DAY —— 01 SEAT NUMBER | | | | | | |

2024	II	21	1100	J-801	(E)

ENGLISH (01)

Time : 3 Hrs. (16 Pages) Max. Marks : 80

Important instructions :

(1) *Each activity has to be answered in complete sentence/s. One word answers will not be given complete credit. Just the correct activity number written in case of options will not be given credit.*

(2) *Web diagrams, flow charts, tables etc. are to be presented exactly as they are with answers.*

(3) *In point 2 above, just words without the presentation of the activity format/design, will not be given credit. Use of colour pencils/pens etc. is not allowed. (Only blue/black pens are allowed.)*

(4) *Multiple answers to the same activity will be treated as wrong and will not be given any credit.*

(5) *Maintain the sequence of the Sections/Question Nos./Activities throughout the activity sheet.*

SECTION - I : PROSE

(Reading for Comprehension, Language Study, Summary and Mind Mapping)

Q. 1. (A) Read the extract and complete the activities given below : **(12) [16]**

This is what Camus meant when he said that "what gives value to travel is fear" — disruption, in other words, (or emancipation) from circumstance, and all the habits

behind which we hide. And that is why many of us travel not in search of answers, but of better questions. I, like many people, tend to ask questions of the places I visit, and relish most the ones that ask the most searching questions back of me: “The ideal travel book,” Christopher Isherwood once said, “ should be perhaps a little like a crime story in which you’re in search of something.” And it’s the best kind of something, I would add, if it’s one that you can never quite find.

I remember, in fact, after my first trips to Southeast Asia, more than a decade ago, how I would come back to my apartment in New York, and lie in my bed, kept up by something more than jet lag, playing back, in my memory, over and over, all that I had experienced, and paging wistfully through my photographs and reading and re-reading my diaries, as if to extract some mystery from them. Anyone witnessing this strange scene would have drawn the right conclusion : I was in love.

When we go abroad is that we are objects of scrutiny as much as the people we scrutinize, and we are being consumed by the cultures we consume, as much on the road as when we are at home. At the very least, we are objects of speculation (and even desire) who can seem as exotic to the people around us as they do to us.

All, in that sense, believed in “being moved” as one of the points of taking trips, and “being transported” by private as well as public means; all saw that “ecstasy” (“ex-stasis”) tells us that our highest moments come when we’re not

stationary, and that epiphany can follow movement as much as it precipitates it.

A1. Read and rewrite the following sentences and state whether they are True or False : (2)

(a) A traveller may sink in love with his travel-memoirs.

(b) One gets inspected as he inspects the world around him.

(c) Quest for something may end in more mystery.

(d) Staying in comfort at home gives one more happiness than travelling.

A2. Match the persons given in column 'A' with opinions/ characteristics given in column 'B' : (2)

Column 'A'	Column 'B'
(1) Narrator	a) ideal travel should be like a crime story.
(2) Camus	b) in love with his memoirs.
(3) Isherwood	c) more happy when on move.
(4) Traveller	d) fear gives value to travel.

A3. Give reasons : (2)

"We are objects of scrutiny," because .....

(i) _____

(ii) _____

A4. "Travelling is an interesting teacher." Write your views in 3-4 sentences. (2)

A5. Do as directed : (2)

(i) I like to ask questions of the places I visit.

(Choose the correct tense form of the above sentence from the following options and rewrite.)

(a) Simple past tense

(b) Simple present tense

(c) Past perfect tense

(d) Present perfect tense

(ii) I would come back to my apartment in New York.

(Choose the correct option using 'used to' for the given sentence and rewrite.)

(a) I use to come back to my apartment in New York.

(b) I have used to come back to my apartment in New York.

(c) I used to come back to my apartment in New York.

(d) I had used to come back to my apartment in New York.

A6. Find out the words from passage which mean : (2)

(i) reminiscence

(ii) exhilaration

B1. Language study — **(4)**

Do as directed :

(1) Avneesh said, "Sanchit, what are you doing in the garden at this time?" (1)

(Identify and rewrite the correct 'indirect narration' from the following options.)

(i) Avneesh asked Sanchit what he was doing in the garden at that time.

(ii) Avneesh wanted to know from Sanchit his cause of being there in the garden.

(iii) Avneesh asked Sanchit whether he was present in the garden at that time.

(iv) Avneesh asked Sanchit whether he was doing in the garden at that time.

(2) Neeraj Chopra may not participate in the world championship due to ankle injury. (1)

(Choose the correct option from the following sentences which uses a more definite modal auxiliary.)

(i) Neeraj Chopra cannot participate in the world championship due to ankle injury.

(ii) Neeraj Chopra will not participate in the world championship due to ankle injury.

(iii) Neeraj Chopra should not participate in the world championship due to ankle injury.

(iv) Neeraj Chopra might not participate in the world championship due to ankle injury.

(3) Unless you are confident, you will not succeed. (1)

(Choose the correct option from the following options to change the sentence beginning with 'If.....')

(i) If you are confidence you will get success.

(ii) If you have confidence you will get success.

(iii) If you are confident you will not get success.

(iv) If you are not confident you will get success.

B2. Spot the error and rewrite correct sentence : (1)
He prescribe medicine alongwith a few exercises to his patients.

Q. 2. (A) Read the following extract and complete the activities given below : **(12) [18]**

Love is a great force in private life; it is indeed the greatest of all things; but love in public affairs does not work. It has been tried again and again; by the people of the Middle Ages, and also by the French Revolution, a secular movement which reasserted the Brotherhood of Man. And it has always failed. The idea that nations should love one another, or that business concerns or marketing boards should love one another or that a man in Portugal should love a man in Peru of whom he has never heard — it is absurd, unreal, dangerous. 'Love is what is needed,' we chant, and then sit back and the world goes on as before. The fact is we can only love what we know personally. And we cannot know much. In public affairs, in the rebuilding of civilization, something much less dramatic and emotional is needed, namely tolerance. Tolerance is a very dull virtue. It is boring. It is negative. It merely means putting up with people, being able to stand things. No one has ever written an ode to tolerance, or raised a statute to her. Yet this is the quality which will be most needed after the war. This is the sound state of mind which we are looking for. This is the only force which will enable different races and classes and interests to settle down together to the work of reconstruction.

The world is very full of people— appallingly full; it has never been so full before, and they are all tumbling over

each other. Most of these people one doesn't know and some of them one doesn't like. Well, what is one to do? If you don't like people, put up with them as well as you can. Don't try to love them; you can't. But try to tolerate them. On the basis of that tolerance a civilized future may be built. Certainly I can see no other foundation for the post-war world.

A1. Choose two correct alternatives which define the theme of the extract : (2)

(i) Love is a greater force in private as well as in public affairs.

(ii) To rebuild civilization we need tolerance more than love.

(iii) Patience is the solution in any sort of confrontation.

(iv) When you do not like people, nations or civilizations, you need to love them to change them.

