreme ray is deviated by:



1.	0°	2.	0.02°
3.	0.02 radian	4.	0.01 radian

- 9** A refracting telescope consists of an objective lens (O , focal length f_O) and an eyepiece (E , focal length f_E) placed co-axially, with a separation d . The object is at infinity and the image formed by the objective lens is viewed through the eyepiece: the eye being placed just behind the eyepiece, E .



If the final image, seen by the eye, is at infinity, the separation d is given by:

1.	$d = f_O - f_E$	2.	$d = f_O + f_E$
3.	$d = f_O$	4.	$d = \frac{f_O + f_E}{2}$

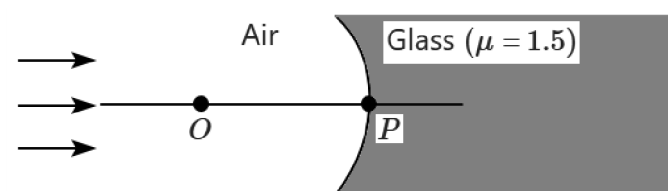
10 A thin hollow equiconvex lens, silvered at the back, converges a beam of light parallel to the principal axis at a distance 0.2 m. When filled with water ($\mu = \frac{4}{3}$), the same beam will be converged at a distance of:

1. 3.75 cm
2. 3.25 cm
3. 0.12 m
4. none of the above

11 The image of an erect object, by a convex mirror, is:

- | | |
|----|------------------------|
| 1. | real and diminished |
| 2. | virtual and diminished |
| 3. | real and magnified |
| 4. | virtual and magnified |

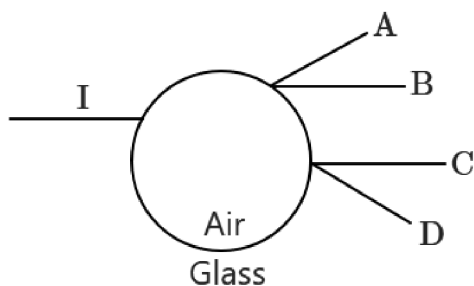
12 A parallel beam of light is incident onto a spherical glass surface (radius, $OP = 30$ cm), parallel to its principal axis OP .



After crossing the air-glass interface, the refracted beam:

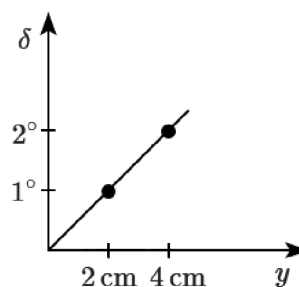
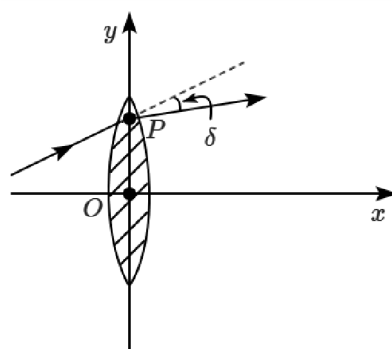
1. is convergent
2. is divergent
3. is parallel
4. is diffuse

13 A spherical air bubble is embedded in glass, and a ray of light (incident ray I) approaches the bubbles as shown in the figure. Which best represents the refracted ray which passes through the bubble?



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

14 A lens is placed as shown in the figure, with the x -axis along the principal axis and the origin at the optical centre. A ray of light incident on the lens at $P(0, y)$ undergoes a deviation δ . A graph of δ vs y is shown:



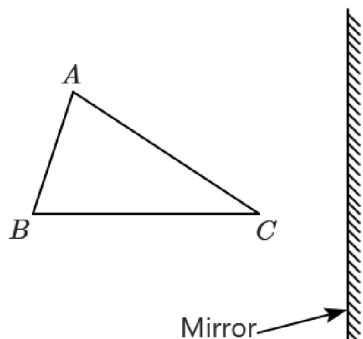
The focal length of the lens is nearly:

1.	2 cm	2.	20 cm
3.	115 cm	4.	230 cm

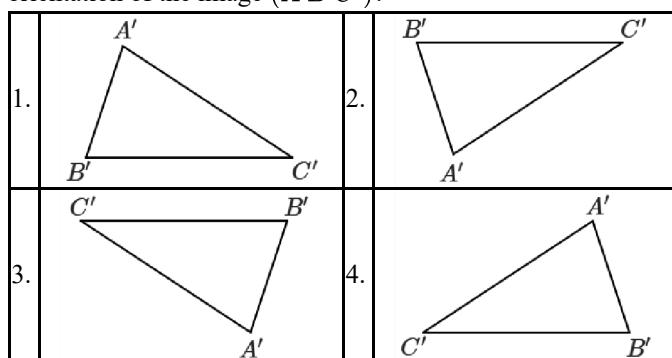
15 In a single-slit diffraction experiment, light of wavelength, $\lambda = 600$ nm is used and the first minimum is observed at an angle, $\theta = 30^\circ$. The width of the slit (a) is:

1.	$1.2 \mu\text{m}$	2.	$1.5 \mu\text{m}$
3.	$1.0 \mu\text{m}$	4.	$1.8 \mu\text{m}$

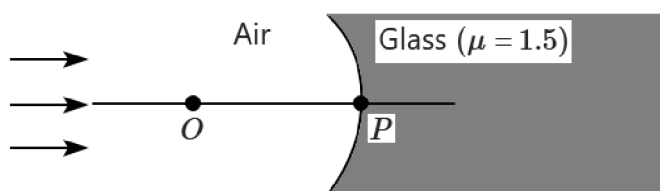
- 16** A plane triangular object (ABC) is placed in front of a mirror, as shown.



Which, of the following diagrams, shows the correct orientation of the image ($A'B'C'$)?



- 17** A parallel beam of light is incident onto a spherical glass surface (radius, $OP = 30$ cm), parallel to its principal axis OP .



The image formed after refraction is located:

1.	between O and P
2.	to the left of O
3.	to the right of P
4.	at the centre O

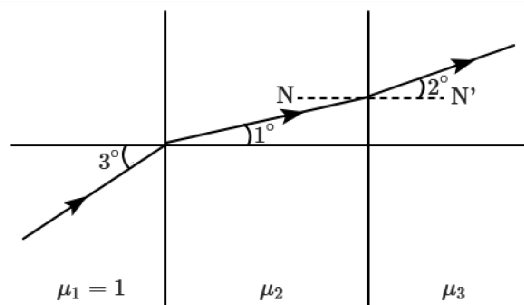
- 18** The sun has a diameter of 1.4×10^6 km and is at a distance of 150×10^6 km from the earth. An image of the sun is formed by a convex lens of focal length 30 cm. The diameter of the image is:

1.	2.8 cm	2.	2.8 mm
3.	1.4 mm	4.	0.7 mm

- 19** If a convex lens and a concave lens, both having the same magnitude of power, are placed back-to-back close to each other – the resulting combination will:

1.	behave as a converging lens, if the convex lens faces incident light
2.	behave as a diverging lens, if the convex lens faces incident light
3.	not converge or diverge parallel beams
4.	shift the direction of incident beam

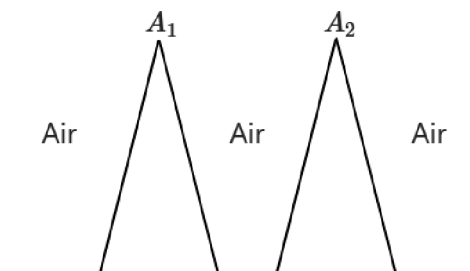
- 20** A ray of light passes through three parallel media, with the angles of incidence and emergence as shown in the figure. The refractive indices of the media are $\mu_1 = 1$, μ_2 and μ_3 .



