

Section 1 — [19 × 1 = 19 Marks]

Q.NO.1: Write the Question No. and the complete correct option on the answer script.

1. The value of i^{2026} is:
 (a) 1 (b) -1 (c) i (d) $-i$
2. If $z = 3 - 4i$, then $|z|$ is equal to:
 (a) 5 (b) 25 (c) 7 (d) 1
3. If A is a square matrix of order 3×3 and $|A| = 4$, then $|2A|$ is:
 (a) 8 (b) 16 (c) 32 (d) 64
4. The multiplicative inverse of a square matrix A exists if and only if:
 (a) $|A| = 0$ (b) $|A| \neq 0$ (c) A is symmetric (d) A is singular
5. The n -th term of an Arithmetic Progression is $a_n = 3n - 1$. Its common difference d is:
 (a) 1 (b) 2 (c) 3 (d) -1
6. The sum of the infinite geometric series $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$ is:
 (a) 1 (b) 2 (c) $\frac{3}{2}$ (d) ∞
7. The sum of the first n natural numbers $\sum_{k=1}^n k$ is equal to:
 (a) $\frac{n(n+1)}{2}$ (b) $\frac{n(n+1)(2n+1)}{6}$ (c) $\left[\frac{n(n+1)}{2}\right]^2$ (d) n^2
8. The value of $P(n, 0)$ is:
 (a) 0 (b) 1 (c) n (d) $n!$
9. If a fair die is rolled once, the probability of getting an even prime number is:
 (a) $\frac{1}{6}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$
10. The number of terms in the expansion of $(a + b)^{10}$ is:
 (a) 9 (b) 10 (c) 11 (d) 12
11. If $P(x) = x^3 - 2x^2 + 4x - 8$ is divided by $(x - 2)$, the remainder is:
 (a) 0 (b) 4 (c) -8 (d) 8
12. If two vectors $\vec{u}$ and $\vec{v}$ are perpendicular, then:
 (a) $\vec{u} \times \vec{v} = 0$ (b) $\vec{u} \cdot \vec{v} = 0$ (c) $\vec{u} = \vec{v}$ (d) $\vec{u} \cdot \vec{v} = 1$
13. The magnitude of the vector $\vec{v} = 2\hat{i} - 3\hat{j} + 6\hat{k}$ is:
 (a) 7 (b) 11 (c) 49 (d) 5
14. $\cos(\alpha + \beta)$ is identically equal to:
 (a) $\cos\alpha\cos\beta - \sin\alpha\sin\beta$ (b) $\cos\alpha\cos\beta + \sin\alpha\sin\beta$ (c) $\sin\alpha\cos\beta + \cos\alpha\sin\beta$ (d) $\sin\alpha\cos\beta - \cos\alpha\sin\beta$
15. The value of $\sin(180^\circ - \theta)$ is:
 (a) $-\sin\theta$ (b) $\sin\theta$ (c) $\cos\theta$ (d) $-\cos\theta$
16. The period of the trigonometric function $f(x) = \tan(3x)$ is:
 (a) π (b) $\frac{\pi}{3}$ (c) 2π (d) $\frac{2\pi}{3}$
17. The domain of the principal function $y = \sin^{-1}(x)$ is:
 (a) $(-\infty, \infty)$ (b) $[0, 1]$ (c) $[-1, 1]$ (d) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
18. The principal value of $\arcsin\left(-\frac{1}{2}\right)$ is:
 (a) $\frac{\pi}{6}$ (b) $-\frac{\pi}{6}$ (c) $\frac{5\pi}{6}$ (d) $-\frac{\pi}{3}$
19. The general solution of the equation $\sin\theta = 0$ is:
 (a) $\theta = n\pi, n \in \mathbb{Z}$ (b) $\theta = 2n\pi, n \in \mathbb{Z}$ (c) $\theta = (2n + 1)\frac{\pi}{2}, n \in \mathbb{Z}$ (d) $\theta = \frac{n\pi}{2}, n \in \mathbb{Z}$

Section II — [17 × 3 = 51 Marks]

Q.NO.2: Attempt any Seventeen (17) questions. Answer concisely with relevant explanation.

- i. Express $\frac{2+3i}{1-2i}$ in the standard form $a + bi$.
- ii. Find the additive and multiplicative inverses of the complex number $z = \sqrt{3} - i$.
- iii. If $A = \begin{pmatrix} 2 & 1 \\ -1 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 4 \\ 2 & -1 \end{pmatrix}$, find the matrix $2A - 3B$.
- iv. Evaluate the determinant of the matrix $M = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 1 & 0 & 6 \end{pmatrix}$.
- v. Find the 12-th term of the arithmetic progression: 3, 7, 11, 15, ...
- vi. Find the geometric mean between the two numbers 4 and 16.

- vii. Find the sum of the series $\sum_{r=1}^n (3r^2 + 2r)$.
- viii. Sum the series up to n terms: $1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + \dots$
- ix. In how many distinct ways can the letters of the word **PAKISTAN** be arranged?
- x. If $\binom{n}{4} = \binom{n}{6}$, find the value of n and hence evaluate $\binom{n}{2}$.
- xi. A bag contains 4 red balls and 6 black balls. If 2 balls are drawn at random, find the probability that both are red.
- xii. Use Mathematical Induction to prove that $1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$ for all $n \in \mathbb{N}$.
- xiii. Find the 5th term in the binomial expansion of $(2x - y)^8$.
- xiv. Use synthetic division to find the quotient and remainder when $P(x) = 2x^3 - 3x^2 + 4x - 5$ is divided by $(x - 2)$.
- xv. Find the value of k such that $(x + 2)$ is a factor of $P(x) = x^3 + kx^2 - 4x + 12$.
- xvi. Find the unit vector in the direction of $\vec{a} = 3\hat{i} - 2\hat{j} + 6\hat{k}$.
- xvii. Find the angle between the two vectors $\vec{u} = \hat{i} + \hat{j}$ and $\vec{v} = \hat{j} + \hat{k}$.
- xviii. Prove the fundamental trigonometric identity: $\sin^2 \theta + \cos^2 \theta = 1$.
- xix. Find the fundamental period of the function $f(x) = 3\cos(4x)$.
- xx. Prove that $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) = \frac{\pi}{4}$.
- xxi. Solve the trigonometric equation $\sqrt{3}\tan\theta - 1 = 0$ for $\theta \in [0, 2\pi)$.

Section III — [5 × 6 = 30 Marks]

Instruction: Each question has two alternatives. Attempt only one alternative from each question.

Q.NO.3: Find the roots of the equation $z^3 - 8 = 0$ in the complex number system and plot them on the Argand plane.

— OR —

Solve the following system of linear equations using **Cramer's Rule**:

$$x + 2y - z = 2$$

$$2x - y + z = 3$$

$$3x + y + 2z = 7$$

Q.NO.4: If S_n denotes the sum of the first n terms of an Arithmetic Progression, prove that $S_{3n} = 3(S_{2n} - S_n)$.

— OR —

Find the sum to n terms of the series:

$$1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \dots$$

Q.NO.5: Prove by Mathematical Induction that $7^n - 2^n$ is divisible by 5 for all positive integers $n \geq 1$.

— OR —

Find the term independent of x in the binomial expansion of:

$$\left(2x^2 - \frac{1}{x}\right)^9$$

Q.NO.6: If the polynomial $P(x) = x^4 + ax^3 - 7x^2 + bx + 6$ is exactly divisible by $(x^2 - 2x - 3)$, find the values of constants a and b .

— OR —

Find the volume of the parallelepiped whose coterminous edges are represented by the vectors:

$$\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}, \quad \vec{b} = 2\hat{i} + \hat{j} - \hat{k}, \quad \vec{c} = \hat{j} + 2\hat{k}$$

Q.NO.7: Prove the trigonometric identity:

$$\frac{\sin\theta + \sin 3\theta + \sin 5\theta}{\cos\theta + \cos 3\theta + \cos 5\theta} = \tan 3\theta$$

— OR —

Find the general solution of the trigonometric equation:

$$\sin 2x + \cos x = 0$$

*** * * THE END * * ***

Section 1 — [19 × 1 = 19 Marks]**Q. No. 1. Write the Question No. and the complete correct option on the answer script.**