A2. Complete the following table with the help of the extract : (2)

Give one merit and one demerit of 'Love' and 'Patience.'

Love	(i)	_____ .
	(ii)	_____ .
Patience	(i)	_____ .
	(ii)	_____ .

A3. Write how we can build up a civilized society; with the help of the extract. (2)

A4. 'Love and tolerance are the true indicators of a civilized person.' Justify. (2)

A5. Do as directed : (2)

(i) It has been tried again and again.

(Identify the correct Active Voice of the above sentence from the given options and rewrite.)

(a) They had tried it again and again.

(b) They has tried it again and again.

(c) They tried it again and again.

(d) They have tried it again and again.

(ii) It is the sound state of mind which we are looking for.

(Identify the correct simple sentence from the given options and rewrite.)

(a) It is the sound state of mind and we are looking for it.

(b) We are looking for the sound state of mind.

(c) We are looking for it but it is the sound state of mind.

(d) The sound state of mind is looked for.

A6. Match the words in column 'A' with their meanings in column 'B'. (2)

Column 'A'	Column 'B'
(i) Secular	(a) feeling of great friendship and understanding between people.
(ii) Absurd	(b) a society which has its own highly developed culture and ways of life.

(iii)	Civilization	(c)	not connected with any religion.
(iv)	Brotherhood	(d)	not at all logical or sensible.

(B) Summarising : **(3)**

Write a 'summary' of the above extract by using the following points.

(Love as a force — its limitations — tolerance — need of tolerance)

(C) Mind Mapping : **(3)**

Prepare a mind map on 'Effects of Music on Human Life' using your ideas/thoughts/concepts to illustrate.

SECTION - II : POETRY
(Poetry and Appreciation)

Q. 3. (A) Read the extract and complete the activities given below : **(10) [14]**

She walks in beauty, like the night
Of cloudless climes and starry skies;
And all that's best of dark and bright
Meet in her aspect and her eyes;
Thus mellowed to that tender light
Which heaven to gaudy day denies.

One shade the more, one ray the less,
Had half impaired the nameless grace
Which waves in every raven tress,
Or softly lightens o'er her face;
Where thoughts serenely sweet express,
How pure, how dear their dwelling-place.

And on that cheek, and o'er that brow,
So soft, so calm, yet eloquent,

The smiles that win, the tints that glow,
But tell of days in goodness spent,
A mind at peace with all below,
A heart whose love is innocent!

A1. Select and write the two statements from the given list which justify the theme of the poem. (2)

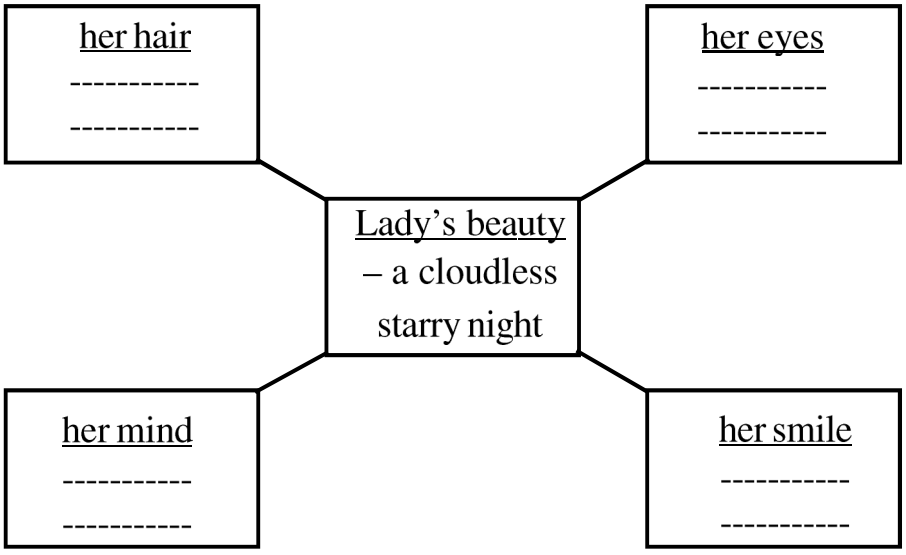
(a) The poet is blunt and direct in his expression of love.

(b) Internal beauty is as important as the external beauty.

(c) The poet is in love with lady's outward beauty.

(d) Beauty lies in the eyes of beholder.

A2. Complete the following web describing the various aspects of the lady's beauty. One is done for you at the centre place. (2)



A3. Write your idea of 'a beautiful person' in your own words. (2)

A4. Find out and explain an example of 'Antithesis' from the given extract. (2)

A5. Compose a poem of your own in about 2 to 4 lines on the topic 'Beauty'. (2)

(B) Appreciation : **(4)**

Read the extract and write the appreciation of the poem :

They hear no sound, the swell is strong;
Though the wind hath fallen they drift along,
Till the vessel strikes with a shivering shock,-
'O Christ! it is the Inchcape Rock!'

Sir Ralph the Rover tore his hair;
He curst himself in his despair;
The waves rush in every side,
The ship is sinking beneath the tide.

But even in his dying fear
One dreadful sound could the Rover hear,
A sound as if with the Inchcape Bell,
The Devil below was ringing his knell.

SECTION - III
(Writing Skills)

Q. 4. Complete the activities as per the instructions given below : **[16]**

(A) Attempt 'Any One' of the following activities : (4)

Drafting a virtual message :

(i) Manisha, a graduate girl, misses her college bus. Her father has gone for his regular morning walk. She needs his bike to appear for her entrance test. Draft a virtual message in about 50 words that she would write to her father.

OR

Statement of Purpose :

(ii) Imagine, after your HSC, you wish to pursue a degree in 'Bachelors in Communication Skills,' in a reputed university in India or abroad.

Prepare a 'statement of purpose' (SOP) in about 150 words which will help you to get admission in your dream university.

OR

Group Discussion :

(iii) Imagine, your class has attended a guest lecture on "Career Development." Write the group discussion in the form of dialogues associated with this lecture among 3 to 4 student participants.

(B) Attempt 'Any One' of the following activities : (4)

E-mail :

(i) Draft an E-mail to the manager of a company to request him/her to give you an opportunity as an apprentice to serve you as an experience for your career development.

OR

Report Writing :

(ii) Imagine your class attended a session on "How to win?" conducted by an expert speaker. Write a report on the session especially the relevant points in about 150 words.

OR

Interview :

(iii) Imagine you have to conduct an interview of a 'Famous Actor.' With the help of the format given below, draft questions on the given fields. (Do not change the sequence of the questions.)

Name of the interviewee :

Field / Reputation

Date / Venue / Time

Duration of Interview

Questions

Questions based on :

(1) Motivation
(2) Initial Preparation
(3) Support
(4) Idols / Gurus / Teachers
(5) First Break
(6) Public response
(7) Recognition
(8) Goals / Dreams

(C) Attempt 'Any One' of the following activities : (4)

Speech :

(i) Imagine you are preparing for an elocution competition and you wish to speak on the topic 'Green Revolution.'

