

GATE -2015 MT

ai25btech11009

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1. Choose the appropriate word/phrase, out of the four options given below, to complete the following sentence:
Apparent lifelessness — dormant life. (GATE 2015 MT)

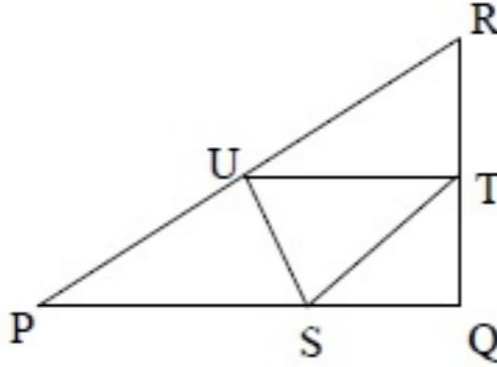
(a) harbours
(b) leads to
(c) supports
(d) affects
2. Fill in the blank with the correct idiom/phrase. That boy from the town was a — in the sleepy village. (GATE 2015 MT)

(a) dog out of herd
(b) sheep from the heap
(c) fish out of water
(d) bird from the flock
3. Choose the statement where underlined word is used correctly. (GATE 2015 MT)

(a) When the teacher eludes to different authors, he is being elusive.
(b) When the thief keeps eluding the police, he is being elusive.
(c) Matters that are difficult to understand, identify or remember are allusive.
(d) Mirages can be allusive, but a better way to express them is illusory.
4. Tanya is older than Eric. Cliff is older than Tanya. Eric is older than Cliff. If the first two statements are true, then the third statement is: (GATE 2015 MT)

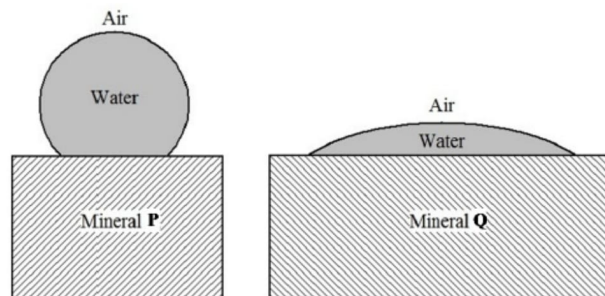
(a) True
(b) False
(c) Uncertain
(d) Data insufficient

5. Five teams have to compete in a league, with every team playing every other team exactly once, before going to the next round. How many matches will have to be held to complete the league round of matches? (GATE 2015 MT)
- (a) 20
 - (b) 10
 - (c) 8
 - (d) 5
6. Select the appropriate option in place of underlined part of the sentence. Increased productivity necessary reflects greater efforts made by the employees. (GATE 2015 MT)
- (a) Increase in productivity necessary
 - (b) Increase productivity is necessary
 - (c) Increase in productivity necessarily
 - (d) No improvement required
7. Given below are two statements followed by two conclusions. Assuming these statements to be true, decide which one logically follows.
 Statements: I. No manager is a leader. II. All leaders are executives.
 Conclusions: I. No manager is an executive. II. No executive is a manager. (GATE 2015 MT)
- (a) Only conclusion I follows.
 - (b) Only conclusion II follows.
 - (c) Neither conclusion I nor II follows.
 - (d) Both conclusions I and II follow.
8. In the given figure, angle Q is a right angle, $PS:QS = 3:1$, $RT:QT = 5:2$ and $PU:UR = 1:1$. If area of triangle QTS is 20 cm^2 , then the area of triangle PQR in cm^2 is —. (GATE 2015 MT)



