

BITSAT 2026 May 25 Shift 1

Question Paper (Memory-Based) with Solutions

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General Instructions

- (i) **Duration:** The total duration of the examination is 3 hours (180 minutes).
- (ii) **Total Marks:** The complete paper carries a maximum of 390 marks.
- (iii) **Structure:** The paper has 4 Sections:
 - **Part 1:** 30 Multiple Choice Questions (Physics).
 - **Part 2:** 30 Multiple Choice Questions (Chemistry).
 - **Part 3:** 10 Multiple Choice Questions (English Proficiency),
20 Multiple Choice Questions (Logical Reasoning)
 - **Part 4:** 40 Multiple Choice Questions (Mathematics/Biology)
- (iv) **Compulsory Questions:** All 130 questions are compulsory, and +12 Questions (Optional Extra Questions)
- (v) Each question has four options. Only **one** option is correct.
- (vi) **Correct Answer:** +3 marks.
- (vii) **Incorrect Answer:** -1 (Negative marking).
- (viii) **Unanswered/Marked for Review:** 0 marks.

English

1. The person with an uncontrollable urge to consume alcohol is called?

- (A) Dipsomaniac
- (B) Kleptomaniac

(C) Megalomaniac

(D) Pyromaniac

Correct Answer: (A) Dipsomaniac

Solution:

A person with an intense, obsessive, and uncontrollable medical or psychological craving for alcoholic beverages is termed a dipsomaniac.

- Etymology: The word is derived from the Greek words *dipsa* (meaning thirst) and *mania* (meaning madness/uncontrollable impulse).
- Other options breakdown: Kleptomaniac is an urge to steal, Pyromaniac is an urge to set fires, and Megalomaniac is an obsession with power.

Quick Tip: Root words are a life-saver in vocabulary tests! Whenever you see the suffix **-mania**, it means an obsession or uncontrollable madness, while the prefix **dipso-** always refers to liquid intake or drinking.

PHYSICS

1. Find the ratio of alpha particles scattered at 60° and 90° in the Rutherford alpha-particle scattering experiment.

(A) 1 : 4

(B) 4 : 1

(C) 1 : 2

(D) 2 : 1

Correct Answer: (B) 4 : 1

Solution:

Concept: According to Rutherford's alpha-particle scattering formula, the number of alpha particles scattered per unit area, $N(\theta)$, at an angle of deviation θ is inversely proportional to

the fourth power of the sine of half the scattering angle:

$$N(\theta) \propto \frac{1}{\sin^4\left(\frac{\theta}{2}\right)}$$

Therefore, the ratio of particles scattered at two unique angles θ_1 and θ_2 is expressed as:

$$\frac{N(\theta_1)}{N(\theta_2)} = \left[\frac{\sin\left(\frac{\theta_2}{2}\right)}{\sin\left(\frac{\theta_1}{2}\right)} \right]^4$$

Step 1: Substituting the given scattering angles into the relation.

Given conditions: $\theta_1 = 60^\circ$ and $\theta_2 = 90^\circ$. Finding half-angle values:

- For $\theta_1 = 60^\circ \implies \frac{\theta_1}{2} = 30^\circ$
- For $\theta_2 = 90^\circ \implies \frac{\theta_2}{2} = 45^\circ$

Setting up the proportional fraction:

$$\frac{N(60^\circ)}{N(90^\circ)} = \left[\frac{\sin 45^\circ}{\sin 30^\circ} \right]^4$$

Step 2: Evaluating exact trigonometric components.

We know the standard exact values are $\sin 45^\circ = \frac{1}{\sqrt{2}}$ and $\sin 30^\circ = \frac{1}{2}$.

$$\frac{N(60^\circ)}{N(90^\circ)} = \left[\frac{\frac{1}{\sqrt{2}}}{\frac{1}{2}} \right]^4 = \left[\frac{2}{\sqrt{2}} \right]^4 = [\sqrt{2}]^4$$

Simplifying the exponent index power:

$$(\sqrt{2})^4 = 2^2 = 4$$

Thus, the required scattering count ratio is 4 : 1.

Quick Tip: Because the sine function increases value as the angle grows from 0° to 90° , the denominator value $\sin^4(\theta/2)$ gets larger for wider tracking angles. This mathematically means that fewer alpha particles will get scattered to wide angles, so $N(60^\circ)$ must confidently evaluate to a higher value than $N(90^\circ)$.

