



TMAQ

MODEL QUESTIONS



IIM
Metallurgy
Materials Engineering

The Indian Institute of Metals
Tiruchirappalli Chapter

THE INDIAN INSTITUTE OF METALS

TMAQ

TIRUCHIRAPPALLI CHAPTER



Quiz on Metals & Materials



SCOPE OF THE QUIZ

History and evolution of materials: Origin of names of minerals and metals, use of metals in the early ages, metal extraction, ores, extraction processes, location of industries and availability of metals in India; Applications of common alloys; Iron and steel making, types of steels and cast irons and their applications.

Atomic structure & periodic table: Bonding; Crystalline materials: Metals, semiconductors, crystal defects, physical properties: Electronic, optical, thermal and magnetic properties; characterisation of materials: X-ray, electron microscopy etc.

Mechanical properties: Elasticity, plasticity and fracture: Tensile, creep, impact and hardness, Processing of metals: Cold and hot working, casting, powder metallurgy, metal joining.

Corrosion: Electro deposition, oxidation of metals, corrosion protection methods.

Non-destructive testing: Radiography, ultrasonic, electrical and magnetic methods, laser methods.

Advanced materials: Amorphous materials, ceramics, polymers, composites, biomaterials, materials in energy production and transport, nuclear materials, electronic materials.

MODEL QUESTIONS

A set of 100 model questions is enclosed. The Questions 1 to 75 are Oral Questions, indicating the model of questions, which a student can expect in the semi final / final rounds. The last 25 questions are objective type questions, which a student can expect in the written round of preliminary quiz. This may be used as guidance in preparing for the quiz.

The students are advised to read books on metals, materials and metallurgy. There are also plenty of websites, which could give a world of information on materials. The students are encouraged to go through them in their preparation process. Knowledge of materials is an asset in life. The Organisers of TMAQ wish the students a great learning experience, together with attractive fame and dime.

1. A variety of HAEMATITE (Fe_2O_3), occurs as rhombohedra crystals. It is black in colour and has attractive metallic lusture. What is its common name? SPECULAR IRON
2. Indian weaponry was famous in history. What was the alloy used for this called? WOOTZ STEEL
3. Name the element that is named after the Greek Goddess of moon & is today very essential to the process of reprography SELENIUM
4. Name the metal produced at the Zawar Mines in Rajasthan? ZINC
5. On December 2nd of this year Enrico Fermi accomplished the historic first nuclear chain reaction? 1942
6. Which ionic compound is known as "Lunar caustic"? AgNO_3 , SILVER NITRATE
7. What is the name given to the alloy of elements Gold, Silver, Copper, Tin and Zinc that was use in the making of idols for temples. PANCHALOKHA
8. What is the name given to describe the phenomenon in which there are dimensional changes associated with the magnetisation of a material such as Fe, Ni, Cu, etc. MAGNETOSTRICTION
9. All effect whereby a conductor carrying an electric current perpendicular to an applied magnetic field develops a voltage gradient transverse to both current and magnetic field is called as HALL EFFECT
10. What is the name given to the phenomenon when the material exhibits spontaneous electric polarisation that changes with heating PYROELECTRICITY
11. When a ferromagnetic material such as Fe is magnetised, while the magnetisation current is increased continuously, the magnetisation does not increase continuously, but as a series of small jumps. What is the name of this phenomenon? BARKHAUSEN EFFECT
12. The expulsion of magnetic flux by a super conducting material is referred to as MEISSNER EFFECT
13. In certain crystals such as calcite, the light travels at different speeds in different directions. What is this phenomenon called? BI-REFRINGENCE

