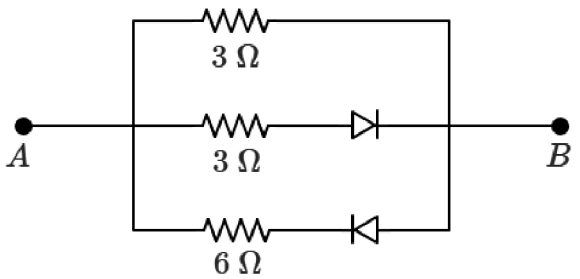
PHYSICS - SECTION A

1 In a nuclear reaction (involving atomic nuclei only), the sum of kinetic energies of the product nuclei was found to be greater than that of the reactants. This means that:

1.	some nucleons are created
2.	some nucleons are destroyed
3.	energy is converted into mass
4.	mass is converted into energy

2 The equivalent resistance between A and B of the network shown below is:



1.	1.2 Ω
2.	3 Ω
3.	1.5 Ω if $V_A > V_B$ and 2 Ω if $V_A < V_B$
4.	2 Ω if $V_A < V_B$ and 1.5 Ω if $V_A > V_B$

3 Photoelectrons are just emitted from the surface of a metal when light of wavelength 400 nm is shone upon it. If light of wavelength 310 nm is used, then the emitted electrons: Take $hc = 1240$ eV-nm.

1.	will have a minimum energy of 90 eV
2.	will have a maximum energy of 90 eV
3.	will have a minimum energy of 0.9 eV
4.	will have a maximum energy of 0.9 eV

4 He^+, Li^{++} ions all behave similar to H-atoms in that they are well described by Bohr's theory, with some modifications. The angular momentum of an electron in the ground state of H-atom is L_H; in the case of He^+, it is L_{He}; and in the case of Li^{++}, it is L_{Li}. Then:

1. $L_H > L_{He} > L_{Li}$
2. $L_H < L_{He} < L_{Li}$
3. $L_H = L_{He} = L_{Li}$
4. $L_H = \frac{L_{He}}{2} = L_{Li}$

5 All particles having a momentum of p are associated with wave-like behaviour and the wavelength, $\lambda = h/p$, where h is Planck's constant. Two particles A and B collide with each other, and come to rest. The de-Broglie wavelengths of A, B are λ_A, λ_B (before collision); while their masses are m_A, m_B. Then:

1.	$\lambda_A = \lambda_B$ only if $m_A = m_B$
2.	$\lambda_A m_A = \lambda_B m_B$
3.	$\frac{\lambda_A}{m_A} = \frac{\lambda_B}{m_B}$
4.	$\lambda_A = \lambda_B$, independent of m_A or m_B

6 Given below are two statements:

Statement I:	Graphite (carbon allotrope) is a semiconductor.
Statement II:	Carbon is an element that is in the same group as silicon, and it has the same number of valence electrons as the latter.

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.

7 Light having a frequency, which is half the threshold frequency for photoelectric effect, is incident on a metal: however, it is emitted from a sodium lamp. If laser light is used, with the same frequency, then it:

1.	will likely cause photoemission of electrons
2.	will not cause photoemission of electrons
3.	may or may not cause photoemission depending on the photon density
4.	will cause photoemission only if its intensity is above a threshold

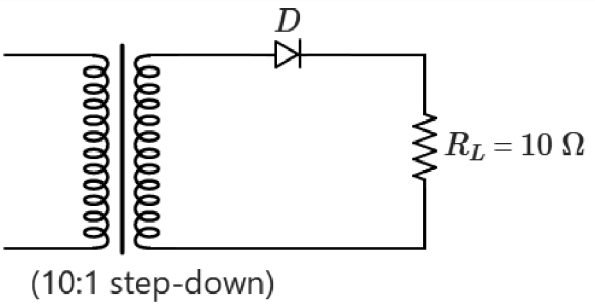
8 For the given radioactive decay

${}^{298}_{94}X \rightarrow {}^{294}_{92}Y + {}^{4}_{2}\alpha + Q$-value,

binding energy per nucleon of X, Y and α are a, b and c. The Q-value is equal to:

1. $(294b + 4c - 298a)$
2. $(92b + 2c - 94a)$
3. $(294b + 4c + 298a)$
4. $(92b + 2c + 94a)$

9 A 10 : 1 step-down transformer has an ideal diode and a 10 Ω resistance connected to its secondary circuit while 220 V AC mains is applied to the primary.



The maximum circuit current through the load resistance is:
1. 22 A
2. 2.2 A
3. $2.2\sqrt{2}$ A
4. $\frac{2.2}{\sqrt{2}}$ A

10 Given below are two statements:

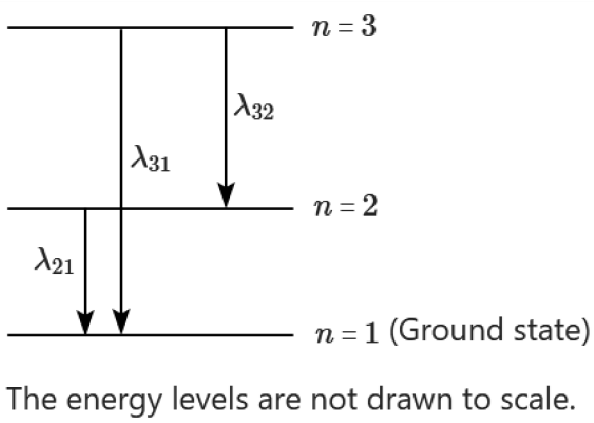
Assertion (A):	The resistivity of silicon, a semiconductor, decreases when its temperature is raised.
Reason (R):	When temperature is raised, the number of electrons in the conduction band as also the number of holes in the valence band increase due to transition of electrons from valence band to the conduction band.

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.

11 The ground state energy of an electron in an H-atom is -13.6 eV. If two photons, each of energy 8 eV, were incident on an H-atom in the ground state, then the electron will:

1.	be emitted with excess kinetic energy
2.	be excited to a higher state, but not emitted
3.	be excited to a higher state and then returned to the ground state
4.	remain in the ground state

12 The figure represents the transitions between the different levels of an H-atom with n representing the (principal) quantum number of the electron in that energy level. The wavelengths of the emitted photons are shown, next to the transitions.



Which of the following is true?
1. $\lambda_{31} = \lambda_{32} + \lambda_{21}$
2. $\frac{1}{\lambda_{31}} = \frac{1}{\lambda_{32}} + \frac{1}{\lambda_{21}}$
3. $2\lambda_{32} = \lambda_{31} + \lambda_{21}$
4. $\lambda_{31} = 2(\lambda_{32} + \lambda_{21})$

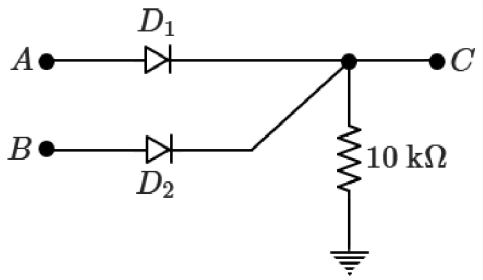
13 Which, of the following, is a semiconductor?

1.	Tin	2.	Germanium
3.	Aluminium	4.	Phosphorus

14 In Bohr's theory of the H-atom, the de-Broglie wavelength of the electron in the n^{th} orbit is λ_n, while the circumference of that orbit is C_n. Then:

1.	$C_n = \frac{\lambda_n}{n}$	2.	$C_n = n\lambda_n$
3.	$C_n = \frac{\lambda_n}{n^2}$	4.	$C_n = n^2\lambda_n$

15 In the circuit shown in the figure, the two diodes D_1, D_2 are considered to be ideal.



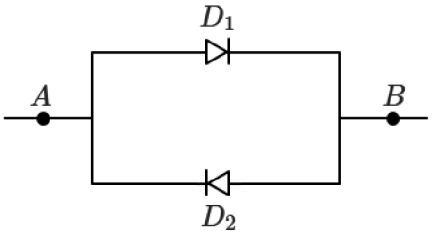
The circuit shown in the figure can be used as:
1. an AND gate
2. an OR gate
3. a NOT gate
4. an XOR gate

16 If a substance absorbs 500 nm wavelength radiation and emits radiation of wavelength 600 nm, then the net change in energy is: (Take $hc = 1240$ eV-nm.)
1. 1.2×10^{-3} eV
2. 3.0×10^{-4} eV
3. 4.1×10^{-1} eV
4. 5.2×10^{-4} eV

17 The energy of an electron in the $n = 2$ level of the H-atom equals that of an electron in the He^+ ion in the level:

1.	$n = 1$	2.	$n = 2$
3.	$n = 3$	4.	$n = 4$

18 In the circuit shown in the figure, current flows between A and B when: (assume that the diodes are ideal)



(A) $V_A > V_B$ (B) $V_B > V_A$

1.	A is true
2.	B is true
3.	Both A, B are true
4.	Neither A nor B is true

19 The nucleus of an atom has a radius which is of the order of:
1. 10^{-9} m
2. 10^{-12} m
3. 10^{-15} m
4. 10^{-18} m

20 An atom of atomic mass 242, having binding energy per nucleon 8.4 MeV, breaks into two atoms of atomic mass 121 (each with binding energy per nucleon 7.1 MeV). What would be the absolute Q-value of the reaction?