2. The geometric triple product magnitude $|\vec{A} \cdot (\vec{B} \times \vec{C})|$ represents which of the following mechanical quantities visually?

- (A) Area of a regular hexagon
- (B) Volume of a parallelepiped
- (C) Surface area of a sphere
- (D) Volume of a regular tetrahedron

Correct Answer: (B) Volume of a parallelepiped

Solution:

In physics, the volume of a parallelepiped built from three vectors is frequently used to determine mechanical properties like torque, angular momentum, or crystal lattice geometries in solid-state physics.

If three forces, displacements, or vector fields form the concurrent edges of a parallelepiped structure, the volume represents the physical magnitude of their scalar triple product:

$$V = |\vec{A} \cdot (\vec{B} \times \vec{C})|$$

Physically, $\vec{B} \times \vec{C}$ represents a vector pointing normal to the base surface whose absolute magnitude equals the area of the base parallelogram. Performing the subsequent dot product with vector \vec{A} multiplies this base area by the vertical projection height ($|\vec{A}| \cos \theta$), giving the structural volume.

Quick Tip: If you want to find the volume of a **tetrahedron** shared by the same three vectors instead of a parallelepiped, simply divide the scalar triple product result by 6: $V_{\text{tetrahedron}} = \frac{1}{6} |\vec{A} \cdot (\vec{B} \times \vec{C})|$.

3. A probe is dropped on the moon from a height of 20 m. Both the probe and the moon are initially at the same temperature as the surface of the moon. The specific heat capacity of the probe is $3 \text{ kJ kg}^{-1} \text{ K}^{-1}$. If upon impact, the center of mass of the probe instantly comes to rest, calculate the final temperature of the probe. (Assume acceleration due to gravity on the moon $g_{\text{moon}} = 2 \text{ m/s}^2$).

- (A) $T_{\text{surface}} + 0.0133 \text{ K}$
- (B) $T_{\text{surface}} + 0.1333 \text{ K}$
- (C) $T_{\text{surface}} + 1.3333 \text{ K}$

(D) $T_{\text{surface}} + 13.333 \text{ K}$

Correct Answer: (A) $T_{\text{surface}} + 0.0133 \text{ K}$

Solution:

Concept: According to the law of **Conservation of Energy**, energy can neither be created nor destroyed; it can only be transformed from one form to another.

When the probe is dropped from a height, it possesses gravitational potential energy. As it falls under the moon's gravity, this potential energy is fully converted into kinetic energy just before the crash. Upon hitting the surface, since the center of mass instantly comes to rest, the mechanical kinetic energy collapses and dissipates completely into internal thermal heat energy (Q), raising the body temperature of the probe.

$$\Delta \text{Potential Energy (PE)} = \text{Thermal Heat Absorbed (Q)}$$

The mechanical energy conversion is governed by:

$$m \cdot g_{\text{moon}} \cdot h = m \cdot c \cdot \Delta T$$

Where:

- m = mass of the probe
- g_{moon} = gravitational acceleration of the moon = 2 m/s^2
- h = release height = 20 m
- c = specific heat capacity of the material
- ΔT = net temperature rise ($T_{\text{final}} - T_{\text{initial}}$)

Step 1: Simplifying the algebraic expression and converting units to standard SI form.

Notice that the mass parameter (m) is present linearly on both sides of the energy equation. Canceling m reveals that temperature elevation is an intrinsic property independent of the object's mass:

$$g_{\text{moon}} \cdot h = c \cdot \Delta T \implies \Delta T = \frac{g_{\text{moon}} \cdot h}{c}$$

Now, we must convert the given specific heat capacity from kilo-Joules into standard SI units (Joules):

$$c = 3 \text{ kJ kg}^{-1} \text{ K}^{-1} = 3 \times 10^3 \text{ J kg}^{-1} \text{ K}^{-1} = 3000 \text{ J kg}^{-1} \text{ K}^{-1}$$

Step 2: Calculating the temperature rise (ΔT).

Substitute the problem values into the isolated temperature equation:

$$\Delta T = \frac{2 \text{ m/s}^2 \times 20 \text{ m}}{3000 \text{ J kg}^{-1} \text{ K}^{-1}}$$

$$\Delta T = \frac{40}{3000} = \frac{4}{300} = \frac{1}{75} \approx 0.0133 \text{ K (or } ^\circ\text{C)}$$

Step 3: Determining the final absolute temperature.

