1. Atomic packing factor of BCC (four decimals)?

   _____

2. A 10.0 mm rod at 15.0 kN: engineering stress in MPa (one decimal)?

   _____ MPa

3. Eutectoid composition of the iron-carbon system in wt% C (two decimals)?

   _____ wt%

4. Rule of mixtures along fibres: E1 with Vf = 0.60, Ef = 230 GPa, Em = 3.0 GPa (one decimal)?

   _____ GPa

5. Quenched and tempered at 600 C: yield strength in MPa (nearest integer)?

   _____ MPa

6. Service amplitude 160 MPa against a Goodman budget of 175: the verdict is:

   ☐ survives with 8.6% margin

   ☐ fails by 15 MPa

   ☐ cannot be judged without the yield

   ☐ exactly at the limit

7. The atomic packing factor measures:

   ☐ the density of the metal

   ☐ the binding energy per atom

   ☐ the number of slip planes

   ☐ the geometric fraction of the cell filled by atoms as hard spheres

8. Yield strength by the certificate convention is read at:

   ☐ the ultimate point

   ☐ fracture

   ☐ the 0.2% strain offset line's crossing of the curve

   ☐ 50% of ultimate

9. Martensite is best described as:

   ☐ a type of grain boundary

   ☐ a hard supersaturated phase that must be tempered before service

   ☐ a fine precipitate in aluminium

10. A laminate datasheet should quote modulus as:

    ☐ only E1, the fibre direction

    ☐ a single average of E1 and E2

    ☐ one value per direction, because E1 and E2 differ 19-fold

    ☐ only E2, the safe choice

1. **0.6802**

   pi*sqrt(3)/8.

2. **191.0 MPa**

   F over pi $d^2/4$.

3. **0.76 wt%**

   The classic constant.

4. **139.2 GPa**

   Vf Ef + Vm Em.

5. **620 MPa**

   The menu line.

6. **survives with 8.6% margin**

   (175-160)/175.

7. **the geometric fraction of the cell filled by atoms as hard spheres**

   Geometry only - mass still decides density.

8. **the 0.2% strain offset line's crossing of the curve**

   The offset construction, always stated.

9. **a hard supersaturated phase that must be tempered before service**

   Hard and brittle as quenched.

10. **one value per direction, because E1 and E2 differ 19-fold**

    Anisotropy is the material.