Draft a speech in about 150 words on the given topic.

OR

Compering :

(ii) Imagine you are given the responsibility to 'compere' a programme by your college authorities. You need to prepare your script on the programme titled 'Cultural Fest 2024.' Draft the script to decide the flow of the programme. You may take help of the given points.

— Prayer
— Lighting of the lamp
— Introduction
— Felicitation
— Cultural Fest Programme

— Speech of the Chief Guest
— Presidential address
— Prize distribution
— Vote of thanks

OR

Expansion of Idea :

(iii) Expand the following idea with the help of the points given below (100 to150 words) :

'Manners Maketh Man'

Essential Virtues

— Politeness
— Speech, tone, gestures and action
— To be courteous and amiable

(D) Attempt 'Any One' of the following activities : (4)

Review :

(i) You have recently read a famous book/magazine. Write a 'Review' on the same with the help of the following points :

— title, front page, back page
— language, features, contents
— Pictures, quality, presentation
— Values, vision and variety

OR

Blog :

(ii) Write a 'Blog' in a proper format on 'Body Language' with the help of the following points (100 to 150 words):

- Meaning and features.
- Characteristics and scope
- Benefits / Importance
- Uses / Ways to utilize

OR

Appeal :

(iii) Prepare an 'Appeal' on the topic 'Traffic Rules for Safety Measures' with the help of the following points (100 to 150 words) :

- Ignorance and lack of knowledge and information
- Purpose / need of obeyance
- Avoid accidents / need of society
- Discipline

SECTION - IV
(LITERARY GENRE - NOVEL)

Q. 5. (A) Complete the activities given below as per the instructions : **(4) [16]**

(i) Match the columns : (2)

Column 'A'		Column 'B'	
(1)	Novel	(a)	Greek Romances
(2)	18th Century Literature	(b)	Middle class readers
(3)	2nd to 6th Century	(c)	A long narrative fiction
(4)	Newspapers and magazines	(d)	Spirit of Realism

(ii) Choose the correct alternatives and rewrite the sentences : (2)

(a) The novel that bears more than one level of meaning is called _____ novel.
[Realistic / Allegorical / Historical]

(b) _____ novel is concerned with the protagonist's overall growth from childhood to adulthood.
[Bildungsroman / Utopian / Gothic]

(c) _____ novel is a novel based on the author's life.
[Epistolary / Psychological / Autobiographical]

(d) The novel based on an imaginary community possessing the ideal qualities is called _____ novel. [Utopian / Epistolary / Picaresque]

(B) Answer in about 50 words to the questions given below : **(4)**

(i) Write a character-sketch of the narrator E.R. Braithwaite in 'To Sir With Love'. (2)

(ii) Consider 'student-teacher relationship' as one of the themes of 'To Sir With Love'. (2)

(C) Answer in about 50 words to the questions given below : **(4)**

(i) Appreciate Phileas Fogg as the protagonist of 'Around the World in Eighty Days.' (2)

(ii) The most interesting part of the extract 'Around the World in Eighty Days' is its climax. Discuss. (2)

(D) Answer in about 50 words to the questions given below: **(4)**

(i) Mary Morstan encourages Dr. Watson to get involved in her case. Justify the statement with reference to 'The Sign of Four.' (2)

(ii) Write the importance of various places such as 'Holmes' residence, Lyceum Theatre and unknown destination with reference to 'The Sign of Four.' (2)

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DAY —— 06 SEAT NUMBER | | | | | | |

2024	II	27	1100	J-837	(E)

PHYSICS (54)

Time : 3 Hrs. **(8 Pages)** **Max. Marks : 70**

General Instructions :

*The question paper is divided into **four** sections :*

(1) ***Section A*** *: Q. No. **1** contains **Ten multiple choice type** of questions carrying **One mark** each.*

*Q. No. **2** contains **Eight very short answer type** of questions carrying **One mark** each.*

(2) ***Section B*** *: Q. No. **3** to Q. No. **14** contain **Twelve short answer** type of questions carrying **Two marks** each. (Attempt **any Eight**).*

(3) ***Section C*** *: Q. No. **15** to Q. No. **26** contain **Twelve short answer** type of questions carrying **Three marks** each. (Attempt **any Eight**).*

(4) ***Section D*** *: Q. No. **27** to Q. No. **31** contain **Five long answer** type of questions carrying **Four marks** each. (Attempt **any Three**).*

*(5) Use of the log table is allowed. Use of calculator is **not** allowed.*

(6) Figures to the right indicate full marks.

(7) For multiple choice type questions, only the first attempt will be considered for evaluation.

(8) Physical Constants :

(i) Mass of electron m = 9.1×10^{-31} kg

(ii) $\varepsilon_0 = 8.85 \times 10^{-12}\ C^2 / Nm^2$

(iii) $\pi = 3.142$

(iv) Charge on electron e $= 1.6 \times 10^{-19} C$

(v) $\mu_0 = 4\pi \times 10^{-7}\ Wb/Am$

(vi) Planck's constant $h = 6.63 \times 10^{-34}$ J.s.

(vii) Speed of light c = 3×10^8 m/s

(viii) $g = 9.8\ m/s^2$

(ix) Rydberg's constant $R_H = 1.097 \times 10^7\ m^{-1}$

(x) Stefan's constant $\sigma = 5.67 \times 10^{-8}\ J\ m^{-2}\ s^{-1} K^{-4}$

SECTION – A

Q. 1. Select and write the correct answer for the following multiple choice type of questions : **[10]**

(i) The moment of inertia (MI) of a disc of radius R and mass M about its central axis is _____.

(a) $\frac{MR^2}{4}$ (b) $\frac{MR^2}{2}$

(c) MR^2 (d) $\frac{3MR^2}{2}$

(ii) The dimensional formula of surface tension is _____.

(a) $[L^{-1}M^1T^{-2}]$ (b) $[L^2M^1T^{-2}]$

(c) $[L^1M^1T^{-1}]$ (d) $[L^0M^1T^{-2}]$

(iii) Phase difference between a node and an adjacent antinode in a stationary wave is _____.

(a) $\frac{\pi}{4}$ rad (b) $\frac{\pi}{2}$ rad

(c) $\frac{3\pi}{4}$ rad (d) π rad

(iv) The work done in bringing a unit positive charge from infinity to a given point against the direction of electric field is known as _____.

(a) electric flux (b) magnetic potential

(c) electric potential (d) gravitational potential

(v) To convert a moving coil galvanometer into an ammeter we need to connect a _____.

(a) small resistance in parallel with it

(b) large resistance in series with it

(c) small resistance in series with it

(d) large resistance in parallel with it

(vi) If the frequency of incident light falling on a photosensitive material is doubled, then kinetic energy of the emitted photoelectron will be _____.

(a) the same as its initial value

(b) two times its initial value

(c) more than two times its initial value

(d) less than two times its initial value

(vii) In a cyclic process, if $\Delta U =$ internal energy, W = work done, Q = Heat supplied then

(a) $\Delta U = Q$ (b) $Q = O$

(c) $W = O$ (d) $W = Q$

(viii) The current in a coil changes from 50A to 10A in 0.1 second. The self inductance of the coil is 20H. The induced e.m.f. in the coil is _____.

(a) 800V (b) 6000V

(c) 7000V (d) 8000V

(ix) The velocity of bob of a second's pendulum when it is 6 cm from its mean position and amplitude of 10 cm, is _____.

(a) 8π cm/s (b) 6π cm/s

(c) 4π cm/s (d) 2π cm/s

(x) In biprism experiment, the distance of 20^{th} bright band from the central bright band is 1.2 cm. Without changing the experimental set-up, the distance of 30^{th} bright band from the central bright band will be _____.

(a) 0.6 cm (b) 0.8 cm

(c) 1.2 cm (d) 1.8 cm

Q. 2. Answer the following questions : **[8]**

(i) Define centripetal force.

(ii) Why a detergent powder is mixed with water to wash clothes?

(iii) What is the resistance of an ideal voltmeter?

(iv) Write the formula for torque acting on rotating current carrying coil in terms of magnetic dipole moment, in vector form.

(v) What is binding energy of a hydrogen atom?

(vi) What is surroundings in thermodynamics?

(vii) In a photoelectric experiment, the stopping potential is 1.5V. What is the maximum kinetic energy of a photoelectron?

(viii) Two capacitors of capacities 5μF and 10μF respectively are connected in series. Calculate the resultant capacity of the combination.

SECTION – B

Attempt any EIGHT questions of the following : **[16]**

Q. 3. Explain the change in internal energy of a thermodynamic system (the gas) by heating it.

Q. 4. Explain the construction of a spherical wavefront by using Huygens' principle.

Q. 5. Define magnetization. State its SI unit and dimensions.

Q. 6. Obtain the differential equation of linear simple harmonic motion.

Q. 7. A galvanometer has a resistance of 30Ω and its full scale deflection current is 20 microampere (μA). What resistance should be added to it to have a range 0-10 volt?

Q. 8. Explain Biot-Savart law.

Q. 9. What is a Light Emitting Diode? Draw its circuit symbol.

Q. 10. An aircraft of wing span of 60 m flies horizontally in earth's magnetic field of $6\times10^{-5}\text{T}$ at a speed of 500 m/s. Calculate the e.m.f. induced between the tips of wings of aircraft.

Q. 11. Derive an expression for maximum speed of a vehicle moving along a horizontal circular track.

Q. 12. A horizontal force of 0.5N is required to move a metal plate of area 10^{-2}m^2 with a velocity of $3\times10^{-2}\text{m/s}$, when it rests on $0.5\times10^{-3}\text{m}$ thick layer of glycerin. Find the coefficient of viscosity of glycerin.

Q. 13. Two tuning forks having frequencies 320 Hz and 340 Hz are sounded together to produce sound waves. The velocity of sound in air is 340 m/s. Find the difference in wavelength of these waves.

Q. 14. Calculate the change in angular momentum of electron when it jumps from third orbit to first orbit in hydrogen atom.

SECTION – C

Attempt any EIGHT questions of the following : **[24]**

Q. 15. A circular coil of wire is made up of 200 turns, each of radius 10 cm. If a current of 0.5A passes through it, what will be the magnetic field at the centre of the coil?

Q. 16. Define photoelectric effect and explain the experimental set-up of photoelectric effect.

Q. 17. Define the current gain α_{DC} and β_{DC} for a transistor. Obtain the relation between them.

Q. 18. Define surface energy of the liquid. Obtain the relation between the surface energy and surface tension.

Q. 19. What is an isothermal process? Obtain an expression for work done by a gas in an isothermal process.

Q. 20. Derive an expression for equation of stationary wave on a stretched string. Show that the distance between two successive nodes or antinodes is $\lambda/2$.

Q. 21. Derive an expression for the impedance of an LCR circuit connected to an AC power supply. Draw phasor diagram.

Q. 22. Calculate the wavelength of the first two lines in Balmer series of hydrogen atom.

Q. 23. A current carrying toroid winding is internally filled with lithium having susceptibility $\chi = 2.1 \times 10^{-5}$. What is the percentage increase in the magnetic field in the presence of lithium over that without it?

Q. 24. The radius of a circular track is 200 m. Find the angle of banking of the track, if the maximum speed at which a car can be driven safely along it is 25 m/sec.

Q. 25. Prove the Mayer's relation : $C_p - C_v = \frac{R}{J}$

Q. 26. An alternating voltage is given by $e = 8 \sin 628.4t$. Find

(i) peak value of e.m.f.

(ii) frequency of e.m.f.

(iii) instantaneous value of e.m.f. at time t = 10 ms.

SECTION – D

Attempt any THREE questions of the following : **[12]**

Q. 27. What is a transformer? Explain construction and working of a transformer. Derive the equation for a transformer.

Q. 28. Using the geometry of the double slit experiment, derive the expression for fringe width of interference bands.

Q. 29. Distinguish between an ammeter and a voltmeter. (Two points each).

The displacement of a particle performing simple harmonic motion is $\frac{1}{3}$rd of its amplitude. What fraction of total energy will be its kinetic energy?

Q. 30. Draw a neat labelled diagram of Ferry's perfectly black body. Compare the rms speed of hydrogen molecules at 227ºC with rms speed of oxygen molecule at 127ºC. Given that molecular masses of hydrogen and oxygen are 2 and 32 respectively.

Q. 31. Derive an expression for energy stored in a charged capacitor.

A spherical metal ball of radius 15 cm carries a charge of 2μC. Calculate the electric field at a distance of 20 cm from the center of the sphere.

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DAY —— 08 SEAT NUMBER | | | | | | |

2024	II	29	1100	J-852	(E)

CHEMISTRY (55)

Time : 3 Hrs. **(7 Pages)** **Max. Marks : 70**

General Instructions :

*The question paper is divided into **four** sections.*

(1) ***Section A :*** *Q. No. **1** contains **Ten** multiple choice type of questions carrying **One** mark each. Only the first attempt will be considered for evaluation.*

*Q. No. **2** contains **Eight** very short answer type of questions carrying **One** mark each.*

(2) ***Section B :*** *Q. No. **3** to Q. No. **14** are **Twelve** short answer type of questions carrying **Two** marks each. (Attempt **any Eight**)*

(3) ***Section C :*** *Q. No. **15** to Q. No. **26** are **Twelve** short answer type of questions carrying **Three** marks each. (Attempt **any Eight**)*

(4) ***Section D :*** *Q. No. **27** to Q. No. **31** are **Five** long answer type of questions carrying **Four** marks each. (Attempt **any Three**)*

(5) Use of log table is allowed. Use of calculator is not allowed.

