CEE 2026

Assam Combined Entrance Examination — Question Paper

3 Parts · Mathematics · Physics · Chemistry · 120 Questions · Bilingual (English / অসমীয়া) · Question Booklet **Set B**

Instructions: All questions are multiple-choice with four options (A)–(D); choose the single best answer. Each question is given in English followed by its Assamese translation. The answer key is provided at the end.

PART A — Mathematics

Questions 1–40 (40 found)

1. The mean of 5 observations is 4.4 and their variance is 8.24. If three of the observations are 1, 2 and 6, then the other two observations are:
5টা পর্যবেক্ষণৰ মাধ্য 4.4 আৰু সিহঁতৰ প্ৰসৰণ 8.24। যদি পর্যবেক্ষণবোৰৰ তিনিটাৰ মান 1, 2 আৰু 6, তেন্তে আন দুটা পর্যবেক্ষণ হ'ব-

(A) 4, 9
(B) 5, 8
(C) 3, 10
(D) 4, 10

2. If f is a subset of $\mathbf{Z} \times \mathbf{Z}$, then which of the following is a function from $\mathbf{Z}$ to $\mathbf{Z}$ (where $\mathbf{Z}$ is the set of integers)?
যদি f এটা Z × Z অৰ উপসংহতি, তেন্তে তলৰ কোনটো Z অৰ পৰা Z অলৈ এটা ফলন হ'ব (যত Z হল অখণ্ড সংখ্যাৰ সংহতি)?

(A) $f = \{(ab, a+b) : a, b \in \mathbf{Z}\}$
(B) $f = \{(a+b, a-b) : a, b \in \mathbf{Z}\}$
(C) $f = \{(ab, a^2b^2) : a, b \in \mathbf{Z}\}$
(D) $f = \{(a^2b^2, ab) : a, b \in \mathbf{Z}\}$

3. In class XII of a school, 40% of the students study Mathematics, 30% study Physics and 20% study Chemistry. 20% of the class study both Mathematics and Physics, 10% of the class study both Mathematics and Chemistry, 10% of the class study both Physics and Chemistry. 5% of the class study all the three subjects—Mathematics, Physics and Chemistry. If a student is selected at random from the class, the probability that he will be studying neither Mathematics nor Physics nor Chemistry is:

(A) 0.55
(B) 0.65
(C) 0.35
(D) 0.45

4. Two motorcyclists A and B leave a place at 12 noon. A travels north at 60 km/hr and B travels east at 80 km/hr. At 2 PM, they are separating at the rate of:
দুজন মটৰ-চাইকেল আৰোহী A আৰু B এ দুপৰীয়া 12 বজাত এটা স্থানৰ পৰা গমন কৰে। A এ উত্তৰ দিশলৈ 60 km/hr গতিবেগত আৰু B এ পূব দিশলৈ 80 km/hr গতিবেগত যাত্ৰা কৰে। দিনৰ দুই বজাত তেওঁলোকৰ মাজৰ দূৰত্বৰ ব্যৱধানৰ হাৰ হ'ব-

(A) 50 km/hr
(B) 100 km/hr
(C) 75 km/hr
(D) 25 km/hr

5. 20 delegates from 20 countries sit in a circle such that two particular delegates never sit together. In how many ways can they be seated?
20খন দেশৰ 20জন প্ৰতিনিধিয়ে এটা বৃত্তত আসন গ্ৰহণ কৰে যাতে দুজন বিশিষ্ট প্ৰতিনিধি একেলগে নবহে। তেওঁলোকক কিমান ধৰণে বহুৱাব পাৰি?

(A) $20! - 2$
(B) $19! - 2$
(C) $19! - 18!$
(D) $17 \times 18!$

6. In an election, the number of candidates is one more than the number of seats. If a voter can cast his vote in 30 ways, find the number of candidates (when a voter can cast his vote for one or more seats).
এটা নিৰ্বাচনত, প্ৰাৰ্থীৰ সংখ্যা আসনৰ সংখ্যাতকৈ এক বেছি। যদি এজন ভোটাৰে 30 ধৰণেৰে ভোটদান কৰিব পাৰে, তেন্তে প্ৰাৰ্থীৰ সংখ্যা কিমান (যেতিয়া এজন ভোটাৰে অতি কমেও এখন আসনত ভোট দিয়ে)?

(A) 31
(B) 29
(C) 5
(D) 6

7. The sum to n terms of the series $1 + 3 + 7 + 15 + \ldots$ is:

(A) $2^{n+1} - 2 - n$
(B) $2^{n+1} - 2$
(C) $2^{n+1} - 2 - n^2$
(D) $2^{n+1} - n$

8. The number of arbitrary constants in the general solution and in the particular solution of a differential equation of fourth order are respectively:
চতুর্থ ক্রমৰ অৱকল সমীকৰণ এটাৰ সাধাৰণ সমাধান আৰু বিশেষ সমাধানত যাদৃচ্ছিক ধ্ৰুৱকৰ সংখ্যা ক্ৰমে-

(A) $0, 4$
(B) $4, 4$
(C) $4, 0$
(D) $0, 0$

9. The differential equation of all circles in a plane of radius r is: (where $y_1 = \frac{dy}{dx}$, $y_2 = \frac{d^2y}{dx^2}$)

(A) $(1+y_1^2)^2 = r^2y_2^2$
(B) $1+y_1^2 = r^2y_2$
(C) $(1+y_1^2)^3 = r^2y_2$
(D) $(1+y_1^2)^3 = r^2y_2^2$

10. The direction cosines of the vector $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ are:

(A) a_1, a_2, a_3
(B) $\frac{a_1}{|\vec{a}|}, \frac{a_2}{|\vec{a}|}, \frac{a_3}{|\vec{a}|}$
(C) $\frac{a_1^2}{|\vec{a}|}, \frac{a_2^2}{|\vec{a}|}, \frac{a_3^2}{|\vec{a}|}$
(D) $\cos a_1, \cos a_2, \cos a_3$

11. If a set A contains 5 elements, then the number of reflexive relations on A is:

(A) 2^5
(B) 2^{25}
(C) 2^{24}
(D) 2^{20}

12. If a set A contains 3 elements and another set B contains 4 elements, then the number of functions from A to B, which are not injective, is:
যদি এটা সংহতি Aত 3টা মৌল আৰু আন এটা সংহতি Bত 4টা মৌল থাকে, তেন্তে Aৰ পৰা Bলৈ পোৱা একেকী ফলন নোহোৱা ফলনৰ সংখ্যা হ'ব-

(A) 24
(B) 64
(C) 40
(D) 12

13. If $A = (-1, 1)$ and $B = (0, \infty)$, then the complement of $A \cup B$ is:
যদি A=(−1,1) আৰু B=(0,∞), তেন্তে A∪Bৰ পূৰক সংহতিটো হ'ব-

(A) $(-\infty, 0]$
(B) $(-\infty, -1]$
(C) $[0, 1]$
(D) $[-1, 0]$

14. If $(1+x)^n = C_0 + C_1x + C_2x^2 + \ldots + C_nx^n$, where $C_i = {}^nC_i$, $i = 0, 1, \ldots, n$, then $(C_0 + C_1)(C_1 + C_2)\ldots(C_{n-1} + C_n)$ equals:

(A) $C_1C_2\ldots C_n \frac{(n+1)^n}{n!}$
(B) $C_1C_2\ldots C_n \frac{(n-1)^2}{n!}$
(C) $\frac{(2n)!}{(n!)^2}$
(D) $n \cdot 2^{n-1}$

15. If $1 + \cos 2\theta + \cos 4\theta + \cos 6\theta = 0$, $0 \le \theta \le 180°$, then:

(A) $\theta = 30°, 150°, 75°$
(B) $\theta = 45°, 135°, 25°$
(C) $\theta = 30°, 135°, 120°$
(D) $\theta = 30°, 45°, 90°, 135°, 150°$

16. The value of $\sin\left[\cos^{-1}\left(\frac{3}{5}\right) + \tan^{-1}(-2)\right]$ is:

(A) $\frac{2}{5\sqrt{5}}$
(B) $-\frac{2}{5\sqrt{5}}$
(C) $\frac{3}{5\sqrt{5}}$
(D) $-\frac{3}{5\sqrt{5}}$

17. The function $y = \frac{\sin x + 2\cos x}{3\sin x + 4\cos x}$:

(A) decreases for all $x \in R$
(B) increases for all $x \in R$
(C) decreases only for $x > 0$
(D) increases only for $x > 0$

18. $f(x)$ is a polynomial of degree 3 such that $f(0) = f(3) = f(-3) = 0$ and $f(1) = -8$. The maximum and minimum values of $f(x)$ are respectively:

f(x) হৈছে 3 মাত্ৰাৰ এনেকুৱা এটা বহুপদ ৰাশি যাতে f(0)=f(3)=f(−3)=0 আৰু f(1)=−8। f(x) অৰ গৰিষ্ঠ আৰু লঘিষ্ঠ মানবোৰ হ'ব ক্ৰমাধ্যায়ে-

(A) $6, -6$

(B) $\sqrt{3}, -\sqrt{3}$

(C) $6\sqrt{3}, -6\sqrt{3}$

(D) $-6\sqrt{3}, 6\sqrt{3}$

19. Which of the following functions is not continuous on the set of real numbers?

বাস্তৱ সংখ্যাৰ সংহতিত তলৰ কোনটো ফলন অবিচ্ছিন্ন নহয়?

(A) $f(x) = |x| + |x+1| + |x-2|$

(B) $f(x) = |\cos x|$

(C) $f(x) = x^3 + |x|$

(D) $f(x) = \lfloor x \rfloor$

20. Which of the following functions is differentiable on the set of real numbers?

বাস্তৱ সংখ্যাৰ সংহতিত তলৰ কোনটো ফলন অৱকলনীয়?

