

4. Mn is added to manganese steel to oxide sulphur.
5. As (Ni)% increase, the melting point of steel decrease.
6. Permanent magnetic alloy is Fe-Cr where soft magnetic alloy is Al-Si.
7. Energy gap of Al is equal to 3 eV so it is bad conductor
8. Insulators have electrical conductivity of order 10^{10} m/s.
9. Martensite forms when there is more time for carbon to diffuse.
10. Gamma iron forms at temp. of $(1394-1538)^{\circ}\text{C}$.
11. Al. wrought alloys are (Al+Cu or Ni).

Q3/ B. Abridge has been in use for ten years and during that time it has been Estimated that.

For first five years, it has carried twenty million cars and three hundred thousand lorries.

for second five years, it has carried ten million cars and one hundred thousand lorries.

Each car and lorry over the bridge give a load cycle of stress amplitude for which fatigue life is 10^8 cycle and 10^6 respectively. **Compute the remaining fatigue life time of a bridge.**

Q4/A Which types of Engineering Material would most suitable for :

- | | |
|-------------------------|-------------------------|
| 1. Milk bottle caps. | 2. High speed aircraft. |
| 3. Domestic water pipe. | 4. Bars for concrete. |
| 5. Machine tool bed. | 6. Grinding mill parts. |
| 7. Toothbrush handle | 8. Gas turbine blades. |
| 9. Electrical cables. | 10. Air tube for cars. |

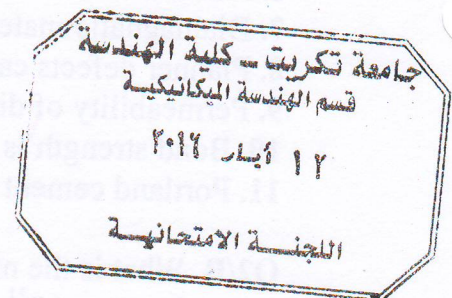
Q4/ B. The diffusions of Iron in (Ni) are given as follow:

T (K)	D(m/s ²)
1273	9.4×10^{-16}
1473	2.4×10^{-14}

Determine:

1. The value of the activation energy.
2. The value of D_0 .
3. The value of (D) at 1100°C .

Note: Assume $K=1.38 \times 10^{-23}$ J/k



Q5/A. Copper has F.C.C. structure and an atomic radius of (0.1278 nm), the atomic mass of Cu is (63.54g/mol), and Avogadro number of 6.022×10^{23} atoms/ mol

A. Determine the theoretical value density

B. In all times the theoretical value density is more than practical density. why

Q5/B. Determine the ($\Delta V\%$) (expansion or contraction) of iron when it changes:

1. From (F.c.c) to (B.c.c)
2. From (B.c.c) to (F.c.c)

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