9. Right triangle PQR is to be constructed in the xy -plane so that the right angle is at P and line PR is parallel to the x -axis. The x and y coordinates of P, Q, and R are to be integers that satisfy the inequalities: $-4 \leq x \leq 5$ and $6 \leq y \leq 16$. How many different triangles could be constructed with these properties? (GATE 2015 MT)
- (a) 110
 - (b) 1,100
 - (c) 9,900
 - (d) 10,000
10. A coin is tossed thrice. Let X be the event that head occurs in each of the first two tosses. Let Y be the event that a tail occurs on the third toss. Let Z be the event that two tails occur in three tosses. Based on the above information, which one of the following statements is TRUE? (GATE 2015 MT)
- (a) X and Y are not independent
 - (b) Y and Z are dependent
 - (c) Y and Z are independent
 - (d) X and Z are independent
11. The standard deviation of the readings 19, 17, 15, 13, 11 is —. (GATE 2015 MT)
12. $\frac{y(x+h)-y(x)}{h}$ is a numerical approximation for (GATE 2015 MT)
- (a) $\frac{dy}{dx}$
 - (b) $\frac{dy}{dh}$

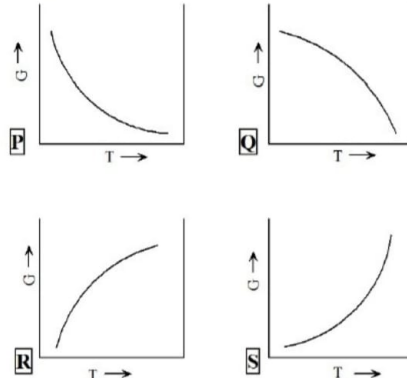
- (c) $\int y dx$
 (d) $\int x dy$
13. If A and B are matrices, $(AB)^T =$ (GATE 2015 MT)
- (a) $A^T B$
 (b) $B^T A$
 (c) $A^T B^T$
 (d) $B^T A^T$
14. Which of the following properties is intensive? (GATE 2015 MT)
- (a) Volume
 (b) Gibbs free energy
 (c) Chemical potential
 (d) Entropy
15. In an Ellingham diagram, the standard free energy change ΔG° for the oxidation reaction of a metal M is plotted as a function of temperature. The slope of this line is positive because (GATE 2015 MT)
- (a) ΔS° is positive
 (b) ΔS° is negative
 (c) ΔH° is positive
 (d) ΔH° is negative
16. In froth flotation, hydrophobic mineral particles ascend with air bubbles preferentially over hydrophilic mineral particles. The figure below shows a schematic of a water droplet placed on the surfaces of two mineral P and Q. (GATE 2015 MT)



- (a) Mineral P ascends with air bubbles preferentially over mineral Q.
 - (b) Mineral Q ascends with air bubbles preferentially over mineral P.
 - (c) Both minerals P and Q ascend with the air bubbles without preference.
 - (d) Both minerals P and Q sink to the bottom.
17. Which of the following oxide addition results in polymerization (i.e., network formation) in a silicate slag? (GATE 2015 MT)
- (a) CaO
 - (b) MgO
 - (c) P_2O_5
 - (d) Na_2O
18. Zn is commercially extracted from which of the following minerals? (GATE 2015 MT)
- (a) Sphalerite
 - (b) Magnetite
 - (c) Chalcopyrite
 - (d) Galena
19. Self supporting arches for furnace roofs can be fabricated using silica bricks but not using magnesia bricks. Why? (GATE 2015 MT)
- (a) Silica has a significantly lower thermal expansion coefficient than magnesia at high temperatures.
 - (b) Silica has a significantly higher thermal conductivity than magnesia at high temperatures.
 - (c) Silica has a significantly lower melting point than magnesia.
 - (d) Silica is significantly more acidic than magnesia.
20. A species can diffuse through the lattice (diffusion coefficient, D_L), along grain boundaries (diffusion coefficient, D_{GB}), and along free surfaces (diffusion coefficient, D_S). Which of the following relations is CORRECT? (GATE 2015 MT)
- (a) $D_L > D_{GB} > D_S$
 - (b) $D_S > D_L > D_{GB}$
 - (c) $D_{GB} > D_S > D_L$

