GATE 2025 Chemistry Memory Based Question Paper

Time Allowed :3 Hours	Maximum Marks :100	Total Questions : 65
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Quick Tip

Read the following instructions very carefully and strictly follow them:

- 1. The GATE Exam will be structured with a total of 100 marks.
- 2. The exam mode is Online CBT (Computer Based Test)
- 3. The total duration of Exam is 3 Hours.
- 4. It will include 65 questions, divided in 3 sections.
- 5. Section 1 : General Aptitude.
- 6. Section 2 : Engineering Mathematics.
- 7. Section 3 : Subject Based Questions.
- 8. The marking scheme is as such : 1 and 2 marks Questions. Each correct answer will carry marks as specified in the question paper. Incorrect answers may carry negative marks, as indicated in the question paper.
- Question Types: The exam will include a mix of Multiple Choice Questions (MCQs), Multiple Select Questions (MSQs), and Numerical Answer Type (NAT). questions.



1. Essential symmetry in a Monoclinic Crystal System:

- (1) one C_6
- (2) one C_4
- (3) one C_2
- (4) one C_3

2. For a spontaneous process, the correct statement(s) is/are:

Given: $(\Delta U)_{S,V} < 0$ (1) $\Delta S > 0$ at constant U, V (2) $\Delta U > 0$ at constant S, V (3) $\Delta (U - TS) < 0$ at constant T, V ($\Delta A < 0$) (4) $\Delta (H - TS) < 0$ at constant T, P ($\Delta G < 0$)

3. A structure like B_2H_6 involving bridging atoms is exhibited by:

- (1) Si_2Cl_6
- (2) I_2Cl_6
- $(3) Cl_2O_6$
- (4) Al_2Cl_6

4. The sequence of reagents used for the transformation shown in the image is likely:

- (1) (i) mCPBA, (ii) BF₃ Et₂O
- (2) (i) NBS, (PhCOO)₂ (ii) aq. NaOH (iii) MnO₂ (iv) di/liq NH₃
- (3) (i) SeO₂ (ii) Dess-Martin (iii) K-selectride

5. Calculate the standard enthalpy change (ΔH°) for a cell reaction given the following data:

$$\frac{\partial \mathcal{E}^{\circ}}{\partial T} = -3.19 \times 10^{-4} \,\mathrm{V} \,\mathrm{K}^{-1}$$
$$\mathcal{E}^{\circ} = 0.2676 \,\mathrm{V}$$
$$T = 298 \,\mathrm{K}$$





6. A structure like B₂H₆ involving bridging atoms is exhibited by:

(1) Si_2Cl_6

- $(2) I_2 Cl_6$
- $(3) \operatorname{Cl}_2 O_6$
- (4) Al_2Cl_6

7. Which of the following exists as a planar molecule?

(1) Al_2Cl_6

(2) Ga_2Br_6

- (3) I₂Cl₆
- (4) Al_2Br_6

8. If a pure (S) compound has a specific rotation of $+14^{\circ}$, and a mixture of (R) and (S) compounds has a specific rotation of $+7^{\circ}$, what is the percentage of the (R) compound in the mixture?

9. What is the multiplicity of the H_a signal in the ¹H NMR spectrum of the given molecule? (Molecule shows H_a coupled to a Ch_3 group and a deuterium atom) Deuterium (D) has I = 1Methyl group (n = 3 protons with I = 1/2)

10. For a molecule belonging to the C_{4v} point group, which of the following statements is correct regarding its symmetry elements?

- (1) C_4 exists
- (2) C_2 exists
- (3) i (center of inversion) does not exist
- (4) σ_v exists

11. Given an undirected/unweighted graph G with a subset of vertices $\{a, b, c, d, e, f, g, h\}$ and the following relationships:



- Edges: (a, e), (a, f), (b, e), (b, g), (c, f), (c, g), (d, g), (d, h) (from the diagram)
- Path: a b c d (implies edges (a, b), (b, c), (c, d))
- Path: e f g h (implies edges (e, f), (f, g), (g, h))
- Relationship: a f c h (implies some connection, not necessarily direct edges between all consecutive pairs)

Which of the following is NOT an edge of G?

1. (e, g)2. (b, d)3. (b, g)4. (b, h) a - b - c - de - f - g - h

12. Complete the following analogy: courage : bravery :: yearning : ?

- (1) desire
- (2) longing
- (3) craving

13. What is the value of the iterated expectation $E\{E\{x|y\}\}$?

- (1) E(x)
- (2) *E*(*y*)
- (3) E(x/y)
- (4) $\frac{E(x)}{E(y)}$

14. Let $f(x) = \frac{e^x - e^{-x}}{2}$ and $f^k(x)$ be the k^{th} derivative of f(x) with respect to x. Find the value of $f^{10}(0)$.



15. Evaluate the following limit:

$$\lim_{t \to \infty} (\sqrt{t^2 + t} - t) = ?$$

16. Which of the following input scenarios does binary search take $O(\log n)$ time complexity?

- (1) An array of integers in increasing order
- (2) An array of integers in any order
- (3) A linked list of n integers in increasing order
- (4) A linked list of n integers in any order

17. Given two Python lists A = [1, 2, 3] and B = [4, 5, 6], which of the following Python statements will result in A becoming [1, 2, 3, 4, 5, 6]?

(1) A.append (B)
(2) A.update (B)
(3) A.insert (B)
(4) A.extend (B)

18. What is the output of the following Python code: print(f(15, 10))

```
def f(a, b):
    if a == 0:
        return b
    if a % 2 == 1:
        return 2 * f((a - 1) // 2, 2 * b)
    return b + f(a - 1, b)
```

19. Suppose that Insertion Sort is applied to the array [1, 3, 5, 7, 9, 11, x, 15, 13] and it takes exactly two swaps to sort the array. Select all possible values of x from the following options:

(a) 14

(b) 16



(c) 12 (d) 10

20. Consider a hash table of size 10 (indices 0 to 9). The hash function is $h(x) = 3x \mod 10$. The following values are inserted using linear probing to resolve collisions: 1, 4, 5, 6, 14, 15. In which indices are 14 and 15 stored?

(A) 2, 5

(B) 2, 6

(C) 4, 6

(D) 4, 5