1.	150 MeV	2.	314.6 MeV
3.	208.4 MeV	4.	290.8 MeV

21 Among radioactive radiation emitted by spontaneous disintegration, the most prevalent are α, β and γ. Let their speeds in air be v_α, v_β and v_γ, respectively. Then:
1. $v_\alpha > v_\beta > v_\gamma$
2. $v_\gamma > v_\beta > v_\alpha$
3. $v_\gamma > v_\alpha > v_\beta$
4. $v_\beta > v_\alpha > v_\gamma$

22 In an experiment on the photoelectric effect, light of wavelength λ is used: but no photocurrent is observed, even when an accelerating voltage is applied to the cathode. Then, which of the following actions may cause a photocurrent?

1.	Increase in intensity of light
2.	Increase in accelerating voltage
3.	Decrease in the wavelength of light
4.	Decrease in the intensity of light

23 The density (d) of a nucleus varies according to the number of nucleons (A) as:

1.	$d \propto A$	2.	$d \propto \frac{1}{A}$
3.	$d \propto A^{1/3}$	4.	$d =$ constant

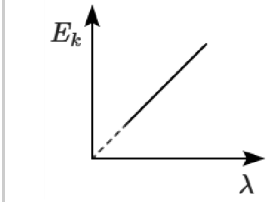
24 When the frequency of incident radiation (causing photoelectric effect) is increased, the de-Broglie wavelength of the:

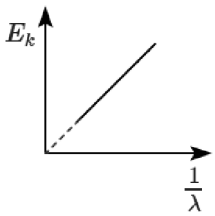
1.	fastest photoelectron increases
2.	slowest photoelectron decreases
3.	fastest photoelectron decreases
4.	slowest photoelectron increases

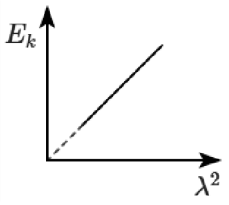
25 Which, of the following solid substances, will most likely show the photoelectric effect easily?

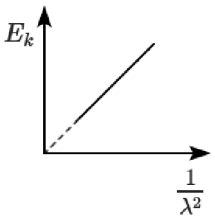
1.	Potassium	2.	Rubber
3.	Plastic	4.	Solid hydrogen

26 The graph between the kinetic energy (E_k) and the de-Broglie wavelength (λ) of a moving electron is best represented by:

1. 

2. 

3. 

4. 

27 Two metals A and B, when exposed to light of wavelength 400 nm shows the photoelectric effect. However, when light of wavelength 620 nm is used photoemission from A just stops but B still shows photoemission. When the latter wavelength is doubled, then photoemission from B just stops. Take $hc = 1240$ eV-nm.
The fastest photoelectrons emitted, in all the experiments, have an energy of:

1.	3.1 eV	2.	2.1 eV
3.	1.1 eV	4.	3 eV

28 The moment of inertia (I) of an orbiting electron in the n^{th} Bohr orbit, measured with respect to the nucleus, is proportional to:

1.	n^2	2.	n^3
3.	n^4	4.	n^6

29 When a p-n junction is formed, the atoms on the p-side are:
1. neutral
2. slightly positive
3. slightly negative
4. all negative

30 The de-Broglie wavelength of an electron in the ground state of the H-atom, according to the Bohr model, is λ_1. The wavelength of an electron in the n^{th} orbit of the H-atom is λ_n. Then, $\frac{\lambda_n}{\lambda_1} =$

1.	n	2.	n^2
3.	n^{-1}	4.	$n^{1/2}$

31 Two metals A and B, when exposed to light of wavelength 400 nm shows the photoelectric effect. However, when light of wavelength 620 nm is used photoemission from A just stops but B still shows photoemission. When the latter wavelength is doubled, then photoemission from B just stops. Take $hc = 1240$ eV-nm.
Work function of A is:

1.	3.1 eV	2.	2 eV
3.	1 eV	4.	1.5 eV

32 During a β-decay, fast electrons are found to have been emitted. These electrons come from:

1.	the outermost atomic shell
2.	the innermost atomic shell
3.	the conduction band
4.	the nucleus

33 Match the following:

	Column-I		**Column-II**
A.	Radiation pressure	P.	particle nature of radiation
B.	Threshold wavelength	Q.	stopping potential
C.	Maximum kinetic energy of photoelectron	R.	maximum wavelength of an incident photon in the photoelectric effect
D.	Quantisation of angular momentum of the electron	S.	de-Broglie hypothesis

Codes:

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

34 The de-Broglie wavelength of light (i.e. photons) of frequency f (calculated using de-Broglie relation):

1.	is directly proportional to f
2.	is inversely proportional to f
3.	is inversely proportional to $\sqrt{f}$
4.	does not exist

35 A p-n junction diode is said to be forward-biased when:

1.	current flows from p to n
2.	current flows from n to p
3.	current flows into p and current also flow into n
4.	electron flow into p and electrons flow into n

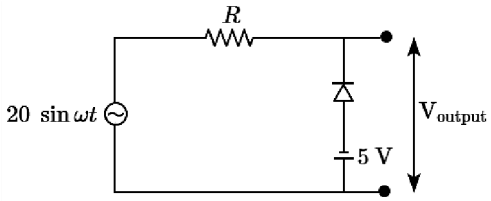
PHYSICS - SECTION B

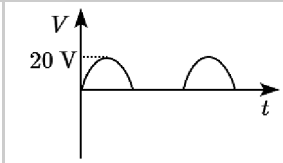
36 Given below are two statements:

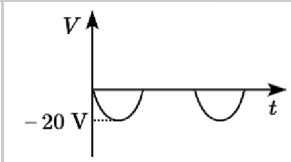
Statement I:	Photodiodes are operated in reverse biased.
Statement II:	Current in forward bias is more than current in reverse bias in p-n diode.

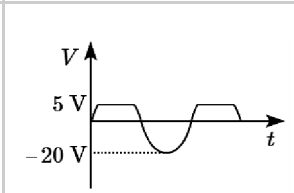
1. Both **Statements** are true.
2. **Statement I** is true and **Statement II** is false.
3. **Statement I** is false and **Statement II** is true.
4. Both **Statements** are false.

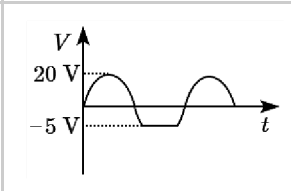
37 Assuming that the diode is ideal, the output waveform for the circuit (shown in the figure) is:



1. 

2. 

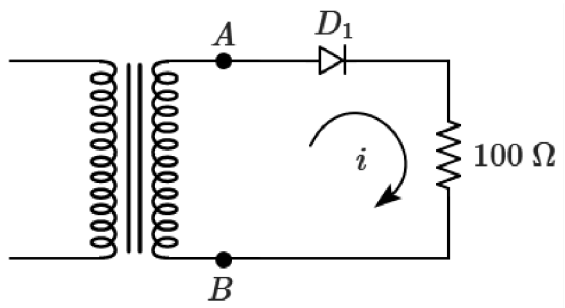
3. 

4. 

