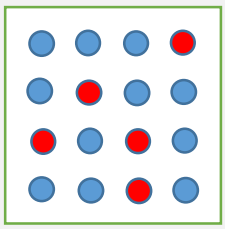
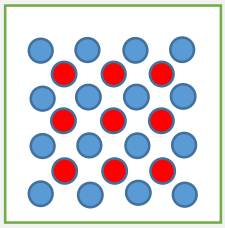
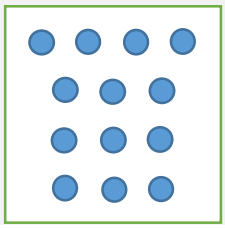
Subject:	Engineering	Title in Book:	Q4 - Exam Papers	Chapter:	N/A	Page Numbers:	N/A

Questions 2005-2016:

KEY POINTS / QUESTIONS:	*DETAILS / ANSWERS:*
CRYSTAL POINT DEFECTS:	
1. SUBSTITUTIONAL POINT DEFECT:	• An atom of another metal is present in the crystal lattice of the parent metal. • Distortion occurs if this atom is larger or smaller than the parent element. • When atoms are of a similar size, one type of crystal may be formed and the mixture will look like a pure metal e.g. copper-nickel • Substitutional Solid Solution is the same principle 
2. INTERSTITIAL POINT DEFECT:	• An atom of another metal moves into the spaces between the atoms of the parent metal lattice. • This causes compression of the surrounding atoms and will strengthen the material as it takes a higher stress to cause distortion • Interstitial Solid Solution is the same principle 
3. VACANT SITE DEFECT:	• If there is an atom missing from the parent metal lattice then distortion occurs as atoms are forced into the empty space.
4. DISLOCATION DEFECT:	• This occurs due to an incomplete layer of atoms in the structure. • A dislocation defect will weaken the structure an may lead to early failure. • As shear force is exerted, the fault moves to the next line and may move to a grain boundary causing slip to occur. 
CRYSTALINE BODY STRUCTURES:	
1. BODY CENTRE CUBIC (BCC):	• Atoms arranged further apart at the corners of a cube with an atom in its centre. • Brittle structure e.g. Iron, Vanadium or Chromium
2. FACE CENTRE CUBIC (FCC):	• Atoms on each of the corners of the cube with a single atom at the centre of each face. • Atoms are more tightly packed making the metal more ductile, allowing slip to occur e.g. Aluminium, Nickel, Silver, Copper.
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HOW CAN YOU PREVENT CORROSION:	• Galvanizing – Hot dipping in zinc • Priming and spray painting • Plastic dip coating • Sacrificial or cathodic protection
WHAT IS A EUTECTIC ALLOY:	A mixture of metal that are completely soluble in the liquid state but completely insoluble in the solid state e.g. Cadmium & Bismuth.
WHAT IS THE EUTECTIC POINT:	It is the point at which the alloy changes from a liquid to a solid without going through a pasty stage.

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WHAT IS A PARTIAL SOLUBILITY ALLOY:	It is an alloy of two metals that will dissolve in one another to a limited degree e.g. Lead & Tin.
WHAT IS A SOLID SOLUTION ALLOY:	When two metals are completely soluble in both the liquid and solid states they are known as a solid solution alloy. When viewed under the microscope it appears like a pure metal e.g. Copper Nickel.
WHAT IS THE EUTECTOID POINT:	This is a solid to solid change point on the Iron Carbo diagram that allows solid pearlite to change to solid austenite at 723 degrees Celsius for .83% carbon.
WHAT DOES SOLVUS MEAN:	Solvus is the transition from one solid form of an alloy to another. On the lead tin diagram it describes the max amount of lead that will dissolve in tin and vice versa.
WHAT IS ALLOTROPY IN METALS:	• Allotropy is the ability of a metal to exist in more than one form. It modifies the amount of carbon solubility allowing some steels to be hardened. • Alpha iron which exists in BCC form is heated above 910 degrees Celsius and it transforms into gamma iron which exists in FCC form. • It is then cooled back to alpha iron forming a compound called cementite as some of the carbon comes back out.
WHAT IS AGE HARDENING:	• This is the increasing in hardens of a metal over time at room temperature. • It occurs in the aluminium alloy Duralinium when it is heated to a high temperature and cooled due to the precipitation of $CuAl_2$
STAGES OF METAL SOLIDIFICATION (DENDRITIC GROWTH):	• As the metal cools solidification starts from the cells and grows to forma a dendrite. • These are tree like structures with braches growing in every direction. • These dendrites meet to form grain boundaries with solid metal crystals.
WHAT IS A COOLING CURVE:	A cooling curve for a combination of metals highlights the start and end of solidification for that particular alloy.
RELATIONSHIP BETWEEN A COOLING CURVE AND A THERMAL EQUILIBRIUM DIAGRAM:	• A cooling curve highlights the start and end of solidification for a particular alloy e.g. 20% Copper and 80% Nickel. • If information from multiple cooling curves for different alloy combinations are transferred to the same diagram, a thermal equilibrium diagram is formed.

Summary: