

### Examination questions for the course in “Materials engineering”

Operational level			
Materials engineering			
Questions			
O/T – specifies the nature of the question (obligatory, time demanding)			
No.	O/T	Question	Correct answer
1.	O	<p>An increase in the temperature in a metal conductor:</p> <ul style="list-style-type: none"> <li>A. leads to an increased mobility of electrons,</li> <li>B. leads to a decreased mobility of electrons,</li> <li>C. does not affect the mobility of energy carriers,</li> <li>D. leads to an increase in the quantity of electrons.</li> </ul>	<div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; text-align: center; margin: 0 auto;">B</div> <div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div>
2.	O	<p>Metal conductivity depends mainly on:</p> <ul style="list-style-type: none"> <li>A. the number of free electrons,</li> <li>B. the number of free electrons for which there is a sufficient number of free energy states in a higher conduction band,</li> <li>C. the number of forbidden energy states,</li> <li>D. the number of free electrons in a lower conduction band.</li> </ul>	<div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; text-align: center; margin: 0 auto;">B</div> <div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div>
3.	O	<p>Which sentence describes the properties of a semiconductor:</p> <ul style="list-style-type: none"> <li>A. a material with a conduction band and a baseband (valence band),</li> <li>B. a material with a conduction band, a baseband, and a forbidden band separating the two previous bands, where an electron may not be present permanently. The forbidden band is broad enough that it is impossible for an electron to ‘jump’ from the baseband to the conduction band,</li> <li>C. a material with a conduction band, a baseband, and a forbidden band separating the two previous bands. The forbidden band is narrow enough that it is possible for an electron to ‘jump’ from the baseband to the conduction band,</li> <li>D. electric current conduction in such materials occurs thanks to the movement of free electric charges along the polymer chain.</li> </ul>	<div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; text-align: center; margin: 0 auto;">C</div> <div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div>

4.	O	<p>The unit of conductivity is:</p> <p>A. <math>S/m^2</math>,  B. <math>\Omega/m</math>,  C. <math>S/m</math>,  D. S.</p>	<div> <div></div> <div></div> <div>C</div> <div></div> </div>
5.	O	<p>The unit of resistivity is:</p> <p>A. <math>\Omega/m^2</math>,  B. <math>\Omega \cdot m</math>,  C. <math>1/\Omega</math>,  D. <math>1/(\Omega \cdot m)^2</math>.</p>	<div> <div></div> <div>B</div> <div></div> <div></div> </div>
6.	O	<p>Shipboard electrical systems should be manufactured with the use of the following conductive materials:</p> <p>A. aluminium,  B. iron (electrical steel),  C. copper,  D. tungsten.</p>	<div> <div></div> <div></div> <div>C</div> <div></div> </div>
7.	O	<p>Which of the following materials offers the highest conductivity?</p> <p>A. silver,  B. aluminium,  C. gold,  D. copper.</p>	<div> <div>A</div> <div></div> <div></div> <div></div> </div>
8.	O	<p>What materials are used most often in manufacturing sliding contacts:</p> <p>A. bronze-graphite composites,  B. gold, silver,  C. silver-copper, silver-nickel,  D. platinum, tungsten.</p>	<div> <div>A</div> <div></div> <div></div> <div></div> </div>

9.	O	<p>Cathodic protection involves:</p> <ul style="list-style-type: none"> <li>A. taking measures to make the protected metal become an anode, and the cathodic area is outside the reach of the protected elements,</li> <li>B. taking measures to make the protected metal become an cathode, and the anodic area is outside the reach of the protected elements,</li> <li>C. taking measures to make the protected metal become a cathode,</li> <li>D. taking measures to make the anode area remain outside the reach of the protected elements.</li> </ul>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto; position: relative;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%);">B</div> </div>
10.	O	<p>Special conductive materials are:</p> <ul style="list-style-type: none"> <li>A. materials which measurement, adjustment, and heating resistors are made of,</li> <li>B. materials resistant to contact arcing,</li> <li>C. materials resistant to corrosion induced by acids, bases, resistant to low temperature levels,</li> <li>D. materials of significant mechanical durability.</li> </ul>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto; position: relative;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%);">C</div> </div>
11.	O	<p>In which of the following metals the phenomenon of temperature superconductivity does not occur?</p> <ul style="list-style-type: none"> <li>A. aluminium,</li> <li>B. gold,</li> <li>C. tin,</li> <li>D. ind.</li> </ul>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto; position: relative;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%);">B</div> </div>
12.	O	<p>Which of the following materials is not a semiconductive material?</p> <ul style="list-style-type: none"> <li>A. silicon,</li> <li>B. selenium,</li> <li>C. germanium,</li> <li>D. platinum.</li> </ul>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto; position: relative;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%);">D</div> </div>
13.	O	<p>Application of a varistor protects an electrical circuit against:</p> <ul style="list-style-type: none"> <li>A. overloads,</li> <li>B. surges,</li> <li>C. short circuits,</li> <li>D. wire temperature rise.</li> </ul>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto; position: relative;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%);">B</div> </div>