Then:

1.	$\mu_2 = \frac{1}{3}$, $\mu_3 = \frac{1}{2}$	2.	$\mu_2 = 3$, $\mu_3 = \frac{3}{2}$
3.	$\mu_2 = \frac{1}{3}$, $\mu_3 = \frac{2}{3}$	4.	$\mu_2 = 3$, $\mu_3 = 2$

- 21** Two identical thin prisms are placed, one after the other, with their bases parallel. A ray of light, falling on the first prism, is deviated by 2° on passing through it. The net deviation of this ray, after passing through both prisms, is:

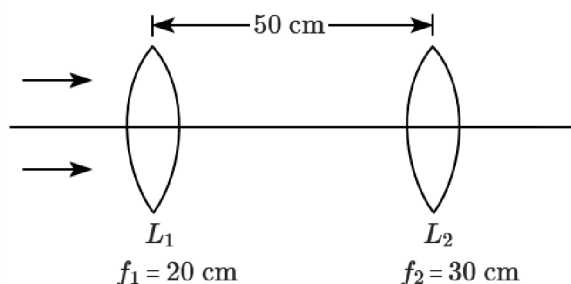


1.	0°	2.	1°
3.	2°	4.	4°

22 If a slab of glass (refractive index = 1.5) were placed on the printed page of a book, the words would appear to be:

- | | |
|----|-----------------------------------|
| 1. | larger in size by a factor of 1.5 |
| 2. | 1.5 times smaller in size |
| 3. | of the same size |
| 4. | inverted, and of the same size |

23 A pair of convex lenses L_1, L_2 having focal lengths 20 cm, 30 cm are placed co-axially, with a separation of 50 cm (Figure).



A parallel beam of light, incident on L_1 parallel to the principal axis, will (after passing through L_1 and L_2):

- | | |
|----|---------------------------------------------------------|
| 1. | emerge parallel to the principal axis |
| 2. | form an image at the focus of L_2 , on its right side |
| 3. | form an image at the focus of L_2 , on its left side |
| 4. | form an image at 60 cm to the right of L_2 |

24 Given below are two statements:

Statement I:	The speed of light does not change after it is reflected from a mirror.
Statement II:	The speed of light depends on the medium in which light is propagating.

- | | |
|----|---------------------------------------------------------------------|
| 1. | Statement I is incorrect and Statement II is correct. |
| 2. | Both Statement I and Statement II are correct. |
| 3. | Both Statement I and Statement II are incorrect. |
| 4. | Statement I is correct and Statement II is incorrect. |

25 Given below are two statements:

Assertion (A):	When light undergoes total internal reflection, the laws of reflection do not apply.
Reason (R):	During total internal reflection, light is incident at an angle greater than the critical angle and there is no refracted ray.

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

26 The component of the velocity of a ray of light along the reflecting surface, while undergoing reflection at the surface of a denser medium:

- | | | | |
|----|------------------|----|------------------|
| 1. | increases | 2. | decreases |
| 3. | remains the same | 4. | reverses in sign |

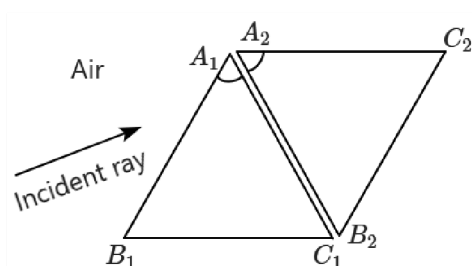
27 A double convex lens with glass of refractive index 1.5 has both faces having the same radius of curvature. If the focal length of the lens is 20 cm, the radius of curvature is:

- | | | | |
|----|-------|----|-------|
| 1. | 40 cm | 2. | 30 cm |
| 3. | 20 cm | 4. | 10 cm |

28 If a convex lens made of glass ($\mu_{\text{glass}} = 1.5$) is dipped in honey ($\mu_{\text{honey}} = 1.7$) then it behaves:

- | | |
|----|------------------------------------------------|
| 1. | as a convergent lens with larger focal length |
| 2. | as a convergent lens with shorter focal length |
| 3. | as a divergent lens |
| 4. | as a mirror |

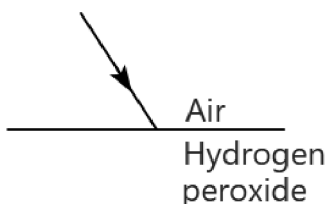
- 29** Two equilateral prisms, made of glass, are placed back-to-back so that the emerging ray from A_1B_1 enters the surface A_2B_2 . The first prism is placed at minimum deviation, and this minimum deviation is 60° .



The refractive index of the glass is:

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

- 30** A light beam of frequency 1.4×10^4 Hz in air encounters a surface of hydrogen peroxide (index of refraction $=\sqrt{2}$) stored in a vessel (as shown below).



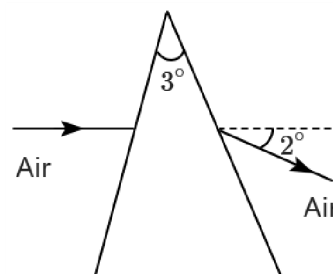
What is the critical angle for this encounter?

1.	30°	2.	45°
3.	60°	4.	none of the above

- 31** The critical angle for diamond (refractive index, $\mu = 2$) is:

1.	60°	2.	45°
3.	30°	4.	nearly 20°

- 32** A ray of light, incident on a thin prism (angle $= 3^\circ$), emerges deviated by 2° . The refractive index, of the material of the prism, is:



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

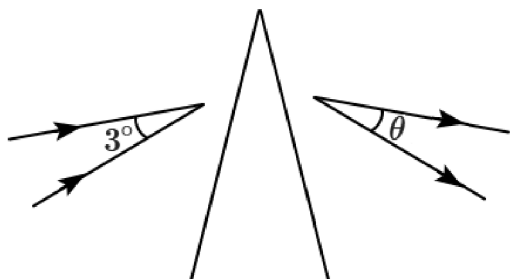
- 33** Two transparent media A and B are separated by a plane boundary. The speed of light in those media are 1.5×10^8 m/s and 2.0×10^8 m/s, respectively. The critical angle for a ray of light for these two media is:

1.	$\tan^{-1}(0.750)$	2.	$\sin^{-1}(0.500)$
3.	$\sin^{-1}(0.750)$	4.	$\tan^{-1}(0.500)$

- 34** If an object is placed under water (refractive index $= \frac{4}{3}$) at a depth d below the surface, and viewed from above, it would appear to be at a depth:

- d
- $\frac{d}{3}$
- $\frac{3d}{4}$
- $\frac{4d}{3}$

- 35** Two rays of light making an angle of 3° with each other, are incident onto a thin prism, which introduces a deviation of 3° to the upper ray. The angle (θ) between the emerging rays will be:



1. 0°
2. 3°
3. 6°
4. 1.5°

PHYSICS - SECTION B

- 36** When a thin layer of petrol floats on water and is observed under bright sunlight, colours are observed. This is due to:

1. refraction
2. luminescence
3. radioactivity
4. interference

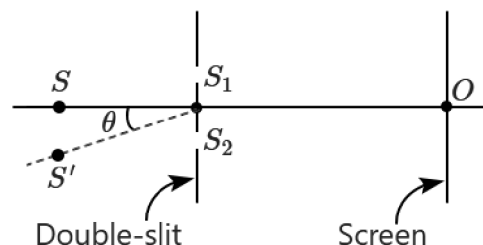
- 37** Two sources S_1, S_2 separated by a distance d , interfere by sending light waves along the line S_1S_2 . The two sources vibrate in phase with each other. The wavelength of light is λ . The separation d , for which the two sources produce a maximum (along S_1S_2), equals (choose the correct option among the given ones):

1. $\frac{3\lambda}{2}$
2. $\frac{5\lambda}{4}$
3. 6λ
4. $\frac{2\lambda}{3}$

- 38** In a standard double-slit experiment on interference, the vibrations emerging from the two slits are found to be in opposite phase. The fringe width is δ . The first maximum on the screen occurs at a distance, from the centre, of:

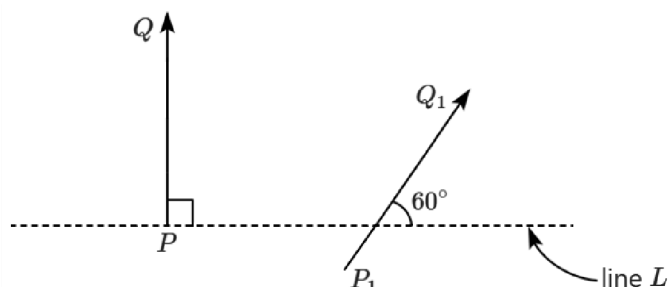
1. $\frac{\delta}{2}$
2. δ
3. $\frac{3\delta}{2}$
4. zero

- 39** In a standard Young's double-slit experiment, the primary source S is moved slightly down to S' . It is observed that the central maximum has moved to the previous position of the 1st minimum. If the angle through which the source has been moved is θ (see figure), and the wavelength of light used is λ , the distance S_1S_2 is:



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

- 40** A simple linear object (PQ) undergoes reflection in a plane mirror, and the image (P_1Q_1) is shown. The angles made by PQ and P_1Q_1 with the line L are 90° and 60° respectively.