Since the probe started at equilibrium with the ambient moon surface temperature ($T_{\text{initial}} = T_{\text{surface}}$):

$$T_{\text{final}} = T_{\text{initial}} + \Delta T = T_{\text{surface}} + 0.0133 \text{ K}$$

Quick Tip: Always double-check your unit prefixes in thermodynamics questions! Leaving c as 3 instead of 3000 is a classic exam trap that will lead to an answer of $\Delta T = 13.33 \text{ K}$ (Option D), which is off by a factor of a thousand.

CHEMISTRY

1. A coordination complex with an electronic configuration of $t_{2g}^3 e_g^2$ is expected to be:

- (A) Strongly colored due to fully allowed transition
- (B) Intensely blue due to charge transfer
- (C) Colorless or extremely faintly colored
- (D) Completely black due to total absorption

Correct Answer: (C) Colorless or extremely faintly colored

Solution:

Concept: According to Crystal Field Theory (CFT), in an octahedral coordination complex environment, the five degenerated d-orbitals split into two distinct energy sets: a lower energy triply degenerate set (t_{2g}) and a higher energy doubly degenerate set (e_g).

Step 1: Analyzing total unpaired electrons.

The electronic configuration is given as $t_{2g}^3 e_g^2$. Let's visualize the arrangement according to

Hund's Rule:

- The three t_{2g} orbitals each hold 1 unpaired electron ($\uparrow, \uparrow, \uparrow$).
- The two e_g orbitals each hold 1 unpaired electron (\uparrow, \uparrow).

Total number of unpaired d-electrons (n) = 3 + 2 = 5. This arrangement is characteristic of a high-spin d^5 coordination complex (such as $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ or $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$).

Step 2: Determining color and d-d transitions.

For a high-spin d^5 complex, every single d-orbital contains exactly one electron. Any potential orbital transition ($t_{2g} \rightarrow e_g$) would require an electron to pair up in an already occupied destination orbital.

According to quantum mechanics selection rules, a transition that requires changing an electron's spin state to pair up is spin-forbidden. Because d-d transitions are strongly spin-forbidden in high-spin d^5 configurations, these complexes absorb visible light extremely weakly. As a result, they are typically colorless or exhibit an extremely faint, light pink/yellow tint.

Quick Tip: A classic example of a $t_{2g}^3 e_g^2$ complex is the hexaaquamanganese(II) ion, $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$. Because its d-d light transitions are spin-forbidden, laboratory samples of this chemical appear almost entirely colorless or have a barely noticeable faint pink color.

2. Oxidation of D-Glucose with mild bromine water ($\text{Br}_2/\text{H}_2\text{O}$) gives _____, while oxidation with strong concentrated HNO_3 gives _____ respectively.

- (A) Saccharic acid, Gluconic acid
- (B) Gluconic acid, Saccharic acid
- (C) Glucaric acid, Gluconic acid
- (D) Sorbose, Fructose

Correct Answer: (B) Gluconic acid, Saccharic acid

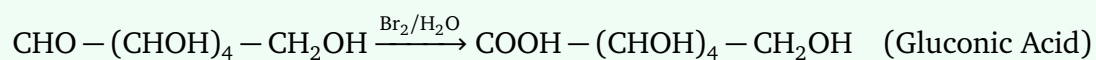
Solution:

These reactions are standard organic diagnostic tests used to deduce the molecular functional group structure of D-Glucose (an aldohexose sugar).

Reaction 1: Chemical attack with Bromine Water ($\text{Br}_2/\text{H}_2\text{O}$)

Bromine water is a mild oxidizing agent. It selectively oxidizes the reactive terminal aldehyde

group ($-\text{CHO}$) of glucose into a carboxylic acid group ($-\text{COOH}$), while leaving the secondary and primary alcohol hydroxyl chains completely untouched. This reaction converts glucose into Gluconic acid:



Reaction 2: Chemical attack with Concentrated Nitric Acid (HNO_3)

Concentrated nitric acid is a strong oxidizing agent. It aggressively attacks and oxidizes both the terminal aldehyde group ($-\text{CHO}$) and the terminal primary alcohol group ($-\text{CH}_2\text{OH}$) at the bottom of the chain, turning both into carboxylic acid groups. This dicarboxylic acid product is called Saccharic acid (also known as glucaric acid):



Quick Tip: To easily memorize these names without mixing them up: Gluconic acid has only one terminal end oxidized into an acid (mono-carboxylic), whereas Saccharic acid is a double-ended dicarboxylic acid because it was formed using the much stronger oxidizing agent.

