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**\*\*\* EXAMINATION \*\*\***

**MAPPING MECHANICAL PROPERTIES ON THE NANOSCALE  
WITH ATOMIC FORCE ACOUSTIC MICROSCOPY**

1. **The atomic-force microscope present an attractive**
  - a) option for characterizing mechanical properties
  - b) option for characterizing chemical properties
  - c) option for characterizing electrical properties
  - d) option for characterizing methodical properties
  
2. **A microscope that measures surface topography with atomic**
  - a) spatial resolution is the scanning electron microscope
  - b) spatial resolution is the optical microscope
  - c) spatial resolution is the atomic-force microscope
  - d) spatial resolution is the scanning probe microscope
  
3. **Amplitude imaging investigates the nanoscale elastic**
  - a) properties of piezoelectric ceramics
  - b) properties of carbon-fiber-reinforced polymers
  - c) properties of dislocations in graphite
  - d) All of the above
  
4. **Correct interpretation of amplitude images is difficult**
  - a) for mechanical systems with several components
  - b) for mechanical systems with single component
  - c) for material systems with single components
  - d) for material systems with several components
  
5. **A digital signal processor facilitates future upgrades**
  - a) because changes in hardware instead of software
  - b) because changes in software instead of hardware
  - c) because changes both in hardware and software
  - d) because no changes on both hardware and software
  
6. **The control voltage is also sent to the AFM through**
  - a) an auxiliary image channel
  - b) an auxiliary audio channel
  - c) a magnetic force channel
  - d) a coaxial cable channel

7. **To increase measurement accuracy, it is important to**
  - a) control surface topography
  - b) control the wearing silicon tip
  - c) control actual tip sample contact mechanics
  - d) All of the above
8. **In order to be widely used, future nanodevices will require**
  - a) nano-mechanical measurement that is accurate
  - b) nano-mechanical parameter that is predictive
  - c) nano-mechanical temperature that is accurate
  - d) nano-mechanical material that is inaccurate
9. **A beam that is supported on only one end is**
  - a) a vertical beam
  - b) a cantilever
  - c) a horizontal beam
  - d) a laser beam
10. **A non-destructive method used in research laboratories is**
  - a) the atomic force acoustic microscopy
  - b) the surface acoustic wave spectroscopy
  - c) the scanning probe microscopy techniques
  - d) the transmission electron microscopy techniques
11. **The contact-resonance spectroscopy methods may be used for**
  - a) two dimensional imaging of near-surface mechanical properties
  - b) three dimensional imaging of near-surface mechanical properties
  - c) two dimensional imaging of near-surface chemical properties
  - d) three dimensional imaging of near-surface chemical properties
12. **The electric current produced by ceramics materials subjected**
  - a) to mechanical pressure is the electro-ceramics
  - b) to mechanical pressure is the crystalline electric
  - c) to mechanical pressure is the piezoelectric ceramics
  - d) to mechanical pressure is the magneto-electric current
13. **The emerging tools for materials characterization includes**
  - a) maps of frequency
  - b) contact stiffness
  - c) modulus
  - d) All of the above
14. **The apparatus used to experiment AFAM concepts include**
  - a) a compressor
  - b) an audio amplifier
  - c) a piezoelectric transducer
  - d) a Rockwell machine

15. **The frequency tracking apparatus is composed of**
- a) a photodiode detector
  - b) an A/D or D/A converter
  - c) a piezoelectric transducer
  - d) All of the above
16. **The film materials used for experiments is composed of**
- a) titanium
  - b) niobium
  - c) helium
  - d) silver
17. **The film thickness for which the substrate depends**
- a) on elastic properties of both the tip and sample
  - b) on chemical properties of both the tip and sample
  - c) on electrical properties of both the tip and sample
  - d) on mechanical properties of both the tip and sample
18. **Electron-backscatter-diffraction analysis indicate that the**
- a) crystalline structure of nanobelts is hexagonal
  - b) crystalline structure of nanobelts is diagonal
  - c) crystalline structure of nanobelts is tetragonal
  - d) crystalline structure of nanobelts is octagonal
19. **Quasi one-dimensional structures that shows promise for new**
- a) nanoscale devices includes nanobelts
  - b) nanoscale devices includes nanowires
  - c) nanoscale devices includes nanotubes
  - d) All of the above
20. **Substrate near the specific nanobelts is marked using the**
- a) optical microscopy technique to stay reliably identified
  - b) ion-milling techniques to stay reliably identified
  - c) confocal microscopy techniques to stay reliably identified
  - d) isometric technique to stay reliably identified

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