38 A Zener diode is used to:

1. increase the voltage
2. decrease the voltage
3. provide a fixed voltage
4. provide an oscillatory voltage

39 The voltage applied across AB is a 50 Hz – AC with a peak voltage of 300 V. The diode D_1 is ideal. The current i, flowing in the direction indicated, is:



1. AC with average zero
2. constant at 3 A
3. unidirectional, but varying with time and peak value of 3 A
4. unidirectional, but a positive peak of 3 A and negative peak of 1 A

40 The electrical conductivity of a semiconductor increases when electromagnetic radiation of wavelength shorter than 2400 nm is incident on it. The band gap (in eV) for the semiconductor would be: ($h = 6.63 \times 10^{-34}$ J-s)

1. 0.33 eV
2. 0.80 eV
3. 0.52 eV
4. 0.10 eV

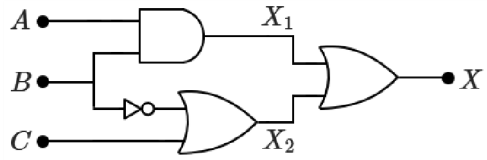
41 An LED is:

1. a p-doped silicon that emits light
2. a n-doped silicon that emits light
3. a p-n diode that emits light
4. a transistor that absorbs light

42 n-type silicon is made by doping silicon crystals with:

1. phosphorus atoms
2. carbon atoms
3. electrons in valence band
4. protons in conduction band

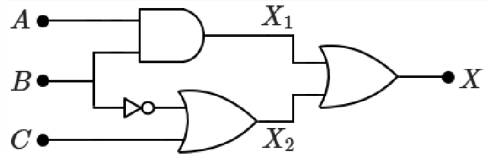
43



Consider the logic circuit represented in the above diagram. Assume that all the elements used are ideal.
In which case is the overall output independent of C?

1.	A=False
2.	B=True
3.	B=False
4.	The output (X) always depends on C

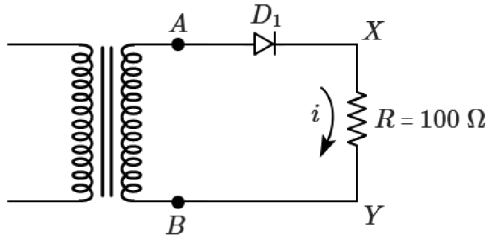
44



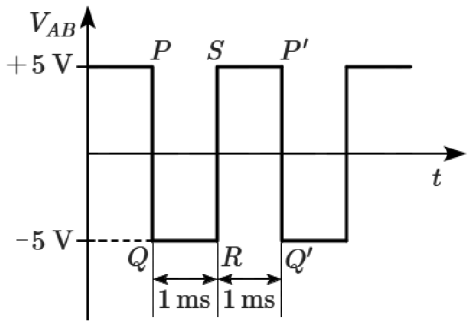
Consider the logic circuit represented in the above diagram. Assume that all the elements used are ideal.
Suppose that the inputs are as follows:
A = True, B = False, C=True
Which, of the following, is correct?

1.	X_1=True	2.	X_2=True
3.	X=False	4.	none of the above

45 In the circuit shown in the figure (i), the (ideal) diode D_1 has negligible resistance (in forward bias). The voltage $(V_A - V_B) = V_{AB}$ is time varying, as shown in the figure (ii):



Figure(i)

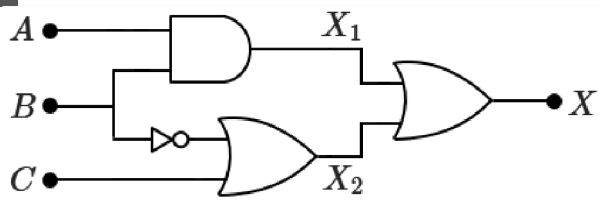


Figure(ii)

The diode D_1 conducts during:

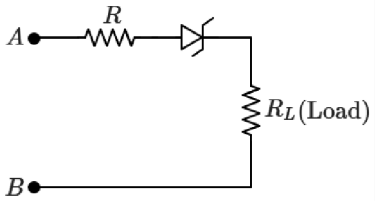
1.	PQ	2.	QR
3.	RS	4.	SP'

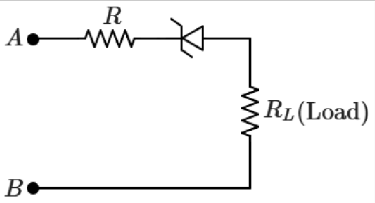
46

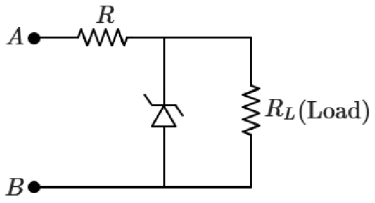


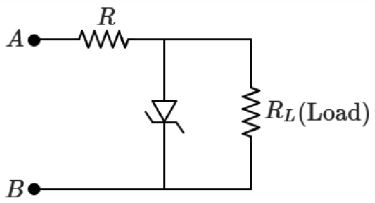
Consider the logic circuit represented in the above diagram. Assume that all the elements used are ideal.
In which case is the overall output independent of A?
1. B=True
2. B=False
3. C=False
4. C=False AND B=True

47 Which, of the following circuits, shows a Zener diode being used properly? Here $V_A > V_B$

1. 

2. 

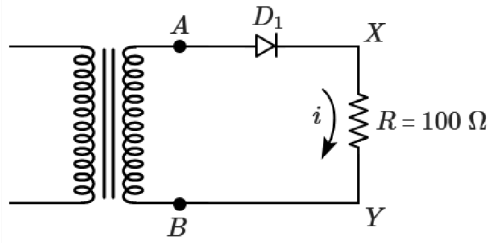
3. 

4. 

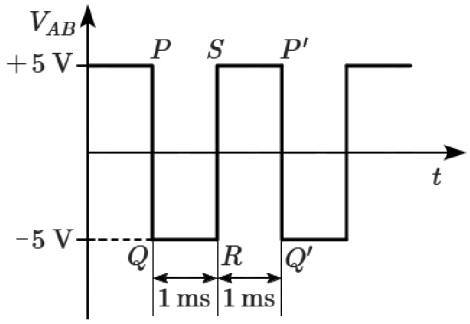
48 The band gap in silicon is nearly 1.1 eV at room temperature. If photons having an energy slightly greater than 1.1 eV are incident on silicon,

1. they are absorbed and an electron-hole pair is created
2. they are absorbed and retained by the silicon atoms
3. they are never absorbed by the silicon
4. they are reflected and cause the formation of holes

49 In the circuit shown in the figure (i), the (ideal) diode D_1 has negligible resistance (in forward bias). The voltage $(V_A - V_B) = V_{AB}$ is time varying, as shown in the figure (ii):



Figure(i)

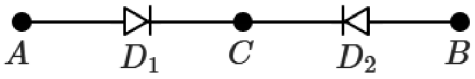


Figure(ii)

The current through the resistance $R = 100\ \Omega$ has a maximum positive value of:

1. 0.05 A
2. 0.1 A
3. 0.025 A
4. 500 A

50 Two diodes are connected as shown in the adjacent figure. A potential difference is applied across A, B. Assume that the diodes are ideal.



If $V_A > V_B$ then:

1. Current flows through D_1 but no current flows through D_2
2. Current flows through D_2 but no current flows through D_1
3. Current flows through both D_1, D_2
4. No current flows through either D_1 or D_2

CHEMISTRY - SECTION A

51 Match the organic compounds given in List – I with their corresponding pK_b given in List – II:

	Amine (List – I)		pK_b (aqueous medium) List - II
A.	Aniline	1.	9.0
B.	Ethanamine	2.	3.29
C.	N-Ethylethanamine	3.	3.25
D.	N,N-diethylethanamine	4.	3.0

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

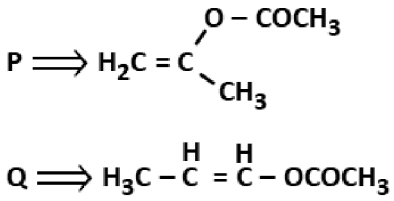
52

Assertion (A):	Maltose is a reducing sugar.
Reason (R):	A free aldehyde group can be produced at C1 of one of the two glucose moieties in the solution of maltose.

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.