(6) Figures to the right indicate full marks.

(7) Given : $R = 8.314\ J.K^{-1}.mol^{-1}$

$N_A = 6.022 \times 10^{23}$

$F = 96500C$

SECTION - A

Q. 1. Select and write the correct answer for the following multiple choice type of questions : **[10]**

(i) The spin only magnetic moment of Cr^{3+} cation is _____.

(a) 3.742 BM (b) 3.755 BM

(c) 3.873 BM (d) 3.633 BM

(ii) The linkage present in Lactose is _____.

(a) α, β –1, 2 – glycosidic linkage

(b) α –1, 4 – glycosidic linkage

(c) β –1, 4 – glycosidic linkage

(d) α –1, 4 – glycosidic linkage

(iii) The product of the following reaction is

$$C_2H_5 - \overset{\overset{O}{\|}}{C} - CH_3 \xrightarrow[\Delta]{H_2 / Ni} ?$$

(a) $CH_3 - CH_2 - CH_2 - CH_2 - OH$

(b) $CH_3 - \underset{\underset{OH}{|}}{CH} - CH_2 - CH_3$

(c) $CH_3 - CH_2 - CH_2 - CH_3$

(d) $CH_3 - CH_2 - CH_2 - COOH$

(iv) The pH of 0.001M HCl solution is _____.

(a) 10 (b) 3

(c) 2 (d) 11

(v) The correct structure of complex having IUPAC name sodium hexanitrocobaltate (III) is

(a) $Na_3 [Co(NO_2)_5]$

(b) $Na_4 [Co(NO_2)_6]$

(c) $Na_3 [Co(NO_2)_6]$

(d) $Na_4 [Co(NO_2)_5]$

(vi) The number of particles present in Face Centred Cubic Unit Cell is/are _____.

(a) 1 (b) 2

(c) 3 (d) 4

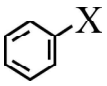
(vii) The monomer used in preparation of teflon is _____.

(a) E caprolactum (b) vinyl chloride

(c) styrene (d) tetrafluoroethene

(viii) Among the following vinylic halide is _____.

(a) $R-\underset{\displaystyle X}{\underset{|}{CH}}-R$ (b) $CH_2 = CH - X$

(c)  (d) $CH_2 = CH - CH_2 - X$

(ix) The product of hydrolysis of propyne in the presence of 1% H_gSO_4 and 40% H_2SO_4 is _____.

(a) methanal (b) ethanal

(c) propanal (d) propanone

(x) If unit of rate constant is mol $dm^{-3}s^{-1}$, the order of reaction would be _____.

(a) zero (b) 1

(c) 2 (d) 3

Q. 2. Answer the following questions : **[8]**

(i) Write the name of metal nanoparticle used to remove E.coli bacteria from water.

(ii) Write the name of reduction product formed when ethyl cyanide is treated with sodium and alcohol.

(iii) Complete the reaction: $CH_3CH_2Cl \xrightarrow[alc.\Delta]{A_gCN} ?$

(iv) Calculate effective atomic number of $[Co(NH_3)_6]^{3+}$ ion.

(v) The compounds of Ti^{4+} ions are colourless due to .....

(vi) Write SI unit of molar conductivity.

(vii) Write the sign convention of work done during expansion of gas.

(viii) Write the condition of reverse osmosis.

SECTION - B

Attempt any EIGHT of the following questions : **[16]**

Q. 3. Derive an expression for maximum work obtainable during isothermal reversible expansion of an ideal gas from initial volume (V_1) to final volume (V_2).

Q. 4. What are interhalogen compounds? Write the chemical reaction, when chlorine reacts with dry slaked lime.

Q. 5. What is nano material? Write the reaction involved in sol-gel process during hydrolysis.

Q. 6. Write classification of proteins with an example.

Q. 7. Calculate the time required to deposit 2·4 g of Cu, when 2·03 A of current passed through $CuSO_4$ solution.
(At. mass of Cu = 63.5 $g.mol^{-1}$)

Q. 8. Why amines are basic in nature? Among dimethylamine (pK_b = 3·27) and diethylamine (pK_b = 3·0), which one is more basic?

Q. 9. Explain buffer action of sodium acetate-acetic acid buffer.

Q. 10. Write preparation of (a) diethyl ether (b) ethyl cyanide from ethyl bromide.

Q. 11. Henry's constant for $CH_3Br_{(g)}$ is 0·159 mol $dm^{-3}.bar^{-1}$ at 25°C. Calculate its solubility in water at 25°C, if its partial pressure is 0·164 bar.

Q. 12. Write the structure and name of monomer of

(a) Nylon-6

(b) Natural rubber

Q. 13. Define Lanthanide contraction. Write the balanced chemical equations when acidified $K_2Cr_2O_7$ reacts with H_2S.

Q. 14. Derive the relationship between molar mass, density of the substance and unit cell edge length.

SECTION - C

Attempt any EIGHT of the following questions : **[24]**

Q. 15. What is osmotic pressure? How will you determine molar mass of solute from osmotic pressure?

Q. 16. Write chemical reactions involved in :

(a) Rosenmund reduction.

(b) Gatterman Koch formylation.

(c) Cannizzaro reaction of methanal.

Q. 17. Calculate the standard enthalpy of combustion of methane, if the standard enthalpy of formation of methane, carbon dioxide and water are $-74{\cdot}8$, $-393{\cdot}5$ and $-285{\cdot}8$ kJmol^{-1} respectively.

Q. 18. What is the action of following on ethyl bromide ?

(a) silver nitrite

(b) Mg in dry ether

(c) alcoholic sodium hydroxide

Q. 19. For the reaction A + B $\rightarrow$ P.

If [B] is doubled at constant [A], the rate of reaction doubled. If [A] is triple and [B] is doubled, the rate of reaction increases by a factor of 6. Calculate the rate law equation.

Q. 20. Arrange the following in the increasing order of the property mentioned:

(i) $HOCl$, $HClO_2$, $HClO_3$, $HClO_4$ (acidic strength)

(ii) MF, MCl, MBr, MI (ionic character)

(iii) HF, HCl, HBr, HI (thermal stability)

Q. 21. Explain Wolf-Kishner reduction reaction. Write preparation of propanone by using ethanoyl chloride and dimethyl cadmium.

Q. 22. Write postulates of Werner theory of co-ordination complexes. Write the name of a hexadentate ligand.

Q. 23. Define electrochemical series and write its two applications.

Q. 24. Identify 'A', 'B' and 'C' in following chain reaction and rewrite the chemical reactions:

$$CH_3CH_2OH \xrightarrow[Br_2]{\text{red 'P'}} A \xrightarrow[\text{alc}]{KCN} B \xrightarrow[\text{Ether}]{LiAlH_4} C$$

Q. 25. Define acids and bases according to Bronsted-Lowry theory. Derive relationship between pH and pOH.

Q. 26. Write the preparation of potassium dichromate from chromite ore.

SECTION - D

Attempt any THREE of the following questions : **[12]**

Q. 27. Convert the following :

(i) acetaldehyde to isopropyl alcohol.