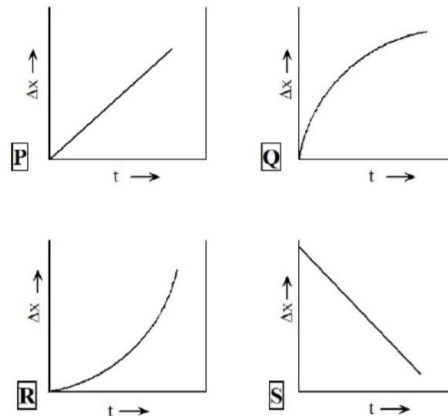
(d) $D_S > D_{GB} > D_L$

21. Select the CORRECT plot of Gibbs free energy (G) vs temperature (T) for a single component system from the following: (GATE 2015 MT)



- (a) P
(b) Q
(c) R
(d) S

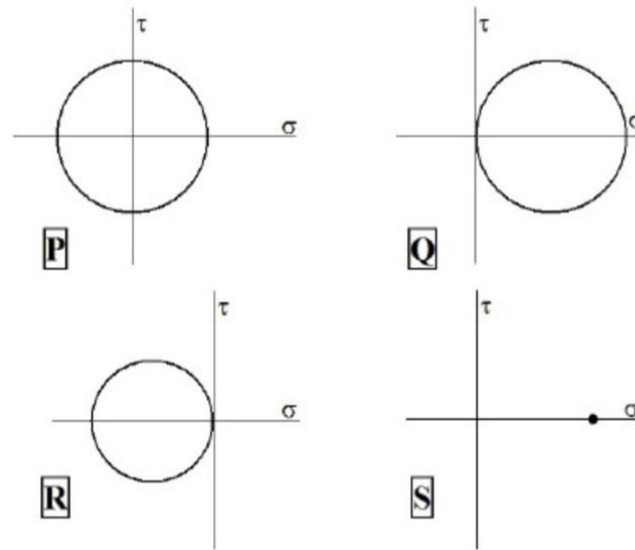
22. If A_x represents adherent oxide layer thickness and t is time, which of the following curves represents diffusion-controlled oxidation kinetics? (GATE 2015 MT)



- (a) P
(b) Q
(c) R
(d) S

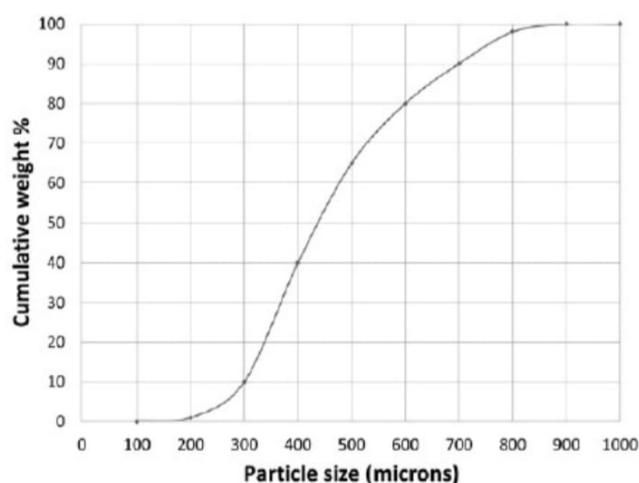
23. Based on the standard galvanic series, select the CORRECT sequence of metals in the increasing order of anodic behaviour: (GATE 2015 MT)
- (a) Zn, Fe, Pt, Cu
 - (b) Pt, Zn, Cu, Fe
 - (c) Fe, Pt, Cu, Zn
 - (d) Pt, Cu, Fe, Zn
24. In a conventional unit cell of a crystal, $a = b = c$ and $\alpha = \beta = \gamma = 90^\circ$. This crystal belongs to which of the following systems? (GATE 2015 MT)
- (a) Cubic
 - (b) Tetragonal
 - (c) Orthorhombic
 - (d) Triclinic
25. In an X-ray powder pattern of a simple cubic crystal, the 2nd peak corresponds to (GATE 2015 MT)
- (a) (111)
 - (b) (100)
 - (c) (200)
 - (d) (110)
26. When boron (trivalent) is doped into silicon, the resulting material is (GATE 2015 MT)
- (a) a p-type semiconductor.
 - (b) an n-type semiconductor.
 - (c) a superconductor.
 - (d) an insulator.
27. Which of the following metal working operations is categorized as an indirect compression process? (GATE 2015 MT)
- (a) Forging
 - (b) Wire drawing
 - (c) Extrusion