(A) $f(x) = \lfloor x \rfloor$

(B) $f(x) = |x| + |x+1|$

(C) $f(x) = \sin x + \log_e x + e^x$

(D) $f(x) = \dfrac{x}{|x|}$

21. The orthocentre of the triangle formed by the following straight lines is: $y = x,\ x - 2y + 1 = 0,\ 3x - 4y - 1 = 0$

(A) $(8, 13)$

(B) $(-8, 13)$

(C) $(8, -13)$

(D) $(-8, -13)$

22. The equations of two circles which touch the coordinate axes and whose centres lie on the line $x - 2y = 3$ are:

(A) $x^2 + y^2 + 6x + 6y + 9 = 0,\ x^2 + y^2 - 2x + 2y + 1 = 0$

(B) $x^2 + y^2 - 6x - 6y - 9 = 0,\ x^2 + y^2 + 2x - 2y - 1 = 0$

(C) $x^2 + y^2 - 6x + 6y + 9 = 0,\ x^2 + y^2 + 2x - 2y + 1 = 0$

(D) $x^2 + y^2 - 6x + 6y - 9 = 0,\ x^2 + y^2 - 2x + 2y - 1 = 0$

23. Assuming that straight lines work as the plane mirror for a point, the image of the point $(1, 2)$ in the line $x - 3y + 4 = 0$ is:

সৰল ৰেখাবোৰক এটা বিন্দুৰ বাবে সমতল দাপোণ হিচাপে বিবেচনা কৰিলে, (1,2) বিন্দুটোৰ x−3y+4=0 ৰেখাত প্ৰতিবিম্ব হ'ব-

(A) $\left(\frac{5}{6}, \frac{7}{5}\right)$

(B) $\left(\frac{6}{5}, \frac{5}{7}\right)$

(C) $\left(\frac{5}{6}, \frac{5}{7}\right)$

(D) $\left(\frac{6}{5}, \frac{7}{5}\right)$

24. If $\vec{a}, \vec{b}$ and $\vec{c}$ are three vectors such that $|\vec{a}| = a,\ |\vec{b}| = b,\ |\vec{c}| = c$ and each one of them is perpendicular to the sum of the other two, then $|\vec{a} + \vec{b} + \vec{c}|$ equals:

যদি a, b আৰু c তিনিটা ভেক্টৰ যাতে |a|=a, |b|=b, |c|=c আৰু প্ৰতিটো ভেক্টৰ আন দুটা ভেক্টৰৰ যোগফললৈ লম্ব, তেন্তে |a+b+c| ৰ মান হ'ব-

(A) $a + b + c$

(B) $a^2 + b^2 + c^2$

(C) $\sqrt{a^2 + b^2 + c^2}$

(D) $\sqrt{a + b + c}$

25. For a linear programming problem, which one is correct?

এটা ৰৈখিক প্ৰগ্ৰেমিং সমস্যাৰ ক্ষেত্ৰত কোনটো শুদ্ধ?

(A) Optimal solution always exists.

(B) If the feasible region is unbounded, then the maximum or minimum value of the objective function exists.

(C) If the feasible region (R) is bounded, then the objective function has a maximum or a minimum value on R.

(D) If the objective function has an optimal value, then this optimal value must occur at a corner point of the feasible region.

26. If a machine is correctly set up, it produces 90% acceptable items. If it is incorrectly set up, it produces 40% acceptable items. Past experience shows that 80% of the setups are correctly done. If after a certain setup, the machine produces 2 acceptable items, then the probability that the machine is correctly set up is:

(A) 0.85

(B) 0.95

(C) 0.75

(D) 0.65

27. The range of the function $f : R - \{-1, 1\} \to R$, defined by $f(x) = \frac{x^2}{1 - x^2}$, is:

ফলন f:R−{−1,1}→R, যাত f(x)=x²/(1−x²), অৰ পৰিসৰ হ'ব-

(A) $(-\infty, -1] \cup (0, \infty)$

(B) $(-\infty, -1] \cup [0, \infty)$

(C) $(-\infty, -1) \cup (0, \infty)$

(D) $(-\infty, -1) \cup [0, \infty)$

28. How many license plates can be made if the license plates contain 6 characters out of which the first two characters are distinct digits and the remaining 4 characters are distinct capital letters (not cursive) of English alphabet?

6টা স্থানযুক্ত কিমানখন লাইচেন্স প্লেট প্ৰস্তুত কৰিব পৰা যায়, যদিহে প্ৰথম দুটা স্থানত দুটা অসমান অংক থাকে, আৰু বাকী থকা 4টা স্থানত 4টা ইংৰাজী বৰ্ণমালাৰ বৰফলাৰ (পকোৱা নহয়) বেলেগ বেলেগ বৰ্ণ থাকে?

(A) 32292000

(B) 2080

(C) 117

(D) 18962

29. If A is a 3×3 matrix with $|A| = -1$, then $|3\,(\text{adj}(A^T))A^2|$ equals:

যদি A এটা 3×3 মৌলকক্ষ যাতে |A|=−1, তেন্তে |3(adj(Aᵀ))A²| অৰ মান হ'ব-

(A) 81

(B) 9

(C) 27

(D) 3

30. If a coin is tossed 10 times, the probability of getting head at least two times but at most five times is:

যদি এটা মুদ্ৰা 10 বাৰ টচ্ কৰা হয়, তেন্তে অতি কমেও দুই বাৰ কিন্তু অতি বেছি পাঁচ বাৰ মুণ্ড পোৱাৰ সম্ভাৱিতা হ'ব-

(A) $\frac{14}{2^{10}}$

(B) $\frac{627}{2^{10}}$

(C) $\frac{2^{10} - 627}{2^{10}}$

(D) $\frac{{}^{10}C_2\,{}^{10}C_3\,{}^{10}C_4\,{}^{10}C_5}{2^{10}}$

31. If $y = \left(\frac{a+x}{b+x}\right)^{a+b+2x}$, then $\frac{dy}{dx}$ at $x = 0$ is:

(A) 1

(B) $\log \frac{a}{b}$

(C) $\left(2\log \frac{a}{b} + \frac{b^2 - a^2}{ab}\right)\left(\frac{a}{b}\right)^{a+b}$

(D) $\left(\log \frac{a}{b} + \frac{ab}{b-a}\right)\left(\frac{b}{a}\right)^{a+b}$

32. If $\arg\left(\frac{z-1}{z+1}\right) = \frac{\pi}{4}$, then the locus of the point $P(z)$ on the Argand's plane is a:

যদি arg((z−1)/(z+1))=π/4, তেন্তে P(z) বিন্দুৰ আৰ্গাণ্ড সমতলত সঞ্চাৰ পথ হ'ব এটা/এডাল-

(A) line

(B) circle

(C) parabola

(D) hyperbola

33. A milkman has 250 litres of milk containing 5% fat. How many litres of milk containing 15% fat should he add to his milk in stock so that the fat content in the mixture would be more than 7% but less than 10%?

এজন গাখীৰ ব্যৱসায়ীৰ হাতত 5% স্নেহযুক্ত গাখীৰ আছে 250 লিটাৰ। ইয়াৰ লগত আৰু কিমান লিটাৰ 15% স্নেহযুক্ত গাখীৰ মিহলি কৰিব লাগিব যাতে মিশ্ৰণটোত স্নেহৰ পৰিমাণ 7% অতকৈ অধিক কিন্তু 10% অতকৈ কম হয়?

(A) More than 62.5 litres but less than 250 litres

(B) More than 100 litres but less than 200 litres

(C) More than 62.5 litres but less than 200 litres

(D) More than 100 litres but less than 250 litres

34. If $x = f(t), y = g(t)$, then $\frac{d^2y}{dx^2}$ equals:

(A) $\frac{\frac{dx}{dt}\frac{d^2y}{dt^2} - \frac{d^2x}{dt^2}\frac{dy}{dt}}{\left(\frac{dx}{dt}\right)^3}$

(B) $\frac{\frac{dx}{dt}y - x\frac{dy}{dt}}{\left(\frac{dx}{dt}\right)^2}$

(C) $\frac{x\frac{dy}{dt} - y\frac{dx}{dt}}{x^2}$

(D) $\frac{\frac{dx}{dt}\frac{d^2y}{dt^2} - \frac{d^2x}{dt^2}\frac{dy}{dt}}{\left(\frac{dx}{dt}\right)^2}$

35. The value of $\int \frac{dx}{\sin x\,(2+3\cos x)}$ is:

(A) $\frac{1}{2}\log|1+\sin x|+\frac{1}{10}\log|\sin x-1|-\frac{3}{5}\log|2+3\sin x|+C$

(B) $\frac{1}{2}\log|1+\cos x|+\frac{1}{10}\log|\cos x-1|-\frac{3}{5}\log|2+3\cos x|+C$

(C) $\frac{1}{2}\log|1+\cos x|+\frac{1}{10}\log|\sin x-1|-\frac{3}{5}\log|2+3\sin x|+C$

(D) $\frac{1}{2}\log|1+\sin x|+\frac{1}{10}\log|\cos x-1|-\frac{3}{5}\log|2+\cos x|+C$

36. The value of $\int_{\alpha}^{\beta}\sqrt{(x-\alpha)(\beta-x)}\,dx,\ \alpha\neq\beta$ is:

(A) $(\beta-\alpha)$

(B) $(\beta-\alpha)^2$

(C) $\frac{\pi}{2}(\beta-\alpha)^2$

(D) $\frac{\pi}{8}(\beta-\alpha)^2$

37. The area of the region bounded by the x-axis, the line $x=4$ and the curve $y=f(x)$, where $f(x)=\begin{cases}x^2, & 0\le x\le 1\\ \sqrt{x}, & x>1\end{cases}$

(A) 5 sq. units

(B) $\frac{1}{3}$ sq. unit

(C) $\frac{1}{5}$ sq. unit

(D) 3 sq. units

38. If the straight line $lx+my+n=0$ touches the parabola $y^2=4ax$, then:

যদি lx+my+n=0 ৰেখাডাল $y^2=4ax$ অধিবৃত্তটোক স্পৰ্শ কৰে, তেন্তে-

(A) $al^2=mn$

(B) $am^2=ln$

(C) $an^2=ml$

(D) $a^2m=l^2n$

39. If P is any point on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ with major axis AA' and N is the foot of the perpendicular drawn from P upon AA', then:

AA' মুখ্য অক্ষবিশিষ্ট উপবৃত্ত $x^2/a^2+y^2/b^2=1$ অৰ ওপৰত P যিকোনো এটা বিন্দু আৰু N হৈছে Pৰ পৰা AA' অৰ ওপৰত টনা লম্বডালৰ পাদবিন্দু, তেন্তে-

(A) $\frac{PN^2}{A'N+AN}=\frac{b^2}{a^2}$

(B) $\frac{PN^2}{A'N+AN}=\frac{a^2}{b^2}$

(C) $\frac{PN^2}{A'N\cdot AN}=\frac{b^2}{a^2}$

(D) $\frac{PN^2}{A'N\cdot AN}=\frac{a^2}{b^2}$

40. The eccentricity of the hyperbola which is the locus of a point moving in a plane such that the difference of its distances from the points $(-5,0)$ and $(5,0)$ is equal to 8, is:

এটা তলত গতি কৰা (−5,0) আৰু (5,0) বিন্দুটোৰ পৰা দূৰত্বৰ ব্যৱধান 8 হোৱা বিন্দুৰ সঞ্চাৰ পথৰ পৰাবৃত্তটোৰ উৎকেন্দ্ৰতা হ'ব-

(A) $\frac{5}{4}$

(B) $\frac{4}{5}$

(C) $-\frac{5}{4}$

(D) $-\frac{4}{5}$

PART B — Physics

Questions 41–80 (40 found)

41. A double convex lens is made of a certain material. The refractive index of the material of the lens is **1.55** for violet rays and **1.50** for red rays. If the focal length of the lens is **20** cm for violet rays, then what will be the focal length of the lens for red rays?