1. According to Francis Bacon in Of Studies, studies serve for delight, ornament and:
a) wealth b) ability c) fame d) power
2. According to Bacon, histories make men:
a) witty b) subtle c) wise d) grave
3. She _____ her assignment before the teacher arrived.
a) completes b) completed c) had completed d) has completed
4. In A Poison Tree, the speaker's concealed anger eventually grows into:
a) a poisonous tree b) a beautiful garden c) a friendship d) a peaceful thought
5. _____ books improves vocabulary.
a) Read b) Reading c) To read d) Reads
6. In A New Microbe, John believes that he has discovered:
a) a new medicine b) a new bacterium c) a new plant d) a new chemical
7. The habits discussed in Healthy Habits for Mind, Body and Soul are primarily intended to promote:
a) popularity b) wealth c) overall well-being d) competition
8. The poem Nature mainly emphasizes the connection between:
a) wealth and happiness b) people and nature c) science and technology d) youth and education
9. She decided _____ harder for the examination.
a) studying b) studied c) to study d) studies
10. The central focus of The Power of Innovation, Creativity, and Success is the importance of innovation and creativity:
a) at school b) in politics c) in agriculture d) in tourism
11. In Youth and Age, the speaker contrasts the vitality of youth with:
a) childhood b) education c) old age d) poverty
12. The _____ window needs to be repaired.
a) breaking b) broken c) broke d) break
13. The meeting was postponed _____ the heavy rain.
a) despite b) because of c) although d) whereas
14. In A Handful of Clay, clay mainly represents something that can be:
a) shaped and transformed b) permanently destroyed c) hidden from others d) exchanged for wealth
15. Trees in the Traffic Island primarily draws attention to:
a) industrial development b) environmental concerns c) medical science d) historical events
16. In The Last Leaf, the "last leaf" becomes a symbol of:
a) wealth b) hope c) jealousy d) anger
17. Students _____ obey the rules of the examination.
a) might b) could c) must d) would
18. _____ I borrow your dictionary, please?
a) Must b) May c) Should d) Need
19. In The Beggar and the King, the beggar challenges the King to throw away his:
a) sword b) robe c) crown d) throne

Section II — [17 × 3 = 51 Marks]**Q. No. 2. Attempt any Seventeen (17) questions. Answer concisely with relevant explanation.**

1. What three purposes of studies does Francis Bacon identify in "Of Studies"?
2. Explain Bacon's statement, "Reading maketh a full man; conference a ready man; and writing an exact man."
3. Why does George Bernard Shaw question whether doctors are truly "men of science"?
4. What does the poisonous apple symbolize in "A Poison Tree", and how does it contribute to the poem's message?
5. Why does John believe that he has discovered a new microbe, and how is his mistake finally revealed?
6. Why are regular sleep, healthy food, and exercise especially important for teenagers?
7. How does Longfellow compare Nature with a loving mother in the poem "Nature"?
8. What natural and cultural features make Pakistan attractive to both local and foreign tourists?
9. Why are innovation and creativity considered important for success in the twenty-first century?
10. What does the poet mean by describing friendship as "a sheltering tree" in "Youth and Age"?
11. How does the writer develop the significance of the tree in the story "Old Tree"?
12. How does the image of clay being moulded and transformed contribute to the message of "A Handful of Clay"?
13. How does "Trees in the Traffic Island" criticize the effects of urbanization on nature?

14. How does the last leaf become a source of hope and change in "The Last Leaf"?
15. How does the possibility of winning money affect the thoughts and relationship of the couple in "The Lottery Ticket"?
16. What conflict exists between the King and the Beggar, and what message does this conflict convey in "The Beggar and the King"?
17. Identify the part of speech of the **bold** word in each sentence. A) The students listened **carefully** to the instructions. B) **Although** he was tired, he completed his work. C) She gave me a **beautiful** painting.
18. Write a pronoun to complete each sentence. A) Sara and Hina completed _____ project on time. B) The boy _____ won the competition is my cousin. C) Ali prepared the presentation by _____.
19. Identify the **bold clause** as **independent** or **dependent**. A) **Although it was raining**, the players continued the match. B) I believe **that she will succeed**. C) **The students completed their work** before the bell rang.
20. Change the following sentences into indirect speech. A) She said, "I am reading a novel." B) Ali said, "I bought a new book yesterday." C) The teacher said, "The sun rises in the east."
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Section III — [5 × 6 = 30 Marks]

Instruction: Each question has two alternatives. Attempt only one alternative from each question.

- Q.3.** Write an argumentative essay on "Social Media: A Tool for Learning or a Source of Distraction for Students?" Present a clear position and support it with logical arguments and relevant examples.
- OR** Write an informative paragraph/short essay explaining how education can help reduce illiteracy and improve the lives of individuals and communities. Organize your ideas logically and use appropriate examples.
- Q.4.** Write a letter to the Principal of your college proposing the organization of an Annual Sports Week. Explain its benefits for students and suggest at least two activities that should be included.
- OR** Write a formal email to your teacher requesting guidance for improving your academic performance. Explain the difficulties you are facing and suggest how the teacher may assist you.
- Q.5.** Develop a coherent story from the following opening. Give your story a suitable title and convey a clear message:
- "As I was returning home, I noticed an old man lying beside the road while people were passing without stopping..."
- OR** Write a brief critical review of the short story "A New Microbe". Comment on its theme, characters, plot, and message, and support your evaluation with relevant references to the story.
- Q.6.** Read the given passage carefully. Identify its central idea, distinguish the essential information from supporting details, and write a précis in your own words. Give it a suitable title.
- Our brain needs the right food to perform at its peak that is why students should not go to school on an empty stomach. During teenage, a child's body starts changing into that of an adult. Among other things, a teenager requires more nutritious food at this stage. However, many teenagers start eating junk food which is loaded with sugar, other harmful chemicals and artificial flavours. It is also a period when many teenagers, especially girls, decide to start "dieting" and skipping meals. Peer pressure can affect their eating behaviour and result in either over-eating or under-eating. Good nutrition is the key to a healthy life.
- OR** Using the ideas expressed in the given stanza, create a short reflective paragraph describing Nature as a gentle guide that leads human beings from childhood through life towards the unknown. Use your own words and imagery.
- So Nature deals with us, and takes away
Our playthings one by one, and by the hand
Leads us to rest so gently, that we go
Scarce knowing if we wish to go or stay,
Being too full of sleep to understand
How far the unknown transcends the what we know
- Q.7.** Write a short dialogue between two students discussing whether creativity and innovation are as important as academic knowledge for success. Present contrasting viewpoints and conclude the dialogue logically.
- OR** Read the paragraph carefully. Identify and correct the errors in grammar, spelling, punctuation, capitalization, and sentence structure. Rewrite the paragraph correctly.

education play an important role in the development of a society. It not only provide knowledge but also help people to develop there thinking skills. A well educated person are more likely to make responsible decisions, respect others and contribute positively towards his community however, many students does not realize the importance of education and wastes their valuable time. They should understands that success depend on regular study, hard work and self discipline.

حصہ اول (19 × 1 = 19)

سوال نمبر 1: درست جواب کا انتخاب کریں۔

1. سیرت النبی ﷺ جلد اول اور دوم کے مصنف _____ ہیں:
(الف) سید سلیمان ندوی (ب) مولانا مودودی (ج) مولانا شبلی نعمانی
(د) ڈاکٹر اسرار احمد
2. ایسا مرکب جو اپنے مفہوم میں نامکمل ہو _____ کہلاتا ہے:
(الف) مرکب (ب) مرکب تام (ج) مرکب ناقص (د) مرکب شعری
3. سعادت حسن منٹو کے شاملِ نصاب افسانے کا نام _____ ہے:
(الف) نیا قانون (ب) ٹھنڈا گوشت (ج) چغد (د) موزیل
4. منگو کوچوان اپنے اڈے میں _____ سمجھا جاتا تھا:
(الف) بے وقوف (ب) عقل مند (ج) کمزور (د) کام چور
5. استاد منگو کو انگریزوں سے _____ تھی:
(الف) محبت (ب) نفرت (ج) الجھن (د) عقیدت
6. بنیادی طور پر افسانہ _____ ہے:
(الف) طویل کہانی (ب) مختصر کہانی (ج) تمثیلی کہانی (د) جادوئی کہانی
7. حروفِ تمنا _____ کے اظہار کے لیے بولے جاتے ہیں:
(الف) غم (ب) خوشی (ج) خواہش (د) نفرت
8. جمع بناتے وقت واحد لفظ کی ہیئت برقرار رہے تو _____ کہلاتا ہے:
(الف) جمع الجمع (ب) جمع سالم (ج) جمع مکسر (د) جمع مقداری
9. افسانہ "تاریخ کا کفن" کے مترجم _____ ہیں:
(الف) ننگر چنا (ب) امر جلیل (ج) پروفیسر طہ خان (د) ڈاکٹر شاہ محمد مری
10. "تاریخ کا کفن" _____ ترجمہ ہے:
(الف) بلوچی زبان سے (ب) پشتو زبان سے (ج) سندھی زبان سے (د) پنجابی زبان سے
11. عید گاہ میں موجود لوگوں نے اپنے چیل _____ رکھے تھے:
(الف) عید گاہ کے باہر (ب) عید گاہ کے اندر (ج) جائے سجدہ سے انچ بھر دور (د) جوتوں کے لیے مخصوص مقام پر
12. "کی طرح، گویا، کے مانند" _____ کی مثالیں ہیں:
(الف) حروفِ استفہام (ب) حروفِ عطف (ج) حروفِ تشبیہ (د) حروفِ تردید
13. فقیر حسین _____ شخص تھا:
(الف) اصول پسند (ب) لالچی (ج) خود غرض (د) کام چور
14. اسرار میاں _____ کردار تھا:
(الف) قابلِ نفرت (ب) قابلِ رحم (ج) قابلِ تقلید (د) قابلِ بھروسہ
15. "ناخوش" اور "لاحاصل" _____ کی مثالیں ہیں:
(الف) سابقے (ب) لاحقے (ج) تشبیہ (د) استعارے
16. شاعری کے علاوہ مرزا غالب کی وجہ شہرت _____ ہے:
(الف) مضمون نگاری (ب) افسانہ نگاری (ج) مکتوب نگاری (د) تنقید نگاری
17. سبق "چارپائی" کے مصنف کا نام _____ ہے:
(الف) رشید احمد صدیقی (ب) پطرس بخاری (ج) شوکت تھانوی (د) مشتاق احمد یوسفی
18. نظم "کھڑا ڈنر" کی ہیئت _____ ہے:
(الف) مخمس (ب) مسدس (ج) مثنیٰ (د) مربع
19. اگر شاعر اپنے کلام میں کسی بات کے لیے وہ وجہ بیان کرے جو اصل میں اس کی وجہ نہ ہو تو یہ _____ کی مثال ہے:
(الف) صنعتِ تلمیح (ب) صنعتِ حسن تعلیل (ج) صنعتِ مبالغہ (د) صنعتِ تکرار