- (d) Stretch forming
28. Which of the following is a typical rolling defect? (GATE 2015 MT)
- (a) Buckling
 - (b) Edge cracking
 - (c) Cold shut
 - (d) Porosity
29. Which manufacturing process is NOT used for producing fine-grained metals? (GATE 2015 MT)
- (a) Electrodeposition
 - (b) Czochralski method
 - (c) Equi-Channel Angular Pressing (ECAP)
 - (d) Sintering of milled powders
30. Which metal forming technique is used for making soft drink cans from aluminum sheets? (GATE 2015 MT)
- (a) Rolling
 - (b) Forging
 - (c) Deep drawing
 - (d) Extrusion
31. Which of the following is NOT a solid state metal joining technique? (GATE 2015 MT)
- (a) Ultrasonic welding
 - (b) Friction welding
 - (c) Diffusion bonding
 - (d) Electroslag welding
32. The stress required for Orowan dislocation bypass is 200 MPa at a 500 nm inter-precipitate spacing. At 200 nm spacing, the required stress is approximately (GATE 2015 MT)
33. Which Mohr's circle represents equi-biaxial tension? (GATE 2015 MT)

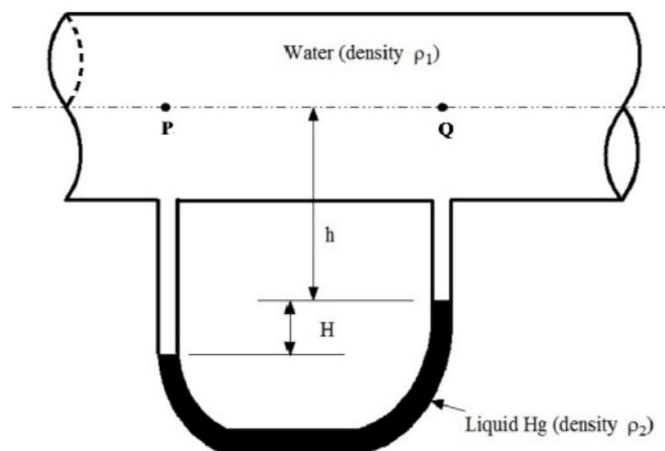


- (a) P
(b) Q
(c) R
(d) S
34. Which statement is INCORRECT about the effect of small carbon addition to iron? (GATE 2015 MT)
- (a) DBTT increases.
(b) Hardenability increases.
(c) Toughness increases.
(d) Yield point phenomenon occurs.
35. In polymers like epoxies, creep resistance is enhanced by (GATE 2015 MT)
- (a) increasing bulkiness of side groups.
(b) increasing cross-link density.
(c) adding plasticizers.
(d) annealing.
36. The value of eigenvalue for matrix A is given, find the other eigenvalues. (NAT question) (GATE 2015 MT)
37. Find the magnitude of gradient of function at point given. (NAT question) (GATE 2015 MT)
38. Determine the determinant of given matrix. (NAT question) (GATE 2015 MT)

39. The solution of given differential equation is: (GATE 2015 MT)
- (a) $y = 5$
 - (b) $y = e^{5x}$
 - (c) $y = 2x$
 - (d) $y = 5x^2$
40. Find the maximum value of function $f(x) = x^2 + 2x$. (NAT) (GATE 2015 MT)
41. Select the correct Gibbs free energy versus temperature plot from figure: (GATE 2015 MT)