MATHEMATICS

1. Given the word **BITSAT**, in how many ways can they be arranged such that both **T** are always together?

- (A) 60
- (B) 120
- (C) 360
- (D) 720

Correct Answer: (B) 120

Solution:

Concept: When certain items in a permutation problem must always remain together, we use the String Method (or bundling method). We treat the items that must stay together as a single

compound object or "bundle."

Step 1: Grouping the letters and forming the bundle.

The given word is BITSAT. Let's analyze its constituent letters: Total number of letters = 6 (B, I, T, S, A, T) where 'T' is repeated twice.

Since both 'T's must always be together, we tie them together into a single block: [TT]. Now, our remaining items to arrange are the unique individual letters along with this single block:

$$B, I, S, A, [TT]$$

Counting these items gives a total of 5 distinct entities to arrange.

Step 2: Calculating the total number of permutations.

The number of ways to arrange these 5 distinct entities is:

$$5! = 5 \times 4 \times 3 \times 2 \times 1 = 120 \text{ ways}$$

Now, we look inside the bundle [TT] to see if rearranging the internal items generates new configurations. The number of ways to arrange two identical 'T's inside their block is:

$$\frac{2!}{2!} = 1 \text{ way}$$

Therefore, the total number of valid arrangements is:

$$120 \times 1 = 120 \text{ ways}$$

Quick Tip: If the letters to be kept together were distinct (for example, keeping 'B' and 'T' together), you would multiply by 2! because [BT] and [TB] are different configurations. Because the letters here are identical [TT], swapping them changes nothing, so no extra multiplication factor is required.

2. Integration of $|x - 1013|$ limits 0 to 2026 is equal to:

- (A) 1013
- (B) 1013^2
- (C) 2×1013^2
- (D) $\frac{1013^2}{2}$

Correct Answer: (B) 1013^2

Solution:

Concept: An integral involving an absolute value function $|f(x)|$ is solved by splitting the integration interval at the critical points where the expression inside the absolute value changes its sign (i.e., where $f(x) = 0$). By definition, the absolute value function is split as:

$$|x - 1013| = \begin{cases} -(x - 1013) & \text{for } x < 1013 \\ (x - 1013) & \text{for } x \geq 1013 \end{cases}$$

Step 1: Splitting the definite integral at the turning point.

The critical value inside our limits of integration is at $x = 1013$. We divide the full range from 0 to 2026 into two separate, continuous operational intervals:

$$I = \int_0^{2026} |x - 1013| dx = \int_0^{1013} -(x - 1013) dx + \int_{1013}^{2026} (x - 1013) dx$$

Step 2: Integrating each segment and evaluating the boundary limits.

Let's compute the anti-derivatives:

$$I = \left[1013x - \frac{x^2}{2} \right]_0^{1013} + \left[\frac{x^2}{2} - 1013x \right]_{1013}^{2026}$$

Evaluating the first bracket segment:

$$\left(1013(1013) - \frac{1013^2}{2} \right) - (0) = 1013^2 - \frac{1013^2}{2} = \frac{1013^2}{2}$$

Evaluating the second bracket segment:

$$\left(\frac{2026^2}{2} - 1013(2026) \right) - \left(\frac{1013^2}{2} - 1013(1013) \right)$$

Since $2026 = 2 \times 1013$, substitute this relationship to simplify:

$$= \left(\frac{4 \times 1013^2}{2} - 2 \times 1013^2 \right) - \left(\frac{1013^2}{2} - 1013^2 \right)$$

$$= (2 \times 1013^2 - 2 \times 1013^2) - \left(-\frac{1013^2}{2} \right) = \frac{1013^2}{2}$$

Summing both evaluated parts together gives the total integral value:

$$I = \frac{1013^2}{2} + \frac{1013^2}{2} = 1013^2 = 1,026,169$$

Quick Tip: Definite integrals of symmetric absolute linear functions can be solved instantly using geometry! The graph of $y = |x - 1013|$ forms a large perfect symmetric 'V' shape on the x-axis. Between $x = 0$ and $x = 2026$, the area under the curve is simply the sum of two identical right-angled triangles, each having a base of 1013 and a height of 1013:

$$\text{Area} = 2 \times \left(\frac{1}{2} \times \text{base} \times \text{height} \right) = 1013 \times 1013 = 1013^2$$