দ্বি-উত্তল লেন্স এখন বিশেষ পদাৰ্থ এবিধেৰে তৈয়াৰী। বেঙুনীয়া ৰশ্মিৰ বাবে লেন্সৰ পদাৰ্থৰ প্ৰতিসৰণ গুণাংক 1.55 আৰু ৰঙা ৰশ্মিৰ বাবে 1.50। বেঙুনীয়া ৰশ্মিৰ বাবে লেন্সৰ ফ'কাচ দৈর্ঘ্য 20 cm হ'লে ৰঙা ৰশ্মিৰ বাবে লেন্সখনৰ ফ'কাচ দৈর্ঘ্য কিমান হ'ব?

(A) 12 cm

(B) 18 cm

(C) 22 cm

(D) 24 cm

42. Two coherent monochromatic light beams of intensities I and $4I$ are superposed. What are the maximum and the minimum possible intensities in the resulting beam?

দুটা I আৰু 4I তীব্ৰতাৰ সং সক্ত আৰু এককৰণী পোহৰ কিৰণৰ অধ্যাৰোপণ ঘটিছে। লব্ধ কিৰণত সম্ভাব্য সৰ্বোচ্চ আৰু সৰ্বনিম্ন তীব্ৰতা কিমান হ'ব?

(A) $I_{max}=2I,\ I_{min}=I$

(B) $I_{max}=4I,\ I_{min}=I$

(C) $I_{max}=9I,\ I_{min}=3I$

(D) $I_{max}=9I,\ I_{min}=I$

43. An astronomical telescope in normal adjustment has magnifying power **5** for distant objects. The separation between the objective and the eyepiece is **36** cm. The focal lengths of the objective and the eyepiece are respectively

স্বাভাৱিক দৰ্শনৰ বাবে সমায়োজিত নভোবীক্ষণ যন্ত্ৰ এটাৰ দূৰৰ লক্ষ্যবস্তুৰ বাবে পৰিবৰ্ধন ক্ষমতা 5। অভিলক্ষ্য আৰু অভিনেত্ৰৰ মাজৰ দূৰত্ব 36 cm। অভিলক্ষ্য আৰু অভিনেত্ৰৰ ফ'কাচ দূৰত্ব ক্ৰমে

(A) 30 cm, 30 cm
(B) 30 cm, 6 cm
(C) 6 cm, 30 cm
(D) 6 cm, 6 cm

44. In the equation $X = \frac{1}{2}\varepsilon_r Y Z^2$, Z has the dimensions of $\frac{1}{2}Li^2$ and X has the dimensions of energy. L stands for coefficient of self-induction and i for electric current. What are the dimensions of Y?

(A) $M^{-1}L^{-1}T^2$
(B) $M^{-1}L^{-2}T^2$
(C) $M^{-1}L^{-2}T^1$
(D) $ML^{-2}T^2$

45. For what value of x, will two vectors $\vec{A} = \hat{i} + 4\hat{j} - 2\hat{k}$ and $\vec{B} = -2\hat{i} + x\hat{j} + x^2\hat{k}$ be mutually perpendicular?

xৰ কি মানৰ বাবে দুটা ভেক্টৰ $\vec{A} = \hat{i} + 4\hat{j} - 2\hat{k}$ আৰু $\vec{B} = -2\hat{i} + x\hat{j} + x^2\hat{k}$ পৰস্পৰ লম্ব হ'ব?

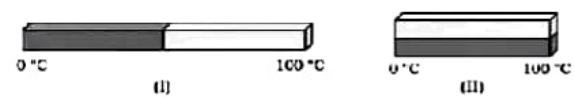
(A) 0
(B) 0.5
(C) 1
(D) 2

46. A block of mass **0.1** kg is held against a vertical wall by applying a horizontal force F on the block. If the coefficient of friction between the wall and the block is **0.4**, then what is the magnitude of the minimum force F needed to be applied for keeping the block at rest? ($g = 10\ m\,s^{-2}$)

0.1 kg ভৰৰ খণ্ড এটাক উলম্ব বেৰ এখনত F অনুভূমিক বল প্ৰয়োগ কৰি স্থিতিতাৱস্থাত ৰখা হৈছে। বেৰ আৰু খণ্ডটোৰ মাজৰ ঘৰ্ষণ গুণাংক 0.4 হ'লে খণ্ডটোক স্থিতিতাৱস্থাত ৰাখিবলৈ প্ৰয়োজন হোৱা নিম্নতম প্ৰয়োগ কৰা বল F ৰ মান কিমান হ'ব? ($g = 10\ m\,s^{-2}$)

(A) 4 N
(B) 0.4 N
(C) 2.5 N
(D) 25 N

47. Two rectangular metal rods, identical in all respects, have been welded end-to-end as shown in figure (I) below. **100** J of heat flows through the combination in **20** minutes. If the rods are welded as one on top of the other as shown in figure (II) below, in how many minutes will the same amount of heat flow through the new combination? In either case, the temperature difference across the entry and exit points of heat is **100 °C**.



(A) 2.5 min
(B) 5 min
(C) 10 min
(D) 10.5 min

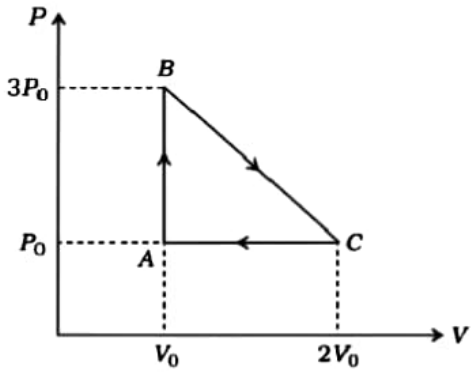
48. A and B are two ideal gases. **3** g mole of gas A at absolute temperature T_1 and **5** g mole of gas B at absolute temperature T_2 have been mixed. There is no loss of energy in the process. Find the temperature of the mixture if the mass of a molecule of gas A is m_1 and that of gas B is m_2, and $T_1 = 300$ K and $T_2 = 500$ K.

A আৰু B দুবিধ আদৰ্শ গেছ। T_1 পৰম উষ্ণতাত থকা গেছ Aৰ 3 g mole আৰু T_2 পৰম উষ্ণতাত থকা গেছ Bৰ 5 g mole মিহলোৱা হ'ল। প্ৰক্ৰিয়াটোত শক্তিৰ কোনো ক্ষয় ক্ষতি নঘটিল। গেছ Aৰ এটা অণুৰ ভৰ m_1 আৰু গেছ Bৰ এটা অণুৰ ভৰ m_2; আৰু $T_1 = 300$ K আৰু $T_2 = 500$ K হ'লে মিশ্ৰণটোৰ উষ্ণতা নিৰ্ণয় কৰা।

(A) 350 K
(B) 401.5 K
(C) 425 K
(D) 450 K

49. Two-thirds mole of an ideal diatomic gas is taken around the cyclic process ABCA as shown in the diagram below. What is the amount of heat rejected by the gas to the surrounding in the path CA?

এবিধ দ্বিপৰমাণৱিক আদৰ্শ গেছৰ দুই তৃতীয়াংশ মল তলৰ চিত্ৰত দেখুওৱা ধৰণে ABCA চক্ৰীয় প্ৰক্ৰিয়াৰ মাজেৰে নিয়া হ'ল। CA পথছোৱাত গেছে চৌপাশলৈ বৰ্জন কৰা তাপৰ পৰিমাণ কিমান হ'ব?



(A) P_0V_0

(B) $\frac{3}{2}P_0V_0$

(C) $\frac{5}{2}P_0V_0$

(D) $\frac{7}{2}P_0V_0$

50. A particle of mass **0.2** kg is moving in a horizontal circle of radius r under a centripetal force equal to $-\frac{K}{r^2}$, where K is a constant. What is the total energy of the particle?

0.2 kg ভৰৰ কণা এটাই অভিকেন্দ্ৰিক বল $-\frac{K}{r^2}$ ৰ প্ৰভাৱত r ব্যাসাৰ্ধৰ অনুভূমিক বৃত্ত এটাত ঘূৰি আছে, ইয়াত K এটা ধ্ৰুৱক। কণাটোৰ মুঠ শক্তি কিমান?

(A) $-\frac{K}{4r^2}$

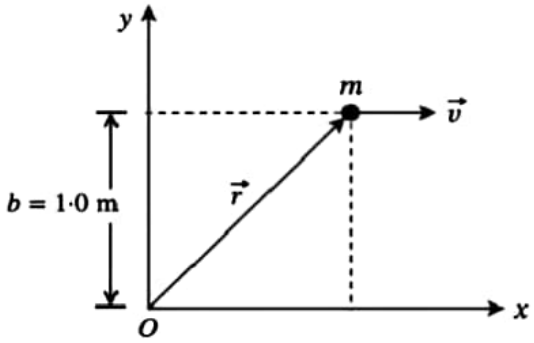
(B) $\frac{K}{4r^2}$

(C) $-\frac{K}{2r^2}$

(D) $\frac{K}{2r^2}$

51. A particle of mass $m = 0.25$ kg is moving along a straight line parallel to x-axis with a constant velocity of $v = 5\ \mathrm{m\,s^{-1}}$ as shown in the figure. What is the angular momentum of the particle with respect to the origin?

$m = 0.25$ kg ভৰৰ কণা এটাই চিত্ৰত দেখুওৱা ধৰণে x-অক্ষৰ সমান্তৰাল সৰলৰেখা এডালেদি $v = 5\ \mathrm{m\,s^{-1}}$ স্থিৰ বেগেৰে গৈ আছে। মূলবিন্দুৰ সাপেক্ষে কণাটোৰ কৌণিক ভৰবেগ কিমান?



(A) 0

(B) $1.25\ \mathrm{kg\,m^2\,s^{-1}}$ along z-axis

(C) $1.25\ \mathrm{kg\,m^2\,s^{-1}}$ along negative z-axis

(D) $1.25\ \mathrm{kg\,m^2\,s^{-1}}$ along x-axis

52. A metal ring of radius **10** cm and mass **0.5** kg is rolling down an inclined plane from rest without slipping. The inclined plane makes an angle of **30°** with the horizontal. What is the linear acceleration of the ring? ($g = 10\ \mathrm{m\,s^{-2}}$)

10 cm ব্যাসাৰ্ধ আৰু 0.5 kg ভৰৰ ধাতুৰ আঙুঠি এটা হেলনীয়া তল এখনদি নিপিছলাকৈ স্থিৰ অৱস্থাৰ পৰা বাগৰি আহিছে। হেলনীয়া তলখনে আনুভূমিকৰ লগত **30°** কোণ উৎপন্ন কৰিছে। আঙুঠিটোৰ ৰৈখিক ত্বৰণ কিমান? ($g = 10\ \mathrm{m\,s^{-2}}$)

(A) $2.5\ \mathrm{m\,s^{-2}}$

(B) $5\ \mathrm{m\,s^{-2}}$

(C) $10\ \mathrm{m\,s^{-2}}$

(D) $3.33\ \mathrm{m\,s^{-2}}$

60. Find the de Broglie wavelength associated with a thermal neutron of mass m at absolute temperature T. (k = Boltzmann constant and h = Planck's constant)

T পৰম উষ্ণতাত থকা আৰু m ভৰৰ তাপীয় নিউট্ৰন এটাৰ সৈতে জড়িত দ্য ব্ৰুই তৰংগদৈৰ্ঘ্য নিৰ্ণয় কৰা। (k = ব'ল্টজমেন ধ্ৰুৱক আৰু h = প্লাংকৰ ধ্ৰুৱক)

(A) $\frac{h}{\sqrt{3mkT}}$

(B) $\frac{h}{\sqrt{2mkT}}$

(C) $\frac{h}{3mkT}$

(D) $\frac{h}{\sqrt{mkT}}$

61. A wave represented by the equation $y = a\cos(kx - \omega t)$ is superposed with another to form a stationary wave such that point $x = 0$ is a node. What is the equation for the other wave?

$y = a\cos(kx - \omega t)$ সমীকৰণে চিহ্নিত কৰা তৰংগ এটাই আন এটা তৰংগৰ ওপৰত অধ্যাৰোপিত হৈ এনে এক স্থানু তৰংগ উৎপন্ন কৰে যাত $x = 0$ বিন্দুত এটা নিস্পন্দ বিন্দু অৱস্থিত হয়। আনটো তৰংগৰ সমীকৰণটো কি হ'ব?

(A) $y = -a\sin(kx + \omega t)$

(B) $y = -a\cos(kx - \omega t)$

(C) $y = a\cos(kx + \omega t)$

(D) $y = -a\cos(kx + \omega t)$

62. In a steel plate of length **100** cm and breadth **50** cm, there is a hole in the shape of equilateral triangle of side **10** cm. The coefficient of linear expansion of steel is $1.2 \times 10^{-5}/°C$. The temperature of the steel plate is increased by **100 °C**. What will be the percentage change in the area of the triangular hole?

100 cm দৈৰ্ঘ্য আৰু 50 cm প্ৰস্থৰ তীখাৰ পাত এখনত 10 cm বাহুবিশিষ্ট সমবাহু ত্ৰিভুজ এটাৰ আকৃতিৰ খালি ঠাই এটুকুৰা আছে। তীখাৰ ৰৈখিক প্ৰসাৰণ গুণাংক হ'ল $1.2 \times 10^{-5}/°C$। তীখাৰ পাতখনৰ উষ্ণতা **100 °C** বৃদ্ধি কৰা হ'ল। ত্ৰিভুজাকাৰ খালি টুকুৰাৰ ক্ষেত্ৰফলৰ শতকৰা পৰিৱৰ্তন কিমান হ'ব?

(A) 0.24%

(B) −0.24%

(C) 0.12%

(D) −1.2%

63. How many grams of ice at **−20 °C** will be needed to cool **1.1** litres of water from **30 °C** to **20 °C**? [The specific heat of ice is **0.5 cal/g °C** and the latent heat of fusion of ice is **80 cal/g**]

1.1 litres পানীৰ উষ্ণতা **30 °C** পৰা **20 °C**লৈ কমাবলৈ **−20 °C** উষ্ণতাত থকা কিমান গ্ৰাম বৰফৰ প্ৰয়োজন হ'ব? [বৰফৰ আপেক্ষিক তাপ **0.5 cal/g °C** আৰু বৰফৰ গলনৰ লীন তাপ **80 cal/g**]

(A) 90 g

(B) 90.1 g

(C) 100.1 g

(D) 100 g

64. For a given length L of a wire carrying a current I, how many circular turns will produce the maximum magnetic moment?

I পৰিমাণৰ প্ৰবাহ বৈ থকা আৰু L প্ৰদত্ত দৈৰ্ঘ্যৰ তাঁৰ এডালৰ কেইটা বৃত্তাকাৰ পাকে সৰ্বোচ্চ চুম্বকীয় ভ্ৰামক উৎপন্ন কৰিব?

(A) 1

(B) L

(C) LI

(D) $L + I$

65. A proton has a velocity $3\hat{i} + 4\hat{j}\ \mathrm{m\,s^{-1}}$ and is subjected to a magnetic field $5\hat{k}$ tesla. Then:

প্ৰ'টন এটাৰ বেগ $3\hat{i} + 4\hat{j}\ \mathrm{m\,s^{-1}}$ আৰু ই $5\hat{k}$ teslaৰ চুম্বকীয় ক্ষেত্ৰ এখনৰ প্ৰভাৱত পৰিছে। তেতিয়া:

(A) its speed will change

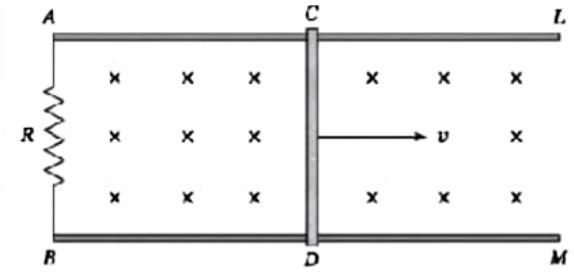
(B) its path will change

(C) its speed as well as path will change

(D) it will not experience any force

66. Two parallel wires AL and BM, placed at a distance l, are connected by a resistor R and placed in a magnetic field B, which is perpendicular to the plane containing the wires. Another wire CD now connects the two wires perpendicularly and is made to slide with velocity v (as shown in the figure below). What is the work done per second needed to slide the wire CD? (Neglect the resistance of all the wires)

পৰস্পৰৰ পৰা। দূৰত্বত সংস্থাপিত আৰু R ৰোধকেৰে সংযোজিত AL আৰু BM দুডাল সমান্তৰাল তাঁৰ, সিহঁতৰ তলৰ লম্বভাৱে থকা B চুম্বকীয় ক্ষেত্ৰত ৰখা হৈছে। এতিয়া আন এডাল তাঁৰ CD এ পূৰ্বৰ তাঁৰ দুডাল লম্বভাৱে সংযোগ কৰি v বেগেৰে চুচৰি গৈছে (তলৰ চিত্ৰত দেখুওৱাৰ দৰে)। CD তাঁৰডালৰ চুচৰা গতি অব্যাহত ৰাখিবলৈ প্ৰতি চেকেণ্ডত কৰিবলগীয়া কাৰ্যৰ পৰিমাণ কিমান হ'ব? (তাঁৰসমূহৰ ৰোধ নগণ্য)



(A) $\frac{Blv}{R}$

(B) $\frac{B^2l^2v^2}{R^2}$

(C) $\frac{Bl^2v}{R}$

(D) $\frac{B^2l^2v^2}{R}$

67. A solenoid of resistance **40 Ω** and inductance **80** H is connected to a **200** V battery. How long will it take the current to reach **50%** of its final equilibrium value?

40 Ω ৰোধ আৰু 80 H স্বয়ং আৱেশ গুণাংক কৰ এটা চ'লেনইড 200 V বেটাৰী এটাৰ লগত সংযোগ কৰা হৈছে। তাঁৰ অন্তিম সাম্য মানৰ 50% প্ৰাপ্ত হ'বলৈ প্ৰৱাহক কিমান সময় লাগিব?

(A) **0.693 s**

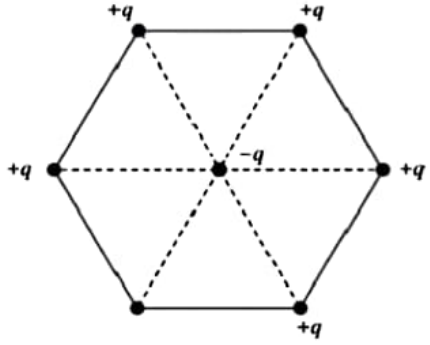
(B) **3 × 0.693 s**

(C) $\frac{1}{2}$ **× 0.693 s**

(D) **2 × 0.693 s**

68. Five point charges, each of value $+q$, are placed on five vertices of a regular hexagon of side L. What is the magnitude of the force on a point charge of value $-q$ placed at the centre of the hexagon?

প্ৰত্যেক $+q$ মানৰ পাঁচটা বিন্দু আধান L বাহুবিশিষ্ট নিয়মীয়া ষড়ভুজ এটাৰ পাঁচটা শীৰ্ষবিন্দুত সংস্থাপিত হৈ আছে। ষড়ভুজটোৰ কেন্দ্ৰত সংস্থাপিত $-q$ মানৰ বিন্দু আধান এটাৰ ওপৰত প্ৰয়োগ হোৱা বলৰ মান কিমান?