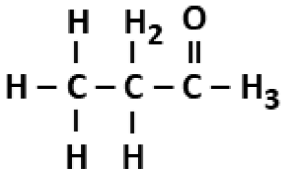
53 C_3H_9N reacts with Hinsberg reagent and the product is insoluble in alkali but soluble in ether.
This nitrogen-containing compound is:
1. Primary amine
2. Secondary amine
3. Tertiary amine
4. Methyl isocyanide

54 The product of acid hydrolysis of (P) and (Q) can be distinguished by:



1. Lucas reagent
2. 2,4-DNP
3. Fehling's solution
4. Oxime

55 Identify the true statements regarding the molecule shown below:

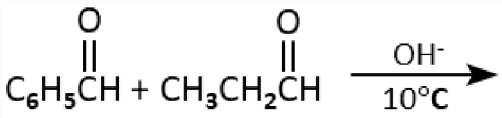


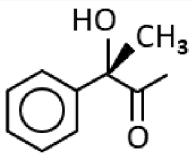
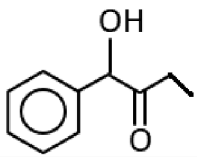
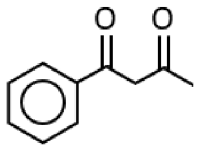
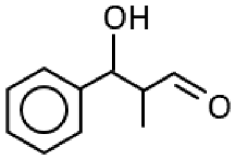
I:	H_2 is more acidic than H_3
II:	H_3 is more acidic than H_2
III:	This molecule typically undergoes nucleophilic substitution.

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

56 Aniline and ethylamine resembles in:
1. Solubility
2. Action with HNO_2
3. Action of Grignard reagent
4. Coupling reaction

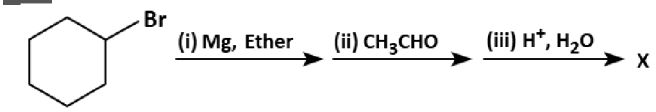
57 The major product of the crossed aldol reaction shown below is:



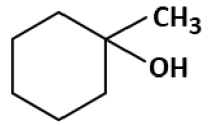
1.		2.	
3.		4.	

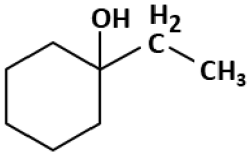
58 Chemical test(s) to distinguish between Benzaldehyde and Acetophenone is :
1. Tollen's test
2. Fehling's test
3. Iodoform test
4. Tollen's test and Iodoform test

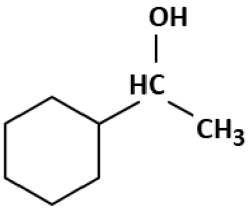
59

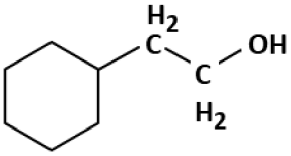


In the above scheme of reactions, product "X" is:

1. 

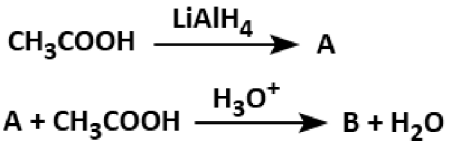
2. 

3. 

4. 

60

Consider the following reactions:



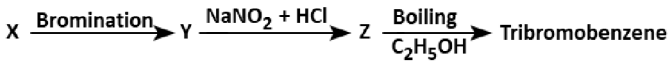
'A' and 'B' ,respectively, in the above reactions are:

1. $CH_3COOC_2H_5$, C_2H_5OH
2. CH_3 CHO, C_2H_5OH
3. C_2H_5OH, CH_3 CHO
4. C_2H_5OH, CH_3 $COOC_2H_5$

61 Rickets is caused by the deficiency of:

1. Vitamin B_{12}
2. Vitamin D
3. Vitamin K
4. Riboflavin

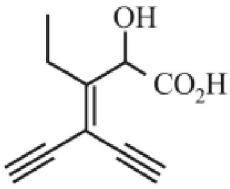
62 Consider the following reaction,

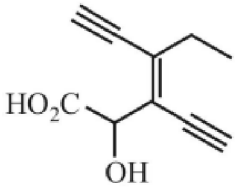


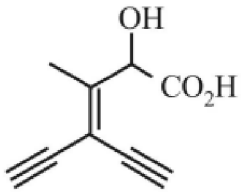
X in the above equation is:

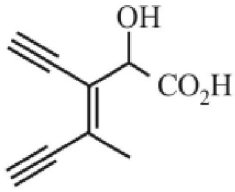
1. Benzoic acid
2. Salicylic acid
3. Phenol
4. Benzenamine

63 The correct structure of 3-ethynyl-2-hydroxy-4-methylhex-3-en-5-ynoic acid among the following is:

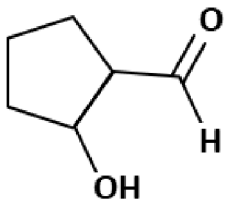
1. 

2. 

3. 

4. 

64 The correct name of the given compound is:



1. 2-Hydroxycyclopentanal
2. 2-Formyl-1-hydroxycyclopentane
3. 2-Hydroxycyclopentanecarbaldehyde
4. Cyclopentane-2-ol-1-al

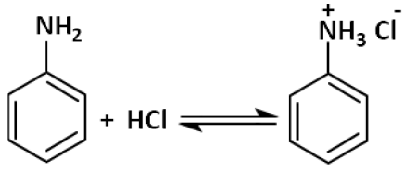
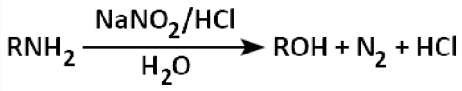
65 Consider the given reaction:

$CH_3COCH_3 \xrightarrow{\text{dil. } Ba(OH)_2} \text{" X "}$

The functional groups present in the compound "X" are:

1. Ketone and double bond
2. Double bond and aldehyde
3. Alcohol and aldehyde
4. Alcohol and ketone

66 The incorrect reaction among the following is:

1. 
2. $RNH_3^+X^- + OH^- \longrightarrow RNH_2 + H_2O + X^-$
3. $RNH_2 + H_2O \rightleftharpoons RNH^+ + H_3O^+$
4. 

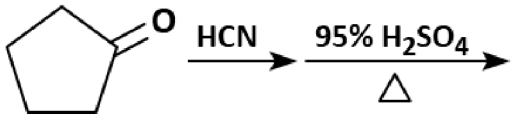
67 Match List I (name of reactions/reagents) with List II (formula):

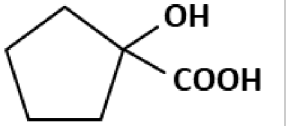
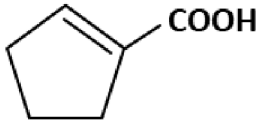
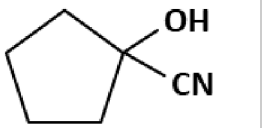
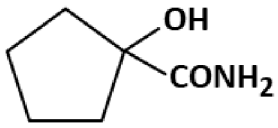
	List-I		List-II
A.	Jones reagent	(i).	$H_2/Pd - BaSO_4$
B.	Clemmensen's reduction	(ii).	N_2H_4, KOH/ ethylene glycol
C.	Rosenmund reduction	(iii).	(i) X_2/Red phosphorus; (ii) H_2O
D.	Wolff-Kishner reduction	(iv).	Zn-Hg/conc. HCl
		(v).	$CrO_3 - H_2SO_4$

Codes

	A	B	C	D
1.	(iii)	(iv)	(ii)	(i)
2.	(iii)	(iv)	(i)	(ii)
3.	(ii)	(i)	(iv)	(v)
4.	(v)	(iv)	(i)	(ii)

68 The product in the given reaction is:

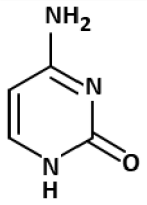
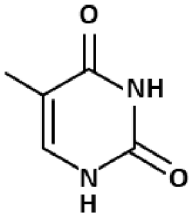
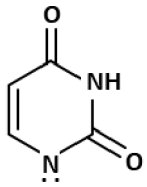


1. 
2. 
3. 
4. 