3. The number of ways to arrange n distinct persons around a circular table is:

- (A) $n!$
- (B) $(n - 1)!$
- (C) $\frac{n!}{2}$
- (D) $\frac{(n-1)!}{2}$

Correct Answer: (B) $(n - 1)!$

Solution:

Concept: In a linear arrangement, the absolute position matters because there is a distinct beginning and a distinct end. However, in a circular arrangement, there are no fixed reference points; only the relative positions of objects with respect to each other matter. To clear this rotational symmetry ambiguity, we fix one person's position arbitrarily to act as a reference milestone, and then arrange the remaining elements linearly relative to them.

Step 1: Deriving the standard circular formula.

If there are n distinct people:

- Fix the position of 1 person anywhere at the table to break the rotational symmetry. There is only 1 unique way to do this because all seats are initially identical.
- The remaining $(n - 1)$ people can now be arranged in the remaining open spots linearly.

The number of ways to arrange $(n - 1)$ items in a line is $(n - 1)!$.

$$\text{Total Circular Arrangements} = (n - 1)!$$

Quick Tip: Remember to check if the clockwise and counter-clockwise arrangements look different. For people sitting around a table, clockwise and counter-clockwise are unique directions (left hand vs right hand neighbor), so the answer is $(n - 1)!$. For making a necklace out of identical-looking decorative beads where the necklace can be flipped over, the two orientations become indistinguishable, dividing the formula by two: $\frac{(n-1)!}{2}$.

4. The volume of a parallelepiped whose coterminous edges are represented by the vectors \vec{a} , \vec{b} , and \vec{c} is given by:

- (A) $\vec{a} \times (\vec{b} \times \vec{c})$
- (B) $\vec{a} \cdot (\vec{b} \times \vec{c})$
- (C) $\vec{a} \cdot (\vec{b} \cdot \vec{c})$
- (D) $\vec{a} \times (\vec{b} \cdot \vec{c})$

Correct Answer: (B) $\vec{a} \cdot (\vec{b} \times \vec{c})$

Solution:

Concept: The volume of a parallelepiped geometrically matches the absolute value of the Scalar Triple Product (STP) of the three vectors defining its intersecting adjacent edges.

$$\text{Volume} = |\vec{a} \cdot (\vec{b} \times \vec{c})|$$

If the vectors are defined in component form as $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$, $\vec{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$, and $\vec{c} = c_1\hat{i} + c_2\hat{j} + c_3\hat{k}$, the scalar triple product is easily evaluated as the determinant of a 3×3 matrix:

$$\vec{a} \cdot (\vec{b} \times \vec{c}) = \begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}$$

Quick Tip: If the scalar triple product of three non-zero vectors is exactly zero ($[\vec{a} \ \vec{b} \ \vec{c}] = 0$), it implies the volume of the parallelepiped has flattened completely. This is the standard condition used to prove that three vectors are coplanar (lying within the exact same flat 2D plane).

5. Three coins are tossed simultaneously. The probability of getting at least one head is:

- (A) $\frac{1}{8}$
- (B) $\frac{3}{8}$
- (C) $\frac{1}{2}$
- (D) $\frac{7}{8}$

Correct Answer: (D) $\frac{7}{8}$

Solution:

Concept: When a problem uses the phrase "at least one," it is almost always significantly easier to compute the solution using the Complement Principle. The complement of getting "at least one head" is getting "no heads at all" (which means every single coin landing on tails).

$$P(\text{At least one Head}) = 1 - P(\text{No Heads})$$

Step 1: Calculating the probability of the complement event.

When a single fair coin is flipped, the probability of getting a tail is $P(T) = \frac{1}{2}$. Since each coin flip is an entirely independent event, the probability of getting tails on all 3 coins simultaneously is:

$$P(\text{No Heads}) = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{2^3} = \frac{1}{8}$$

Step 2: Applying the complement subtraction.

Subtracting this from the total sample space probability value of 1 gives:

$$P(\text{At least one Head}) = 1 - \frac{1}{8} = \frac{7}{8}$$

Quick Tip: This formula directly scales for n coins as $1 - \frac{1}{2^n}$. If the question instead asks for at least one tail, the symmetry of a fair coin means the formula and final answer remain completely identical!