(A) $\frac{1}{4\pi\varepsilon_0}\left[\frac{q}{L}\right]^2$

(B) $\frac{1}{4\pi\varepsilon_0}\left[\frac{q}{L^2}\right]$

(C) $\frac{1}{4\pi\varepsilon_0}\left[\frac{5q}{L}\right]^2$

(D) $\frac{1}{4\pi\varepsilon_0}\left[\frac{5q}{L^2}\right]$

69. Which of the following semiconductors is electrically negative?

তলত উল্লেখ কৰা কোনবিধ অৰ্ধপৰিবাহী বৈদ্যুতিকভাৱে ঋণাত্মক?

(A) Intrinsic semiconductor

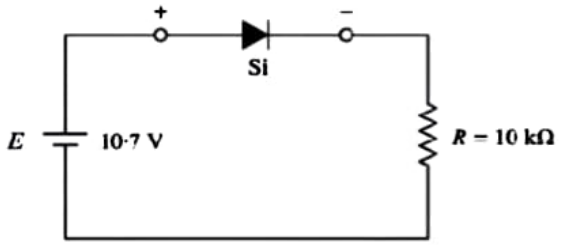
(B) Silicon doped with pentavalent impurities

(C) Silicon doped with trivalent impurities

(D) None of the alternatives (A), (B) and (C) is correct

70. In the circuit shown below, determine the current in the resistor.

তলত দেখুওৱা বৰ্তনীৰ বোধকটোৰে বোৱা প্ৰবাহ নিৰ্ণয় কৰা।



(A) 1 mA
(B) 1.07 mA
(C) 0.1 mA
(D) 10 mA

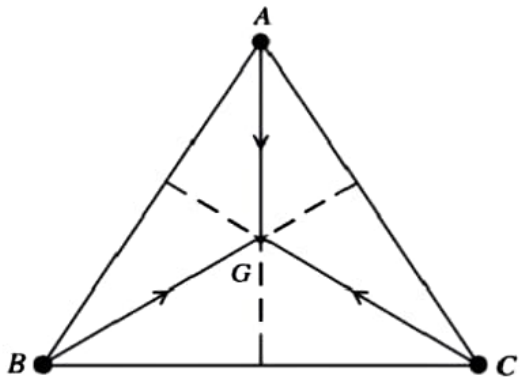
71. Two spheres of the same material have radii **1** m and **2** m, and temperatures **2000** K and **1000** K respectively. What is the ratio of energy radiated per second by the first sphere to that by the second?

একে পদাৰ্থৰে তৈয়াৰী দুটা গোলকৰ ব্যাসাৰ্ধ ক্ৰমে 1 m আৰু 2 m আৰু উষ্ণতা ক্ৰমে 2000 K আৰু 1000 K। প্ৰথম আৰু দ্বিতীয় গোলকটোৱে প্ৰতি চেকেণ্ডে বিকিৰণ কৰা শক্তিৰ অনুপাত কিমান?

(A) 1 : 2
(B) 2 : 1
(C) 1 : 4
(D) 4 : 1

72. Three small particles ***A***, ***B*** and ***C*** of equal mass move with equal speed v along the medians of an equilateral triangle as shown in the figure below. They collide at the centroid ***G*** of the triangle. After the collision, ***A*** comes to rest, while ***B*** retraces its path with the same speed v. What is the speed and direction of motion of ***C*** after the collision?

একে ভৰৰ তিনিটা সৰু কণা A, B আৰু C এ তলৰ চিত্ৰত দেখুওৱা ধৰণে সমবাহু ত্ৰিভুজ এটাৰ মধ্যমাৰে সম দ্ৰুতি v ৰে গতি কৰি ত্ৰিভুজৰ কেন্দ্ৰবিন্দু G ত পৰস্পৰ সংঘাতত লিপ্ত হ'ল। সংঘাতৰ পিছত A স্থিতিশীল অৱস্থা প্ৰাপ্ত হয় আৰু B এ পূৰ্বৰ দ্ৰুতি v ৰে অহা বাটেৰে উলটি যায়। সংঘাতৰ পিছত C ৰ দ্ৰুতি আৰু গতিৰ দিশ কি হ'ব?



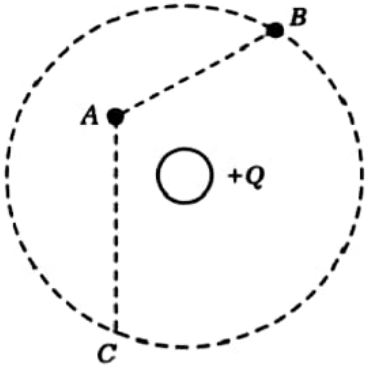
(A) v in the direction along ***GB***
(B) v in the direction along ***BG***
(C) $4v$ in the direction along ***GB***
(D) $2v$ in the direction along ***BG***

73. A particle accelerates from rest at constant rate $\alpha = 6\ \mathrm{m\,s^{-2}}$ for some time, after which it decelerates at a constant rate $\beta = 4\ \mathrm{m\,s^{-2}}$ to come to rest. If the total time of travel is **10** seconds, what is the maximum speed attained by the particle during its motion?

কণা এটাই স্থিতিশীল অৱস্থাৰ পৰা $\alpha = 6\ \mathrm{m\,s^{-2}}$ স্থিৰ হাৰত কিছু সময়ৰ বাবে ত্বৰান্বিত হ'ল, তাৰ পিছত ই $\beta = 4\ \mathrm{m\,s^{-2}}$ স্থিৰ হাৰত মন্থৰিত হৈ স্থিতিশীল অৱস্থালৈ আহিল। যদি ভ্ৰমণৰ মুঠ কাল 10 চেকেণ্ড হয়, তেন্তে তাৰ গতিৰ কালত কণাটোৱে প্ৰাপ্ত হোৱা সৰ্বোচ্চ দ্ৰুতি কিমান আছিল?

(A) $6\ \mathrm{m\,s^{-1}}$
(B) $12\ \mathrm{m\,s^{-1}}$
(C) $24\ \mathrm{m\,s^{-1}}$
(D) $12.5\ \mathrm{m\,s^{-1}}$

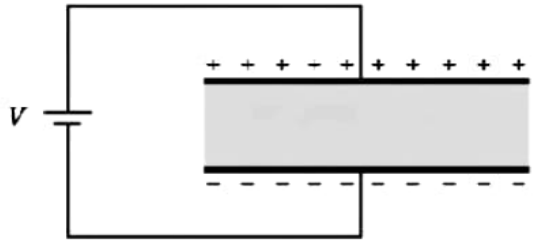
74. A hollow metal sphere of radius r contains an amount of charge $+Q$. Consider an imaginary circle of radius R ($R > r$) concentric with the charged sphere. A point charge q is carried from (I) A to B and then from (II) A to C. Choose the correct answer from the given alternatives.



(A) The work done in case (I) is less than that done in case (II).
(B) The work done in case (I) is greater than that done in case (II).
(C) Identical finite amount of work is done in both the cases.
(D) No work is done in either of the cases.

75. A battery is kept connected to the plates of a parallel-plate capacitor. A dielectric slab of dielectric constant K is then introduced between the plates such that it covers the entire space between the plates as shown in the diagram below. Choose the correct answer from the given alternatives.

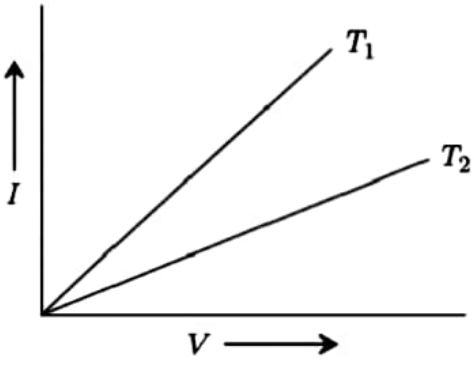
সমান্তৰাল-পাত ধাৰক এটাৰ পাত দুখনৰ সৈতে বেটাৰী এটা সংযোগ কৰি থোৱা আছে। তলৰ চিত্ৰত দেখুওৱা অনুসৰি K পৰাবৈদ্যুতিক ধ্ৰুৱকবিশিষ্ট পৰাবৈদ্যুৎ মাধ্যমৰ খণ্ড এটা পাত দুখনৰ মাজত এনেদৰে সুমুৱাই দিয়া হ'ল যাতে ই পাত দুখনৰ মাজৰ গোটেই অংশটো ভৰি পৰে। তলৰ বিকল্পসমূহৰ পৰা শুদ্ধ উত্তৰটো বাছি উলিওৱা।



(A) The electric field between the plates will increase.
(B) The charge on the plates will decrease.
(C) The energy stored in the capacitor will decrease.
(D) The electric field between the plates will remain the same.

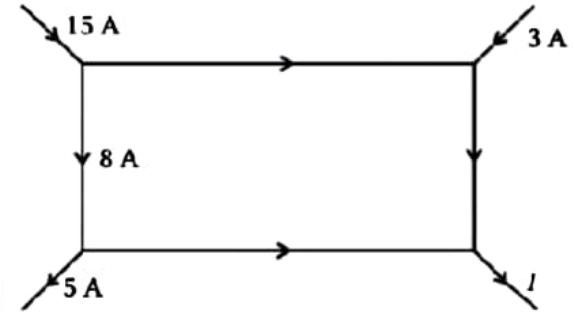
76. The current-voltage graphs for a given conducting sample at two different temperatures T_1 and T_2 are shown in the figure below. R_1 is the resistance of the sample at temperature T_1 and R_2 is its resistance at temperature T_2. Choose the correct answer from the given alternatives.