69 Fat soluble vitamin among the following is:

1. Thiamine
2. Pyridoxine
3. Vitamin C
4. Vitamin A

70 Match the structure of the bases in column I with their names given in column II:

Column -I	Column -II
A. 	I. Uracil
B. 	II. Adenine
C. 	III. Cytosine
D. 	IV Thymine

Choose the correct answer from the options given below:

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

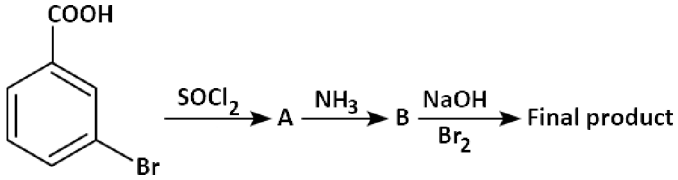
71 Given the following compounds:

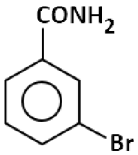
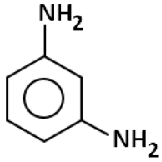
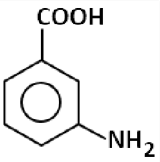
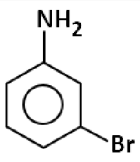
$C_2H_5NH_2$, $C_6H_5NH_2$, NH_3, $C_6H_5CH_2NH_2$ and $(C_2H_5)_2NH$

The correct increasing order of basic strength of the compounds, given above, in gas phase is:

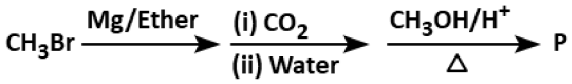
1.	$C_2H_5NH_2 < C_6H_5NH_2 < NH_3 < C_6H_5CH_2NH_2 < (C_2H_5)_2NH$
2.	$C_2H_5NH_2 < C_6H_5NH_2 < NH_3 < (C_2H_5)_2NH < C_6H_5CH_2NH_2$
3.	$C_6H_5CH_2NH_2 < C_6H_5NH_2 < NH_3 < (C_2H_5)_2NH < C_2H_5NH_2$
4.	$C_6H_5NH_2 < NH_3 < C_6H_5CH_2NH_2 < C_2H_5NH_2 < (C_2H_5)_2NH$

72 The final product in the given sequence of reactions is:



1.		2.	
3.		4.	

73 The product 'P' in the given reaction is:



1.	Methyl ethanoate	2.	Ethanoic acid
3.	Propanal	4.	Methyl propanoate

74 Given the following acids:

A: Trichloroacetic acid
B: Trifluoroacetic acid
C: Acetic acid
D: Formic acid

The correct order of decreasing acid strength of the above-given acids is:

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

75

Assertion (A):	Gabriel's phthalimide reaction can be used to prepare aryl and alkyl amines.
Reason (R):	Aryl halides have the same reactivity as alkyl halides towards nucleophilic substitution reactions.

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

76 The most basic compound among the following is:

1. $C_6H_5NH_2$
2. $p-NO_2-C_6H_4NH_2$
3. $m-NO_2-C_6H_4NH_2$
4. $C_6H_5CH_2NH_2$

77 The product of hydrolysis of alkyl cyanide, among the following, is:

1. Acidic medium
2. Alkaline medium
3. Acidic as well as alkaline medium
4. Neither acidic nor alkaline medium

78 Identify the correct statement regarding lactose among the following:

1. It is non-reducing sugar.
2. Glycosidic bond [1, 4] between glucose and galactose.
3. Glycosidic bond [1, 4] between glucose and fructose.
4. Glycosidic bond [1, 2] between glucose and galactose.

79 Complete hydrolysis of RNA gives:

1.	β-D-ribose and phosphoric acid only
2.	β-D-2-deoxyribose and phosphoric acid only
3.	β-D-ribose, phosphoric acid and nitrogen-containing heterocyclic compounds
4.	β-D-2-deoxyribose and nitrogen-containing heterocyclic compounds only

80 Choose the correct statement among the following.

1.	Monosaccharides are held together by peptide linkages to form disaccharides or polysaccharides.
2.	Disaccharides are held together by peptide linkages to form monosaccharide or polysaccharides.
3.	Monosaccharides are held together by phosphodiester linkages to form disaccharides or polysaccharides.
4.	Monosaccharides are held together by glycosidic linkages to form disaccharides or polysaccharides.

81 A positive carbylamine test is shown by which one of the following?

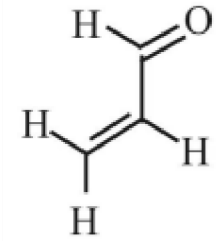
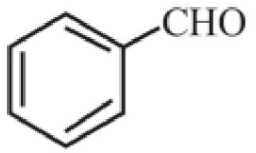
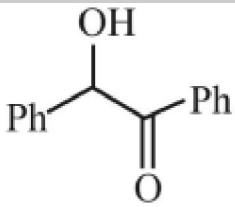
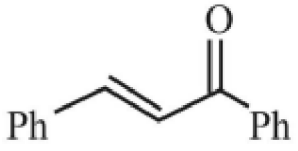
1. N, N-diethyl aniline
2. N-methyl propyl amine
3. N, N-diethyl butyl amine
4. 2, 4-dimethyl aniline

82 Match the reactions given in column I with corresponding names given in column II :

	Column -I		Column-II
(A)	$RNH_2 + CHCl_3 + KOH(alc) \xrightarrow{\Delta}$	(p)	Schotten-Baumann reaction
(B)	$C_6H_5N_2Cl \xrightarrow[\Delta]{CuBr/HBr}$	(q)	Coupling reaction
(C)	$C_6H_5NH_2 + C_6H_5COCl \xrightarrow{NaOH(aq)}$	(r)	Carbylamine reaction
(D)	$C_6H_5N_2Cl + C_6H_5OH \xrightarrow{pH9-10}$	(s)	Sandmeyer reaction

	A	B	C	D
1	q	r	p	s
2	p	q	r	s
3	r	s	p	q
4	s	r	p	q

83 The compound, among the following that cannot give a positive Tollen's test is:

1. 
2. 
3. 
4. 

84 The reagent that is used to change nitromethane into methylhydroxylamine is:

1. $Zn/NaOH$
2. Sn/HCl
3. Zn/NH_4Cl
4. Zn/HCl

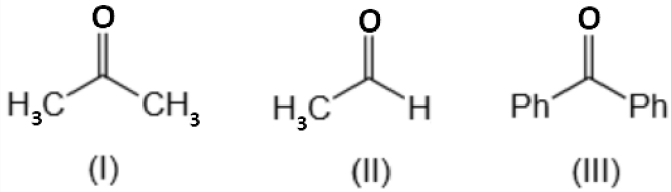
85 An organic compound '*X*' on treatment with pyridinium chloro chromate in dicholoromethane gives compound '*Y*'. Compound '*Y*' reacts with I_2 and alkali to form triiodomethane.

The compound '*X*' is:

1. C_2H_5OH
2. CH_3CHO
3. CH_3COCH_3
4. CH_3COOH

CHEMISTRY - SECTION B

86 The order of reactivity of phenyl magnesium bromide with the following compounds is :



(I) (II) (III)

1. II > III > I
2. I > III > II
3. II > I > III
4. all react with the same rate

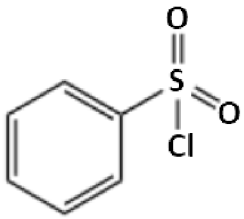
87 A compound, containing only carbon, hydrogen, and oxygen has a molecular weight of 44. On complete oxidation, it is converted into a compound of molecular weight 60. The original compound is:

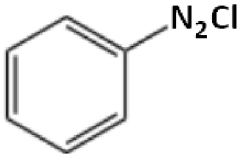
1. Alcohol
2. Acid
3. Aldehyde
4. Ether

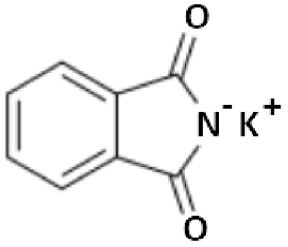
88 Pyridoxine is:

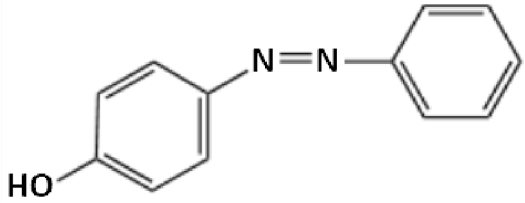
1. Vitamin B_6
2. Vitamin B_1
3. Vitamin B_2
4. Vitamin B_{12}

89 Hinsberg reagent, among the following:

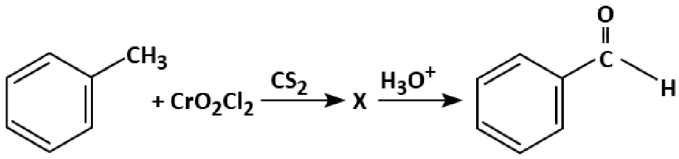
1. 

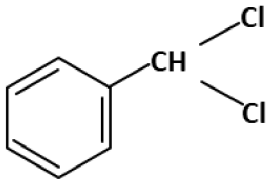
2. 

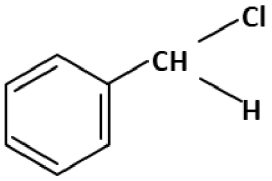
3. 