6. Solve the differential equation: $\frac{dy}{dx} = \cos(x + y) + \sin(x + y)$

(A) $\log \left| 1 + \tan \left(\frac{x+y}{2} \right) \right| = x + C$

(B) $\log \left| 1 + \tan \left(\frac{x+y}{2} \right) \right| = y + C$

(C) $\tan \left(\frac{x+y}{2} \right) = x + C$

(D) $\log \left| \sec \left(\frac{x+y}{2} \right) \right| = x + C$

Correct Answer: (A) $\log \left| 1 + \tan \left(\frac{x+y}{2} \right) \right| = x + C$

Solution:

Concept: When a differential equation contains a linear combination of variables embedded inside trigonometric or transcendental functions, such as $f(x + y)$, it cannot be integrated using direct separation of variables.

To solve it, we apply a linear variable substitution:

$$x + y = v$$

Differentiating this substitution equation with respect to x allows us to completely replace the $\frac{dy}{dx}$ term, transforming the expression into a standard ****separable differential equation**** in terms of v and x .

Step 1: Applying linear substitution and rearranging terms.

Let:

$$x + y = v \quad \dots(1)$$

Differentiating both sides with respect to x :

$$1 + \frac{dy}{dx} = \frac{dv}{dx} \implies \frac{dy}{dx} = \frac{dv}{dx} - 1 \quad \dots(2)$$

Substitute equations (1) and (2) into the given differential equation:

$$\frac{dv}{dx} - 1 = \cos v + \sin v$$

$$\frac{dv}{dx} = 1 + \cos v + \sin v \quad \dots(3)$$

Step 2: Separating the variables using trigonometric half-angle identities.

Rearranging equation (3) to group all v parameters on the left side and x parameters on the

right side:

$$\frac{dv}{1 + \cos v + \sin v} = dx \quad \dots(4)$$

To integrate the left side, we express $\cos v$ and $\sin v$ in terms of their standard half-angle tangent identities ($\tan \frac{v}{2}$):

$$\cos v = \frac{1 - \tan^2(v/2)}{1 + \tan^2(v/2)} \quad \text{and} \quad \sin v = \frac{2 \tan(v/2)}{1 + \tan^2(v/2)}$$

Substitute these identities into the denominator of equation (4):

$$\frac{dv}{1 + \frac{1 - \tan^2(v/2)}{1 + \tan^2(v/2)} + \frac{2 \tan(v/2)}{1 + \tan^2(v/2)}} = dx$$

Taking the common denominator ($1 + \tan^2(v/2)$) up to the numerator:

$$\frac{(1 + \tan^2(v/2)) dv}{(1 + \tan^2(v/2)) + (1 - \tan^2(v/2)) + 2 \tan(v/2)} = dx$$

Since $1 + \tan^2(v/2) = \sec^2(v/2)$ and simplifying the terms in the denominator:

$$\frac{\sec^2(v/2) dv}{2 + 2 \tan(v/2)} = dx \quad \implies \quad \frac{\sec^2(v/2) dv}{2(1 + \tan(v/2))} = dx \quad \dots(5)$$

Step 3: Integrating both sides using substitution.

Integrating both sides of equation (5):

$$\int \frac{\sec^2(v/2)}{2(1 + \tan(v/2))} dv = \int dx$$

To solve the left integral, let's use a temporary substitution: $t = 1 + \tan(v/2)$. Differentiating gives:

$$dt = \frac{1}{2} \sec^2\left(\frac{v}{2}\right) dv$$

Notice that this matches the numerator expression perfectly! Rewriting the integral in terms of t :

$$\int \frac{1}{t} dt = \int dx$$
$$\log |t| = x + C$$

Substituting back the value of t :

$$\log \left| 1 + \tan \left(\frac{v}{2} \right) \right| = x + C$$

Finally, substituting back the original value $v = x + y$:

$$\log \left| 1 + \tan \left(\frac{x + y}{2} \right) \right| = x + C$$

Quick Tip: Whenever you see a differential equation format like $\frac{dy}{dx} = f(ax + by + c)$, skip trying to separate x and y directly. Instantly substitute $u = ax + by + c$. This core reducing technique turns any complex non-separable trigonometric equation into a simple calculus integration profile.