(ii) cumene to phenol.

(iii) anisole to phenol.

Write two uses of neon.

Q. 28. Define : (i) Extensive and Intensive properties

(ii) Isobaric and Adiabatic processes

What are enzymes?

Write the atomic numbers of transuranium elements.

Q. 29. Predict the type of cubic lattice of a solid element having edge length of 400 pm and density is 6·25 g/ml
(Atomic mass of element = 60)
Define : Nanoscience
Write chemical reaction for the preparation of polyacrylonitrile.

Q. 30. Derive the relation between half life period and rate constant for first order reaction.

Write the net cell reaction during discharging of lead accumulator.

Draw the structure of peroxymonosulphuric acid.

Q. 31. Mention the number of unpaired electrons and geometry of following complexes :

(i) $[Ni(Cl)_4]^{2-}$

(ii) $[Ni(CN)_4]^{2-}$

Convert the following :

(a) Ethanenitrile into ethanal.

(b) Cyclohexane into adipic acid.

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DAY —— 09 SEAT NUMBER | | | | | | |

2024	III	02	1100	J-862	(E)

MATHEMATICS & STATISTICS (40)
(ARTS & SCIENCE)

Time : 3 Hrs. **(8 Pages)** **Max. Marks : 80**

General instructions :

*The question paper is divided into **FOUR** sections.*

(1) ***Section A :*** *Q. 1 contains **Eight** multiple choice type of questions, each carrying **Two** marks.*
*Q. 2 contains **Four** very short answer type questions, each carrying **One** mark.*

(2) ***Section B :*** *Q. 3 to Q. 14 contain **Twelve** short answer type questions, each carrying **Two** marks. (Attempt any **Eight**)*

(3) ***Section C :*** *Q. 15 to Q. 26 contain **Twelve** short answer type questions, each carrying **Three** marks. (Attempt any **Eight**)*

(4) ***Section D :*** *Q. 27 to Q. 34 contain **Eight** long answer type questions, each carrying **Four** marks. (Attempt any **Five**)*

(5) Use of log table is allowed. Use of calculator is not allowed.

(6) Figures to the right indicate full marks.

(7) Use of graph paper is not necessary. Only rough sketch of graph is expected.

(8) For each multiple choice type of question, only the first attempt will be considered for evaluation.

(9) Start answer to each section on a new page.

SECTION – A

Q. 1. Select and write the correct answer for the following multiple choice type of questions : **[16]**

(i) The dual of statement $t \vee (p \vee q)$ is _____.

(a) $c \wedge (p \vee q)$ (b) $c \wedge (p \wedge q)$

(c) $t \wedge (p \wedge q)$ (d) $t \wedge (p \vee q)$ (2)

(ii) The principle solutions of the equation $\cos\theta = \frac{1}{2}$ are _____.

(a) $\frac{\pi}{6}, \frac{5\pi}{6}$ (b) $\frac{\pi}{3}, \frac{5\pi}{3}$

(c) $\frac{\pi}{6}, \frac{7\pi}{6}$ (d) $\frac{\pi}{3}, \frac{2\pi}{3}$ (2)

(iii) If α, β, γ are direction angles of a line and $\alpha = 60°$, $\beta = 45°$, then γ = _____.

(a) 30º or 90º (b) 45º or 60º

(c) 90º or 130º (d) 60º or 120º (2)

(iv) The perpendicular distance of the plane $\bar{r} \cdot (3\hat{i} + 4\hat{j} + 12\hat{k}) = 78$, from the origin is _____.

(a) 4 (b) 5

(c) 6 (d) 8 (2)

(v) The slope of the tangent to the curve $x = \sin\theta$ and $y = \cos 2\theta$ at $\theta = \frac{\pi}{6}$ is _____.

(a) $-2\sqrt{3}$ (b) $\frac{-2}{\sqrt{3}}$

(c) -2 (d) $-\frac{1}{2}$ (2)

(vi) If $\int_{\frac{-\pi}{4}}^{\frac{\pi}{4}} x^3.\sin^4 x\,dx = k$ then $k =$ _____.

(a) 1 (b) 2

(c) 4 (d) 0 (2)

(vii) The integrating factor of linear differential equation $x\frac{dy}{dx} + 2y = x^2 \log x$ is _____.

(a) x (b) $\frac{1}{x}$

(c) x^2 (d) $\frac{1}{x^2}$ (2)

(viii) If the mean and variance of a binomial distribution are 18 and 12 respectively, then the value of n is _____.

(a) 36 (b) 54

(c) 18 (d) 27 (2)

Q. 2. Answer the following questions : **[4]**

(i) Write the compound statement 'Nagpur is in Maharashtra and Chennai is in Tamilnadu' symbolically. (1)

(ii) If the vectors $2\hat{i} - 3\hat{j} + 4\hat{k}$ and $p\hat{i} + 6\hat{j} - 8\hat{k}$ are collinear, then find the value of p. (1)

(iii) Evaluate : $\int \frac{1}{x^2 + 25} dx$ (1)

(iv) A particle is moving along X-axis. Its acceleration at time t is proportional to its velocity at that time. Find the differential equation of the motion of the particle. (1)

SECTION – B

Attempt any EIGHT of the following questions : **[16]**

Q. 3. Construct the truth table for the statement pattern :
$[(p \rightarrow q) \wedge q] \rightarrow p$ (2)

Q. 4. Check whether the matrix $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ is invertible or not. (2)

Q. 5. In ΔABC, if $a = 18$, $b = 24$ and $c = 30$ then find the value of

$\sin\left(\frac{A}{2}\right)$. (2)

Q. 6. Find k, if the sum of the slopes of the lines represented by $x^2 + kxy - 3y^2 = 0$ is twice their product. (2)

Q. 7. If $\bar{a}, \bar{b}, \bar{c}$ are the position vectors of the points A, B, C respectively and $5\bar{a} - 3\bar{b} - 2\bar{c} = \bar{0}$, then find the ratio in which the point C divides the line segment BA. (2)

Q. 8. Find the vector equation of the line passing through the point having position vector $4\hat{i} - \hat{j} + 2\hat{k}$ and parallel to the vector $-2\hat{i} - \hat{j} + \hat{k}$. (2)