The mirror must make an angle, with the line L , of:

1.	30°	2.	75°
3.	15°	4.	-30°

- 41** A thin-walled spherical glass vessel is completely filled with water, and within the water swims a small fish. A person, outside, views this fish when it is motionless – floating at the centre of curvature of the vessel. ($\mu_{\text{glass}} = 1.5, \mu_{\text{water}} = \frac{4}{3}$) The image of the fish would appear to be (relative to the viewer):

1.	closer than the centre of curvature
2.	farther than the centre of curvature
3.	at the centre of curvature
4.	at infinity

42 Given below are two statements:


Statement I:	If white light is used in a standard Young's double-slit experiment, then coloured fringes are formed on the screen.
Statement II:	If white light is used in a standard Young's double-slit experiment, then the central fringe remains white.

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

43 Two polarisers P_1 and P_2 are placed such that the angle between their transmission axis is 45° . Ordinary light is passed through P_1 , I_1 intensity is observed and when this light is passed through P_2 , I_2 intensity is observed. The ratio of $\frac{I_1}{I_2}$ is:

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

44 Match Column-I with Column-II.

Column-I		Column-II	
A.	Light diverging from a point source	P.	plane wavefront
B.	Light emerging from a convex lens when a point source is placed at its focus	Q.	spherical wavefront
C.	Light reflected from a concave mirror when a point source is placed at its focus	R.	cylindrical wavefront
D.		S.	concave right wavefront

Codes:

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

45 Two coherent waves of amplitude 8 cm each are superimposed on one another. If the amplitude of a resultant wave is 8 cm, then the phase difference between two waves is:

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

46 Given below are two statements:

Assertion (A):	Two separate lamps cannot produce a stable, visible interference pattern on the screen, even if they emit monochromatic light of identical wavelengths.
Reason (R):	This happens because any two ordinary lamps are not coherent, even though they emit light of the same wavelength.

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

47 A parallel beam of light of wavelength λ is incident normally on a narrow slit. A diffraction pattern is formed on a screen placed perpendicular to the direction of the incident beam. At the second minimum of the diffraction pattern, the phase difference between the rays coming from the two edges of the slit is:

1.	2π	2.	3π
3.	4π	4.	$\pi\lambda$

48 Red light and violet light are simultaneously incident onto a convex lens, made of glass. The refractive index of glass for red light (μ_R) is less than that for violet light (μ_V). The focal length of the lens is:

1.	greater for red than for violet.
2.	greater for violet than for red.
3.	the same for violet and red.
4.	undefined, because the two colours of light interfere with each other.

49 Wavelengths of light, $\lambda_1 = 700$ nm and $\lambda_2 = 400$ nm are used in a standard double-slit experiment. Both the slits emit light, in phase with each other. If the fringe widths corresponding to λ_1, λ_2 are δ_1, δ_2 then:

1.	$\delta_1 = \delta_2$	2.	$\delta_1 = 2\delta_2$
3.	$2\delta_1 < \delta_2$	4.	$\delta_1 < 2\delta_2$

50 Wavelengths of light, $\lambda_1 = 700 \text{ nm}$ and $\lambda_2 = 400 \text{ nm}$ are used in a standard double-slit experiment. Both the slits emit light, in phase with each other.

If n_1^{th} maximum corresponding to λ_1 coincides with n_2^{th} maximum corresponding to λ_2 , then, which are the possible values of n_1 and n_2 ?

1.	$n_1 = 1, n_2 = 1$
2.	$n_1 = 2, n_2 = 3.5$
3.	$n_1 = 7, n_2 = 4$
4.	$n_1 = 4, n_2 = 7$

CHEMISTRY - SECTION A

51 Freon (refrigerant gas) can be represented by:

1. $\text{CF}_2 = \text{CF}_2$
2. CH_2F_2
3. CCl_2F_2
4. CF_4

52 The correct statements among the following are:

a.	Enantiomers are non-superimposable mirror images.
b.	The process of converting an enantiomer into a racemic mixture is known as racemization.
c.	Enantiomers possess different physical properties.
d.	The reactivity of the alkyl halide for $\text{S}_{\text{N}}2$ is $\text{R-I} > \text{R-Br} > \text{R-Cl} > \text{R-F}$.

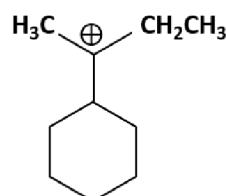
1. Only b and d are correct.
2. Only a, b, and d are correct.
3. Only c and d are correct.
4. Only a and b are correct.

53

Statement I:	DDT (Dichloro-diphenyl-trichloroethane ($\text{C}_{14}\text{H}_9\text{Cl}_5$)) is a herbicide.
Statement II:	Triiodomethane (Iodoform) was used earlier as an antiseptic, but the antiseptic properties are due to the liberation of free iodine and not to iodoform itself.

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

54 The total number of contributing structures showing hyperconjugation (involving C-H bonds) for the given carbocation is:



1. 8
2. 7
3. 6
4. 9

55 The correct structure of 4-Methylhex-5-en-3-ol is:

1.		2.	
3.		4.	

56

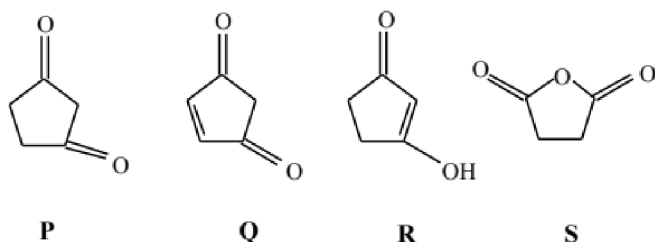
In Williamson's synthesis, ethoxy ethane is prepared by:

1. Heating sodium ethoxide with ethyl bromide.
2. Passing ethanol over heated alumina.
3. Treating ethyl alcohol with an excess of conc. H_2SO_4 at 430-440 K.
4. Heating ethanol with dry Ag_2O

57 A pair of carbocations that has a more stable second carbocation than the first is :

1.	$\text{CH}_2 = \overset{+}{\text{CH}}\text{CH}_2$ and $\text{CH}_2 = \text{CH}\overset{+}{\text{CH}}_2\text{CH}_2$
2.	$\text{CH}_3\text{NH}\overset{+}{\text{CH}}_2$ and $\overset{+}{\text{CH}}_2\text{OH}$
3.	$\text{CH}_3\overset{+}{\text{CH}}\text{CH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}_2\overset{+}{\text{CH}}\text{CH}_2\text{CH}_3$
4.	$\text{CH}_3\text{OCH}_2\overset{+}{\text{CH}}_2$ and $\text{CH}_3\text{O}\overset{+}{\text{CH}}_2$

58 The proper relationship for the four chemicals P, Q, R, and S that are displayed below is:

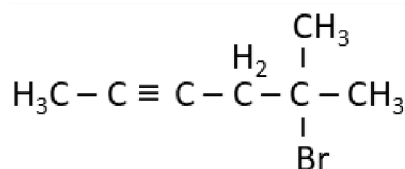


1. P and Q are tautomers.
2. P and R are tautomers.
3. P and S are isomers.
4. Q and R are resonance structures.

59 The correct match among the following is :

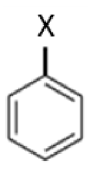
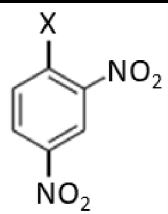
1. Hexane-2-one and Hexane-3-one :	Position isomers.
2. Pentane - 3- one and Pentane-2-one:	Functional isomers.
3. 2-Pentene and 1-Pentene:	Metamers.
4. Pentanoic acid and Hexanoic acid:	Functional isomers.