14.	O	<p>The SI unit for (absolute) permittivity is:</p> <p>A. C·m, B. C/m, C. F/m, D. F/m<sup>2</sup>.</p>	<div> <div></div> <div></div> <div>C</div> <div></div> </div>
15.	O	<p>In the case of F class (heat resistance class) insulation, the permitted continuous operating temperature is:</p> <p>A. 120 °C, B. 130 °C, C. 155 °C, D. 180 °C.</p>	<div> <div></div> <div></div> <div>C</div> <div></div> </div>
16.	O	<p>The simplest method of cathodic protection of ship hulls is:</p> <p>A. one based on the use of a sacrificial anode, B. one based on an external power source, C. one based on simple drainage, D. one based on polarized drainage.</p>	<div> <div>A</div> <div></div> <div></div> <div></div> </div>
17.	O	<p>Synthetic gas electrical insulation materials include:</p> <p>A. helium, B. hydrogen, C. air, D. sulphur hexafluoride.</p>	<div> <div></div> <div></div> <div></div> <div>D</div> </div>
18.	O	<p>Sulphur hexafluoride in operated medium- and high-voltage equipment is a substance:</p> <p>A. that is harmless to human health, B. that is safe to use, C. that is potentially dangerous to human health, D. that is harmless to the natural environment.</p>	<div> <div></div> <div></div> <div>C</div> <div></div> </div>

19.	O	<p>The highest permitted level of temperature of insulating oil in contact with oxygen in conditions of continuous operation should not exceed:</p> <p>A. 70 °C, B. 85 °C, C. 95 °C, D. 110 °C.</p>	<div></div> <div></div> <div>C</div> <div></div>
20.	O	<p>What type of dielectrics is the notion of surface resistivity applied to?</p> <p>A. solid dielectrics, B. synthetic liquid synthetics, C. mineral liquid synthetics, D. gaseous dielectrics.</p>	<div>A</div> <div></div> <div></div> <div></div>
21.	O	<p>Which of the following solid dielectrics has the lowest relative permittivity?</p> <p>A. rubber, B. dry paper, C. mica, D. amber.</p>	<div></div> <div>B</div> <div></div> <div></div>
22.	O	<p>Which of the following does not describe the qualities of organic dielectrics?</p> <p>A. low thermal resistance, B. large number of atoms forming a particle, C. non-combustibility, D. low boiling and melting temperature.</p>	<div></div> <div></div> <div>C</div> <div></div>
23.	O	<p>A dielectric's ability to resist the formation of permanently or temporarily conductive bridges, chemical decomposition, or mechanical damage (e.g. cracking) refers to:</p> <p>A. volume resistivity, B. electrical strength, C. resistance to tracking, D. resistance to electric arc.</p>	<div></div> <div></div> <div></div> <div>D</div>

24.	O	<p>A phenomenon involving induction occurring in a body found inside an external magnetic field of the opposite field, reducing the effect of the external field, refers to:</p> <p>A. paramagnetism,  B. diamagnetism,  C. ferromagnetism,  D. antiferromagnetism.</p>	<div> <div></div> <div>B</div> <div></div> <div></div> </div>
25.	O	<p>A paramagnetic material is:</p> <p>A. strongly repelled by a magnet,  B. strongly attracted by a magnet,  C. neutral to the effect of a magnet,  D. poorly attracted by a magnet,</p>	<div> <div></div> <div></div> <div></div> <div>D</div> </div>
26.	O	<p>Ferromagnetic materials do not include:</p> <p>A. iron,  B. copper,  C. cobalt,  D. nickel.</p>	<div> <div></div> <div>B</div> <div></div> <div></div> </div>
27.	O	<p>Which point does not describe a magnetically soft material intended for electro-technical application?</p> <p>A. low loss,  B. high saturation induction,  C. high magnetic permeability,  D. low resistivity.</p>	<div> <div></div> <div></div> <div></div> <div>D</div> </div>

28.	O	<p>Addition of silicon in electrical steel sheets:</p> <p>A. increases resistivity,  B. decreases resistivity,  C. decreases brittleness,  D. decreases the value of circulating currents.</p>	<div style="border: 1px solid black; padding: 2px; text-align: center;">A</div> <div style="border: 1px solid black; height: 15px; margin: 2px;"></div> <div style="border: 1px solid black; height: 15px; margin: 2px;"></div> <div style="border: 1px solid black; height: 15px; margin: 2px;"></div>
29.	O	<p>The Curie temperature is the temperature above which:</p> <p>A. a diamagnetic loses its magnetic properties rapidly and becomes a paramagnetic,  B. a ferromagnetic loses its magnetic properties rapidly and becomes a paramagnetic,  C. a ferromagnetic loses its magnetic properties rapidly and becomes a diamagnetic,  D. a paramagnetic loses its magnetic properties rapidly and becomes a diamagnetic.</p>	<div style="border: 1px solid black; height: 15px; margin: 2px;"></div> <div style="border: 1px solid black; padding: 2px; text-align: center;">B</div> <div style="border: 1px solid black; height: 15px; margin: 2px;"></div> <div style="border: 1px solid black; height: 15px; margin: 2px;"></div>
30.		<p>The resistivity of amorphous transformer sheets is of the range of:</p> <p>A. <math>130 \cdot 10^{-8} \Omega \cdot m</math>,  B. <math>48 \cdot 10^{-8} \Omega \cdot m</math>,  C. <math>11 \cdot 10^{-8} \Omega \cdot m</math>,  D. <math>5 \cdot 10^{-8} \Omega \cdot m</math>.</p>	<div style="border: 1px solid black; padding: 2px; text-align: center;">A</div> <div style="border: 1px solid black; height: 15px; margin: 2px;"></div> <div style="border: 1px solid black; height: 15px; margin: 2px;"></div> <div style="border: 1px solid black; height: 15px; margin: 2px;"></div>