Q. 9. Find $\frac{dy}{dx}$, if $y = (\log x)^x$. (2)

Q. 10. Evaluate : $\int \log x \, dx$. (2)

Q. 11. Evaluate : $\int_0^{\frac{\pi}{2}} \cos^2 x \, dx$ (2)

Q. 12. Find the area of the region bounded by the curve $y = x^2$, and the lines $x = 1$, $x = 2$ and $y = 0$. (2)

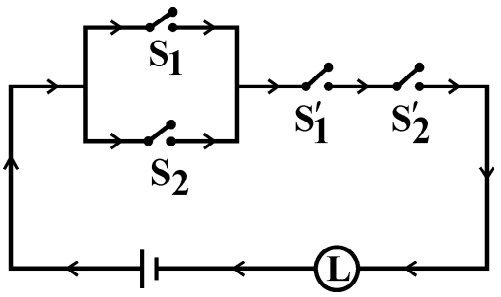
Q. 13. Solve : $1 + \frac{dy}{dx} = \text{cosec}(x + y)$; put $x + y = u$. (2)

Q. 14. If two coins are tossed simultaneously, write the probability distribution of the number of heads. (2)

SECTION – C

Attempt any EIGHT of the following questions : **[24]**

Q. 15. Express the following switching circuit in the symbolic form of logic. Construct the switching table :



(3)

Q. 16. Prove that : $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) = \frac{\pi}{4}$ (3)

Q. 17. In ΔABC, prove that : $\frac{\cos A}{a} + \frac{\cos B}{b} + \frac{\cos C}{c} = \frac{a^2 + b^2 + c^2}{2abc}$. (3)

Q. 18. Prove by vector method, the angle subtended on a semicircle is a right angle. (3)

Q. 19. Find the shortest distance between the lines $\bar{r} = (4\hat{i} - \hat{j}) + \lambda(\hat{i} + 2\hat{j} - 3\hat{k})$ and $\bar{r} = (\hat{i} - \hat{j} - 2\hat{k}) + \mu(\hat{i} + 4\hat{j} - 5\hat{k})$ (3)

Q. 20. Find the angle between the line $\bar{r} = (\hat{i} + 2\hat{j} + \hat{k}) + \lambda(\hat{i} + \hat{j} + \hat{k})$ and the plane $\bar{r} \cdot (2\hat{i} + \hat{j} + \hat{k}) = 8$. (3)

Q. 21. If $y = \sin^{-1} x$, then show that : $(1 - x^2)\frac{d^2y}{dx^2} - x \cdot \frac{dy}{dx} = 0$. (3)

Q. 22. Find the approximate value of $\tan^{-1}(1.002)$.

[Given : $\pi = 3.1416$] (3)

Q. 23. Prove that : $\int \frac{1}{a^2 - x^2} dx = \frac{1}{2a} \log\left(\frac{a + x}{a - x}\right) + c$. (3)

Q. 24. Solve the differential equation :

$$x \cdot \frac{dy}{dx} - y + x \cdot \sin\left(\frac{y}{x}\right) = 0.$$ (3)

Q. 25. Find k, if

$f(x) = kx^2(1 - x)$, for $0 < x < 1$,

$= 0$ otherwise

is the p.d.f. of random variable X. (3)

Q. 26. A die is thrown 6 times, if 'getting an odd number' is success, find the probability of 5 successes. (3)

SECTION – D

Attempt any FIVE of the following questions : **[20]**

Q. 27. Solve the following system of equations by the method of reduction : $x + y + z = 6,\ y + 3z = 11,\ x + z = 2y$. (4)

Q. 28. Prove that the acute angle θ between the lines represented by the equation $ax^2 + 2hxy + by^2 = 0$ is $\tan\theta = \left|\frac{2\sqrt{h^2 - ab}}{a + b}\right|$.

Hence find the condition that the lines are coincident. (4)

Q. 29. Find the volume of the parallelopiped whose vertices are $A(3,2,-1),\ B(-2,2,-3),\ C(3,5,-2)$ and $D(-2,5,4)$. (4)

Q. 30. Solve the following L.P.P. by graphical method :

Maximize : $z = 10x + 25y$

Subject to : $0 \le x \le 3,$

$0 \le y \le 3,$

$x + y \le 5.$

Also find the maximum value of z. (4)

Q. 31. If $x = f(t)$ and $y = g(t)$ are differentiable functions of t, so that y is function of x and $\frac{dx}{dt} \neq 0$ then prove that $\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$.

Hence find $\frac{dy}{dx}$, if $x = at^2,\ y = 2at$. (4)

Q. 32. A box with a square base is to have an open top. The surface area of box is 147 sq.cm. What should be its dimensions in order that the volume is largest? (4)

Q. 33. Evaluate : $\int \frac{5e^x}{(e^x+1)(e^{2x}+9)}\,dx$ (4)

Q. 34. Prove that :

$$\int_0^{2a} f(x)\,dx = \int_0^{a} f(x)dx + \int_0^{a} f(2a-x)dx$$

Hence show that :

$$\int_0^{\pi} \sin x\,dx = 2\int_0^{\frac{\pi}{2}} \sin x\,dx$$ (4)

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DAY —— 12 SEAT NUMBER | | | | | | |

2024	III	06	1100	J-885	(E)

BIOLOGY (56)

Time : 3 Hrs. **(8 Pages)** **Max. Marks : 70**

General Instructions :

*The question paper is divided into **four** sections.*

(1) ***Section A :*** *Q. No. **1** contains **Ten multiple choice** type of questions carrying **one** mark each. Evaluation will be done for the **first attempt** only.*

*Q. No. **2** Contains **Eight very short answer** type of questions carrying **one** mark each.*

(2) ***Section B :*** *Q. No. **3** to **14** are **short answer** type of questions carrying **two** marks each. **(**Attempt **any Eight)***

(3) ***Section C :*** *Q. No. **15** to **26** are **short answer** type of questions carrying **three** marks each. **(**Attempt **any Eight)***

(4) ***Section D :*** *Q. No. **27** to **31** are **long answer** type of questions carrying **four** marks each. **(**Attempt **any Three)***

(5) *Begin the answer of each section on a new page.*

SECTION – A

Q. 1. Select the correct alternatives and write the answers : **[10]**

(i) Identify the growth hormone in plants which causes inhibitory effect.

(a) Cytokinins (b) Abscissic acid

(c) Gibberellin (d) Ethylene

(ii) Which one of the following is not a part of lac operon?

(a) Promoter (b) Regulator

(c) Inducer (d) Operator

(iii) In absence of fertilization, corpus luteum degenerates into _____.

(a) tunica albugenia (b) membrana granulosa

(c) zona pellucida (d) corpus albicans

(iv) Which of the following divides nasal cavity?

(a) Hyaline cartilage (b) Mesethmoid cartilage

(c) Ligamentum arteriosum (d) Laryngopharynx

(v) Which of the following is caused by unsterilized needle?

(a) Elephantiasis (b) AIDS

(c) Malaria (d) Dengue

(vi) Recognition sequence of restriction enzymes are generally _____ nucleotides long.

(a) 2 to 4 (b) 4 to 8

(c) 8 to 10 (d) 14 to 18

(vii) Which of the following types require pollinator but result is genetically similar to autogamy?