T_1 আৰু T_2 দুটা পৃথক উষ্ণতাত প্ৰদত্ত পৰিবাহী নমুনা এটাৰ প্ৰবাহ-বিভব লেখ তলৰ চিত্ৰত দেখুওৱা হৈছে। T_1 উষ্ণতাত নমুনাটোৰ ৰোধ R_1 আৰু T_2 উষ্ণতাত ইয়াৰ ৰোধ R_2। তলৰ বিকল্পসমূহৰ পৰা শুদ্ধ উত্তৰটো বাছি উলিওৱা।



(A) $R_2 > R_1, T_2 > T_1$
(B) $R_2 > R_1, T_2 < T_1$
(C) $R_2 < R_1, T_2 > T_1$
(D) $R_2 < R_1, T_2 < T_1$

77. Find the value of the current I in the circuit shown in the figure below.
তলৰ বৰ্তনী চিত্ৰত প্ৰবাহ। ৰ মান নিৰ্ণয় কৰা।

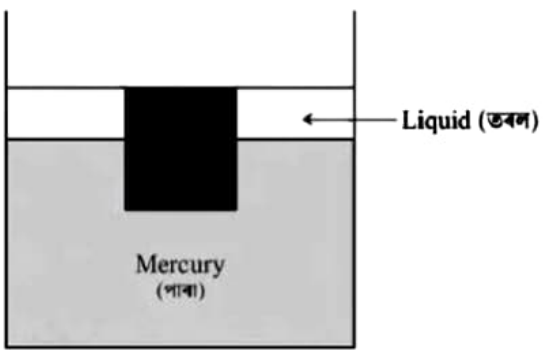


(A) **3** A
(B) **13** A
(C) **6** A
(D) **−13** A

78. A satellite A of mass m is orbiting around the Earth in a stable circular orbit of radius r and another satellite B of mass $2m$ is orbiting in a similar orbit of radius $2r$. What is the ratio of the time periods of revolution of satellites A and B?
পৃথিৱীৰ চাৰিওফালে r ব্যাসাৰ্ধৰ এক সুস্থিৰ বৃত্তিকাৰ কক্ষপথেদি m ভৰৰ উপগ্ৰহ A পৰিভ্ৰমণৰ অৱস্থাত আছে; আকৌ 2m ভৰৰ আন এটা উপগ্ৰহ B, 2r ব্যাসাৰ্ধৰ একেধৰণৰ কক্ষপথেদি পৰিভ্ৰমণৰত। A আৰু B উপগ্ৰহ দুটাৰ পৰিভ্ৰমণৰ পৰ্যায়কালৰ অনুপাত কিমান হ'ব?

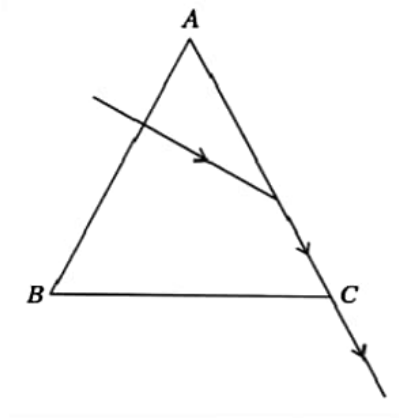
(A) $1 : 2\sqrt{2}$
(B) $1 : \sqrt{2}$
(C) $2\sqrt{2} : 1$
(D) $1 : 2$

79. A cubical metal block **5** cm on each side is floating in mercury in a vessel. Now, a liquid is gently poured into the vessel so that it just covers the metal block as shown in the figure below. What is the depth of the liquid that has been poured over the mercury? (Given, relative density of mercury $= 13.6$, that of the metal $= 7.6$ and that of the liquid $= 1.6$)
5 cm দৈৰ্ঘ্যৰ ৰাহুবিশিষ্ট ধাতুৰ ঘনক এটা পাৰদডৰ্তি পাত্ৰ এটাত উপঙি আছে। এতিয়া লাহে লাহে তৰল এবিধ পাত্ৰটোত ঢালি দিয়া হ'ল যাতে ই চিত্ৰত দেখুওৱা ধৰণে ধাতুৰ ঘনকটোকে আৱৰিব পাৰে মাত্ৰ। পাৰদৰ ওপৰত ঢলা তৰলৰ গভীৰতা কিমান? (দিয়া আছে, পাৰাৰ আপেক্ষিক ঘনত্ব = 13.6, ধাতুবিধৰ আপেক্ষিক ঘনত্ব = 7.6 আৰু তৰলবিধৰ আপেক্ষিক ঘনত্ব = 1.6)



(A) 1.0 cm
(B) 1.5 cm
(C) 2.5 cm
(D) 2.54 cm

80. A ray of light is incident normally on a refracting face of a prism. The subsequent journey of the ray through the prism is shown in the diagram below. The refractive index of the material of the prism is **1.5**. Find the angle of the prism ($\angle A$).
প্রিজম এটাৰ প্রতিসৰণ পৃষ্ঠ এখনত পোহৰ ৰশ্মি এডাল লম্বভাৱে আপতিত হৈছে। তলৰ চিত্ৰত প্রিজমৰ ভিতৰৰ জৰিয়তে ৰশ্মিডালৰ পৰৱৰ্তী যাত্ৰাপথ চিহ্নিত কৰা হৈছে। প্রিজমৰ পদাৰ্থৰ প্রতিসৰণ গুণাংক 1.5। প্রিজমৰ কোণ ($\angle A$) নিৰ্ণয় কৰা।



(A) $\sin^{-1}\left[\frac{2}{3}\right]$
(B) $\sin^{-1}\left[\frac{3}{2}\right]$
(C) $\cos^{-1}\left[\frac{3}{2}\right]$
(D) $\sin^{-1}\left[\frac{3}{4}\right]$

PART C — Chemistry
Questions 81–120 (40 found)

81. Match the batteries given in Column-I with the electrolytes given in Column-II:

	Column I		Column II
(a)	Lead storage battery	(p)	Moist KOH
(b)	Leclanché cell	(q)	KOH and ZnO paste
(c)	Mercury cell	(r)	38% solution of H_2SO_4
(d)	Nickel-Cadmium cell	(s)	Moist paste of NH_4Cl and $ZnCl_2$

(A) (a) – (r), (b) – (s), (c) – (q), (d) – (p)
(B) (a) – (s), (b) – (r), (c) – (q), (d) – (p)
(C) (a) – (r), (b) – (s), (c) – (p), (d) – (q)
(D) (a) – (q), (b) – (p), (c) – (s), (d) – (r)

82. The products obtained during the electrolysis of aqueous solution of sodium chloride are:
ছ'ডিয়াম ক্লৰাইডৰ জলীয় দ্রৱৰ বিদ্যুৎবিশ্লেষণৰ ফলত উৎপন্ন হোৱা দ্রব্যবোৰ হ'ল-

(A) Na, Cl_2
(B) Na, O_2
(C) $NaOH, Cl_2$
(D) $NaOH, H_2, Cl_2$

83. The rate constant for decomposition of ammonia on platinum surface is $2.46 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$. The rate of production of hydrogen is:
প্লেটিনাম পৃষ্ঠত এম'নিয়াৰ বিয়োজনৰ বিক্রিয়া হাৰ ধ্রুৱক হ'ল $2.46 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$। হাইড্রজেনৰ উৎপাদনৰ হাৰ হ'ব-

(A) $1.23 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$
(B) $4.92 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$
(C) $7.38 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$
(D) $14.76 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$

84. The atomic number of the element with systematic name of Ununnilium is:
পদ্ধতিগত নাম আনআননিলিয়াম (Ununnilium) হোৱা মৌলটোৰ পাৰমাণৱিক সংখ্যা হ'ল-

(A) 101
(B) 109
(C) 110
(D) 111

85. The increasing order with respect to dipole moment of the following molecules is:
BF_3, H_2O, NF_3, NH_3

(A) $NF_3 < BF_3 < NH_3 < H_2O$
(B) $NF_3 < BF_3 < H_2O < NH_3$
(C) $BF_3 < NH_3 < H_2O < NF_3$
(D) $BF_3 < NF_3 < NH_3 < H_2O$

86. Identify the incorrect statement(s) about PCl_5 molecule from the following:
Statement-I : P atom is sp^3d hybridized.
Statement-II : Shape is trigonal bipyramidal.
Statement-III : The equatorial $P-Cl$ bonds make an angle of $120°$ with each other.
Statement-IV : An axial $P-Cl$ bond is stronger than an equatorial bond.

(A) I, II
(B) II, III
(C) III
(D) IV

87. Which one of the following reactions does not occur?
তলৰ কোনটো বিক্ৰিয়া সংঘটিত নহয়?

(A) $2H_2O(l)+2F_2(g)\rightarrow 4HF(aq)+O_2(g)$
(B) $2KF(aq)+Cl_2(g)\rightarrow 2KCl(aq)+F_2(g)$
(C) $2KBr(aq)+Cl_2(g)\rightarrow 2KCl(aq)+Br_2(l)$
(D) $2KI(aq)+Br_2(l)\rightarrow 2KBr(aq)+I_2(s)$

88. Match the following compounds in Column-I with their uses in Column-II:

	Column I		Column II
(a)	Acetophenone	(p)	Manufacture of acetic acid
(b)	Benzaldehyde	(q)	Preparation of Bakelite
(c)	Ethanal	(r)	Preparation of perfumes
(d)	Methanal	(s)	To increase good odour and flavour

(A) (a) – (r), (b) – (s), (c) – (q), (d) – (p)
(B) (a) – (s), (b) – (r), (c) – (p), (d) – (q)
(C) (a) – (q), (b) – (r), (c) – (s), (d) – (p)
(D) (a) – (q), (b) – (s), (c) – (r), (d) – (p)

89. Consider the following statements and select the correct option:
Statement-I : Solubility of aliphatic amines in water decreases with increase in molecular mass.
Statement-II : On increase in size of the hydrophobic alkyl part, higher amines become insoluble in water.

(A) Both Statement-I and Statement-II are correct and Statement-II justifies Statement-I.
(B) Both Statement-I and Statement-II are incorrect.
(C) Statement-I is correct but Statement-II is incorrect.
(D) Statement-I is incorrect but Statement-II is correct.

90. Match items of Column-I with those in Column-II:

	Column I		Column II
(a)	A laevorotatory carbohydrate	(p)	Sucrose
(b)	A non-reducing sugar	(q)	Maltose
(c)	Carbohydrate stored in animal body	(r)	Fructose
(d)	A disaccharide made of two glucose units	(s)	Glycogen

(A) (a) – (s), (b) – (r), (c) – (q), (d) – (p)
(B) (a) – (r), (b) – (s), (c) – (p), (d) – (q)
(C) (a) – (r), (b) – (p), (c) – (s), (d) – (q)
(D) (a) – (q), (b) – (r), (c) – (p), (d) – (s)

91. The partition wall of negligible volume between two adjacent systems of same composition having volume V, temperature T, pressure P and density d of each system, is removed to make one system. What will be the respective parameters of the new system?
একে সংযুতিৰ প্ৰত্যেকৰে V আয়তন, T উষ্ণতা, P চাপ আৰু d ঘনত্বৰ দুটা ওচৰা-উচৰি তন্ত্ৰৰ মাজৰ নগণ্য আয়তনৰ বেৰখন আঁতৰাই এটা তন্ত্ৰ কৰা হল। নতুন তন্ত্ৰটোৰ সংশ্লিষ্ট কাৰকবোৰ কি কি হব?