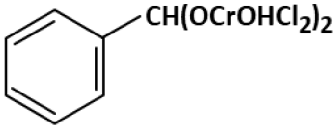
4. 

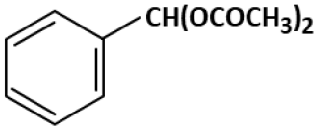
90 The intermediate compound 'X' in the following chemical reaction is :



1. 

2. 

3. 

4. 

91 The total number of chiral carbons/centers in $\beta - D-$ ribose are:

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

92 Denaturation of proteins involves:

1. Loss of tertiary structure.
2. Loss of primary structure.
3. Loss of peptide bonds.
4. Loss of linear chain structure.

93 Match column I with column II and mark the appropriate choice:

	Column I		Column II
(A)	Nucleoside	(i)	Sugar + base + phosphoric acid group
(B)	Nucleotide	(ii)	Cytosine + uracil
(C)	DNA	(iii)	Sugar + base
(D)	RNA	(iv)	Cytosine + thymine

1. (A) → (iii), (B) → (i), (C) → (iv), (D) → (ii)
2. (A) → (i), (B) → (iv), (C) → (iii), (D) → (ii)
3. (A) → (ii), (B) → (iii), (C) → (i), (D) → (iv)
4. (A) → (iv), (B) → (ii), (C) → (i), (D) → (iii)

94 Enzyme that is used to convert starch into maltose is:
1. Diastase
2. Maltase
3. Zymase
4. Invertase

95 All of the following can form hydrogen bond(s) with water except:
1. Aldehydes
2. Carboxylic acids
3. Ethers
4. Alkenes

96 The product formed from the reaction of a ketone and 1° amine is:
1. Amides
2. Oximes
3. Urea
4. Imines

97 Blood haemoglobin contains:
1. Al
2. Mg
3. Cu
4. Fe

98 The functional groups present in zwitter ion are:
1. $-NH_2$, -COOH
2. $-NH_2$, SO_3H
3. Both (1) and (2)
4. None of the above

99 Semicarbazide, among the following, is:
1. NH_2CONH_2
2. NH_2-NH_2
3. $NH_2CONHNH_2$
4. None of the above

100 Consider the following reactions,

(i) $\text{Glucose} + \text{ROH} \xrightarrow{\text{dry HCl}} \text{Acetal} \xrightarrow[(CH_3CO)_2O]{x\ eq.of} \text{acetyl derivative}$

(ii) $\text{Glucose} \xrightarrow{Ni/H_2} \text{A} \xrightarrow[(CH_3CO)_2O]{y\ eq.of} \text{acetyl derivative}$

(iii) $\text{Glucose} \xrightarrow[(CH_3CO)_2O]{z\ eq.of} \text{acetyl derivative}$

'x', 'y' and 'z' in the above given reactions are, respectively, :
1. 5,4 and 5
2. 4,6 and 5
3. 4,5 and 5
4. 5, 6 and 5

BIOLOGY I - SECTION A

101 Identify the plant, anecdotally known as the "terror of Bengal" due to its invasive growth tendencies, that was introduced into India as an ornamental plant:
1. *Parthenium hysterophorus*
2. *Lantana camara*
3. *Eicchornia crassipes*
4. *Acacia dealbata*

102 Consider the given two statements:

Assertion (A):	Organisms at each trophic level depend on those at the lower trophic level for their energy demands.
Reason (R):	The amount of energy decreases at successive trophic levels.

1.	Both **(A)** and **(R)** are true and **(R)** correctly explains the **(A)**.
2.	**(A)** is true but **(R)** is false
3.	**(A)** is false but **(R)** is true
4.	Both **(A)** and **(R)** are true but **(R)** does not correctly explain the **(A)**.

103 *Cuscuta* [dodder]:

I:	is a parasitic plant that is commonly found growing on hedge plants
II:	has lost its chlorophyll and leaves in the course of evolution.

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

104 Figure A is population pyramid for India in 1971 and Figure B is population pyramid for India in 2024. What conclusions can be drawn from the given figures?

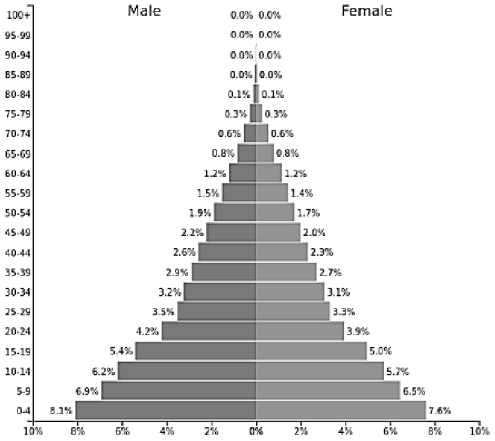


Figure A

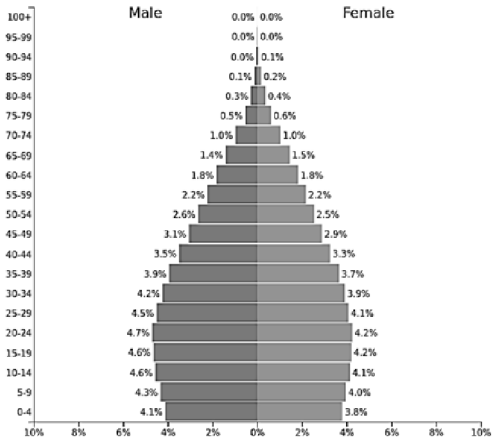


Figure B

I:	The population of India has reduced over the given period of time.
II:	India has become the most populous country in 2024

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

105 Consider the following statements:

I:	Among invertebrates, maximum species richness is seen in insects
II:	Among vertebrates, maximum species richness is seen in mammals
III:	Among plants, algae have a greater diversity than angiosperms.

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

106 Secondary consumers in a food chain normally are:

1. Primary producers
2. Herbivores
3. Primary carnivores
4. Decomposers

107 Typically, the Level 2 in a food chain in an ecosystem will be occupied by:

1. Primary producer
2. Herbivore
3. Carnivore
4. Apex predator

108 Consider the given two statements:

Statement I:	Predators in nature are 'prudent'.
Statement II:	Prey species have evolved various defenses to lessen the impact of predation.

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

109 Each trophic level has a certain mass of living material at a particular time called as the:

1. Standing state
2. Primary Productivity
3. Secondary Productivity
4. Standing crop

110 Consider the given two statements:

Statement I:	That humans derive countless direct economic benefits from nature is the broadly utilitarian argument for the need to conserve biodiversity.
Statement II:	That biodiversity plays a major role in many ecosystem services that nature provides is the narrowly utilitarian argument for the need to conserve biodiversity.

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

111 The variation shown by the medicinal plant *Rauwolfia vomitoria* growing in different Himalayan ranges might be in terms of the potency and concentration of the active chemical (reserpine) that the plant produces is:

1. Genetic diversity
2. Species diversity
3. Ecological diversity
4. Global diversity

112 Consider the given two statements:

Assertion (A):	When resources in the habitat are unlimited, the population grows in an exponential or geometric fashion.
Reason (R):	When resources in the habitat are unlimited, each species has the ability to realise fully its innate potential to grow in number.

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

113 In a terrestrial ecosystem, major producers are:

1. herbaceous and woody plants.
2. phytoplankton
3. algae
4. mosses

114 The number of correctly matched pairs from the given pairs is:

I.	Flamingos visiting American lakes and resident fishes	Commensalism
II.	Yucca plant and *Tegeticula yuccasella,* the yucca moth	Mutualism
III.	Female Anopheles and humans	Parasitism
IV.	Lichens	Predation

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

115 Consider the given two statements:

I:	Primary production of an ecosystem is expressed in terms of weight (gm^{-2}) or energy (kcal m^{-2}).
II:	Productivity of an ecosystem is expressed in terms of gm^{-2} yr^{-1} or (kcal m^{-2}) yr^{-1} .

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

116 Parasites, especially endoparasites, are highly adapted to their lifestyles. They are generally characterised with all of the following except:

1. the loss of unnecessary sense organs
2. presence of adhesive organs or suckers to cling on to the host
3. loss of digestive system
4. low reproductive capacity

117 All the following are ex-situ methods for conservation of biodiversity except:

1.	Botanical Gardens	2.	Seed banks
3.	Plant tissue culture	4.	Biosphere Reserves

118 What approximate percentage of the annual net primary productivity of the whole biosphere is the net primary productivity of oceans?

