

# MagLev Written Test

## BISOT

***Do not open booklet until instructed to do so.***

*Place your answers and do scratch work on the Answer Sheet*

For each question choose the best possible answer.

1. The temperature above which a magnet loses its magnetic properties is called the...  
A. Critical temperature. B. Curie point. C. Debye temperature. D. Power point.
2. Magnetic field intensity CANNOT be measured in...  
A. Gauss. B. Maxwells. C. Tesla. D.  $\text{Wb/m}^2$
3. A magnet will NOT stick to... (Well, not without glue, anyway!)  
A. Cobalt B. Copper C. Iron D. Nickel
4. Approximately 41,000 year ago, the Earth's magnetic field reversed and quickly "re-reversed" over a period of less than 1,000 years. This period is called the:  
A. Ragnoor Period B. Heier millenium  
C. Cyclic period D. Laschamp period
5. Traffic lights at busy intersections sense when cars are sitting over...  
A. commutators. B. switching hubs. C. reed switches. D. induction loops.
6. The first commercial MAGLEV system operated in...  
A. China. B. Japan C. Germany D. United States
7. Which choice best explains how a MAGLEV train is propelled forward?  
A. small propeller located beneath the track push the trains.  
B. banks of electrically driven wheels project the train forward at regular intervals.  
C. the electromagnets on the train is powered with alternating current.  
D. just like regular trains, electric motors.
8. Extremely weak magnetic fields can be detected by...  
A. CLAMS B. SQUID C. MUSSELS D. OCTOPI
9. What happens if a magnetic field exists in a superconductive material when it is brought below its "Critical Temperature" ( $T_c$ )? (This is known as the 'Meisner Effect')  
A. A black hole forms!  
B. The magnetic field remains in the superconductor even when the external field is switched off.  
C. The magnetic field is immediately expelled from the superconductor when  $T_c$  is reached.  
D. The polarity of the magnetic field immediately reverses when  $T_c$  is reached.
10. Which best describes why the Earth's outer core generates a magnetic field.  
A. Coriolis effect B. Dynamo effect C. Hall effect D. Maxwell effect

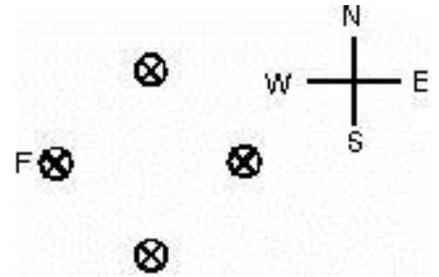
11. A beam of positively charged particles is moving horizontally toward you. As it approaches, it passes through a magnetic field directed downward. This magnetic field deflects the beam...
- A. Down                      B. Up                      C. To your Left                      D. To your Right
12. A grape can be levitated in a strong magnetic field. This effect is an illustration of...
- A. Ferromagnetism                      B. Diamagnetism                      C. Paramagnetism                      D. Paranormalism
13. In headline news recently, researchers at IBM demonstrated the ability of a small cluster of 12 iron atoms to retain a magnetic field. This atomic level magnetic storage device is a demonstration of...
- A. Anti-disestablishmentarianism                      B. Ferromagnetism  
C. Anti-Ferromagnetism                      D. Diamagnetism
14. The investigator associated with discovering the equations that form the basis of modern electromagnetic theory (and bad poetry)...
- A. Michael Faraday                      B. James Clerk Maxwell  
C. Hans Christian Ørsted                      D. Nikola Tesla
15. The scientist who is associated with the discovery and investigation of how currents cause magnetic forces...
- A. Edwin Herbert Hall                      B. André-Marie Ampère  
C. Hans Christian Ørsted                      D. Nikola Tesla
16. The person associated with realizing that there was a connection between electricity and magnetism...
- A. Nikola Tesla                      B. Michael Faraday  
C. Hans Christian Ørsted                      D. André-Marie Ampère
17. The physicist credited with discovering that when a current flows through a material simultaneously with a magnetic field, a voltage develops across that same material... (hint: this is the basis for many common, low cost, magnetic field detectors in use today named for the discoverer)
- A. Michael Faraday                      B. Heinrich Barkhausen  
C. Edwin Herbert Hall                      D. Louis Néel
18. The self-taught investigator who was famous for his amazing lectures and demonstrations as well as discovering the induction motor (the forerunner of the electric motor)...
- A. Nikola Tesla                      B. Heinrich Barkhausen  
C. Hans Christian Ørsted                      D. Michael Faraday
19. Who is credited with explaining the polarity of the current in a loop of wire induced by a changing magnetic flux?
- A. Andre Ampere                      B. Heinrich Lenz  
C. Nikola Tesla                      D. Albert Michelson

20. A loop of wire is placed flat on the floor. A magnetic field directed out of the floor is present throughout. As the radius of the wire loop increases, what direction does the induced conventional current flow (as viewed from above)?

- A. Clockwise      B. Counterclockwise      C. No current is induced

21. Four long straight wires carry equal currents into the page as shown. The magnetic force exerted on wire F is:

- A. North      B. South      C. East      D. West      E. Zero



22. Helmholtz coils are commonly used in the laboratory because the magnetic field between them:

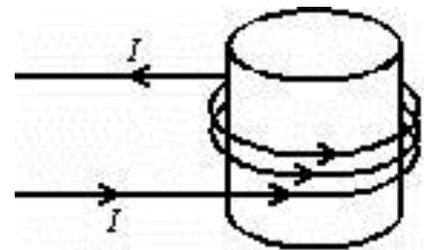
- A. can be varied more easily than the fields of other current arrangements  
 B. is especially strong  
 C. is nearly uniform  
 D. is parallel to the plane of the coils  
 E. nearly cancels the Earth's magnetic field

23. The magnetic field  $B$  inside a long ideal solenoid is independent of:

- A. the current  
 B. the cross-sectional area  
 C. the direction of the current  
 D. the spacing of the windings  
 E. the core material

24. Magnetic field lines inside the electromagnet shown are:

- A. counterclockwise circles as viewed from above  
 B. in no direction since  $B = 0$   
 C. toward the bottom of the page  
 D. toward the top of the page  
 E. clockwise circles as viewed from above



25. Solenoid 2 has twice the radius and six times the number of turns per unit length as solenoid 1. The ratio of the magnetic field in the interior of 2 to that in the interior of 1 is:

- A. 4      B. 1/3      C. 1      D. 6      E. 2