14. A type of deformation behaviour, which although results in a complete recovery after the removal of stress, where a part of the deformation is viscous is called as VISCO-ELASTICITY
15. A tree like pattern that is usually formed by the solidification of a metal is called by a specific name. What is it? DENDRITE
16. "Nataraja" idols were made by some casting route, which is used today to make turbine blades for jet engines. Name this casting route. INVESTMENT CASTING (Also called as FULL MOULD CASTING)
17. What is the name given to the process in which a block of metal is reduced in cross section by forcing it to flow through a die orifice under high pressure? EXTRUSION
18. What is the name given to the process that involves heating the sample in carbonaceous atmosphere to harden steel components? CARBURISING
19. What is the name given to the process in which a continuous sheet of the thermoplastic material is fabricated by squeezing the softened material between two horizontal rollers? CALENDERING
20. What is the name given to the process of heating natural rubber with sulphur, which results in the increase in cross linking of the polymer and an increase in strength? VULCANISATION
21. What is the name given to the process of coating zinc on steel? GALVANISATION
22. What is the common name for the mineral HgS? CINNABAR
23. A silicate of beryllium and aluminium, $3\text{BeO} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2$, crystallizes in hexagonal form. The gem varieties are lustrous and transparent have emerald or aquamarine colour. What are these called? BERYL
24. A sulphide of Zn that crystallizes in cubic form. How is it referred to in mineralogy? BLACK JACK
25. Fool's Gold is of course not gold. What is it? CHALCOPYRITE
26. What is the common name for the mineral TiO_2 ? RUTILE
27. What is the popular name of cubic zirconia? AMERICAN DIAMONDS
28. What is the common name for the mineral potassium aluminium silicate ($\text{KAl}_3\text{Si}_3\text{O}_{10}$)? FELDSPAR
29. What is the trade name of the ceramic Silicon Carbide (SiC)? CARBORUNDUM
30. You may be aware that ceramics are increasingly being used as bio-compatible materials. Which is the ceramic material used as prosthesis for hip joints? ALUMINA (Al_2O_3)
31. What is the technical term that characterizes the high melting point ceramics? REFRACTORY
32. What is the important property of ceramics like BaTiO_3 that is used in the fabrication of ceramic disk capacitors? HIGH DIELECTRIC CONSTANT
33. A ceramic, $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$, is used as a refractory material for furnace linings. What is its common name? MULLITE
34. A naturally occurring oxide of aluminium that forms rhombohedral crystal and nearly as hard as diamond is called as CORUNDUM
35. A class of materials closely related to magnetic, having superior magnetic properties in view of their lower conductivity are called as FERRITES
36. Natural rubber is polymer. Can you tell the name of the monomer out of which this polymer is made? ISOPRENE
37. We all know that cotton is one the natural fibres that is derived from Plants. Can you name another? JUTE or HEMP
38. What is the common name for the polymeric material Phenol Formaldehyde? BAKELITE
39. Protective helmets, toys and automobile parts are made from this plastic which in short form is referred to as "ABS" What does "ABS" stand for? ACRYLIC BUTADIENE STYRENE.
40. Now with consciousness for preserving and protecting our environment, newer kinds of plastics are being formulated that can be attacked by microbes and broken down to cellulose. What is the name given to such plastics? BIO DEGRADABLE PLASTICS
41. An important class of polymers are polyamides. What is their common name? NYLON
42. What is the polymer in the packing material thermocole? POLYSTYRENE
43. A very widely used polymer is Polymethyl methacrylate. How is it otherwise called? PERSPEX

- 44 Which thermosetting material is used for making tableware? MELAMINE FORMALDEHYDE.
- 45 What is the name of the plastic fibre of which bullet proof vests are made? KEVLAR
- 46 What is the common name for the construction material that is a combination of calcite and clay? PORTLAND CEMENT
- 47 Name the mineral in the gem JADE. SODIUM ALUMINIUM SILICATE, $\text{NaAlSi}_3\text{O}_8$
- 48 What is the common name for the mineral $\text{CaSO}_4 \cdot 2 \text{H}_2\text{O}$? GYPSUM
- 49 Name the process by which metals heated to higher temperature and cooled rapidly in water, air, molten or fused salts for the purpose of hardening. QUENCHING
- 50 What is gun metal? BRONZE (88% Cu, 10% Sn and 2% Zn)
- 51 Name the metal widely used in aerospace industry and named after Greek mythology hero? TITANIUM
- 52 This Al Cu alloy denoted by 2024, used predominantly in aerospace industry? DURALUMIN
- 53 Springs are used to absorb motion or energy and balance the mechanical loads in a system. This element is commonly added to spring steel? SILICON
- 54 The Tarapur Atomic Power Plant is located in this state MAHARASHTRA
- 55 Where is the oldest oil well in India located? DIGBOI (ASSAM)
- 56 He is the prime architect of the Indian Nuclear Programme? HOMI JEHANGIR BHABA
- 57 An American rolling mill company first produced commercially very pure iron. What is the name given to this pure iron? ARMCO IRON
- 58 The names LINZ and DONAVITZ are associated with the production of which material? STEEL
- 59 One of the figurines excavated near Mohenjo-dara is the "DANCING GIRL". What is it made of? BRONZE
- 60 This metal was formerly known as Glucinum, meaning sweet owing to the sweet taste of its' salts but its present name was derived from one of its minerals. What is this Metal? BERYLLIUM
- 61 The expansion of the acronym MRI is: MAGNETIC RESONANCE IMAGING
- 62 Francium is named after France. Name one more element, which derives its name from France? GALLIUM
- 63 What are SIALONS? CERAMIC
- 64 What makes stainless steel stainless? ADDITION OF CHROMIUM
- 65 What is Rayon? A general name for artificial silk.
- 66 What is ALNICO and what is its application? It is a permanent magnetic material, composed of aluminium, nickel and cobalt.
- 67 Why Dolomite is added along with the charge in blast furnace? TO FLUX SILICEOUS IMPURITIES AS SLAG.
- 68 We know about normal process cooling. What is Super cooling? COOLING OF LIQUID BELOW ITS NORMAL FREEZING POINT.
- 69 We know normal electrical conductivity as the ability of the material to carry current. What is super conductivity? REFERS TO ZERO RESISTANCE FOR CONDUCTING ELECTRICITY.
- 70 Name the element, which finds extensive application in photocopying? SELENIUM
- 71 Alloy refers to a phase with more than one element. What is a super alloy? AN ALLOY WITH SUPERIOR MECHANICAL PROPERTIES AT HIGH TEMPERATURES.
- 72 Crystal structure refers to arrangement of atoms in a lattice. What is a super lattice?
WHEN MORE THAN ONE TYPE OF ATOMS ARE PRESENT, AND WHEN DISTINCT ATOMS OCCUPY DISTINCT POSITIONS, THE RESULTING LATTICE IS CALLED SUPER LATTICE.
- 73 Atomic Packing Factor of Hexagonal close packed Crystal is? 0.74
- 74 The most common colour of the gemstone Topaz is ? Yellow
- 75 Sphalerite is an ore of ? Zinc

