Uka Tarsadia University (Diwaliba Polytechnic)
Diploma in Mechanical Engineering
Assignment (Material Science and Metallurgy – 020020204)

Unit-1 Engineering Materials

2 marks

1] Define unit cell.
2] Define: (i) Grain (ii) Crystal.
3] What is primary bonds?
4] Enlist the different types of secondary bonds?
5] State the characteristics of secondary compounds.
6] Give the classification of engineering materials.
7] Enlist different types of nonmetallic materials.
8] Differentiate between micro structure and macro structure.
9] Define: (i) Porosity (ii) Resistivity
10] What is grain boundary?
11] What is super conductivity?
12] What is Die Electric constant?
13] Explain the molecular arrangement of solid.
14] Explain the molecular arrangement of Liquid.
15] Explain the molecular arrangement of gas.

3 Marks

1] Explain with neat sketches the arrangement of atoms in B.C.C, F.C.C. and H.C.P. lattice.
2] Explain Constructions of Ionic bonds with neat sketch.
3] What is metallic bond explain in detail.
4] State the characteristics of covalent bonds.
5] State the characteristics of Ionic bonds.
6] Explain Constructions of covalent bonds with neat sketch.
7] Explain the effect of grain boundary and grain size.
8] With neat sketch explain dendritic solidification of metal.
9] Explain chemical properties of materials.
10] List Physical properties of materials and explain any two of them.
11] With neat sketch explain the effect of different cooling rates on grain size.
12] State and explain electromagnetic properties.
13] With neat sketch explain sequential steps for solidification of molten metal.
14] Describe the concept of crystal structure of metal.
15] Define following properties :
16] (i)Boiling point (ii) Thermal expansion (iii) Thermal conductivity

Unit-2 Phase Diagrams & Metallurgical Microscope

2 Marks:

1] List the alloying elements for steel.
2] Give the definition of equilibrium diagram.
3] What is interstitial solid solution?
4] What is substitutional solid solution?
5] Enlist the different types of heat treatment process.
6] Draw the micro structure of annealing and Normalizing.
7] Draw the microstructure of Hardening.
8] Enlist the different quenching media which are used in hardening process.
9] Enlist the different types of surface hardening treatment.
10] Give the definition of hardening Process.
11] Enlist the different parts of metallurgical microscope.
12] Write eutectic reaction for iron carbon diagram?
13] Write eutectoid reaction for iron carbon diagram?
14] Write peritectic reaction for iron carbon diagram?
15] What is a limitation of Iron carbon diagram?
16] Draw the micro structure of 0.8 % and 0.4 % carbon steel.
17] Draw the micro structure of 0.2 % and 0.008% carbon steel.

3 Marks:

1] State the concept of phase diagram.
2] State the reasons of introducing alloy steel.
3] Define heat treatment and state its objectives.
4] Define annealing process and state its objectives.
5] Describe Normalizing process in details.
6] Write the difference between annealing and normalizing.
7] Write the difference between annealing and hardening.
8] Explain carburizing process with figure.
9] Describe tempering process in detail.
10] State the application of tempering process.
11] State hardening defects and their reasons.
12] State the steps of drawing TTT diagram.
13] State the need and applications of TTT diagram.
14] Explain Time Temperature curve.
15] Draw the Iron carbon diagram with all details.
16] Explain flam hardening in detail.
17] Explain Induction hardening in detail.
18] Write the importance and factors affecting of hardenability
19] State the sequential steps of preparing a micro-specimen.

20] Explain the importance of of metallographic Examination.
21] Draw neat figure of metallurgical microscope and name its main parts.

Unit-3 Metals and its Alloys

2 MARKS:

1] Enlist the different types of Brass which are used in engineering applications.
2] Enlist the different types of Bronze which are used in engineering applications.
3] Enlist the Different types of ferrous materials.
4] Enlist the Different types of Non ferrous materials.
5] Give the classification of ferrous materials.
6] Draw the micro structure of grey cast iron and Nodular cast Iron.
7] Draw the microstructure of malleable cast iron and plain carbon steel.
8] Give the application of plain carbon steel.
9] Enlist the different application of copper in industries.
10] Give the advantage of surface hardening process.
11] What is alloy steel?
12] Give the chemical composition of Brass and Bronze.
13] Enlist the basic alloying elements which are used for steel making.
14] Give the classification of Engineering Materials.
15] What is a importance of coding and Designation for metals.
16] Give the difference between ferrous and non ferrous metals.

3 MARKS:

1] State the composition, properties and uses of grey cast Iron.
2] State the composition, properties and uses of white cast Iron.
3] State the composition, properties and uses of Nodular cast Iron.
4] State the composition, properties and uses of malleable cast Iron.
5] Differentiate steel and Cast Iron.
6] Differentiate Brass and Bronze.
7] State the reasons for using non ferrous metals and alloys in engineering field.
8] State application of engineering aluminium metal.
9] State composition, properties and application of Plain carbon steel.
10] State composition, properties and application of Duralumin.
11] Give the important properties of aluminum alloy, which make it a valuable engineering metal.
12] State the effect of phosphorus, Sulphur ,silicon, manganese as impurities on Cast Iron.
13] Give the composition and uses of the following.
(a) Naval brass (b) Gun metal
14] Give the composition and uses of the following.
(a)Cartridge brass (b)Babbit Metal.