حصہ دوم (51 × 3 = 17)

سوال نمبر 2: درج ذیل سوالات میں کوئی سے سترہ (17) کے مختصر جواب تحریر کریں۔

1. مسجد نبوی میں حضور ﷺ کے بیٹھنے کی جگہ کیسی تھی؟
2. کوچوان منگو کے مزاج و کردار پر روشنی ڈالیں۔
3. سعادت حسن منٹو کے اسلوب کی خصوصیات کیا ہیں؟
4. شیدی پہلی صف تک کیوں پہنچنا چاہتا تھا؟
5. آپ ڈرامہ "دبلیز" کا کون سا کردار بننا پسند کریں گے اور کیوں؟
6. ناول "آنگن" کا موضوع کیا ہے؟
7. غالب کے خطوط کی خصوصیات بیان کریں۔
8. سبق "چارپائی" میں مصنف نے چارپائی کا تعارف کس طرح کروایا ہے؟
9. مطلع کی تعریف لکھیں اور ایک مثال بھی دیں۔
10. "دومعنی" الفاظ کی تعریف لکھیں اور دو مثالیں دیں۔
11. شاملِ نصاب نعت میں آپ ﷺ کے لیے استعمال ہوئے کوئی سے تین القابات تحریر کریں۔
12. ملی نغمے کا موضوع کیا ہوتا ہے؟ مختصراً بیان کریں۔
13. وادی لولاب سے کیا مراد ہے؟
14. محاورے کی تعریف کریں اور دو مثالوں سے وضاحت کریں۔
15. نظم "آزادی" کا مرکزی خیال تحریر کریں۔
16. تشبیہ کی تعریف کریں اور کوئی شعری مثال دیں۔
17. نظم "کھڑا ڈنر" میں غریب الدیار سے کیا مراد ہے؟
18. صنعتِ تلمیح کی تعریف کریں اور مثال لکھیں۔
19. شاملِ نصاب احمد فراز کی غزل سے اپنی پسند کا کوئی شعر تحریر کریں۔
20. پروین شاکر کی شاملِ نصاب غزل میں کن جذبات کا گہرا عکس ملتا ہے؟
21. درج ذیل حروفِ فجائیہ کا استعمال کرتے ہوئے ایک ایک جملہ بنائیں: شاید، کاش، سبحان اللہ!
22. شعر مکمل کریں: بے چین بہت پہرنا، گھبرائے ہوئے رہنا

حصہ سوم (30 = 5 × 6)

ہدایت : سوال 3 تا 7، ہر سوال کے دو متبادل دیے گئے ہیں۔ صرف ایک متبادل حل کریں۔

سوال نمبر 3: ذیل میں دی گئی عبارت کی تلخیص اپنے الفاظ میں کرتے ہوئے مناسب عنوان تجویز کریں۔ (6)

خود اعتمادی انسان کو اپنی صلاحیتوں پر یقین رکھنے کا حوصلہ دیتی ہے۔ جو شخص اپنے آپ پر اعتماد کرتا ہے وہ مشکلات کا سامنا زیادہ مضبوطی سے کرتا ہے۔ خود اعتمادی کا مطلب یہ نہیں کہ انسان اپنی ہر بات کو درست سمجھے یا دوسروں کے مشورے کو نظر انداز کرے۔ حقیقی خود اعتمادی اپنی صلاحیتوں اور کمزوریوں دونوں کو پہچاننے کا نام ہے۔ طالب علم کے لیے خود اعتمادی بہت ضروری ہے۔ امتحان، تقریر، انٹرویو یا کسی نئے کام کے آغاز میں اعتماد انسان کی کارکردگی بہتر بنا سکتا ہے۔ البتہ خود اعتمادی علم، تیاری اور مسلسل محنت سے پیدا ہوتی ہے۔ بغیر تیاری کے صرف اپنے آپ پر یقین کرنا کامیابی کی ضمانت نہیں۔ انسان کو اپنی غلطیوں کو تسلیم کرتے ہوئے اپنی صلاحیتوں کو بہتر بنانے کی کوشش جاری رکھنی چاہیے۔ اس طرح خود اعتمادی آہستہ آہستہ مضبوط کردار میں تبدیل ہو جاتی ہے۔

سوال نمبر 4: کسی ایک جزو کی سیاق و سباق کے ساتھ تشریح کریں نیز سبق اور مصنف کا نام بھی لکھیں۔ (6)

(الف) انار کلی سے نکل کر وہ مال روڈ کی چمکیلی سطح پر اپنے تانگے کو آہستہ آہستہ چلا رہا تھا کہ موٹروں کی دکان کے پاس اسے چھاؤنی کی ایک سواری مل گئی۔ کرایہ طے کرنے کے بعد اس نے اپنے گھوڑے کو چابک دکھایا اور دل میں خیال کیا، چلو یہ بھی اچھا ہوا شاید چھاؤنی ہی سے نئے قانون کا کچھ پتا چل جائے۔

(ب) میرا شہر میں ہونا حکام کو معلوم ہے مگر چوں کہ میری طرف سے بادشاہی دفتر میں سے یا مخبروں کے بیان سے کوئی بات نہیں پائی گئی لہذا طلبی نہیں ہوئی ورنہ جہاں بڑے بڑے جاگیر دار بلائے ہوئے یا پکڑے ہوئے آئے ہیں میری کیا حقیقت تھی؟ غرض کہ اپنے مکان میں بیٹھا ہوں، دروازے سے باہر نہیں نکل سکتا۔ سوار ہونا اور کہیں جانا تو بہت بڑی بات ہے۔

سوال نمبر 5 : (الف) نظم کے درج ذیل اشعار میں سے کسی ایک شعر کی تشریح کریں، نظم اور شاعر کا نام بھی بتائیں۔ (3)

1. یہاں جو پھول کھلے وہ کھلا رہے برسوں
2. کس کی طلب میں اہل محبت ہیں داغ داغ
- یہاں خزاں کو گزرنے کی بھی مجال نہ ہو
- کس کی ادا سے حشر بپا ہے اُفق اُفق

(ب) غزل کے درج ذیل اشعار میں سے کسی ایک شعر کی تشریح کریں نیز شاعر کا نام بھی لکھیں۔ (3)

1. ایک مشت خاک اور وہ بھی ہوا کی زد میں ہے
2. ایک مدت سے تیری یاد بھی آئی نہ ہمیں
- زندگی کی بے بسی کا استعارہ دیکھنا
- اور ہم بھول گئے ہوں تجھے ایسا بھی نہیں

سوال نمبر 6: ڈپٹی کمشنر کے نام اپنے شہر میں شجرکاری مہم شروع کرنے کی درخواست لکھیں۔ (6)

(یا) اپنے بچپن کے دوست کے نام خط لکھیں، جس سے کئی برسوں سے ملاقات نہیں ہوئی۔

سوال نمبر 7: مسافر اور بس ڈرائیور کے درمیان کرائے میں اضافے کے موضوع پر مکالمہ لکھیے۔ (6)

(یا) کسی خون کے عطیات کے کیمپ میں شرکت کی روداد لکھیں۔

حصہ اول (11x1=11)

سوال نمبر 1: تمام سوالات لازمی ہیں۔ صحیح جواب کا انتخاب کر کے اپنی جوابی کاپی پر درج کریں۔