(A) $2V, 2T, 2P, 2d$
(B) $2V, 2T, 2P, d$
(C) $2V, T, 2P, 2d$
(D) $2V, T, P, d$

92. The ΔH and ΔS values of a reaction are $400\ kJ\ mol^{-1}$ and $200\ J\ K^{-1}\ mol^{-1}$ respectively which are constant over a wide range of temperature. The temperature above which the reaction will be spontaneous is:
এটা বিক্ৰিয়াৰ ΔH আৰু ΔS ৰ মান হল ক্ৰমে $400\ kJ\ mol^{-1}$ আৰু $200\ J\ K^{-1}\ mol^{-1}$ যিবোৰ উষ্ণতাৰ বিস্তৃত পৰিসৰত স্থিৰ। যি উষ্ণতাৰ ওপৰত বিক্ৰিয়াটো স্বতঃস্ফূৰ্ত হয়, সেইটো হল-

(A) $2\ K$
(B) $400\ K$
(C) $2000\ K$
(D) $800\ K$

93. The equilibrium constants in terms of molar concentration and partial pressure for two reactions are given below. On the basis of these, find the incorrect relationship out of the options given:

$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$; K_c and K_p

$2HI(g) \rightleftharpoons H_2(g) + I_2(g)$; K_c' and K_p'

(A) $K_c = K_p$

(B) $K_c = K_c'$

(C) $K_c' = K_p'$

(D) $K_p = \frac{1}{K_p'}$

94. Thermal decomposition of **2.51** g of an impure sample of $ZnCO_3$ produces **0.018** mol of CO_2. The percentage of impurity in $ZnCO_3$ sample is:

[Atomic mass of Zn = 65.5]

(A) 1%

(B) 10%

(C) 50%

(D) 90%

95. The total negative charge of all the electrons present in **100** g of water is:

100 g পানীত থকা আটাইবোৰ ইলেক্ট্রনৰ মুঠ ঋণাত্মক আধান হল-

(A) $8.900 \times 10^{-18}\ C$

(B) $1.602 \times 10^{-17}\ C$

(C) $5.360 \times 10^{6}\ C$

(D) $6.022 \times 10^{23}\ C$

96. Match the atoms/ions given in Column-I with the number of unpaired electrons possessed by these as given in Column-II:

	Column I		Column II
(a)	Cr	(p)	1
(b)	Mn^{++}	(q)	3
(c)	N	(r)	5
(d)	Sc^{++}	(s)	6

(A) (a) – (s), (b) – (r), (c) – (q), (d) – (p)

(B) (a) – (r), (b) – (s), (c) – (q), (d) – (p)

(C) (a) – (s), (b) – (r), (c) – (p), (d) – (q)

(D) (a) – (s), (b) – (q), (c) – (r), (d) – (p)

97. Match the compounds in Column-I with the properties/uses/effects given in Column-II:

	Column I		Column II
(a)	Chloroform	(p)	Soluble in fat
(b)	DDT	(q)	Antiseptic
(c)	Freon	(r)	Oxidation to phosgene
(d)	Iodoform	(s)	Depletion of stratospheric O_3 layer

(A) (a) – (q), (b) – (s), (c) – (p), (d) – (r)

(B) (a) – (r), (b) – (q), (c) – (p), (d) – (s)

(C) (a) – (s), (b) – (q), (c) – (r), (d) – (p)

(D) (a) – (r), (b) – (p), (c) – (s), (d) – (q)

98. Select the set of correct statements:

Statement-I : The dipole moment of trans-but-2-ene is zero.

Statement-II : The boiling points of 2-methylpropane and butane are equal.

Statement-III : Chlorobenzene on Friedel-Crafts acylation produces 2-chloroacetophenone as the main product.

Statement-IV : 1-iodobutane undergoes S_N2 reaction faster than 1-chlorobutane.

(A) I, II

(B) II, III

(C) III, IV

(D) I, IV

99. Select the correct order with respect to acid strength:

(A) *m*-Cresol < Phenol < *m*-Nitrophenol < *p*-Nitrophenol

(B) *m*-Cresol < Phenol < *p*-Nitrophenol < *m*-Nitrophenol

(C) *m*-Cresol < *p*-Nitrophenol < Phenol < *m*-Nitrophenol

(D) *p*-Nitrophenol < *m*-Cresol < Phenol < *m*-Nitrophenol

100. SO_2 gas reacts with $K_2Cr_2O_7$ in presence of H_2SO_4 to produce a coloured substance. If **10** g of each of the reactants in pure form were taken to carry out the reaction, what will be the mass of the coloured product?
[Consider atomic masses : $H = 1, O = 16, S = 32, K = 39, Cr = 52$]

(A) **13.33** g (B) **20.42** g

(C) **40.00** g (D) **61.25** g

101. The increasing order of the following elements (atomic numbers given) with respect to atomic radius is:
$Eu(63), Ho(67), La(57), Yb(70)$

(A) $La < Eu < Ho < Yb$ (B) $Yb < Ho < Eu < La$

(C) $Yb < Ho < La < Eu$ (D) $Ho < Yb < La < Eu$

102. Match the metals/ions/compounds given in Column-I with the reactions where they act as catalyst as given in Column-II:

	Column I		Column II
(a)	V_2O_5	(p)	Synthesis of ammonia by Haber's process
(b)	Fe powder	(q)	Hydrogenation of alkene
(c)	Fe^{3+}	(r)	Manufacture of H_2SO_4 by contact process
(d)	Ni (s)	(s)	Oxidation of I^- by $S_2O_8^{2-}$

(A) (a) – (s), (b) – (r), (c) – (q), (d) – (p) (B) (a) – (r), (b) – (s), (c) – (p), (d) – (q)

(C) (a) – (s), (b) – (q), (c) – (r), (d) – (p) (D) (a) – (r), (b) – (p), (c) – (s), (d) – (q)

103. A compound P on treatment with C_2H_5MgBr in presence of ether followed by acidic hydrolysis produces a compound Q. Q on treatment with Cl_2/red P in moist condition produces a compound R. Compound Q on heated with soda lime produces a hydrocarbon S. Compounds P, Q, R and S are respectively:

(A) $HCHO, C_2H_5COOH, CH_3CHClCOOH, CH_4$ (B) $HCHO, CH_3COOH, CH_3COCl, C_2H_6$

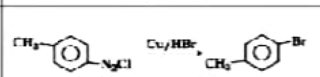
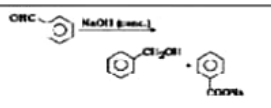
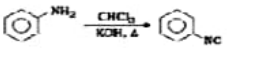
(C) $CO_2, C_2H_5COOH, CH_3CHClCOOH, C_2H_6$ (D) $CO_2, CH_3COOH, CH_3COCl, CH_4$

104. State True (T) or False (F) and select the correct option:
Statement-I : Alcohols can react both as electrophile and nucleophile.
Statement-II : Ethanol is stronger than methanol with respect to acidic character.
Statement-III : The $C - O$ bond length in phenol is slightly less than that in methanol.
Statement-IV : The $\angle C - O - C$ bond angle in methoxymethane is slightly smaller than normal tetrahedral angle.

(A) (I) – F, (II) – T, (III) – F, (IV) – T (B) (I) – T, (II) – F, (III) – T, (IV) – F

(C) (I) – T, (II) – F, (III) – F, (IV) – T (D) (I) – F, (II) – T, (III) – T, (IV) – F

105. Match the following reactions in Column-II with the names in Column-I:

Column I		Column II
(a) Cannizzaro reaction	(p)	
(b) Carbylamine reaction	(q)	
(c) Gattermann reaction	(r)	
(d) Sandmeyer reaction	(s)	

(A) (a) – (q), (b) – (s), (c) – (r), (d) – (p) (B) (a) – (s), (b) – (q), (c) – (p), (d) – (r)

(C) (a) – (r), (b) – (p), (c) – (s), (d) – (q) (D) (a) – (q), (b) – (s), (c) – (p), (d) – (r)

106. Select the set of incorrect statements:
Statement-I : The pH of neutral water at **310 K** is lower than 7.
Statement-II : The pH of an aqueous solution of 1×10^{-8} **M HCl** is 8.
Statement-III : The ionization of CH_3COONa is suppressed in presence of CH_3COOH.
Statement-IV : **CuS** is precipitated when H_2S is passed through a solution of Cu^{++} and Zn^{++} ions in presence of dil. **HCl** since $K_{sp}(CuS) < K_{sp}(ZnS)$.

(A) I, II, III
(B) II, III
(C) II, IV
(D) III, IV

107. **45 g** urea (CON_2H_4) dissolved in **1000 g** of water depresses the freezing point by **1.395 K**. The depression of freezing point of a solution of **90 g** glucose ($C_6H_{12}O_6$) in **2000 g** water will be:
1000 g পানীত **45 g** ইউৰিয়া (CON_2H_4) ৰ দ্ৰৱই হিমাংক অৱনমিত কৰে **1.395 K**। **90 g** গ্লুকজ ($C_6H_{12}O_6$) **2000 g** পানীত বনোৱা দ্ৰৱই হিমাংক অৱনমিত কৰিব-

(A) **0.465 K**
(B) **0.930 K**
(C) **1.395 K**
(D) **1.860 K**

108. An acid of general molecular formula **HA** is 25% dissociated during the study of boiling point of its solution. If the calculated elevation of boiling point of the solution is **1.62 K**, find the observed value of elevation of boiling point of the solution.
HA সাধাৰণ আণৱিক সংকেতৰ এটা অম্লৰ দ্ৰৱৰ উতলাংক নিৰ্ণয় কৰাৰ সময়ত 25% অণু বিয়োজিত হয়। যদিহে দ্ৰৱটোৰ গণনা কৰা উতলাংক উন্নয়ন **1.62 K** হয়, দ্ৰৱটোৰ পৰীক্ষালব্ধ উতলাংক উলিওৱা।