Unit-4 Non Metallic Materials

2 Marks:

1] State two properties and two application of ceramic.
2] What is meant by dimensional stability?
3] Write-down properties of Polyvinyl chloride.
4] What is meant by ceramic bond?
5] Write-down properties of Polyvinyl formal.
6] State two properties and two application of insulator.
7] What is refractory? State its basic properties.
8] Write-down properties of Cellulose.
9] State two properties and two application of fiber.
10] Write-down properties of Acrylics.
11] State two properties and two application of Glass.
12] What are the advantages of adhesive material?
13] State two properties and two application of Teflon.
14] Write-down properties of Polyethylene.
15] What are the qualities require in rubber as engineering material?

3 Marks:

1] Write down classification of non-metallic material.
2] Write down desired properties of good refractory materials.
3] Explain process of vulcanizing.
4] Why plastics are used as alternative of the metal in certain application?
5] Describe the heat and electrical insulating material properties.
6] Write down classification of ceramic material.
7] Write down the engineering application of abrasive material.
8] Write the natural and artificial properties of abrasive material.
9] Write causes of failure of refractories material.
10] Why fibre is useful material in automobile engineering?
11] Which are the factors to be consider while selecting an adhesive material.
12] Enlist the insulating material with application.
13] Why Teflon is used in non-stick cooking utensils?
14] Differentiate between Thermoplastics and Thermosetting Plastics.

Unit-5 Electrolysis

2 marks:

1] What is meant by electrolysis and non-electrolysis?
2] State the difference between EMF and galvanic series.
3] Write faraday's laws of electrolysis.
4] What is meant by Electro plating and Concentration cell?
5] State 2^{nd} law of faraday of electrolysis.

6] Enlist the reason for conduct electrolysis process done in industry.
7] What is meant by electrolysis and concentration cell?
8] State 1st law of faraday of electrolysis.
9] What is meaning of stress corrosion?
10] What is meant by Electrode Potential and Concentration cell?
11] State industrial application of electrolysis.
12] Draw surface coating setup.
13] What is meant by Electro plating and Electrolysis?
14] What is concentration cell? How it is formed?
15] Draw neat sketch of Standard Hydrogen Electrode setup.

3 Marks:

1] Explain standard EMF series.
2] Short note on 2nd law of Faraday.
3] Explain in brief uniform corrosion.
4] Draw surface coating setup for electroplating & explain its working.
5] Explain erosion corrosion in detail.
6] Explain the reason for electrolysis process done in industry.
7] State the types of corrosion and describe any one of them.
8] Draw Standard Hydrogen electrode setup & explain its working.
9] Explain standard galvanic series.
10] Short note on Standard Hydrogen electrode.
11] Explain uniform corrosion and pitting corrosion.
12] Write advantages and disadvantages of electro plating process.
13] Short note on 1st law of faraday.
14] Write difference between golvanic and biological corrosion.
15] Explain with neat sketch standard hydrogen electrode.

Unit-6 Coating Materials

2 Marks:

1] Classify fluid materials and state the different types of oil.
2] Define powder metallurgy. How does differ from other methods of components production?
3] Write down minimum five uses of lubrication oil.
4] Write classification of powder material.
5] State the applications of coolant and cutting fluid in mechanical engineering.
6] Draw neat sketch of die-pressing.
7] Explain compacting process in powder metallurgy.
8] Define powder metallurgy. How does differ from other methods of components production?
9] State the difference between sintering and pre-sintering.
10] State demerits of powder metallurgy.
11] State the applications of coolant and cutting fluid in mechanical engineering.
12] Describe different methods of coating paints and varnish in brief.
13] Explain viscosity of oil.

14] List the powder materials.
15] State merits of powder metallurgy.

3 Marks:

1] Explain the selection criteria of cleaning process for surface or metal.
2] Write the properties of metal powder and explain each all.
3] Enlist the properties of oil and explain any two.
4] Write short note on powder metallurgy.
5] Explain sintering process and pre-sintering.
6] Explain powder coating process.
7] Write the properties of metal powder and explain any two.
8] State merits and demerits of powder metallurgy.
9] Explain special gravity and oiliness properties of oil.
10] Short note on cleaning surface process in powder metallurgy.
11] Explain pre sintering. In which type of material it is required to carry out this process.
12] Explain the purpose of adding lubricating oil in powder mixture.
13] Write six application of cutting fluid or coolant.
14] What are the selection criteria of cleaning process for surface or metal?
15] Explain any three properties of lubricating oil.