76. The wavelength of light can be experimentally found using:

A	Ripple Tank	B	Diffraction Grating	C	Plane Mirror	D	Glass Prism
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77. A transformer steps up the voltage from 220 Volts to 11,000 Volts. If the primary has 100 turns the secondary should have _____ turns? (Answer = $(11,000/220)*100 = 5000$)

A	5000	B	500	C	50	D	50000
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78. In a Germanium Crystal the inter atomic bonds are:

A	Ionic	B	Metallic	C	Van der Waals	D	Covalent
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79. A compound alloy of metals A and B has a unit cell containing A atoms at the corners and B atoms at the face centres of the FCC structure. What would be the formula for the compound?

A	AB	B	AB ₃	C	AB ₂	D	A ₂ B
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80. A wire of length 2 m is redrawn to a length of 4 m. Then its resistance will:

A	Decrease to $\frac{1}{4}$ of original	B	Double	C	Increase four times	D	Does not change
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81. At the magnetic equator the angle of dip would be:

A	0°	B	90°	C	180°	D	45°
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82. The SI units of magnetic field is:

A	Gauss	B	Oersted	C	Tesla	D	Pascal
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83. The activity of a radioactive sample decreases to one third of its original intensity (I_0) in 9 years. After a further period of 9 years, its activity would be:

A	Same	B	$I_0/6$	C	$I_0/4$	D	$I_0/9$
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84. The unit of Planck's constant is:

A	Nm	B	eV	C	Js ⁻¹	D	Js
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85. An example of a dia-magnetic substance is:

A	Aluminium	B	Copper	C	Antimony	D	Cobalt
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86. Poisonous gas present in the exhaust fume of a car is:

A	CH ₄	B	C ₂ H ₂	C	CO	D	CO ₂
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87. Carborundum is the commercial name of:

A	Al ₂ O ₃	B	Ca (H ₂ PO ₄) ₂	C	H ₃ PO ₄	D	SiC
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88. During the daytime, plants absorb:

A	Carbon dioxide	B	Carbon monoxide	C	Nitrogen	D	Oxygen
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89. Which of the following forms of carbon finds use in the sugar industry?

A	Animal charcoal	B	Sugar charcoal	C	Lamp black	D	Wood charcoal
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90. Iron is rendered passive by treatment with concentrated:

A	H ₂ SO ₄	B	H ₃ PO ₄	C	HCl	D	HNO ₃
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91. Melting point of an alloy is normally

A	Less than pure metal	B	More than pure metal	C	Same as pure metal	D	Dependent on the base metal and alloy
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92. In the extraction of iron, the furnace charge consists of iron ore coke and limestone. The function of limestone is to act as:

A	An oxidiser	B	A deoxidiser	C	Flux	D	Slag
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93. This is a measure of toughness of a material?

A	Tensile Strength	B	Yield Strength	C	Creep Strength	D	Impact Strength
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94. The anode mud obtained during electrolytic refining of copper contains:

A	Iron	B	Nickel	C	Silver	D	Zinc
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95. Aluminium is not present in the mineral:

A	Cryolite	B	Feldspar	C	Fluorspar	D	Mica
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96. PVC has the repeating unit of:

A	Acrylonitrile	B	Ethylene	C	Tetrafluoroethylene	D	Vinyl Chloride
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97. Bakelite is manufactured by the reaction between:

A	Ethylene glycol and Phthalic acid	B	Melamine and Formaldehyde	C	Phenol and Formaldehyde	D	Urea and Formaldehyde
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98. Terylene is the polyester of:

A	Ethylene glycol and phthalic acid	B	Hexa-methylene	C	Phenol fordiamine & Adipic acid	D	Urea and formaldehyde maldehyde
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99. A raw material used in making nylon is:

A	Adipic acid	B	Butadiene	C	Ethylene	D	Methyl methacrylate
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100. Chemically considering, digestion is basically:

A	Hydrolysis	B	Anabolism	C	Hydrogenation	D	Dehydrogenation
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Answers

76 B 77 A 78 D 79 B 80 C 81 A 82 C 83 D 84 D 85 B 86 C 87 D 88 A
89 A 90 D 91 A 92 C 93 D 94 C 95 C 96 D 97 C 98 A 99 A 100 A

“Education is not the filling of a pail, but the lighting of a fire.”
William Butler Yeats