(A) **2.025 K**
(B) **2.430 K**
(C) **2.632 K**
(D) **2.835 K**

109. If $\lambda_{Li^{2+}}$ and λ_D represent the wavelengths related to first line (shortest line) of Lyman series of line spectrum of Li^{2+} and ^2_1H respectively, then $\lambda_{Li^{2+}} : \lambda_D$ is:
যদি $\lambda_{Li^{2+}}$ আৰু λ_D এ ক্ৰমে Li^{2+} আৰু ^2_1H ৰ ৰেখাবৰ্ণালীৰ লাইমেন শ্ৰেণীৰ প্ৰথম ৰেখাৰ (আটাইতকৈ চুটি ৰেখা) লগত জড়িত তৰংগদৈৰ্ঘ্য বুজায়, তেন্তে $\lambda_{Li^{2+}} : \lambda_D$ হ'ব-

(A) 1 : 4
(B) 1 : 9
(C) 4 : 1
(D) 9 : 1

110. The increasing order of 2s-orbitals of the following atoms with respect to energy is:
H, K, Li, Na

(A) $E_{2s}(H) < E_{2s}(Li) < E_{2s}(Na) < E_{2s}(K)$
(B) $E_{2s}(Li) < E_{2s}(H) < E_{2s}(Na) < E_{2s}(K)$
(C) $E_{2s}(H) < E_{2s}(Li) < E_{2s}(K) < E_{2s}(Na)$
(D) $E_{2s}(K) < E_{2s}(Na) < E_{2s}(Li) < E_{2s}(H)$

111. Identify the two ions having the highest and lowest length of ionic radius respectively out of the following:
$F^-, Mg^{2+}, Na^+, O^{2-}$

(A) O^{2-}, Mg^{2+}
(B) O^{2-}, Na^+
(C) F^-, Mg^{2+}
(D) F^-, Na^+

112. Select the option in which all the given functional groups exhibit $+R$ effect.
প্ৰদত্ত সকলোবোৰ কাৰ্যকৰী মূলকে $+R$ প্ৰভাৱ দেখুওৱা বিকল্পটো বাছনি কৰা।

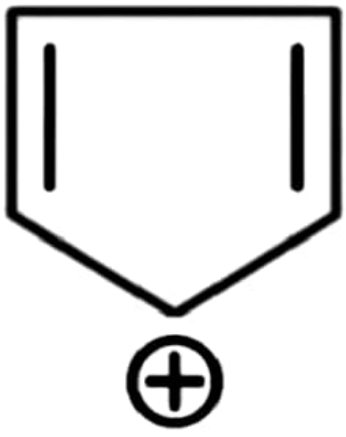
(A) $-OH, -NH_2, -OCOR, -NHCOR$
(B) $-OH, -NH_2, -NO_2, -NR_2$
(C) $-CHO, -NHR, -OR, -OCOR$
(D) $-NHR, >C=O, -NHCOR, -OR$

113. Identify the incorrect reaction from the following:

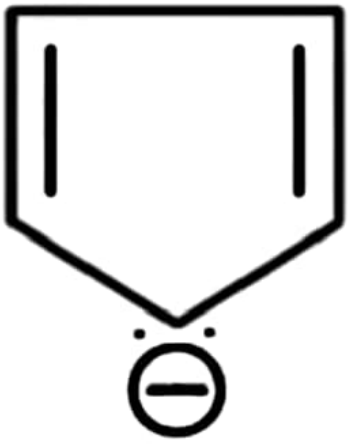
(A) $H_3C-CH=CH_2 \xrightarrow[Zn/H_2O]{O_3} CH_3CHO + HCHO$
(B) $H_3C-CH=CH_2 \xrightarrow[273\ K]{dil.\ KMnO_4} CH_3-CH(OH)-CH_2(OH)$
(C) $H_3C-CH=CH_2 \xrightarrow{HBr}$ (প্ৰধান) $H_3C-CHBr-CH_3$ (Major) + (গৌণ) $H_3C-CH_2-CH_2-Br$ (Minor)
(D) $H_3C-CH=CH_2 \xrightarrow[Peroxide]{HCl}$ (প্ৰধান) $H_3C-CHCl-CH_3$ (Major) + (গৌণ) $H_3C-CH_2-CH_2-Cl$ (Minor)

114. Which of the following lacks aromatic properties?

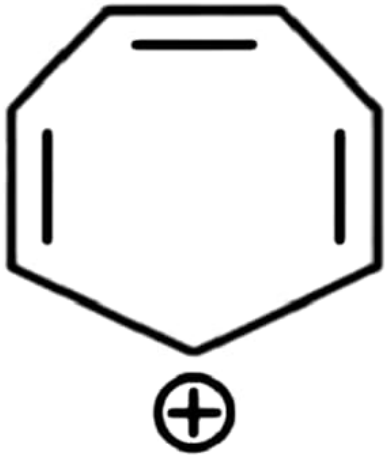
(A)



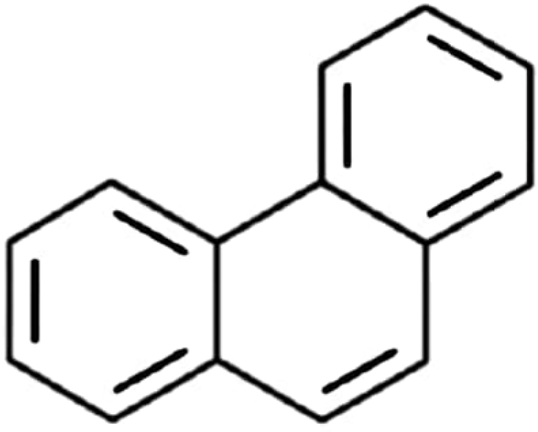
(B)



(C)



(D)



115. In which of the following compounds, an electrophile prefers to attack the meta position?

(A) $C_6H_5 - OH$ (Phenol)

(B) $C_6H_5 - Cl$ (Chlorobenzene)

(C) $C_6H_5 - NO_2$ (Nitrobenzene)

(D) $C_6H_5 - NH_2$ (Aniline)

116. A first-order reaction is carried out at two different temperatures of $300\ K$ and $310\ K$, where the rate constants are k_1 and k_2 respectively. The activation energies of the reaction in absence and presence of catalysts are E_{a1} and E_{a2} respectively. Which of the following options is correct?

এটা প্ৰথম-ক্ৰমৰ বিক্ৰিয়া দুটা উষ্ণতা $300\ K$ আৰু $310\ K$ ত সম্পন্ন কৰা হয় যাত বিক্ৰিয়া হাৰ ধ্ৰুৱক হল যথাক্ৰমে k_1 আৰু k_2। অনুঘটকৰ অনুপস্থিতি আৰু উপস্থিতিত বিক্ৰিয়াটোৰ সক্ৰিয়ন শক্তি হ'ল যথাক্ৰমে E_{a1} আৰু E_{a2}। তলৰ কোনটো বিকল্প শুদ্ধ?

(A) $k_1 > k_2, E_{a1} > E_{a2}$

(B) $k_1 < k_2, E_{a1} < E_{a2}$

(C) $k_1 < k_2, E_{a1} > E_{a2}$

(D) $k_1 < k_2, E_{a1} = E_{a2}$

117. The IUPAC name of the following compound is:

$H_3C - C \equiv C - CH = CH - CH = CH - CH_3$

(A) Octa-2-yn-4,6-diene

(B) Octa-2,4-dien-6-yne

(C) Octa-4,6-dien-2-yne

(D) Octa-6-yn-2,4-diene

118. Consider the following statements and select the correct option:

Statement-I : $\overset{+}{C}H_3$ lacks hyperconjugative stability.

Statement-II : There is no vacant p-orbital in $\overset{+}{C}H_3$ and as such it cannot participate in hyperconjugation.

(A) Statement-I is correct and Statement-II is the correct explanation of Statement-I.

(B) Statement-I is correct but Statement-II is incorrect.

(C) Statement-I is incorrect but Statement-II is correct.

(D) Both Statement-I and Statement-II are incorrect.

119. The total number of geometrical and optical isomers possible with $[CoCl_2(en)_2]Cl$ are respectively:

$[CoCl_2(en)_2]Cl$ ৰ ক্ষেত্ৰত সম্ভৱপৰ জ্যামিতীয় আৰু আলোক সমযোগীৰ সংখ্যা যথাক্ৰমে হ'ল-

(A) 0, 2

(B) 2, 0

(C) 2, 2

(D) 2, 4

120. Identify the paramagnetic outer orbital complex ion from the following:

তলত দিয়াবোৰৰ পৰা অনুচুম্বকীয় বহিঃকক্ষকীয় জটিল আয়নটো চিনাক্ত কৰা।

(A) $[Co(C_2O_4)_3]^{3-}$

(B) $[CoF_6]^{3-}$

(C) $[Fe(CN)_6]^{3-}$

(D) $[Mn(CN)_6]^{3-}$

Answer Key

PART A — Mathematics (Q1–Q40)

Q.No	1	2	3	4	5	6	7	8	9	10
Ans	A	C	D	B	D	C	A	C	D	B
Q.No	11	12	13	14	15	16	17	18	19	20
Ans	D	C	B	A	D	B	A	C	D	C
Q.No	21	22	23	24	25	26	27	28	29	30
Ans	B	A	D	C	D	B	D	A	C	B
Q.No	31	32	33	34	35	36	37	38	39	40
Ans	C	B	A	A	B	D	A	B	C	A

PART B — Physics (Q41–Q80)

Q.No	41	42	43	44	45	46	47	48	49	50
Ans	C	D	B	B	C	C	B	C	D	B
Q.No	51	52	53	54	55	56	57	58	59	60
Ans	C	A	B	C	A	D	A	B	C	A
Q.No	61	62	63	64	65	66	67	68	69	70
Ans	D	A	D	A	B	D	D	A	D	A
Q.No	71	72	73	74	75	76	77	78	79	80
Ans	D	B	C	C	D	A	B	A	C	B

PART C — Chemistry (Q81–Q120)

Q.No	81	82	83	84	85	86	87	88	89	90
Ans	A	D	C	C	D	D	B	B	A	C
Q.No	91	92	93	94	95	96	97	98	99	100
Ans	D	C	B	B	C	A	D	D	A	A
Q.No	101	102	103	104	105	106	107	108	109	110
Ans	C	D	C	B	D	B	A	A	B	D
Q.No	111	112	113	114	115	116	117	118	119	120
Ans	A	A	D	A	C	C	B	B	C	B