- (a) A
 - (b) B
 - (c) C
 - (d) D
42. Calculate equilibrium P_{CO_2}/P_{CO} ratio for given reaction at temperature. (NAT question) (GATE 2015 MT)
43. Calculate the amount of ore required for producing pure metal. (NAT question) (GATE 2015 MT)
44. Determine pressure difference in manometer shown. (GATE 2015 MT)



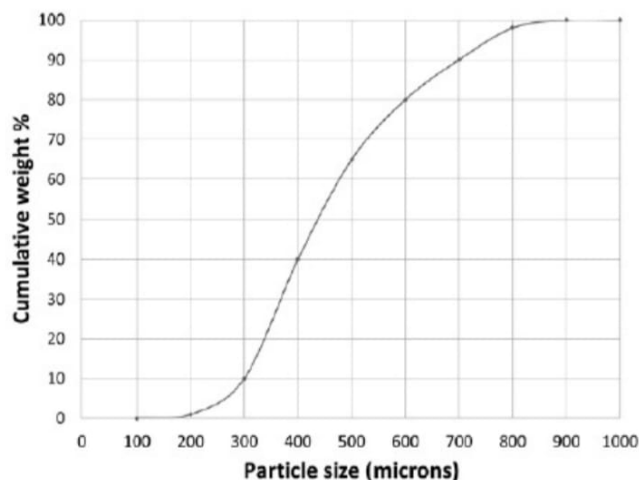
- (a) $P_2 g H$
- (b) $P_1 g h$
- (c) $(\rho_2 - \rho_1) g H$
- (d) $(P_2 - P_1) g h$

45. Match metals in Group I with extraction routes in Group II: (GATE 2015 MT)

Group I	Group II
P. Al	3. Electrolysis of fused salts
Q. Ti	2. Matte smelting
R. Cu	4. Halide metallurgy
S. Fe	1. Blast furnace

- (a) P-3, Q-2, R-4, S-1
- (b) P-2, Q-4, R-3, S-1
- (c) P-3, Q-4, R-2, S-1
- (d) P-4, Q-1, R-3, S-2

46. Particle size distribution after sieving (NAT question) (GATE 2015 MT)



47. Calculate voltage in electrolytic refining. (NAT question) (GATE 2015 MT)
48. Configurational entropy maximum mole fraction (NAT question) (GATE 2015 MT)
49. Calculate free energy change on undercooling (NAT question) (GATE 2015 MT)
50. Match names in Group I with reactions in Group II: (GATE 2015 MT)

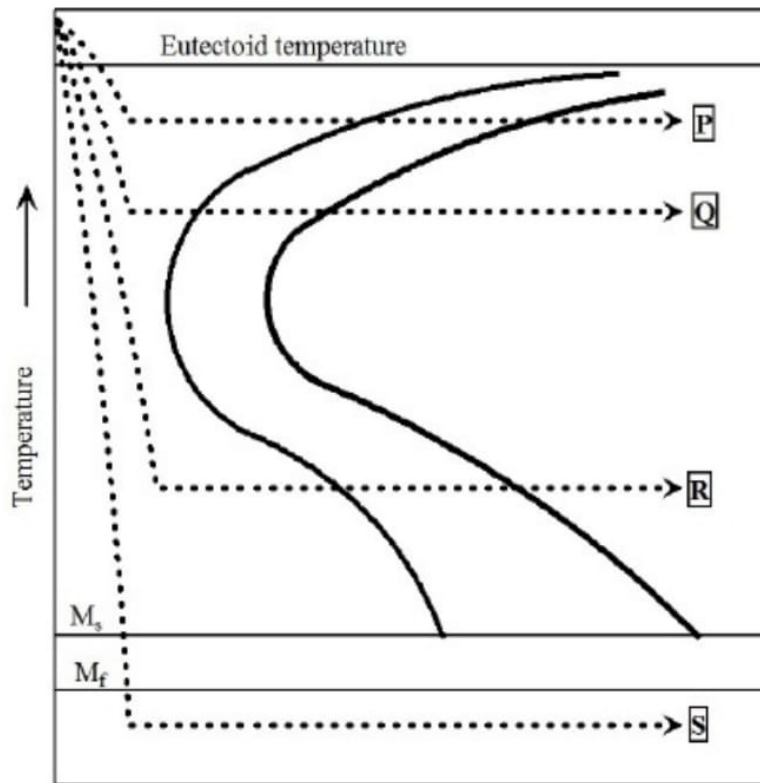
Group I	Group II
P. Eutectic	2. $L \rightarrow \alpha + \beta$
Q. Peritectic	3. $L_1 \rightarrow L_2 + \alpha$
R. Peritectoid	1. $\gamma + \beta \rightarrow \alpha$
S. Monotectic	4. $L + \beta \rightarrow \alpha$

