DAILY TEST SERIES FOR IIT-JEE 2009 FROM VIDYA DRISHTI

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Total time: 20 min

Assertion-reason type questions

Each question has two statements. Consider these for statements:

(a) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1

(b) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1

(c) STATEMENT-1 is True, STATEMENT-2 is False

(d) STATEMENT-1 is False, STATEMENT-2 is true

Physics

1. Statement I: If an ideal gas enclosed in a container with adiabatic walls expands, temperature falls.
   Statement II: The work done by the ideal gas in an adiabatic process equals the decrease in its internal energy.

2. Statement I: A body can have kinetic energy without having linear momentum.
   Statement II: A body can have linear momentum without having kinetic energy.

Chemistry

3. Statement I: Alkali metals dissolve in liquid ammonia to give blue solutions.
   Statement II: Alkali metals in liquid ammonia give solvated species of the type $[M(NH_3)_n]^+$ where M is an alkali metal.
4. Statement I: Glucose gives a reddish-brown precipitate with Fehling's solution.
   Statement II: Reaction of glucose with Fehling's solution gives CuO and gluconic acid.

Mathematics

5. Statement I: The maximum and minimum values of the function $f(x)=\frac{1}{6\sin x-8\cos x+5}$ does not exist.
   Statement II: Range of f(x) is unbounded.

6. Statement I: The probability for the graph of $y = 16x^2 + 8(a + 5)x – 7a – 5$ in the interval $[– 20, 0]$ is strictly above the x-axis is $\frac{9}{20}$

Statement II: If the graph of $y = ax^2 + bx + c$ is strictly above the x-axis the discriminant is negative and $a > 0$.

SOLUTION:

Physics

1. (a)

$dU = dQ – pdV = – pdV$ ($dQ = 0$, for adiabatic process)

⇨ $dU = – pdV$

⇨ $n C_v dT = – pdV$ (because $dU = n C_v dT$ for an ideal gas)

⇨ $dT = – pdV/ n C_v$

Negative sign tells that when volume increases adiabatically, temperature decreases.

2. (c)

Chemistry

3. (a)

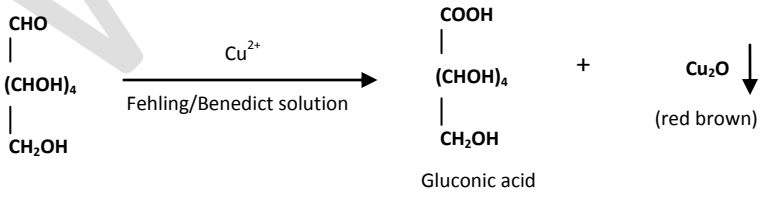
The alkali metals dissolve in liquid NH_3 without evolution of hydrogen. The colour of the dilute solution is blue.

$M \rightarrow M^+$ (in liquid) + e (ammoniated)

$M + (x + y)\ NH_3 \rightarrow [M(NH_3)_x]^+ + e\ (NH_3)_y^-$

It is ammoniated electron which is responsible for colour.

4. (c)



Mathematics

5. (a)

Let g(x) = $6\sin x - 8\cos x + 5$

$\therefore$ $-5 \le g(x) \le 15$

$\Rightarrow$ $\frac{1}{g(x)} \le -\frac{1}{5}$ or $\frac{1}{g(x)} \ge \frac{1}{15}$

$\therefore$ Range of f(x) is $R - \left(-\frac{1}{5}, \frac{1}{15}\right)$

i.e., range of f(x) is unbounded.

$\therefore$ the maximum and the minimum value of f(x) do not exist.

6. (d)

$y = ax^2 + bx + c$

$\Rightarrow$ $y + \frac{D}{4a} = a\left(x + \frac{b}{2a}\right)^2$ ...(1)

where $D = b^2 - 4ac$.

Clearly equation (1) represent a parabola with vertex $\left(-\frac{b}{2a}, \frac{D}{4a}\right)$

If the expression is strictly positive for all real values of *x* the *y* coordinate of the vertex is positive and the parabola is upward parabola. Hence a is positive and D is negative.

The discriminant of $16x^2 + 8(a + 5)x - 7a - 5$ is

$64(a+5)^2 + 64(7a+5) < 0$

$\Rightarrow$ $a^2 + 17a + 30 < 0$

$\Rightarrow$ $-15 < a < -2$

Hence, required probability = $\frac{\text{the length of interval } [-15,-2]}{\text{the length of interval } [-20,0]} = \frac{13}{20}$