60 IUPAC name for the given alkyne is :



1. 5-Bromo-2-heptyne
2. 3-Bromo-5-heptyne
3. 5-Bromo-5-methyl-2-hexyne
4. 2-Bromo-2-methyl-5-hexyne

61 The correct order of increasing C-X bond reactivity toward nucleophiles among the following is:

I		II	
III	$(\text{CH}_3)_3\text{C}-\text{X}$	IV	$(\text{CH}_3)_2\text{CH}-\text{X}$

1.	$\text{I} < \text{II} < \text{IV} < \text{III}$	2.	$\text{II} < \text{III} < \text{I} < \text{IV}$
3.	$\text{IV} < \text{III} < \text{I} < \text{II}$	4.	$\text{III} < \text{II} < \text{I} < \text{IV}$

62 The incorrect order of stability of the compounds among the following is:

1.	$\text{PhCH}_2\text{Br} > \text{PhCHBrCH}_3 > \text{PhCBr}(\text{CH}_3)_2$ ($\text{S}_{\text{N}}1$)
2.	$\text{R}-\text{I} > \text{R}-\text{Br} > \text{R}-\text{Cl}$ ($\text{S}_{\text{N}}2$)
3.	$\text{CH}_2=\text{CHCl} < \text{CH}_2=\text{CHCH}_2\text{Cl} < \text{PhCH}_2\text{Cl}$ ($\text{S}_{\text{N}}1$)
4.	$\text{R}-\text{Cl} < \text{R}-\text{Br} < \text{R}-\text{I}$ ($\text{S}_{\text{N}}1$)

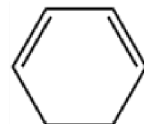
63 The incorrect statement regarding enantiomers, among the following, is:

1. Enantiomers have an identical refractive index.
2. Enantiomers have the same chemical properties.
3. Enantiomers are superimposable mirror images of each other.
4. Enantiomers have equal but opposite optical rotation.

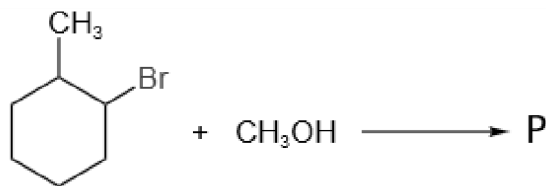
64 Compound, among the following, that cannot have enantiomeric form is:

1. 3-Chloro-1-butene
2. 1,3,4-Trichlorocyclohexane
3. trans-1, 4-Dichlorocyclohexane
4. 4-Chloro-1-cyclohexene

65 A compound among the following that is not a conjugate system:

1.	$\text{CH}_2=\text{CHCl}$	2.	$\text{CH}_2=\text{CHCHO}$
3.	$\text{CH}_3\text{CH}=\text{CH}_2$	4.	

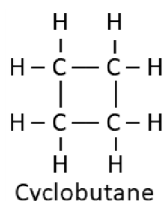
66



The major product P in the reaction given above is:

1.		2.	
3.		4.	

67 A constitutional isomer of cyclobutane among the following is:

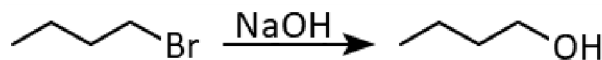


1.		2.	
3.		4.	

68 Ethyl bromide is converted to Ethyl iodide using sodium iodide and dry acetone. This reaction is known as:

1. Swarts reaction
2. Finkelstein reaction
3. Sandmeyer reaction
4. Stephen reaction

69 The incorrect statement regarding the following substitution reaction is:

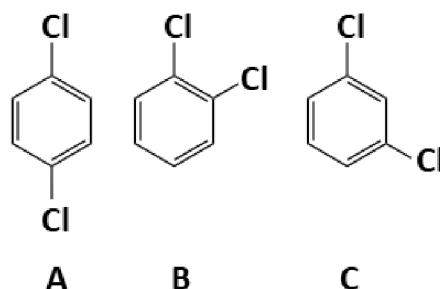


1. The process is bimolecular.
2. Increasing the concentration of hydroxide will cause an increase in the rate of reaction.
3. The use of a polar aprotic solvent will enhance the rate.
4. The reaction proceeds via a carbocation intermediate.

70 The decreasing order of dipole moment among the following is:

1. $\text{CH}_3\text{Cl} > \text{CH}_3\text{Br} > \text{CH}_3\text{F}$
2. $\text{CH}_3\text{Cl} > \text{CH}_3\text{F} > \text{CH}_3\text{Br}$
3. $\text{CH}_3\text{Br} > \text{CH}_3\text{Cl} > \text{CH}_3\text{F}$
4. $\text{CH}_3\text{Br} > \text{CH}_3\text{F} > \text{CH}_3\text{Cl}$

71 The correct order of melting point for the given compounds is:



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

72 The example of dehydrohalogenation reaction among the following is:

1.	$\text{CH}_3 - \text{CH}_2 - \text{OH} \xrightarrow[\Delta]{\text{Cu}} \text{CH}_3\text{CHO}$
2.	$\text{CH}_3 - \text{CH}_2\text{Br} \xrightarrow[\Delta]{\text{Base}} \text{CH}_2 = \text{CH}_2$
3.	$\text{Br} - \text{C}(\text{H}_2) - \text{C}(\text{H}_2) - \text{C}(\text{H}_2) - \text{Br} \xrightarrow{\text{Zn}} \triangle$
4.	$\text{CH}_2 = \text{CH}_2 \xrightarrow[\text{Pt}]{\text{H}_2} \text{CH}_3 - \text{CH}_3$

73 An aromatic compound among the following is:

1.		2.	
3.		4.	

74 0.5 gram of an organic compound gives 0.4 gram of dry AgBr ppt.

The percentage of Br in the given organic compound is:
[At. Wt. of Ag=108, At. Wt. of Br=80]

1. 45 %
2. 34 %
3. 25 %
4. 52 %

75 The structure that does not represent 2-Methylpentane is :

1.		2.	
3.		4.	

76

Assertion (A):	Aryl halides and vinyl halides are less reactive than alkyl halides and are not easily hydrolyzed.
Reason (R):	The cleavage bond in aryl halides acquires a double bond character due to resonance, which makes its cleavage difficult.

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.

77

An alcohol gave Lucas test in about 5 minutes. When the alcohol was treated with hot concentrated H_2SO_4 , it gave an alkene of molecular formula C_4H_8 which on ozonolysis gave $\text{C}_2\text{H}_4\text{O}$. The structure of the alcohol is:

1. $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_3$
2. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
3. $\text{CH}_3\text{CHOHCH}_2\text{CH}_3$
4. $(\text{CH}_3)_3\text{C-OH}$

78

$\text{CH}_3\text{CH}_2\text{CHCl}_2$ upon reaction with NaNH_2 gives:

1.	$\text{H}_3\text{C}-\text{C}=\text{CH}_2$ H	2.	$\text{H}_3\text{C}-\text{C}\equiv\text{CH}$
3.	$\text{CH}_3\text{CH}_2\text{CH}(\text{NH}_2)_2$	4.	$\text{CH}_3\text{CH}_2\text{CH}(\text{Cl})(\text{NH}_2)$

79

Assertion (A):	A reaction of 2-Bromo-2-methyl propane with sodium methoxide gives 2-Methylpropene.
Reason (R):	Alkoxides are nucleophiles.

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.	(A) is False but (R) is True.

80

Assertion (A):	Grignard's reagent reaction occurs in dry ether.
Reason (R):	In the presence of water, Grignard's reagent gets destroyed.

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.

81

Assertion (A):	tert-Butyl methyl ether on treatment with HI at 100 °C gives a mixture of Methyl iodide and tert-Butyl alcohol.
Reason (R):	This reaction occurs via S _N 2 mechanism.

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

82 Which of the following halides undergoes S_N1 reaction at the fastest rate?

1.		2.	
3.		4.	

83

The incorrect matches among the following are:

a.		= chiral
b.		= chiral
c.		= chiral
d.		= chiral

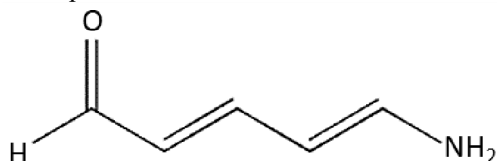
1.	a, b	2.	b, c, d
3.	c, d	4.	c, b

84

The most acidic compound among the following is:

1.		2.	
3.		4.	