- 1- قرآنی تعلیمات کی روشنی میں حق اور باطل کے درمیان واضح فرق نمایاں کرنے کی بناء پر قرآن مجید کو کیا نام دیا گیا ہے؟
(الف) الذکر (ب) الفرقان (ج) البربان (د) الشفاء
- 2- خلیفہ راشد حضرت عمر بن عبدالعزیز رحمہ اللہ نے تدوین حدیث کا باقاعدہ سرکاری حکم کس ہجری سال میں جاری فرمایا؟
(الف) 80 ہجری (ب) 99 ہجری (ج) 103 ہجری (د) 104 ہجری
- 3- عقیدہ توحید پر پختہ ایمان انسان کی شخصیت میں کونسا بنیادی اخلاقی اور نفسیاتی اثر پیدا کرتا ہے؟
(الف) دنیا سے مکمل بیزارى (ب) خود داری، عزت نفس اور استقامت (ج) دوسرے انسانوں پر تسلط (د) ناامیدی اور خوف
- 4- سابقہ تمام آسمانی کتابوں اور شریعتوں کے مقابلے میں قرآن پاک کو کون سی دائمی صفت حاصل ہے؟
(الف) مخصوص قومی ہدایت (ب) عارضی احکام (ج) جامعیت، ابدیت (د) صرف عبادات تک محدود
- 5- صاحب نصاب مسلمان پر زکوٰۃ کی فرضیت کے لیے چاندی کا شرعی نصاب کتنا مقرر ہے؟
(الف) 40 تولے (ب) ساڑھے باون (52.5) تولے (ج) 60 تولے (د) 7.5 تولے
- 6- غزوہ بدر کے وہ قیدی جو فدیہ دینے کی استطاعت نہیں رکھتے تھے، نبی کریم ﷺ نے ان کی رہائی کے لیے کس شرط کا انتخاب فرمایا؟
(الف) مسلمان بچوں کو لکھنا پڑھنا سکھانا (ب) مدینہ چھوڑ کر چلے جانا (ج) کھیتی باڑی میں مدد کرنا (د) جنگی ہتھیار سوئپ دینا
- 7- رسول اللہ ﷺ نے کس عمل کو انسان کی اخلاقی و معاشی تباہی اور شدید ترین گناہ قرار دیا ہے؟
(الف) زیادہ گفتگو کرنا (ب) والدین کی نافرمانی اور سود خوری (ج) سفر میں تاخیر کرنا (د) تجارت کرنا
- 8- اسلام میں عقد نکاح کے وقت عورت کا کون سا شرعی اور معاشی حق مقرر کیا گیا ہے جو صرف اسی کی ذاتی ملکیت ہوتا ہے؟
(الف) جہیز (ب) حق مہر (ج) نان و نفقہ (د) وراثت کا نصف
- 9- حضرت عمر فاروق رضی اللہ عنہ نے بیت المال کا نگران ہونے کے ناطے اپنے لیے الاؤنس کے تعین میں کیا طرز عمل اختیار فرمایا؟
(الف) شاہانہ زندگی گزارنا (ب) عام شہری کے برابر (ج) تمام مال اپنے پاس رکھنا (د) تجارتی منافع میں حصہ
- 10- میت کے ترکہ کی وراثت میں تقسیم سے پہلے سب سے پہلا شرعی حق کون سا پورا کرنا واجب ہے؟
(الف) تمام ورثاء میں مساوی تقسیم (ب) تجہیز و تکفین کے اخراجات اور قرض کی ادائیگی (ج) رشتہ داروں کو تحائف (د) بیت المال میں جمع کرنا
- 11- "اسلاموفوبیا" اور بدگمانیوں کا مؤثر تعلیمی جواب دینے کے لیے مسلمانوں کی بنیادی ذمہ داری کیا ہے؟
(الف) جذباتی نعرے بازی کرنا (ب) اسلام کا پر امن پیغام پیش کرنا (ج) عالمی برادری سے بائیکاٹ کرنا (د) خاموشی اختیار کر لینا

حصہ دوم (8x3=24)

سوال نمبر 2: درج ذیل 12 سوالات میں سے کوئی سے 8 سوالات کے مختصر جوابات تحریر کریں۔

1. مکی اور مدنی سورتوں کے نزول اور مضامین میں بنیادی فرق کیا ہے؟
2. حدیث "مرفوع" اور "موقوف" میں تکنیکی لحاظ سے کیا فرق ہے؟
3. عقیدہ آخرت پر ایمان لانے سے انسان کے اندر ذمہ داری کا احساس اور گناہوں سے نفرت کیسے پیدا ہوتی ہے؟
4. نماز میں "خشوع و خضوع" کی حقیقت کیا ہے اور اس سے نمازی کو کیا باطنی سکون حاصل ہوتا ہے؟
5. میثاق مدینہ کے معاہدے نے مدینہ منورہ کو کس طرح ایک پر امن اور منظم فلاحی ریاست کی شکل دی؟
6. فتح مکہ کے موقع پر رسول اکرم ﷺ کے حلم اور درگزر سے کیا سبق ملتا ہے؟
7. کسی انسان کو برے القاب سے پکارنا اور طنز و تحقیر کرنا کیوں گناہ اور معاشرتی بگاڑ کا سبب ہے؟
8. وراثت کا اسلامی نظام کس طرح مال کو چند ہاتھوں میں سمٹنے سے روکتا ہے؟
9. طلاق کا معنی کیا ہے؟ اور طلاق حسن کا کیا فائدہ ہے؟
10. دور خلافت راشدہ میں عوام کے سامنے خلیفہ کے احتساب اور قانون کی بالادستی کی ایک مثال بیان کریں؟
11. حضرت پیر سید مہر علی شاہ رحمہ اللہ نے اپنے دور کے فکری اور عقائدی حوادث کا کس طرح علمی مقابلہ کیا؟
12. پیغام پاکستان کے متفقہ بیانیے کا بنیادی مقصد کیا ہے اور یہ کس طرح ملک میں امن قائم کرتا ہے؟

حصہ سوم (3x5=15)

ہدایت: سوال 3 تا 5، ہر سوال کے دو متبادل دیے گئے ہیں۔ صرف ایک متبادل حل کریں

- سوال نمبر 3: قرآن مجید کی عالمگیریت، جامعیت اور ابدیت پر دلائل کے ساتھ تفصیلی روشنی ڈالیں۔
یا
تدوین حدیث کے تاریخی ادوار کتنے ہیں اور کسی ایک دور میں حدیث کی تدوین کو واضح کریں۔
- سوال نمبر 4: نبی کریم ﷺ نے بطور سربراہ ریاست جو سیاسی اخلاقیات قائم فرمائیں، انہیں بیان کریں۔
یا
ارکان اسلام میں سے زکوٰۃ کا معنی اور اس کے دو انفرادی و دو اجتماعی فوائد تحریر کریں۔
- سوال نمبر 5: حقوق العباد سے کیا مراد ہے؟ - اساتذہ کرام اور طلباء کے باہمی حقوق کون سے ہیں؟
یا
عصر حاضر میں "اسلاموفوبیا" کے تدارک کے لیے مسلم نوجوانوں کی ذمہ داریوں کی تشریح کریں۔

حصہ اول

سوال 1	سوالات کے سامنے دیئے گئے آپشنز میں سے درست جواب اپنی جوابی کاپی میں تحریر کریں	(11x1=11)
(i)	سورۃ البقرۃ کو قرآن مجید کی قرار دیا گیا ہے	(الف) چوٹی (ب) نور (ج) دل (د) بلندی
(ii)	سورۃ آل عمران کی آیات کی تعداد ہے	(الف) 100 (ب) 150 (ج) 175 (د) 200
(iii)	کس آیت کو تمام آیات قرآنیہ کی سردار کہا گیا ہے	(الف) آیت الدین (ب) آیت البر (ج) آیت الکرسی (د) آیت نور
(iv)	سورۃ الانفال کس جنگ پر بطور تبصرہ نازل ہوئی	(الف) جنگ بدر (ب) جنگ احد (ج) جنگ خندق (د) جنگ موہ
(v)	سورۃ الانفال کے شروع میں مال غنیمت کے لیے لفظ استعمال ہوا	(الف) صدقہ (ب) خیرات (ج) انفال (د) زکوٰۃ
(vi)	کس سورت کی تلاوت سے پہلے بسم اللہ نہیں پڑھی جاتی	(الف) البقرہ (ب) آل عمران (ج) النساء (د) التوبہ
(vii)	سورۃ التوبہ میں ذکر غزوہ حنین میں مسلمانوں کی تعداد تھی	(الف) نو ہزار (ب) دس ہزار (ج) گیارہ ہزار (د) بارہ ہزار
(viii)	اسرائیل کس نبی کا لقب ہے	(الف) حضرت ابراہیم (ب) حضرت (ج) حضرت یعقوب (د) حضرت داؤد
(ix)	کس جانور کو ذبح کرنے کے لیے بنی اسرائیل نے بہانے تراشے	(الف) بھینس (ب) بکری (ج) گائے (د) اونٹنی
(x)	الاحقاف نام ہے	(الف) میدان کا (ب) ریت کے ٹیلوں کا (ج) پہاڑ کا (د) جن کا
(xi)	اے عقلمندو! تمہارے لیے زندگی ہے	(الف) معاف کردینے میں (ب) قصاص میں (ج) چھوڑ دینے میں (د) دیکھ لینے میں