1. 25
2. 33
3. 66
4. 70

119 Identify the correctly matched pair:

	Scientist	Contribution
I.	Connell	Competitive release
II.	Gauss	Competitive exclusion principle
III.	MacArthur	Resource partitioning
IV.	Tillman	Rivet popper hypothesis

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

120 Consider the given two statements:

Assertion (A):	Global efforts to conserve biodiversity largely concentrate on the hot biodiversity spots located all over the world.
Reason (R):	Biodiversity hotspots' regions have very high levels of species richness and high degree of endemism.

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

121 The diversity of plants and animals is not uniform throughout the world but shows a rather uneven distribution. What will be true in this regard?

I:	In general, species diversity decreases as we move away from the equator towards the poles.
II:	With very few exceptions, tropics harbour more species than temperate or polar areas.

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

122 Predators:

I:	act as conduits for energy transfer across trophic levels
II:	do not include herbivores even in broad ecological context

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** nor **II** are incorrect

123 Identify the incorrect statements:

1.	Decomposition is largely an anaerobic process.
2.	In a particular climatic condition, decomposition rate is slower if detritus is rich in lignin and chitin, and quicker, if detritus is rich in nitrogen and water-soluble substances like sugars.
3.	Warm and moist environment favour decomposition whereas low temperature and anaerobiosis inhibit decomposition.
4.	Detritus is the raw material for decomposition

124 Approximately, what percent of all insects are phytophagous?
1. 1
2. 10
3. 25
4. 90

125 If in a pond there were 40 lotus plants last year and through reproduction 16 new plants are added, taking the current population to 56, the birth rate will be calculated as:
1. 0.2 offspring per lotus per year.
2. 0.4 offspring per lotus per year.
3. 1.2 offspring per lotus per year.
4. 1.6 offspring per lotus per year.

126 The historic Convention on Biological Diversity ('The Earth Summit') was held in Rio de Janeiro in:
1. 1986
2. 1987
3. 1992
4. 2002

127 Identify the incorrect statement:

1.	Any calculations of energy content, biomass or numbers, need not include all organisms at that trophic level.
2.	No generalisations we make will be true if we take only a few individuals at any trophic level into account.
3.	A given organism may occupy more than one trophic level simultaneously.
4.	The trophic level represents a functional level, not a species as such.

128 Which Indian state is the location of the sacred groves of Khasi and Jaintia hills?
1. Assam
2. Meghalaya
3. Manipur
4. Arunachal Pradesh

129 Consider the given two statements:

Statement I:	The pyramid of energy is always upright and can never be inverted because when energy flows from one trophic level to the next, some energy is always lost as heat at each step.
Statement II:	The pyramid of biomass in the sea is generally inverted because the biomass of fishes far exceeds that of phytoplankton.

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

130 Consider the given two statements:

Assertion (A):	The tiger census in our national parks and tiger reserves is often based on pug marks and fecal pellets.
Reason (R):	For ecological investigations, it is mandatory to know the absolute population densities in all instances.

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

131 Identify the examples of commensalism:

I:	An orchid growing as an epiphyte on a mango branch
II:	Barnacles growing on the back of a whale
III:	Cuckoo laying eggs in the nests of crow
IV:	Clown fish living among the tentacles of sea anemone

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

132 Consider the given two statements:

Assertion (A):	Competition can be avoided even if two species compete for the same resource.
Reason (R):	Totally unrelated species could also compete for the same resource.

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

133 The number of ecological hotspots of biodiversity that cover India currently are:

1. 3
2. 12
3. 25
4. 34

134 A stable biological community:

I:	should not show too much variation in productivity from year to year
II:	must be either resistant or resilient to occasional disturbances (natural or man-made)
III:	must also be resistant to invasions by alien species

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

135 Consider the given two statements:

Assertion (A):	Measurement of biomass in terms of fresh weight is more accurate.
Reason (R):	The standing crop is measured as the mass of living organisms (biomass) or the number in a unit area.

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

BIOLOGY I - SECTION B

136 Net primary productivity of whole biosphere is about:
1. 55 billion tons per month
2. 55 billion tons per year
3. 170 billion tons per month
4. 170 billion tons per year

137 The process of decomposition is expected to occur at the fastest rate in:
1. Tropical rain forest
2. Siberia
3. Dry arid conditions
4. Alpine region

138 Co-existence between competing species can be promoted by:
1. Resource partitioning
2. Periodic migration
3. Aestivation
4. Reproductive isolation

139 Mediterranean Orchid is pollinated in a unique way as it employs:
1. Production of foul odour
2. Sexual deceit
3. Batesian mimicry
4. Aposematic colouration

140 Consider the given two statements:

I:	Some aquatic ecosystems have inverted biomass pyramids.
II:	Such aquatic ecosystems also have inverted energy pyramids.

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 Imagine a land area is getting newly colonized by humans for the first time. The population in this area will primarily be decided by:

1.	Natality	2.	Mortality
3.	Immigration	4.	Emigration

142 Introduction of Nile perch in Lake Victoria led to the dramatic decline in the population of indigenous:
1. Gambusia
2. Cichlid fish
3. Salmon fish
4. Pomfrets

143 On a logarithmic scale, the species-area relationship is a:

1.	straight line	2.	rectangular hyperbola
3.	parabola	4.	concave up curve

144 IUCN stands for:
1. Indian Union for Conservation of Nature
2. International Union for Conservation of Nature
3. Indian Union for Classification of Natural ecosystems
4. Indian Union for Classification of Natural ecosystems

145 Most common morphological defence adaption against herbivory in plants is the presence of:

1.	toxic metabolites	2.	thorns
3.	spines	4.	slime

146 Consider the given two statements:

Assertion (A):	Pyramid of energy is always upright, can never be inverted.
Reason (R):	When energy flows from a particular trophic level to the next trophic level, some energy is always lost as heat at each step.

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

147 Primary production in deep sea hydrothermal vents is carried out by:
1. Chemoheterotrophic prokaryotes
2. Chemoautotrophic prokaryotes
3. Photosynthetic prokaryotes
4. Photosynthetic eukaryotes

148 The rate of formation of new organic matter by consumers is:
1. Gross Primary Productivity (GPP)
2. Net Primary Productivity (NPP)
3. Secondary productivity
4. Redundant productivity

149 The consequences of loss of biodiversity is least likely to result in:
1. decline in primary production
2. increased resistance to environmental perturbance
3. increased variability in water use
4. increased variability in pest and disease cycle

150 Which of the following will represent a higher Darwinian Fitness?
1. Low r value
2. High r value
3. Low carrying capacity
4. High carrying capacity

BIOLOGY II - SECTION A

151 Consider the given two statements:

Assertion (A):	The number of trophic levels in the grazing food chain is restricted.
Reason (R):	Based on the source of their nutrition or food, organisms occupy a specific place in the food chain that is known as their trophic level.

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

152 The current episode of mass extinction of species on Earth:

I:	is the sixth such episode overall
II:	is faster than the previous such episodes
III:	is mainly due to anthropogenic action

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

153 Who is revered as 'the father of ecology' in India?
1. Gurdev Singh Khush
2. Panchanan Maheshwari
3. M. S. Swaminathan
4. Ramdeo Misra

154 Which of the following is the home for greatest biodiversity on Earth?

1.	The Amazon Forest	2.	The Western Ghats
3.	The African grasslands	4.	The Australian Continent

155 The study of Ecology begins at the level of a/an:

1.	Organism	2.	Population
3.	Cell	4.	Biomolecules

156 Identify the correct statement regarding the energy flow in an ecosystem:

1.	About 2 to 10 % of incident solar radiation is PAR
2.	An ecosystem is exempt from the Second Law of Thermodynamics
3.	The amount of energy increases at successive trophic levels
4.	The number of trophic levels in a grazing food chain is limited

157 The Verhulst-Pearl Logistic growth equation is correctly written as [N - population size; r - the intrinsic growth rate, K - carrying capacity of the local environment]:
1. $dN/dt = rN[1- N/K]$
2. $dN/dt = rN[1- K/N]$
3. $dN/dt = rN + [1- N/K]$
4. $dN/dt = rN + [1- K/N]$

158 What reproductive strategy has evolved for most birds and mammals?

1.	They breed many times during their lifetime and produce a small number of large-sized offspring.
2.	They breed only once during their lifetime and produce a small number of large-sized offspring.
3.	They breed many times during their lifetime and produce a large number of small-sized offspring.
4.	They breed only once during their lifetime and produce a large number of small-sized offspring.