85 The correct stability order of the resonating structure of the given compound is:

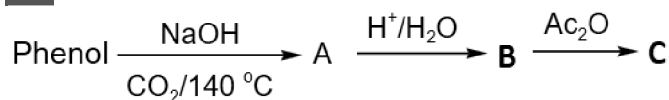


A.	
B.	
C.	

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

CHEMISTRY - SECTION B

86



In the above reaction the end product 'C' is:

1. Salicylaldehyde
2. Salicylic acid
3. Phenyl acetate
4. Aspirin

87 Phenol reacts with chloroform in the presence of sodium hydroxide to form salicylaldehyde.

This reaction is known as:

1. Kolbe's reaction
2. Reimer-Tiemann reaction
3. Stephan reaction
4. Etard reaction

88

Assertion (A):	The ease of dehydration with H_2SO_4 follows the following order:
Reason (R):	The more stable the carbocation, the easier the dehydration in an acidic medium.

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.

89

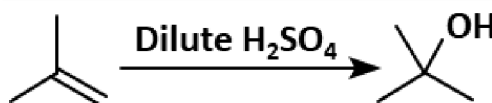
I	The product of the reaction of phenol with bromine depends on the nature of the solvent.
II	The reaction of phenol with bromine in CHCl_3 gives a monosubstituted bromo derivative whereas the reaction of phenol with bromine water yields a trisubstituted bromo derivative of phenol.

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

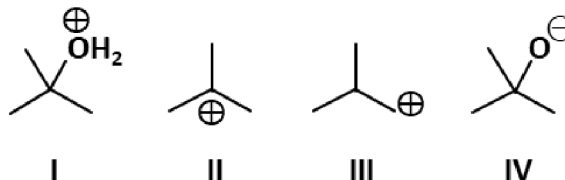
1.	I is correct and II is incorrect
2.	I is incorrect and II is correct
3.	Both I and II are correct
4.	Both I and II are incorrect

90

Consider the following acid-catalyzed hydration reaction:



Which of the following ion(s) is/are intermediates in the accepted mechanism for this process?

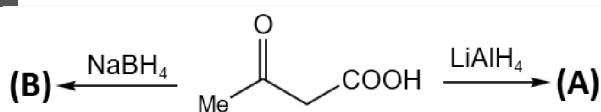


1. I, II and III
2. I and II
3. None of the above.
4. Only IV

91 The most suitable method for the synthesis of the compound *n*-Propyl tert-butyl ether is:

1. tert-Butanol with sodium followed by 1-Bromopropane.
2. tert-Butanol with 1-Propene in the presence of conc. sulphuric acid.
3. 1-Propanol with sodium followed by tert-Butyl bromide.
4. tert-Butanol with 1-Propene at high temperature in the presence of conc. sulphuric acid.

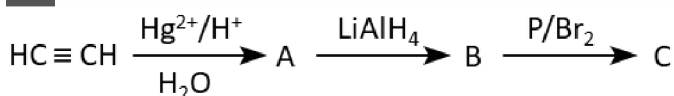
92



The products (A) and (B) in the above reaction, respectively, are:

	A	B
1.		
2.		
3.		
4.		

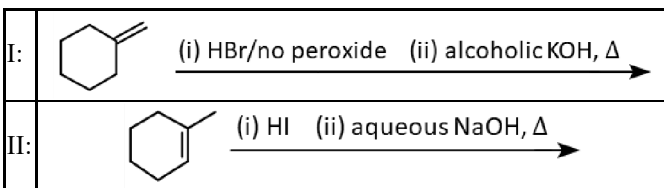
93



The final product C in the above sequence of reactions is:

1.	$\text{CH}_3\text{CH}_2\text{OH}$	2.	$\text{CH}_3\text{CH}_2-\text{Br}$
3.	$\text{BrCH}_2\text{CH}_2\text{Br}$	4.	

94 Two processes are given below:



The processes that do not produce 1-Methylcyclohexanol is/are

1. Both I and II
2. Only I
3. Only II
4. Both I and II produce 1-Methylcyclohexanol

95

- A. Phenol
B. p-Cresol
C. m-Nitrophenol
D. p-Nitrophenol

The correct order of acidic strength of the above compounds is:

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

96

Match the reagents (List-I) with the products (List-II) obtained from phenol:

	List-I		List-II
(A)	(i) NaOH (ii) CO ₂ (iii) H ⁺	(I)	Benzoquinone
(B)	(i) Aqueous NaOH + CHCl ₃ (ii) H ⁺	(II)	Benzene
(C)	Zn dust, Δ	(III)	Salicylaldehyde
(D)	Na ₂ Cr ₂ O ₇ , H ₂ SO ₄	(IV)	Salicylic acid

Choose the correct answer from the options given below:

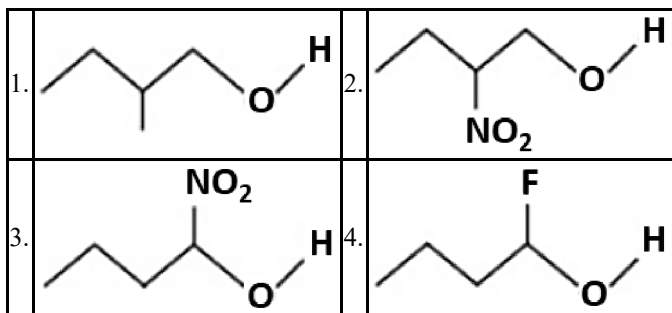
	(A)	(B)	(C)	(D)
1.	(III)	(IV)	(I)	(II)
2.	(II)	(I)	(IV)	(III)
3.	(IV)	(III)	(II)	(I)
4.	(IV)	(II)	(I)	(III)

97

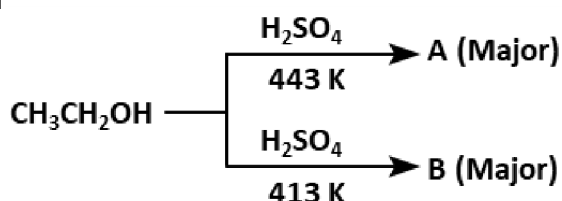
The incorrect statement among the following is:

1. Tertiary alcohols readily react with conc. HCl in the presence of zinc chloride.
2. The order of reactivity of alcohols with a given halo acid is 1° > 2° > 3°.
3. The IUPAC name of glycerol is Propane-1,2,3-triol.
4. Oxidation of phenol with chromic acid produces a conjugated diketone known as benzoquinone.

98 The most acidic hydroxyl proton among the following structures is:



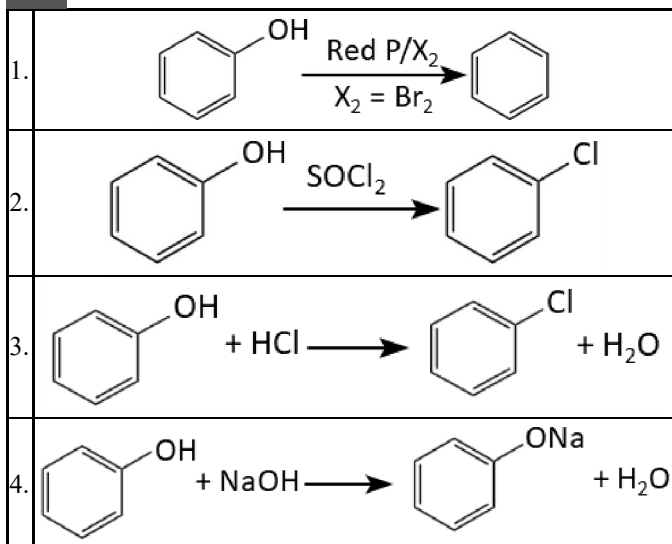
99 Consider the following reactions.



Major products, A and B, are:

1. $\text{CH}_2=\text{CH}_2$ and $\text{CH}_2=\text{CH}_2$
2. $\text{CH}_2=\text{CH}_2$ and $\text{CH}_3\text{CH}_2\text{-O-CH}_2\text{-CH}_3$
3. $\text{CH}_3\text{-CH}_2\text{-O-CH}_3$ and $\text{CH}_3\text{-O-CH}_3$
4. $\text{CH}_3\text{CH}_2\text{-O-CH}_2\text{CH}_3$ and $\text{CH}_2=\text{CH}_2$

100 The feasible reaction among the following is:



BIOLOGY I - SECTION A

101 Consider the two statements:

Assertion (A):	Use of chemical fertilisers in agriculture worldwide should be avoided.
Reason (R):	Chemical fertilisers, contrary to popular belief, are ineffective and do not add any nutrients to the soil.