(a) Geitonogamy (b) Xenogamy

(c) Apogamy (d) Cleistogamy

(viii) Which one of the following does not evolve further?

(a) Climax community

(b) Primary Succession

(c) Pioneer Species

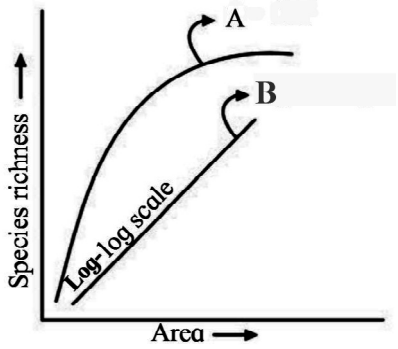
(d) Seral Community

(ix) Identify the appropriate term for the number of births under ideal conditions :

(a) Absolute mortality (b) Realized natality

(c) Realized mortality (d) Absolute natality

(x) Observe the graph and select correct option :



(a) Line 'A' represents $S\text{-}CA^2$

(b) Line 'B' represents $\log C = \log A + Z \log S$

(c) Line A represents $S = CA^Z$

(d) Line B represents $\log S = \log Z + C \log A$

Q. 2. Answer the following questions : **[8]**

(i) What are vestigeal organs?

(ii) Expand the term ZIFT.

(iii) Give the name of endocrine gland which is prominent at birth but gets gradually atrophied in adult stage.

(iv) What is the full form of IAA?

(v) Give the name of microbial source of antibiotic chloromycetin.

(vi) Which cells of islets of Langerhans produce a hormone insulin?

(vii) How many meiotic divisions are required for the formation of 300 seeds in angiosperm?

(viii) Explain the term Emigration.

SECTION – B

Attempt any EIGHT of the following questions : **[16]**

Q. 3. What are the reasons for the success of Mendel?

Q. 4. Arrange the following steps of DNA fingerprinting in correct sequence :

(a) Gel electrophoresis

(b) Isolation of DNA

(c) Southern blotting

(d) Restriction digestion

Q. 5. Distinguish between human sperm and ovum.

Q. 6. Enlist the uses of gene therapy.

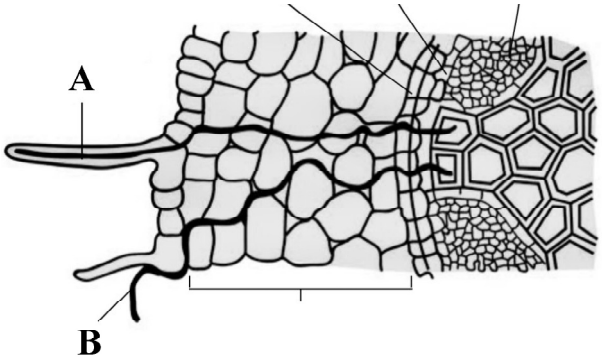
Q. 7. Define the following terms :

(a) Gene flow

(b) Chromosomal aberrations

Q. 8. What are the significances of double fertilization?

Q. 9. Identify and define 'A' and 'B' in relation to uptake of water by the root :



Q. 10. Describe mutualism.

Q. 11. Explain factors affecting water absorption.

Q. 12. What is differentiation and redifferentiation?

Q. 13. Select and rewrite appropriate disorder of respiratory system with the given symptoms :

[sinusitis, emphysema, silicosis and asbestosis, laryngitis]

(a) Breakdown of alveoli, shortness of breath.

(b) Inflammation of the sinuses, mucous discharge.

(c) Inflammation of larynx, vocal cord, sore throat, hoarseness of voice, mucous build up and cough.

(d) Inflammation of fibrosis, lung damage.

Q. 14. Explain the steps involved in preliminary treatment of sewage.

SECTION – C

Attempt any EIGHT of the following questions : **[24]**

Q. 15. Give the different steps involved in formation of m-RNA from hn-RNA.

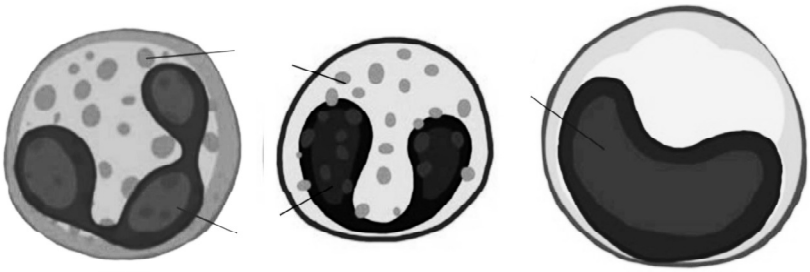
Q. 16. What is reproductive isolation? Describe any two types each of pre-mating and post-mating isolating mechanism.

Q. 17. Explain unique features of acquired immunity.

Q. 18. Name and describe hormones secreted by ovaries.

Q. 19. Explain different steps involved in PCR technique.

Q. 20.



A **B** **C**

Identify A, B, and C from the above diagrams and give their functions.

Q. 21. What are the limitations of root pressure theory?

Q. 22. Explain green house effect with reference to gases responsible for it and their sources.

Q. 23. Describe physiological effects and applications of ethylene.

Q. 24. Give the name and type of I, IV and VII cranial nerves.

Q. 25. Describe pyramid of energy with the help of diagram.

Q. 26. What is lac? Enlist economic importance of Lac.

SECTION – D

Attempt any THREE of the following questions : **[12]**

Q. 27. Describe histological structure of Testis with well labelled diagram.

Q. 28. What are chromosomal disorders? Describe Turner's syndrome and Klinefelter's syndrome.

Q. 29. Describe nervous system in planaria with well labelled diagram.

Q. 30. Explain following terms :

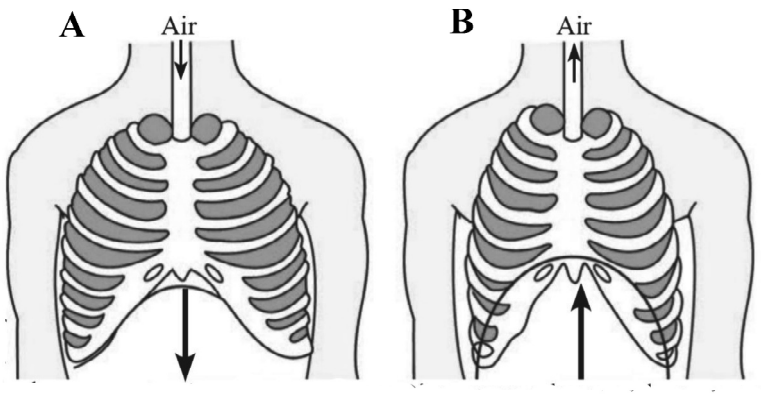
(a) Grafting

(b) Apomixis

(c) Polyembryony

(d) Parthenocarpy

Q. 31. Interpret the given diagrams A and B. Enlist the changes occuring during inspiration and expiration.



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