



OFFLINE  
TEST SERIES

# MADE EASY

India's Best Institute for IES, GATE & PSUs

## ESE-2017 : Prelims Exam

UPSC Engineering Services Examination

## GENERAL STUDIES & ENGG . APTITUDE

Answer Key & Solutions

Test 10: Part Syllabus Non-Technical  
Basics of Material Science and Engineering

- |         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 1. (c)  | 11. (d) | 21. (b) | 31. (b) | 41. (c) |
| 2. (a)  | 12. (c) | 22. (c) | 32. (b) | 42. (b) |
| 3. (c)  | 13. (a) | 23. (a) | 33. (b) | 43. (b) |
| 4. (a)  | 14. (b) | 24. (c) | 34. (c) | 44. (c) |
| 5. (a)  | 15. (d) | 25. (d) | 35. (a) | 45. (c) |
| 6. (a)  | 16. (b) | 26. (c) | 36. (b) | 46. (c) |
| 7. (d)  | 17. (d) | 27. (c) | 37. (c) | 47. (d) |
| 8. (b)  | 18. (b) | 28. (d) | 38. (b) | 48. (c) |
| 9. (a)  | 19. (d) | 29. (d) | 39. (c) | 49. (b) |
| 10. (c) | 20. (c) | 30. (c) | 40. (a) | 50. (a) |

## DETAILED EXPLANATIONS

1. (c)  
It is the valence electrons that participate in chemical reactions and bonding to affect material properties.
3. (c)  
Low melting materials are highly susceptible to creep.
4. (a)  
Increase in weight and volume is not the desired criteria.
5. (a)  
Paramagnetic materials has small and positive value of magnetic susceptibility so they are attracted by the field but not strongly.
20. (c)
- | Types of steel      | Percentage of carbon |
|---------------------|----------------------|
| Dead mild steel     | 0.15%                |
| Mild steel          | 0.15 to 0.30%        |
| Medium Carbon steel | 0.30 to 0.80%        |
| High carbon steel   | 0.80 to 1.5%         |
21. (b)  
The fatigue test is carried out to find out the endurance strength or fatigue limit of a material. In this test failure of specimen takes place.
22. (c)  
Left handed metamaterial transmission lines exhibit backward wave propagation due to the coexistence of negative effective permittivity and permeability.
23. (a)  
Quantum dot is a zero dimensional structure in which carriers are confined in all three directions.
24. (c)  
Duralumin is an alloy aluminium.
25. (d)  
Hydrogen bond is stronger than dipole bond.
28. (b)  
Nomex fibre is a textile fibre
29. (d)  
Concrete is a particle reinforced composite in which cement is a binding material while sand and aggregates are agglomerates (particle).
30. (c)  
Silicon carbide is a hard refractory carbide.
31. (b)  
Lead has good corrosion resistance so it is least affected by sea water.

32. (b)

Superconductors are essentially diamagnetic they repel magnetic field.

34. (c)

Mobility of electron is always greater than mobility of hole.

39. (c)

$$R = \frac{\rho l}{A}$$
$$\rho = \frac{RA}{l}$$
$$= \frac{0.171 \times 0.1 \times 10^{-6}}{1}$$
$$\rho = 1.71 \times 10^{-8} \Omega\text{-m}$$

43. (b)

Unit for flux density (B) is  $\text{Wb/m}^2$  or Tesla.

i.e.  $B = \frac{\text{Flux}(\text{unit Wb})}{\text{Area}(\text{m}^2)}$

$$B = \frac{1.2 \times 10^{-3}}{30 \times (10^{-2})^2} \text{ Wb/m}^2 \text{ or Tesla.}$$
$$= 0.4 \text{ Wb/m}^2 \text{ or Tesla}$$

46. (c)

Reason is false as switching action is characteristics of several other devices such as diode, BJT etc also along with superconductors.