1.	Both (A) and (R) are True and (R) correctly explains the (A).
2.	(A) is True; (R) is False.
3.	(A) is False; (R) is True.
4.	Both (A) and (R) are True but (R) does not correctly explain the (A).

102 In order to break the cell open to release DNA along with other macromolecules such as RNA, proteins, polysaccharides and also lipids, a bacterial cell must initially be treated with:

1.	DNase	2.	Proteases
3.	Lysozyme	4.	Cellulase

103 The first restriction endonuclease, whose functioning depended on a specific DNA nucleotide sequence, isolated and characterised was:

1. EcoR I
2. Hind II
3. Pst I
4. BamH I

104 A piece of DNA, which is somehow transferred into an alien organism, most likely:

1.	would not be able to multiply itself in the progeny cells of the organism.
2.	would be transcribed but the transcript will not be translated.
3.	would express as different proteins from the organism it was derived from.
4.	would be invariably destroyed by the cytosolic endonucleases in eukaryotic cells.

105 'Toddy', a traditional drink in some parts of southern India, is made by fermenting sap from:

1.	Palms	2.	Soybean
3.	Potato	4.	Barley

106 The genetic material of all organisms without exception is:

1. DNA
2. RNA
3. Nucleic acid
4. Nucleotide

107 Consider the two statements:

Assertion (A):	The use of baculovirus as biocontrol agents is especially desirable when an ecologically sensitive area is being treated.
Reason (R):	Baculoviruses are species-specific, narrow spectrum insecticides.

1. Both (A) and (R) are True and (R) correctly explains the (A).
2. (A) is True; (R) is False
3. (A) is False; (R) is False
4. Both (A) and (R) are True but (R) does not correctly explain the (A)

108 Agarose is:

1. a polysaccharide obtained from certain red alga.
2. a polysaccharide obtained from certain brown alga.
3. a polypeptide obtained from certain red alga.
4. a polypeptide obtained from certain brown alga.

109 Cyanobacteria:

I:	serve as an important biofertilizer in paddy fields.
II:	add organic matter to the soil and increase its fertility.

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

110 The large holes in 'Swiss cheese' are due to production of a large amount of CO₂ by a bacterium named:

1. *Staphylococcus aureus*
2. *Propionibacterium shermanii*
3. *Penicillium roqueforti*
4. *Bacillus subtilis*

111 Which of the following can replicate within bacterial cells independent of the control of chromosomal DNA?

- I. Plasmid
- II. Phage DNA
1. Only I
2. Only II
3. Both I and II
4. Neither I nor II

112 A recombinant DNA is the one that is:

1. present on the non-sister chromatids of homologous chromosomes after recombination in meiosis.
2. results from the exchange of segments between heterologous chromosomes.
3. is composed of DNA from different sources/genomes.
4. is synthesised in lab in a template independent manner.

113 Consider the given two statements:

Assertion (A):	In order to force bacteria to take up the plasmid, the bacterial cells must first be made 'competent' to take up DNA.
Reason (R):	All bacterial cells already have plasmids and will not normally pick up another.

1. Both (A) and (R) are True and (R) correctly explains the (A).
2. (A) is True; (R) is False
3. (A) is False; (R) is False
4. Both (A) and (R) are True but (R) does not correctly explain the (A)

114 All the following will be true for native plasmids seen in bacterial cells except:

1. they are circular
2. they are chromosomal DNA molecules
3. they replicate autonomously
4. they are double stranded

115 A plasmid has two genes providing resistance to antibiotics A and B respectively. A foreign DNA has been inserted within the gene for resistance to antibiotic A:

I.	Non-Transformants will not survive in a medium containing antibiotic A and in a medium containing antibiotic B.
II.	Recombinant transformants will survive in a medium containing antibiotic B but not in a medium containing antibiotic A.
III.	Non-recombinant transformants will survive in a medium containing antibiotic A and in a medium containing antibiotic B.

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

116 Traditional hybridisation procedure used in plant and animal breeding:

- | | |
|----|-----------------------------------------------------------------------------------------------------|
| 1. | is not useful in production of improved variants. |
| 2. | preserves the genetic information in populations. |
| 3. | is a very fast process to produce large number of progeny in a very short time. |
| 4. | very often leads to inclusion and multiplication of undesirable genes along with the desired genes. |

117 Consider the two statements:

Assertion (A):	Cyclosporin produced by <i>Trichoderma</i> has been commercialised as blood-cholesterol lowering agents.
Reason (R):	Cyclosporin acts by competitively inhibiting the enzyme responsible for synthesis of cholesterol.

- | | |
|----|-----------------------------------------------------------------------|
| 1. | Both (A) and (R) are True and (R) correctly explains the (A). |
| 2. | (A) is True; (R) is False |
| 3. | (A) is False; (R) is False |
| 4. | Both (A) and (R) are True but (R) does not correctly explain the (A). |

118 Microbes can be used as biocontrol agents. The Ladybird, and Dragonflies are useful to get rid, respectively, of:

1. Jassids and Dipterans
2. Aphids and Mosquitoes
3. Corn borers and Bollworms
4. Roundworms and Fungal spores

119 Methanogens:

I:	are commonly found in the anaerobic sludge during sewage treatment.
II:	are also present in the rumen (a part of stomach) of cattle.

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

120 Identify the incorrect statement:

- | | |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Antibiotics are chemical substances, which are produced by some microbes and can kill or retard the growth of other (disease-causing) microbes. |
| 2. | Penicillin was the first antibiotic to be discovered, and it was a chance discovery. |
| 3. | Alexander Fleming while working on Staphylococci bacteria, discovered Penicillin in the mould <i>Penicillium chrysogenum</i> . |
| 4. | Penicillin's full potential as an effective antibiotic was established much later by Ernest Chain and Howard Florey. |

121 Any piece of DNA can be made to replicate within the host cells if it is linked to a/an:

1. Enzyme
2. Ori sequence
3. promoter sequence
4. Centromere

122 Techniques to alter the chemistry of genetic material (DNA and RNA), to introduce these into host organisms and thus change the phenotype of the host organism constitute:

1. Biotechnology
2. Genetic engineering
3. Bioprocess engineering
4. Genomics

123 *Agrobacterium tumefaciens*:

- | | |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I: | is a pathogen of several monocot plants |
| II: | is able to deliver a piece of DNA known as 'T-DNA' to transform normal plant cells into a tumor and direct these tumor cells to produce the chemicals required by the pathogen. |

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

124 The DNA fragments separated by gel electrophoresis can be visualised only after staining the DNA with which of the following compound?

1. ethidium bromide
2. methylene blue
3. Janus green
4. acid Fuchsin

125 Each restriction endonuclease:

I:	binds to the DNA after identifying its specific recognition sequence
II:	cuts one of the two strands of the double helix at random points in their sugar-phosphate backbones

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

126 In the vector pBR322, you can ligate a foreign DNA at the:

1.	BamH I site of tetracycline resistance gene in the vector pBR32
2.	Sal I site of ampicillin resistance gene in the vector pBR322.
3.	Pst I site of tetracycline resistance gene in the vector pBR322.
4.	EcoR I site of ampicillin resistance gene in the vector pBR322

127 The cut out 'gene of interest' from the source DNA and the cut vector with space can be joined together using:

1. DNA polymerase
2. DNA ligase
3. Restriction endonuclease
4. DNA helicase

128 When lactic acid bacteria (LAB) is used for converting milk to curd, it improves the nutritional quality of curd by increasing:

1. Iron content of the curd
2. Vitamin B₁₂ content of the curd
3. Vitamin D content of the curd
4. Protein content of the curd

129 An interesting example of fungus that is also used as a fungicide is:

1. *Trichoderma harzianum*
2. *Botrytis cinerea*
3. *Fusarium graminearum*
4. *Penicillium camemberti*

130 Which of the following is the correct representation of the recognition sequence of EcoR I?

1.	
2.	
3.	
4.	

131 Which of the following microbes is used for the commercial production of citric acid?

1. *Aspergillus niger*
2. *Clostridium butylicum*
3. *Acetobacter aceti*
4. *Lactobacillus*

132 By inventing recombinant-DNA technology, which of the following duo jump-started the biotechnology industry?

1. Paul Berg and Nathans
2. Herbert Boyer and Stanley Cohen
3. Werner Arber and Matthew Meselson
4. Werner Arber and Hamilton O. Smith

133 Consider the given two statements:

Statement I:	BOD is a measure of the organic matter present in the water.
Statement II:	BOD refers to the amount of the oxygen that would be consumed if all the organic matter in one litre of water were oxidised by bacteria.