- (a) P-2, Q-3, R-1, S-4
- (b) P-3, Q-4, R-1, S-2
- (c) P-2, Q-4, R-1, S-3
- (d) P-4, Q-1, R-3, S-2
51. Time to homogenize alloy at different temperature (NAT question) (GATE 2015 MT)
52. Match materials in Group I with applications in Group II: (GATE 2015 MT)

Group I	Group II
P. Iron-Silicon alloy	3. Transformer core
Q. GaAs	4. Light emitting diode
R. Nichrome	1. Heating element
S. Quartz crystals	2. Ultrasonic generator

- (a) P-3, Q-4, R-1, S-2
- (b) P-1, Q-3, R-4, S-2
- (c) P-2, Q-4, R-1, S-3
- (d) P-3, Q-2, R-4, S-1

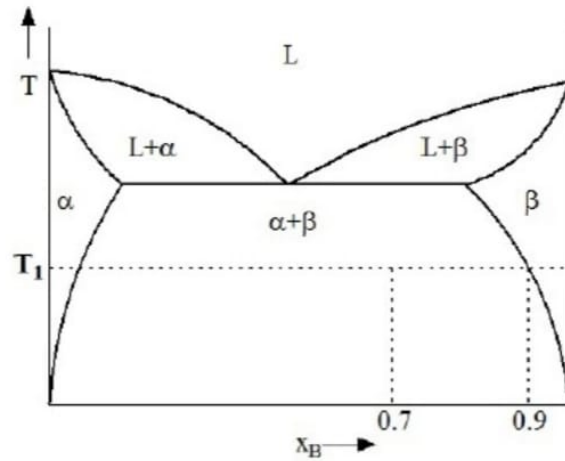
53. Match heat treatment microstructures for eutectoid steel (GATE 2015 MT)



P	Fine pearlite
Q	Martensite
R	Bainite
S	Coarse pearlite

- (a) P-1, Q-2, R-4, S-3
- (b) P-4, Q-1, R-3, S-2
- (c) P-2, Q-4, R-1, S-3
- (d) P-1, Q-4, R-3, S-2

54. Microstructure phase diagram question (NAT) (GATE 2015 MT)



55. Calculate diameter of forged pancake (NAT question) (GATE 2015 MT)

56. Correctness of assertion and reason (GATE 2015 MT)

- (a) Both are true, reason is correct
- (b) Both are true, reason incorrect
- (c) Both are false
- (d) Assertion true, reason false

57. Metal mass flow rate issue (NAT) (GATE 2015 MT)

58. Match defects with their cause in castings (GATE 2015 MT)

Group I	Group II
P. Macrosegregation	4. Density difference and convection
Q. Fine grained structure	1. Inoculation
R. Porosity	2. Gas evolution and shrinkage
S. Dendrites	3. Temperature gradients and supercooling

- (a) P-1, Q-3, R-2, S-4
- (b) P-4, Q-1, R-2, S-3
- (c) P-2, Q-4, R-1, S-3
- (d) P-4, Q-1, R-3, S-2

59. Driving force for sintering particle size reduction (NAT) (GATE 2015 MT)

60. Detecting internal flaws in ceramic materials - NOT applicable techniques (GATE 2015 MT)

- (a) Liquid penetration and ultrasonic testing
- (b) Ultrasonic testing and eddy current