حصہ دوم

سوال 2	درج ذیل سوالات میں سے کوئی سے آٹھ سوالات کے مختصر جوابات تحریر کریں	(8x3=24)
(i)	سورۃ البقرۃ کا مرکزی مضمون اور کوئی سے دو بنیادی مضامین لکھیں	
(ii)	سورۃ البقرۃ کی ابتدائی آیات کی روشنی میں متقین کی کوئی سی تین بنیادی صفات لکھیں	
(iii)	سورۃ آل عمران کی روشنی میں قرآن مجید کی تین صفات لکھیں	
(iv)	سورۃ آل عمران کے تین بنیادی مضامین لکھیں	
(v)	سورۃ البقرہ اور سورۃ آل عمران کی فضیلت لکھیں	
(vi)	سورۃ الانفال میں مومنین کی تین صفات تحریر کیجیے	
(vii)	سورۃ التوبہ میں غزوہ حنین پر تبصرہ کرتے ہوئے تین نکات لکھیں	
(viii)	سورۃ الاحقاف کا مرکزی مضمون اور دو بنیادی مضامین لکھیں	
(ix)	سورۃ الاحقاف کی روشنی میں قوم عاد کا انجام تین نکات کی شکل میں لکھیں	
(x)	جن تین صحابہ کرام رضوان اللہ علیہم غزوہ تبوک میں عدم شرکت کے بعد توبہ قبول ہوئی ان کے نام لکھیں	
(xi)	سورۃ البقرۃ کی روشنی میں بنی اسرائیل کے کوئی سے تین جرائم لکھیں	
(xii)	حضرت ابراہیم اور حضرت اسماعیل نے خانہ کعبہ کی تعمیر کے دوران جو دعا مانگی اس کا مفہوم تحریر کریں	

حصہ سوئم

سوال 3	ہدایت : سوال 3 تا 5، ہر سوال کے دو متبادل دیئے گئے ہیں۔ صرف ایک متبادل حل کریں	(3x5=15)
(یا)	سورۃ البقرۃ اور سورۃ آل عمران کا تعارف لکھیں اور باہمی مناسبت بتائیں۔	
(یا)	سورۃ البقرۃ کے فضائل تفصیلاً تحریر کریں۔	
سوال 4	سورۃ التوبہ کی روشنی میں غزوہ تبوک پر تفصیلی نوٹ تحریر کریں	
(یا)	سورۃ الاحقاف میں مذکور نبی اکرم ﷺ سے جنات کی ملاقات اور جنات کی اپنی قوم کو دعوت کا احوال لکھیں؟	
سوال 5	سورۃ الانفال کی روشنی میں غزوہ بدر کے اسباب اور نصرت الہی کے ظہور کے بارے میں تفصیلاً تحریر کریں	
(یا)	آیت الکرسی میں موجود توحید و صفات باری تعالیٰ پر نوٹ تحریر کریں	

(THE END)

Section 1 — [17 × 1 = 17 Marks]**Q1. Write the Question No. and the complete correct option on the answer script.**

- I. Which organelle is primarily responsible for ATP production in a eukaryotic cell?
A. Golgi apparatus B. Mitochondrion C. Lysosome D. Ribosome
- II. The plasma membrane is mainly composed of:
A. Cellulose and proteins B. Phospholipids and proteins C. DNA and RNA D. RNA and lipids
- III. A stem cell is characterized primarily by its ability to:
A. Produce antibodies B. Divide and differentiate into specialized cells C. Destroy other cells D. Carry out photosynthesis
- IV. DNA replication occurs during which phase of the cell cycle?
A. G₁ phase B. S phase C. G₂ phase D. M phase
- V. Which carbohydrate is commonly known as the storage polysaccharide in plants?
A. Glycogen B. Cellulose C. Starch D. Chitin
- VI. The region of an enzyme where the substrate binds is called the:
A. Allosteric site B. Active site C. Phosphate group D. Glycosidic site
- VII. The immediate energy currency of most cells is:
A. DNA B. ATP C. Glucose D. NADP
- VIII. Glycolysis takes place in the:
A. Nucleus B. Cytoplasm C. Mitochondrial matrix D. Chloroplast
- IX. The genetic material of a virus may be:
A. Only DNA B. Only RNA C. DNA or RNA D. DNA and RNA
- X. Bacteria are classified as: A. Eukaryotes B. Prokaryotes C. Protists D. Fungi
- XI. The cell wall of fungi is primarily composed of:
A. Cellulose B. Chitin C. Peptidoglycan D. Glycogen
- XII. Which group of plants produces seeds but does not form flowers?
A. Bryophytes B. Pteridophytes C. Gymnosperms D. Angiosperms
- XIII. Animals belonging to phylum Arthropoda possess:
A. Jointed appendages B. Notochord C. Radial symmetry only D. No exoskeleton
- XIV. Which phylum includes animals with a notochord at some stage of their development?
A. Mollusca B. Annelida C. Chordata D. Arthropoda
- XV. The main function of roots is to:
A. Absorb water and minerals B. Produce pollen C. Carry out gas exchange D. Produce seeds directly
- XVI. Which tissue transports water and mineral salts from roots to other parts of a plant?
A. Phloem B. Xylem C. Epidermis D. Cambium
- XVII. The basic structural unit of DNA is the:
A. Amino acid B. Nucleotide C. Fatty acid D. Monosaccharide

Section II — [13 × 3 = 39 Marks]**Q 2. Attempt any Thirteen (13) questions. Answer concisely with relevant explanation.**

- I. Which organelle is called cell within cell? Give reasons.
- II. Why are stem cells considered different from most specialized cells? Explain the two important properties that make stem cells useful in medicine.
- III. A student consumes a meal containing carbohydrates, proteins and lipids. Explain how these three classes of biological molecules differ in their basic building units.
- IV. Why does an enzyme generally lose its activity when exposed to very high temperature? Relate your answer to enzyme structure.
- V. A plant is kept in complete darkness for several days. Predict two major effects on its energy metabolism and explain the reasons.
- VI. Viruses are described as acellular entities. Explain why they cannot normally reproduce independently outside a suitable host cell.
- VII. Give three structural features that distinguish a typical prokaryotic cell from a typical eukaryotic cell.
- VIII. Why are fungi not classified as plants even though many fungi remain stationary and possess cell walls? Give three biological reasons.
- IX. Differentiate between bryophytes, pteridophytes and seed-producing plants on the basis of vascular tissue and reproduction.
- X. A plant produces seeds but does not produce flowers or fruits. Which major plant group is it most likely to belong to? Give reasons for your answer.
- XI. What characteristics distinguish members of phylum Arthropoda from members of phylum Annelida?
- XII. An animal has a notochord, dorsal hollow nerve cord and pharyngeal structures at some stage of its development. Which major animal group does it belong to? Explain your identification.
- XIII. Explain how xylem and phloem differ in their structure and function.

- XIV. A plant's roots are damaged severely, but its leaves remain intact initially. Predict two effects that will gradually appear in the aerial parts of the plant and explain why.
- XV. Explain how DNA structure allows it to serve as a reliable molecule for storing hereditary information.
- XVI. Suppose a DNA molecule contains 30% adenine. What percentage of the DNA bases would be thymine? Explain the biological principle used to reach your answer.
- XVII. Explain how variation within a population provides the raw material for natural selection.
- XVIII. Differentiate between a population, community and ecosystem, giving one example of each.

Section III — [4 × 6 = 24 Marks]

Instruction: Each question has two alternatives. Attempt only one alternative from each question.

Q3. A cell contains a large number of mitochondria and ribosomes. What does this indicate about the activities of the cell? Explain the role of these organelles.

OR Describe the major stages of mitosis and explain how the chromosomes behave during each stage. Why is accurate chromosome distribution important for the daughter cells?

Q4. A student consumes a diet containing very little protein. Predict two possible effects on the body and explain why proteins are essential for normal body functions.

OR An enzyme-controlled reaction is very slow at low temperature, becomes faster at an optimum temperature, and then slows down at high temperature. Explain this pattern using the properties of enzymes.

Q5. Explain the importance of light, carbon dioxide, and water, in photosynthesis. How would a decrease in light intensity or carbon dioxide concentration affect the rate of photosynthesis?

OR Write the main steps of cellular respiration and describe steps of Krebs's cycle with a suitable diagram.

Q6. Animals show great diversity in their body structures and functions. Describe the main characteristics of arthropods. Why are they successful group of animals on land?