1.	Statement I is correct; Statement II is incorrect
2.	Statement I is incorrect; Statement II is incorrect
3.	Statement I is correct; Statement II is correct
4.	Statement I is incorrect; Statement II is correct

134 Which of the following, if present in a vector, helps in identifying and eliminating non-transformants and selectively permitting the growth of the transformants?

1. ROP
2. Selectable marker
3. MCS
4. Enhancers and repressors

135 Consider the given two statements:

Assertion (A):	In agar gel electrophoresis, DNA moves towards the positive electrode (anode).
Reason (R):	DNA is a hydrophilic molecule

1. Both (A) and (R) are True and (R) correctly explains the (A).
2. (A) is True; (R) is False
3. (A) is False; (R) is False
4. Both (A) and (R) are True but (R) does not correctly explain the (A)

BIOLOGY I - SECTION B

136 In a continuous culture system:

I:	the used medium is drained out from one side while fresh medium is added from the other.
II:	cells are maintained in their physiologically most active log/exponential phase.

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

137 How many of the given statements are correct?

I:	Bioreactors can be thought of as vessels in which raw materials are biologically converted into specific products, individual enzymes, etc., using microbial plant, animal or human cells.
II:	A bioreactor provides the optimal conditions for achieving the desired product by providing optimum growth conditions (temperature, pH, substrate, salts, vitamins, oxygen).
III:	The most commonly used bioreactors are of stirring type.

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

138 Root knot of tobacco is caused due to an infection by:

1. *Radopholus similis*
2. *Meloidogyne incognita*
3. *Globodera rostochiensis*
4. *Ditylenchus dipsaci*

139 Consider the given two statements:

Assertion (A):	Toxic insecticidal proteins present in protein crystals formed by <i>B. thuringiensis</i> do not kill the <i>Bacillus</i> .
Reason (R):	The Bt toxin protein exists as inactive protoxin in the <i>Bacillus</i> .

1. Both (A) and (R) are True and (R) correctly explains the (A).
2. (A) is True; (R) is False
3. (A) is False; (R) is False
4. Both (A) and (R) are True but (R) does not correctly explain the (A).

140 In a stirred-tank reactor, the stirrer facilitates:

I:	even mixing of nutrients in the medium
II:	oxygen availability throughout the bioreactor

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

141 Which US pharma giant introduced human insulin – the first recombinant therapeutic product approved for human use?

1. Johnson & Johnson
2. Merck & Co Inc
3. Eli Lilly and Co
4. Bristol-Myers Squibb Co

142 Some strains of *Bacillus thuringiensis* produce proteins that kill certain insects such as:

I:	lepidopterans including tobacco budworm and armyworm
II:	coleopterans including beetles
III:	dipterans including flies and mosquitoes

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

143 Genetic modification has:

I:	made crops more tolerant to abiotic stresses (cold, drought, salt, heat).
II:	reduced reliance on chemical pesticides (pest-resistant crops).
III:	enhanced nutritional value of food, e.g., golden rice, i.e., Vitamin 'A' enriched rice.
IV:	enabled plants to fix atmospheric nitrogen on their own.

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

144 Regarding the possible ways to introduce alien DNA into host cells:

I.	In a method known as micro-injection, recombinant DNA is directly injected into the nucleus of an animal cell.
II.	In another method, suitable for plants, cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA in a method known as biolistics or gene gun.
III.	A method uses 'disarmed pathogen' vectors, which when allowed to infect the cell, transfer the recombinant DNA into the host.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. **I, II** and **III** are correct

145 RNA interference involves silencing of a specific mRNA by a complementary:

1.	ssRNA	2.	dsRNA
3.	ssDNA	4.	dsDNA

146 Polymerase Chain Reaction, used to amplify DNA, is carried out in certain steps. Identify the correct chronology of these steps:

1.	Denaturation - Primer annealing - Extension of primers
2.	Denaturation - Extension of primers - Primer annealing
3.	Extension of primers - Primer annealing - Denaturation
4.	Primer annealing - Extension of primers - Denaturation

147 Downstream processing includes all of the following except:

1. Biosynthesis
2. Separation of product
3. Purification of product
4. Polishing of the product

148 Consider the given two statements:

Statement I:	There is a need for the recombinant DNA to be expressed in heterologous host.
Statement II:	In almost all recombinant technologies, the ultimate aim is to produce a desirable protein.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is incorrect; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is correct

149 Consider the two statements:

Statement I:	Agro-chemical based agriculture is not a suitable method for increasing food production worldwide in the future.
Statement II:	Agrochemicals are often too expensive for farmers in the developing world.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is incorrect; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is correct

150 In a broad context, how many of the following could be included in 'biotechnology'?

I:	making curd, bread or wine
II:	use of genetically modified organisms to produce therapeutic proteins
III:	in vitro fertilisation leading to a 'test-tube' baby
IV:	synthesizing a gene and using it
V:	developing a DNA vaccine
VI:	correcting a defective gene

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

BIOLOGY II - SECTION A

151 Identify the correct statement:

1.	Cancer cells divide in a highly regulated manner
2.	Cancer cells exhibit contact inhibition
3.	Cancer cells can spread to other places in the body
4.	Cancer cells are well differentiated and capable of performing their functions correctly

152 Abuse of alkaloids obtained from coca plant, deadly nightshade and Datura can cause:

1. Hallucinations
2. Excessive sleep
3. CNS suppression
4. Hypothyroidism

153 Committee responsible for appraisal of activities involving large scale use of hazardous microorganisms and recombinants in research and industrial production from the environmental angle is the:

1. Genetic Engineering Appraisal Committee
2. Gene Technology Approval Committee
3. Department of Biotechnology [DBT]
4. Indian Council of Agricultural Research

154 Consider the given two statements:

Assertion (A):	Smoking is associated with increased incidence of cancers of lung, urinary bladder and throat.
Reason (R):	Nicotine, present in tobacco, stimulates adrenal gland to release adrenaline and nor-adrenaline into blood circulation

1. Both (A) and (R) are True and (R) correctly explains the (A).
2. (A) is True; (R) is False
3. (A) is False; (R) is True
4. Both (A) and (R) are True but (R) does not correctly explain the (A).

155 Consider the given two statements:

Statement I:	It is desirable to use Restriction enzymes, used to construct rDNA that cut the strand of DNA right in the middle of the palindrome sites.
Statement II:	Such restriction enzymes produce sticky ends in the resultant fragments.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is incorrect; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is correct

156 Cirrhosis is a chronic liver condition related to excessive consumption of:

1. Barbiturates
2. Tobacco
3. Alcohol
4. Cannabinoids

157 The thermostable DNA polymerase used in PCR is isolated from a/an:

1. Virus	2. Bacterium
3. Plant cell	4. Animal cell

158 The DNA fragments formed because of the cutting of DNA by restriction endonucleases can be separated by agarose gel electrophoresis on the basis of:

1. their size.
2. the charge present on them.
3. the presence or absence of sticky ends.
4. whether they are single or double stranded.

159 Consider the given two statements:

Statement I:	Computed tomography uses X-rays to generate a three-dimensional image of the internals of an object.
Statement II:	MRI uses strong magnetic fields and non-ionising radiations to accurately detect pathological and physiological changes in the living tissue.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is incorrect; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is correct

160 The biggest advantage of using Recombinant DNA technology, PCR and ELISA, over conventional diagnostic techniques like serum and urine analysis will be:

1. cost effectiveness
2. early detection
3. absence of adverse effects
4. universal availability

161 Insulin earlier extracted from pancreas of slaughtered cattle and pigs:

I:	was not effective at all in bringing blood glucose levels down towards normal range in diabetics.
II:	caused some patients to develop allergy or other types of reactions to the foreign protein.

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

162 Consider the given two statements:

Assertion (A):	Morphine should not be routinely used in patients with mild to moderate pain.
Reason (R):	Morphine increases sensitivity to pain.

1.	Both (A) and (R) are True and (R) correctly explains the (A).
2.	(A) is True; (R) is False
3.	(A) is False; (R) is True
4.	Both (A) and (R) are True but (R) does not correctly explain the (A).