159 How many of the given statements are true?

I:	Amazon rain forest produces 20% of total oxygen in the Earth's atmosphere
II:	All the biodiversity hotspots put together cover about 10 % of the Earth's land area
III:	About 23 % of all species of gymnosperms in the world face the threat of extinction
IV:	India's share of the global species diversity is about 2.4 %

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

160 Some organisms have big-bang reproduction – they breed only once in their lifetime, produce many progeny and usually die after the event. An example of such organism may be:

1.	Most perennial plants	2.	Birds
3.	Pacific salmon	4.	Humans

161 An abandoned field has luxuriant growth of Calotropis but cattle and goats are not seen browsing in this field because Calotropis produces:
1. stipules
2. thorns
3. mustard oils
4. cardiac glycosides

162 The term 'Biodiversity' to describe the combined diversity at all levels of biological organisation was popularized by:
1. Robert May
2. Paul Ehrlich
3. Edward Osborne Wilson
4. Alexander von Humboldt

163 The Monarch butterfly is highly distasteful to its predator (bird) because:

1.	it accumulates TMAO as an osmolyte.
2.	it accumulates silica on its wings.
3.	the butterfly acquires a chemical during its caterpillar stage by feeding on a poisonous weed.
4.	it is covered with toxin mucilage.

164 Consider the given two statements:

Assertion (A):	Detritus food chain (DFC) may be connected with the grazing food chain (GFC) at some levels.
Reason (R):	Some of the organisms of DFC are prey to the GFC animals, and in a natural ecosystem, some animals are omnivores.

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

165 The leading cause of the loss of global biodiversity in current times is:
1. Habitat loss and fragmentation
2. Alien species invasion
3. Over-exploitation
4. Co-extinction

166 Alexander von Humboldt is known for the concept of:
1. Competitive release
2. Character displacement
3. Species Area relationship
4. Interference competition

167 What would be true for an orchid growing as an epiphyte on a mango plant?

I:	It grows on mango for physical support
II:	It affects mango negatively

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

168 Consider the given two statements:

Statement I:	Detritus Food Chain begins with dead organic matter.
Statement II:	In an aquatic ecosystem, DFC is the major conduit for energy flow.

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

169 Consider the given two statements:

Assertion (A):	Ecosystems are not exempt from the Second Law of thermodynamics.
Reason (R):	There is a constant supply of energy to synthesise the molecules they require, to counteract the universal tendency toward increasing disorderliness.

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

170 In an ecosystem, during decomposition, bacterial and fungal enzymes degrade detritus into simpler inorganic substances. This process is called as:

1.	Fragmentation	2.	Leaching
3.	Catabolism	4.	Humification

171 A process in which the fitness of one species (measured in terms of its 'r', the intrinsic rate of increase) is significantly lower in the presence of another species best describes:
1. competition
2. commensalism
3. predation
4. amensalism

172 Identify the correctly matched pairs:

	Extinct animal	Country/Continent
I.	Dodo	Mauritius
II.	Quagga	India
III.	Thylacine	Australia
IV.	Stellar's sea cow	Russia

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

173 According to the International Union for Conservation of Nature and Natural Resources (IUCN) (2004), the total number of plant and animal species described so far is:
1. less than 1.0 million
2. slightly more than 1.5 million
3. around 7 million
4. between 20 and 25 million

174 About what per cent of the energy in the sunlight, available to them, primary producers can convert into Net Primary Productivity (NPP)?
1. 1
2. 10
3. 50
4. 90

175 Consider the given two statements:

Statement I:	An individual may have births and deaths, but a population has birth rates and death rates.
Statement II:	An individual is either a male or a female but a population has a sex ratio.

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

176 To evolve the desired traits, natural selection operates at the level of:
1. Organism
2. Population
3. Species
4. Biological community

177 Vertical distribution of different species occupying different levels in an ecosystem is called:

1.	edge effect	2.	ecotone
3.	stratification	4.	canopy structure

178 A scientifically sound estimate that the global species diversity may be about 7 million has been made by:

1.	Paul Ehlrich	2.	David Tilman
3.	Robert May	4.	MacArthur

179 If N is the population density at time t, then its density at time t +1 is [B is births; I is immigration; D is deaths; E is emigration]:
1. $N_{t+1} = N_t + [(B + I) – (D + E)]$
2. $N_{t+1} = N_t + [(B + I) + (D + E)]$
3. $N_{t+1} = N_t + [(B + I) (D + E)]$
4. $N_{t+1} = N_t + [(B + I) / (D + E)]$

180 Consider the given two statements:

Assertion (A):	In-situ conservation is preferred if the organism, needed to be protected, is facing a high threat of extinction.
Reason (R):	In-situ conservation is an on-site conservation where we conserve and protect the whole ecosystem.

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

181 Consider the given two statements:

Assertion (A):	In an ecosystem, organisms are linked through food chains and food webs.
Reason (R):	No energy that is trapped into an organism remains in it forever.

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

182 Which of the following describes the amount of energy which the plants can capture?

1.	2-10 percent of the incident solar radiation
2.	5-10 percent of the photosynthetically active radiation
3.	5-10 percent of the incident solar radiation
4.	2-10 percent of the photosynthetically active radiation

183 Consider the given two statements:

Assertion (A):	The female Anopheles mosquito is considered a parasite.
Reason (R):	The female Anopheles depends on humans for food and shelter.

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

184 Consider the given two statements:

Assertion (A):	The earthworm has been referred to as a farmer's 'friend'
Reason (R):	They help in the breakdown of complex organic matter as well as in loosening of the soil.

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

185 What caused the extinction of Steller's sea cow and passenger pigeon?
1. Habitat loss and fragmentation
2. Over exploitation
3. Invasion by alien species
4. Co-extinction

Biology II - Section B

186 The maximum Net Primary Productivity (NPP) is expected in:

1.	Oceans	2.	Deserts
3.	Tropical rain forests	4.	Estuaries

187 Consider the given two statements:

Assertion (A):	Tropics have greater biodiversity than other regions on Earth.
Reason (R):	Tropics are subjected to larger seasonal variations than other regions on Earth.

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

188 The trophic level occupied by zooplankton in an aquatic ecosystem is:

1.	First	2.	Second
3.	Third	4.	Fourth

189 Which of the following features characterizes humus?
1. Easily broken down by microbes
2. Rapid decomposition
3. Acts as a reservoir of nutrients
4. Forms very rapidly

190 There are certain limitations of ecological pyramids including all the following except:

1. It does not take into account the same species belonging to two or more trophic levels.
2. It assumes a simple food chain, something that almost never exists in nature.
3. It does not accommodate a food web.
4. Saprophytes are given multiple levels in ecological pyramids.

191 Camouflage is:
1. cryptic coloration
2. aposematic coloration
3. bioluminescence
4. phenotypic plasticity

192 What will be true for nutrients in an ecosystem?

1. They are continuously lost from the ecosystem.
2. A continuous supply is needed to sustain an ecosystem.
3. They are recycled time and again indefinitely.
4. They are synthesized de novo by physical forces.

193 Who gave the rivet-popper hypothesis?

1.	Humboldt	2.	Ehlrich
3.	Tilman	4.	Tansley

194 Maximum global diversity amongst the following is exhibited by:

1.	Mollusks	2.	Echinoderms
3.	Annelids	4.	Crustaceans

195 Consider the given two statements:

I:	In most ecosystems, all the pyramids, of number, of energy and biomass are upright.
II:	Energy at a lower trophic level is always more than at a higher level.

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 What is subtracted from the gross primary productivity to get the net primary productivity?

1. the respiratory losses
2. secondary productivity
3. biomass consumed by herbivores
4. biomass trapped in dead organisms

197 The total number of biodiversity hotspots [based on information in NCERT] in the world are:

1.	3	2.	25
3.	34	4.	98

198 To complete its life cycle, the human liver fluke needs:

1. one intermediated host
2. only humans as host
3. two intermediate hosts
4. arthropod vectors

199 Which of the following is least likely to affect the size of a population?

1.	Competition	2.	Brood parasitism
3.	Commensalism	4.	Predation

200 Lichens is a mutualistic symbiotic relationship between:

1. An alga and a fungus
2. An alga and a blue green alga
3. A fungus and roots of vascular plants
3. Zooxanthellae and plants