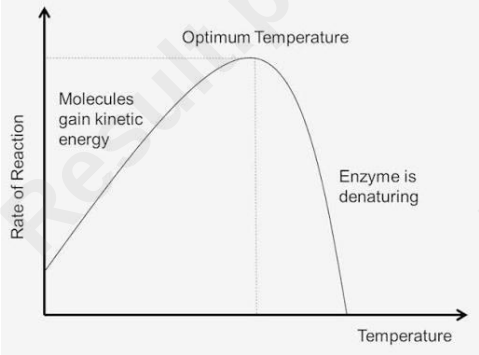
OR Compare bryophytes, pteridophytes, and seed plants with respect to their body structure, vascular tissues, and method of reproduction. Explain how these features are related to their survival on land.

Section IV — Practical Based Assessment (8+2=10 Marks)

I — Effect of Temperature on Enzyme Activity [4]

A student investigates the effect of temperature on the activity of amylase. Equal volumes of starch and amylase are placed in test tubes and maintained at different temperatures. The time required for the starch to disappear is recorded.

Temperature (°C)	20	30	40	50	60
Time taken (s)	180	120	70	45	110



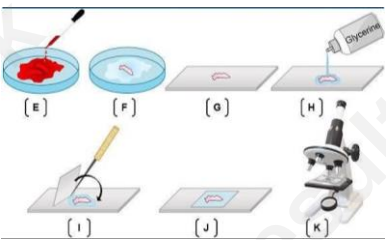
a) Identify the independent variable in this experiment. [1]

b) Identify the dependent variable. [1]

c) Which temperature appears to be closest to the optimum temperature? [1]

d) State two variables that should be kept constant. [1]

II— Temporary Slide of Onion Epidermis [4]



a) Name a suitable stain used for observing onion epidermal cells. [1]

b) Why is a stain used? [1]

c) Write the main steps for preparing a temporary onion epidermal slide. [2]

Q. Write the procedure of your favorite experiment with a labelled diagram (2 Marks)

Section 1 — [17 × 1 = 17 Marks]**Q1. Write the Question No. and the complete correct option on the answer script.****I.** The volume occupied by 1.4 g of N₂ gas at STP is

- a) 2.24 dm³ b) 22.4 dm³
 c) 1.12 dm³ d) 11.2 dm³

II. If n is equal to 4, then f is equal to:

- a) 0 b) 0, 1
 c) 0, 1, 2 d) 0, 1, 2, 3

III. The distance between first and third orbit is:

- a) 4 times b) 6 times
 c) 9 times d) 12 times

IV. The example of a paramagnetic molecule is:

- a) H₂ b) N₂
 c) O₂ d) F₂

V. Which liquid has weak intermolecular forces?

- a) Water b) Gasoline
 c) Gas oil d) Ethyl alcohol

VI. The boiling point of glycerine at 50 mmHg is:

- a) 100°C b) 120°C
 c) 240°C d) 360°C

VII. In an exothermic reaction, the sign of ΔH is:

- a) Positive b) Negative
 c) Zero d) Variable

VIII. A catalyst alters, which of the following in a chemical reaction?

- a) Entropy b) Enthalpy
 c) Internal energy d) Activation energy

IX. When an acid is added to water, then:

- a) $[H^+] > [OH^-]$ b) $[H^+] < [OH^-]$
 c) $[H^+] = [OH^-]$ d) $[H^+] \sim [OH^-]$

X. The block of the periodic table that contains the transition metals is:

- a) s-block b) p-block
 c) d-block d) f-block

XI. The halogen that is a liquid under normal conditions is:

- a) Fluorine b) Chlorine
 c) Bromine d) Iodine

XII. The primary cause of acid rain is:

- a) CO₂ b) CH₄
 c) SO₂ d) CFCs

XIII. The property of carbon that allows it to form long chains and cyclic structures is:

- a) Isomerism b) Catenation
 c) Solubility d) Flammability

XIV. The product formed when haloalkanes react with aqueous NaOH is:

- a) Alkyl cyanides b) Nitroalkanes
 c) Alcohols d) Amines

XV. The organic compounds containing a hydroxyl functional group are:

- a) Aldehydes b) Ketones
 c) Alcohols d) Alkyl halides

XVI. If the theoretical yield of a reaction is 100 grams but the actual yield is 85 grams, what is the percent yield?

- a) 85 % b) 80 %
 c) 75 % d) 65 %

XVII. The functional group that is easily oxidized to carboxylic acids is:

- a) Aldehyde b) Alkene
 c) Alcohol d) Alkyne

Section II — [13 × 3 = 39 Marks]**Q 2. Attempt any Thirteen (13) questions. Answer concisely with relevant explanation.**

- I. Define mole with an example? (2+1)
- II. How many orbitals are in the 2p and 3d subshells? (1.5+1.5)
- III. Which three molecules among the following have dipole moment: H₂O, CO₂, NH₃, Cl₂, CHCl₃ (1+1+1)
- IV. What is sp³ hybridization? Which molecule show sp³ hybridization. (2+1)
- V. Give the three factors affecting the electron affinity. (1+1+1)
- VI. Evaporation is a cooling process and occurs at all temperature. How? (03)
- VII. Differentiate exothermic reactions with endothermic reactions by suitable examples. (1+1+1)
- VIII. Define elementary reaction with an example. (2+1)
- IX. Distinguish reversible reaction with irreversible reaction by suitable example. (2+1)
- X. Define s, p and d-block elements. (1+1+1)
- XI. What is nitrification? Name the two bacteria involved in nitrification. (1+1+1)
- XII. Define acid rain? Give two oxides that cause acid rain. (1+1+1)
- XIII. What is functional group? Write the functional groups of alcohol and aldehyde. (1+1+1)
- XIV. Define empirical formula? Give the empirical formulas of glucose and benzene. (1+1+1)
- XV. Write the formulas of primary, secondary and tertiary alkyl halides? (1+1+1)
- XVI. What is Tollen's test? For what purpose is it used? (2+1)

Section III — [4 × 6 = 24 Marks]**Instruction: Each question has two alternatives. Attempt only one alternative from each question.**

Q.3. A liquid is heated under different external pressure conditions. Analyze how the change in external pressure affects its boiling point. Explain the molecular basis of boiling and identify the factors that determine the boiling point of a liquid. (2+2+2)

- OR** Define Lowery–Bronsted acids and bases. Also identify them in the following reactions. (2+1+1+1+1)
- (i) $\text{HCO}_3^- + \text{H}_2\text{O} \rightleftharpoons \text{CO}_3^{2-} + \text{H}_3\text{O}^+$ (ii) $\text{NH}_3 + \text{HNO}_3 \rightleftharpoons \text{NH}_4\text{NO}_3$
- (iii) $\text{HF} + \text{HSO}_4^- \rightleftharpoons \text{H}_2\text{SO}_4 + \text{F}^-$ (iv) $\text{CH}_3\text{COOH} + \text{H}_2 \rightleftharpoons \text{CH}_3\text{COO}^- + \text{H}_3\text{O}^+$
- Q.4.** Consider the bonding in C–C, C=C, and C≡C. Analyze the formation of sigma (σ) and pi (π) bonds in these molecules and compare their orbital overlap, strength, and rotational characteristics. (6)
- OR** What is Le Chatelier's Principle? How does it apply to concentration and temperature changes? (2+2+2)
- Q.5.** Explain the four major layers of the atmosphere along with their altitudes and temperature ranges. (6)
- OR** Differentiate between homolytic and heterolytic fission. Also explain Free radical reaction. (2+1+1+1+1)
- Q.6.** Explain the basicity of amines. Also write the reactions of amines with water and acids properly. (2+2+2)
- OR** Alcohols can be prepared by several chemical methods. Analyze any three important methods for the preparation of alcohols, explaining the starting materials, reaction conditions, chemical equations, and the type of alcohol obtained in each method. (6)

Section IV — Practical Based Assessment (8+2=10 Marks)

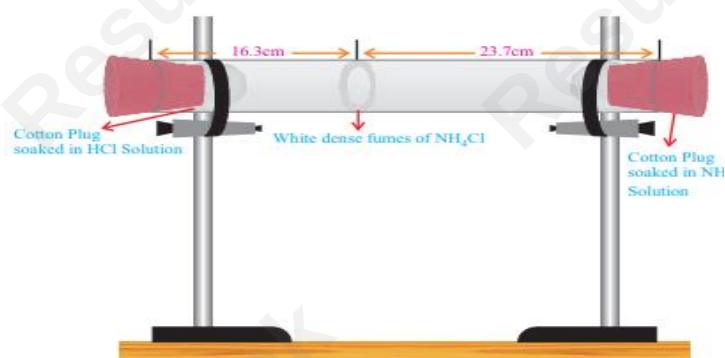
Q. Attempt any TWO of the three PBA questions. Each carries equal marks. (2 × 4 = 8)