163 Biological theft, illegal collection of indigenous plants by corporations who patent them for their own use, comes under:

1.	Bioprospecting	2.	Bioremediation
3.	Biopiracy	4.	Bioethics

164 *Toxoplasma*, an organism commonly causing opportunistic infection in AIDS patients is a/an:

1. autotrophic bacterium
2. fungus
3. protozoan
4. helminth

165 Cannabinoids are a group of chemicals used to produce all the following except:

1. Hashish
2. Afeem
3. Charas
4. Ganja

166 DNA ligase catalyses the formation of:

1. N Glycosidic bond.
2. Hydrogen bond.
3. Phosphodiester bond.
4. Ester bond.

167 The first clinical gene therapy was given in 1990 to correct:

1.	Sickle cell anaemia	2.	ADA deficiency
3.	Phenylketonuria	4.	Burkitt's lymphoma

168 The side-effects of the use of anabolic steroids in males include all of the following except:

1. increased aggressiveness
2. testicular enlargement
3. decreased sperm production
4. breast enlargement

169 After getting into the body of the person, the first cells that HIV uses as HIV factory are:

1. T cytotoxic cells
2. T helper cells
3. Macrophages
4. Dendritic cells

170 Consider the given two statements:

Assertion (A):	The risk of getting into drug/alcohol abuse is higher in adolescence.
Reason (R):	The period between 12-18 years of age may be thought of as adolescence period.

1.	Both (A) and (R) are True and (R) correctly explains the (A).
2.	(A) is True; (R) is False
3.	(A) is False; (R) is True
4.	Both (A) and (R) are True but (R) does not correctly explain the (A).

171 A nucleic acid that contains nucleotides from two different heterologous sources (species) is called as:

1.	B DNA	2.	rDNA
3.	mRNA	4.	tRNA

172 The most serious, and sometimes even fatal, malignant malaria is caused by:

1. Plasmodium vivax
2. Plasmodium ovale
3. Plasmodium falciparum
4. Plasmodium malariae

173 Consider the two given statements:

Assertion (A):	Foreign and vector DNA must be cleaved with the same restriction enzyme when making recombinant DNA.
Reason (R):	Each restriction enzyme cuts DNA at a specific cleavage site.

1.	Both (A) and (R) are True and (R) correctly explains the (A).
2.	(A) is True; (R) is False
3.	(A) is False; (R) is True
4.	Both (A) and (R) are True but (R) does not correctly explain the (A).

174 Consider the given two statements:

Assertion (A):	Early detection of cancers is essential.
Reason (R):	It allows the disease to be treated successfully in many cases.

1.	Both (A) and (R) are True and (R) correctly explains the (A).
2.	(A) is True; (R) is False
3.	(A) is False; (R) is True
4.	Both (A) and (R) are True but (R) does not correctly explain the (A).

175 Over 95 per cent of all existing transgenic animals are:

1.	Aquarium fishes	2.	Mice
3.	Bacteria	4.	Cattle

176 A single-stranded nucleic acid fragment, tagged with a radioactive molecule, that interacts with a complementary sequence of a target nucleic acid is called a:

1.	Gene gun	2.	Gene probe
3.	Snip	4.	Selectable marker

177 HIV is a:

1.	retrovirus which has an envelope enclosing the DNA genome
2.	retrovirus which has an envelope enclosing the RNA genome
3.	retrovirus which lacks an envelope
4.	reovirus which lacks an envelope

178 Opioids are the drugs, which bind to specific opioid receptors present in our:

1. central nervous system and gastrointestinal tract.
2. central nervous system and genitourinary tract.
3. central nervous system and cardiovascular system.
4. cardiovascular system and gastrointestinal tract.

179 Transgenic animals that produce useful biological products can be created to treat all the following except:

1. emphysema.
2. phenylketonuria (PKU).
3. Down's syndrome.
4. cystic fibrosis.

180 All of the following will be true for heroin except:

1. It is commonly called smack.
2. It is chemically diacetylmorphine.
3. It is a CNS stimulant.
4. It is generally taken by snorting and injection.

181 A widely used diagnostic test for AIDS is:

1.	ELISA	2.	VDRL
3.	Schick's test	4.	TORCH

182 In the name 'Sma I', which of the following is missing?

1. Indicative of generic name
2. Indicative of specific name
3. Indicative of strain
4. Order of identification in the bacterium

183 Consider the given two statements:

Assertion (A):	In order to link the alien DNA, the vector needs to have very few, preferably single, recognition sites for the commonly used restriction enzymes.
Reason (R):	Presence of more than one recognition sites within the vector will generate several fragments, which will complicate the gene cloning.

1.	Both (A) and (R) are True and (R) correctly explains the (A).
2.	(A) is True; (R) is False
3.	(A) is False; (R) is False
4.	Both (A) and (R) are True but (R) does not correctly explain the (A).

184 Time lag between the infection and appearance of AIDS symptoms may vary from:

1.	a few months to many years (usually 5-10 years).
2.	a few months to a few years (usually 1-2 years).
3.	a few days to many months (usually 10 – 12 months).
4.	a few days to a few weeks (usually 5-10 weeks).

185 Transmission of HIV infection can generally occur by all of the following means except:

1.	sexual contact with the infected person
2.	by transfusion of contaminated blood and blood products
3.	from infected mother to her child through placenta
4.	mosquito bite

BIOLOGY II - SECTION B

186 Polio, diphtheria, pneumonia and tetanus:

1.	are all bacterial diseases
2.	are transmitted by arthropod vectors
3.	have been controlled to a large extent by the use of vaccines
4.	are invariably fatal

187 Identify the correct statements/s:

A: IgA class of antibodies are present in colostrum

B: IgA class of antibodies can cross placenta

1. Only A
2. Only B
3. Both A and B
4. Neither A nor B

188 Ringworm:

I: is a fungal infection of the skin.

II: is typically caused by *Trichoderma*, *Macrosporium*, or *Epicoccum*

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

189 *Wuchereria* (*W. bancrofti* and *W. malayi*), the filarial worm affect:

- | | |
|---------------------|---------------------|
| 1. lungs | 2. large intestines |
| 3. lymphatic system | 4. brain |

190 Mary Mallon:

1. was the recipient of the first gene therapy.
2. was the last known case of small pox.
3. was a chronic carrier of *Salmonella typhi*.
4. was the first child born through IVF.

191 Interferons are immunomodulators secreted in our body against:

1. Bacterial pathogens
2. Self-antigens
3. Helminths
4. Viral pathogens

192 For diseases transmitted through insect vectors, the most important measure to control the spread will be:

- | | |
|----|----------------------------------------------------------------|
| 1. | to control or eliminate the vectors and their breeding places. |
| 2. | to vaccinate people residing in the area. |
| 3. | to wear proper clothes to cover the exposed areas. |
| 4. | biocontrol by pathogens |

193 Which of the following is an autoimmune disease?

1. coronary artery disease
2. Beta thalassemia
3. Erythroblastosis fetalis
4. Rheumatoid arthritis

194 The mediator of inflammation, histamine, is secreted in tissues by:

- | | |
|---------------|----------------|
| 1. basophils | 2. monocytes |
| 3. mast cells | 4. macrophages |

195 Cancer detection is based on:

I: biopsy

II: histopathological studies

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

196 All the following are true regarding *Entamoeba histolytica* except:

- | | |
|----|-----------------------------------------------------------------------------------------|
| 1. | is a protozoan parasite |
| 2. | causes amoebic dysentery |
| 3. | can be mechanically carried by rodents and dogs |
| 4. | is mainly transmitted through drinking water and food contaminated by the faecal matter |

197 The main phagocytes in our body are:

1. Basophils and Acidophils
2. Neutrophils and Macrophages
3. NK cells and Mast cells
4. Dendritic cells and Glial cells

198 Memory cells:

I: are produced in humoral immune response

II: are produced in cell mediated immune response

III: are responsible for passive immunity

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

199 Where is the antigen-binding site of an antibody molecule found?

1. in the variable heavy chain
2. in the variable light chain
3. in the variable portion between heavy and light chain
4. Hinge region

200 Relief in allergic reactions can be provided by the use of all of the following except:

- | | |
|--------------------|----------------|
| 1. Anti-histamines | 2. Steroids |
| 3. Adrenaline | 4. Antibiotics |

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