I. Consider the diagram carefully and answer the following questions. [04]



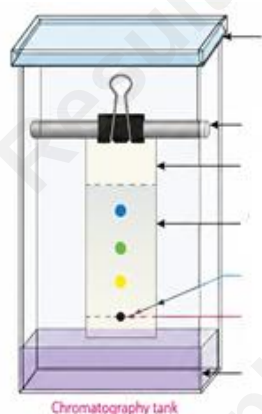
- (i) Which technique is illustrated in the above diagram? [1]
- (ii) Label the steps (a-e) shown in the diagram. [1]
- a. _____ b. _____ c. _____ d. _____ e. _____
- (iii) Why is it important to use hot water to dissolve the crude benzoic acid? [1]
- (iv) Why is the filtrate allowed to cool slowly? [1]

II. Pay close attention to the figure and respond to the following questions. [04]



- (i) From the tube, calculate the distance travelled by ammonia and that travelled by HCl. [2]
- (ii) In the diagram, the gases diffuse from the area of _____ concentration. [1]
- (iii) Complete the chemical equation. [1]
- $$\text{NH}_3 + \text{HCl} \rightarrow ?$$

III. Take a close look at the diagram and respond to the following questions. [04]



- (i) Label the following parts in the diagram: [1]
- a. Solvent front b. Origin (sample spot)
- c. Solvent d. Filter paper
- (ii) Name the stationary phase and the mobile phase used in this technique. [1]
- a. Stationary phase: _____
- b. Mobile phase: _____
- (iii) What is the purpose of placing the origin (sample spot) above the solvent level? [1]
- (iv) Why do different colored components separate from each other in this technique? [1]

Q. Pen down One of your favourite practical along with its sketch and application. [1+0.5+0.5=2]

Section 1 — [17 × 1 = 17 Marks]

Q1. Write the Question No. and the complete correct option on the answer script.

- I. Which of the following physical quantities has a unit but no physical dimensions?
(a) Strain (b) Angle Relative (c) Permittivity (d) Refractive Index
- II. If the dot product of two non-zero vectors is zero, the magnitude of their cross product is equal to:
(a) Zero (b) AB (c) -AB (d) 1
- III. The slope of a displacement-time graph represents:
(a) Acceleration (b) Velocity (c) Momentum (d) Force
- IV. The banking angle of a curved road depends directly on the speed of the vehicle and:
(a) Mass of the vehicle (b) Radius of curvature (c) Friction coefficient (d) Air resistance
- V. Under Hooke's law, if the stress on a metal wire is doubled, its strain will be:
(a) Quadrupled (b) Halved (c) Doubled (d) Unchanged
- VI. Squeezing the end of a water garden hose leads to an increase in water flow velocity. This demonstrates:
(a) Bernoulli's Principle (b) Torricelli's Theorem (c) Equation of Continuity (d) Stokes' Law
- VII. If a Carnot engine absorbs 1000 J of heat from a hot reservoir and rejects 400 J to a cold reservoir, its efficiency is:
(a) 40% (b) 60% (c) 100% (d) 25%
- VIII. The frequency of a train's horn increases as it approaches a stationary listener because of:
(a) Increased amplitude (b) Beats phenomenon (c) Doppler Effect (d) Polarization
- IX. If the distance between two-point charges is halved, the electrostatic force between them:
(a) Decreases to $\frac{1}{4}$ (b) Increases 4 times (c) Doubles (d) Remains unchanged
- X. Which of the following materials is most suitable for making a transformer core due to its high magnetic permeability and low retentivity?
(a) Hard Steel (b) Soft Iron (c) Copper (d) Brass
- XI. According to the first postulate of special relativity, the laws of physics are identical in all:
(a) Accelerating frames (b) Inertial frames of reference (c) Gravitational fields (d) Rotating frames
- XII. The derived SI unit of Young's Modulus is Pascal (Pa). In terms of base units, this is represented by:
(a) $\text{kg m}^{-1} \text{s}^{-2}$ (b) $\text{kg m}^{-2} \text{s}^{-2}$ (c) $\text{kg m}^2 \text{s}^{-2}$ (d) $\text{kg m}^{-1} \text{s}^{-1}$
- XIII. A rocket works in space on the basis of conservation of:
(a) Mass (b) Mechanical Energy (c) Linear Momentum (d) Angular Momentum
- XIV. The change in internal energy during an isothermal expansion of an ideal gas is equal to:
(a) Total work done (b) Zero (c) Heat absorbed (d) Heat rejected
- XV. Which wave phenomenon demonstrates that light is a transverse wave and not a longitudinal wave?
(a) Interference (b) Diffraction (c) Refraction (d) Polarization
- XVI. A region of space where an electric charge experiences an electrostatic force is called:
(a) Electric potential (b) Electric flux (c) Electric field (d) Electric potential gradient
- XVII. An astronaut inside an Earth-orbiting satellite experiences apparent weightlessness because:
(a) Gravity is zero (b) Centrifugal force cancels gravity
(c) Mass becomes zero (d) Satellite and astronaut are in free fall

Section II — [13 × 3 = 39 Marks]

Q 2. Attempt any Thirteen (13) questions. Answer concisely with relevant explanation.

- I. Show that the famous mass-energy equation $E = mc^2$ is dimensionally homogenous.
- II. Differentiate between precision and accuracy of physical measurements.
- III. State why the scalar product of two mutually perpendicular vectors is zero, and give one physical example.
- IV. Briefly explain why the horizontal and vertical components of projectile motion are treated independently.
- V. State the law of conservation of angular momentum and write its algebraic expression.
- VI. Differentiate between elastic deformation and plastic deformation.
- VII. Explain why water flows faster through a narrower section of a pipe than a wider section using the conservation of mass.
- VIII. Explain the second law of thermodynamics and relate entropy to the degree of disorder of particles in a system.
- IX. Differentiate between constructive and destructive interference of sound waves.

- X. Explain why the core of an electromagnet is made of soft iron rather than hard steel.
- XI. Calculate the impulse delivered to a 0.15 kg baseball hit by a bat, changing its velocity from 30 m/s to 40 m/s.
- XII. A metal wire is 2.0 m long and has a cross-sectional area of $1.0 \times 10^{-6} \text{ m}^2$. A force of 100 N produces an extension of 1.0 mm. Calculate the Young modulus of the wire.
- XIII. Two point charges of $+2.0 \text{ }\mu\text{C}$ and $-3.0 \text{ }\mu\text{C}$ are separated by 0.20 m in free space. Calculate the magnitude of the electrostatic force between them. Take $k = 9.0 \times 10^9 \text{ N m}^2\text{C}^{-2}$.
- XIV. Calculate the magnetic force acting on a 1.5 m straight wire carrying a current of 2.0 A placed perpendicular to a 0.5 T magnetic field.
- XV. Compute the length of a 10-meter rod as measured by an observer moving at 0.6c relative to the rod.
- XVI. An ideal gas occupies 0.020 m^3 at a pressure of $1.5 \times 10^5 \text{ Pa}$. It expands at constant pressure to 0.050 m^3 . Calculate the work done by the gas.

Section III — [4 × 6 = 24 Marks]

Instruction: Each question has two alternatives. Attempt only one alternative from each question.

- Q 3. Derive the mathematical expressions for the Time of Flight and Maximum Height of a projectile launched with initial velocity v_i at an angle θ above the horizontal.

OR

Analyze why astronauts inside an Earth-orbiting satellite experience apparent weightlessness. Prove mathematically that the normal reaction force acting on them is zero.
- Q4. Explain dot product and cross product of two vectors in detail. Outline at least three physical properties of each, and provide one real-world physical example for both products.

OR

Derive the formula for the magnetic force $F = ILB\sin\theta$ acting on a current-carrying conductor placed inside a uniform magnetic field. Discuss the conditions for maximum and zero force.
- Q5. Derive Bernoulli’s Equation for the steady, laminar flow of an ideal, incompressible fluid through a pipe of non-uniform cross-section at different heights.

OR

State and explain the four stages of a Carnot Cycle. Derive the equation for the efficiency of a Carnot heat engine in terms of reservoir temperatures T_h and T_c .
- Q6. Design an experiment to determine the Young modulus of a metal wire. Identify the measurements required and explain how the experimental data can be used to calculate the Young modulus.

OR

Analyze how the predictions of special relativity differ from classical physics when an object moves at a speed close to the speed of light, with reference to time dilation and length contraction.

Section IV — Practical Based Assessment (8+2=10 Marks)

Q. Attempt any TWO of the three PBA questions. Each carries equal marks. (2 × 4 = 8)

I. A screw gauge having a 0.5 mm pitch and 50 divisions on its circular scale is used to measure the diameter of an Aluminum sphere. Before taking the measurement, it is seen that when the two jaws of the screw gauge are closed together, the 23rd division matches with the main scale line, and the main scale zero is barely visible.

Fill in the Fractional reading column, observed reading column and how will you use the zero correction?
(2)

No. of obs.	Main scale reading M (mm)	Circular scale Reading ' n '	Fractional reading $V = n \times \text{L.C.}$	Observed Reading $R = M + V$ (mm)	Corrected Reading $R \pm \text{Z.C.}$
1	0.5	25			
2	0.7	35			
3	0.6	41			

The diagram shows a micrometer screw gauge used to measure the diameter of a sphere.

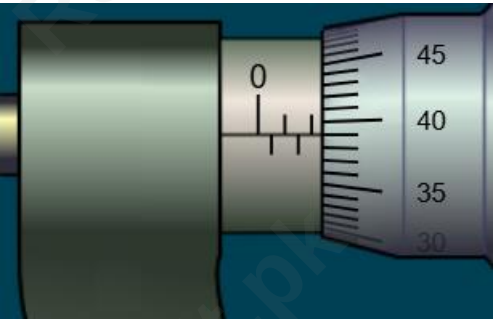
(i) What is the main scale reading on the micrometer? (1)

Reading = _____ unit = _____

(ii) What is circular scale reading on the micrometer. (0.5)

Reading = _____.

(iii) What is the diameter of the sphere. (0.5)



II. The following observations are made in an experiment. Complete the missing entries in the table. (03)

No. of obs	Mass (hanger+ weights)	Height	String turns on the axle	Rotation of the wheel N			Time for N rotations t			ω	I
	m	h	n	1	2	Mean	1	2	Mean	rad/s	g·cm ²
	gm	cm					sec	sec	sec		
1	150	121	14	19	17	18	4.3	4.1	4.2		
2	160	121	14	22	23	22.5	4.5	4.6	4.55		
3	140	120	15	18	17	17.5	4.2	4.1	4.15		

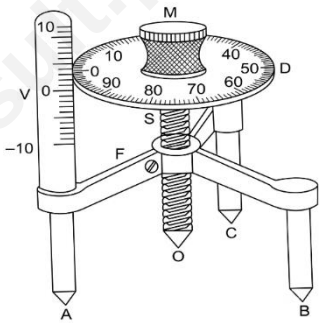


If the mass attached to the string is increased, what effect will it have on the angular velocity of the flywheel? (1)

III. Figure below shows a spherometer being used to measure the radius of curvature of a convex lens.

(i) The pitch of a spherometer is 1 mm, and its circular disc has 100 divisions. Calculate the least count of the instrument. (1)

Answer:



(ii) The spherometer is first placed on a plane glass plate, and the mean reading of the central screw is found to be 3.15 mm. It is then placed on a convex mirror. The distance between the two outer legs (the “leg distance” l) is 5 cm. (3)

S.N	Main Scale Reading (mm)	Circular Scale Reading		Total Reading
		No. of divisions	Value	
		coinciding	$\times$ LC (in mm)	(in cm)
1	3.0	45		
2	2.8	52		
3	3.1	38		

Complete the “Total Reading” column for all three observations in cm.

Q. Write the procedure of your favorite experiment with a labelled diagram

(2 Marks)

Section 1 — [17 × 1 = 17 Marks]**Q1. Write the Question No. and the complete correct option on the answer script.****I.** The smallest unit of data in a computer is.

- A) Byte B) Bit C) KB D) MB

II. Which is an example of analog signal?

- A) Digital image B) Binary data C) Human speech D) Computer file

III. Which logic gate gives output 1 only when all inputs are 1?

- A) OR B) NOT C) AND D) NOR

IV. In which SDLC phase are system requirements studied and analyzed?

- A) Design B) Testing C) Analysis D) Maintenance

V. Which topology connects all computers to a central device?

- A) Bus B) Ring C) Star D) Mesh

VI. Which is an example of a computational artifact?

- A) Website B) Chair C) Notebook D) Pen

VII. Which is an important property of a good algorithm?

- A) Ambiguity B) Reliability C) Complexity D) Randomness

VIII. A prototype is mainly used to.

- A) Collect feedback B) Delete data C) Install software D) Format a disk

IX. Which operator gives the remainder in Python?

- A) / B) // C) % D) **

X. The first index of a Python list is.

- A) 0 B) 1 C) -1 D) 2

XI. Which term is used for the variable whose value is observed during experiment?

- A) Independent variable B) Dependent variable C) Control variable D) Constant

XII. Which chart is most suitable for showing parts of a whole?

- A) Pie chart B) Line chart C) Scatter plot D) Histogram

XIII. Which technology is important for connecting devices in IoT?

- A) Wireless Sensor Networks B) Word processor C) Printer D) Compiler

XIV. Which of the following best describes blockchain technology?

- A. Programming language B. Digital ledger of transactions C. Network topology D. Database table.

XV. Information collected directly from an original source is called.

- A) Secondary information B) Primary information C) Processed information D) Duplicate information

XVI. When a sample does not properly represent the population, it may cause.

- A) Sampling bias B) Data storage C) Encryption D) Compilation

XVII. What is the primary purpose of a firewall in cybersecurity?

- A) Encryption Data B) Monitoring Network Traffic C) Blocking Malicious Traffic D) Generating Strong Password

Section II — [13 × 3 = 39 Marks]**Q 2. Attempt any Thirteen (13) questions. Answer concisely with relevant explanation.**

1. Draw the truth table of NAND gate.
2. Differentiate between supervised learning and unsupervised learning with examples.
3. A school is developing an online attendance system. The team is collecting the requirements and then designs the system. Identify the two SDLC phases involved and state the purpose of each.
4. A college lab has all computers connected to one central switch. Identify the topology and give one advantage.
5. What is cybersecurity? Give two reasons why it is important.
6. What is computational thinking? Name any two of its components.
7. What is pseudo code? Why is it used in algorithm design instead of writing actual code directly?
8. A list is first arranged in ascending order before searching. Which searching method can be used and why?
9. A program performs the same calculation several times. How can a Python function make the program easier to manage?
10. What is blockchain? Name two types of blockchain.
11. What is a Python variable? Write two rules for naming variables.
12. Compare bus topology and star topology with respect to their cost, fault tolerance, and network architecture.
13. What is a for loop? What is the purpose of range() in Python?
14. Given marks = [65,72,81,54], write the statement to display 81 and state its index.
15. Define statistical modeling. What is meant by a dependent variable?
16. A student finds two websites giving different information about the same topic. State two steps the student should take before using the information.
17. What is an MVP? Why is it useful for a new digital business?

Section III — [4 × 6 = 24 Marks]

Instruction: Each question has two alternatives. Attempt only one alternative from each question.

- Q 3.

Explain the working of AND, OR, NAND, NOR and NOT gates. Draw the truth tables of any two gates and state one practical use of a logic gate.
- OR

A bank wants to protect its online transactions of its customers. Explain how encryption, firewalls and two-factor authentication will help to protect the data.
- Q 4.

Use a K-Map to simplify. $F = \overline{X}YZ + \overline{X}YZ + X\overline{Y}Z + XYZ + XY\overline{Z}$
- OR

Write a Python program using a function to find the square and cube of a number.
- Q 5.

Given marks=[65,72,81,54,90], write Python statements to: (a) Display the list, (b) Display the third element, (c) Find minimum, (d) Find maximum, (e) Find the sum. (f) Display each mark along with its position number (e.g., "Mark 1: 65").
- OR

Use the Bubble Sort method to arrange the following list in ascending order. Show the steps of each pass. [12, 5, 18, 7, 10].
- Q 6.

A student wants to use information found on social media for an assignment. Explain four steps the student should follow to evaluate and verify the information.
- OR

What is IoT? Explain any four technologies that help IoT work, with one example.

Section IV — Practical Based Assessment (8+2=10 Marks)

Q. Attempt any TWO of the three PBA questions. Each carries equal marks. (2 × 4 = 8)

I. Look at the pseudocode and answer the questions. (04)

Step 1: Set total = 0
Step 2: FOR i = 1 to 3
Step 3: total = total + i
Step 4: END FOR
Step 5: PRINT total

I	Total
1	
2	
3	

- A) What is the starting value of total?

(01)
- B) Complete the table given above.

(01)
- C) What will be printed at the end?

(01)
- D) Write the name of the flowchart symbol used for PRINT.

(01)

II. Look at the Python code and write the output. (04)

```
a = 6
b = 2
print(a + b)
print(a * b)
print(a ** b)
if a > b:
    print("a is greater")
else:
    print("b is greater")
```

- A) What is the output of print(a + b)?

(01)
- B) What is the output of print(a * b)?

(01)
- C) What is the output of print(a ** b)?

(01)
- D) What is the output of the if-else statement?

(01)

III. Read the information about three networks and answer the questions. (04)

Network	Description
X	All computers are connected to one central switch.
Y	All computers are connected to one common cable.
Z	Computers are connected to each other in a circle.

- A) Write the topology name of Network X.

(01)
- B) Write the topology name of Network Y.

(01)
- C) Write the topology name of Network Z.

(01)
- D) Which network (X, Y or Z) stops working completely if the central switch fails?

(01)

Q. Write about one practical you have performed. Write its name, its program or steps and one use in daily life. (0.5 + 1 + 0.5 = 2)