



NATIONAL Science Bee

National Science Bee – 2021-22 B Set Qualifying Exam

Name _____

School _____

Grade _____

Email address _____

Instructions - Circle the correct answer or leave it blank. Correct answers are worth 2 points. Incorrect answers are worth -1 point. Questions left blank are worth 0 points.

- Identify the geometry of the complex ion if the hybridization is dsp^2 .
 - square planar
 - octahedral
 - tetrahedral
 - linear
- The general formula for _____ is C_nH_{2n} .
 - alkanes
 - alkynes
 - aromatic compounds
 - alkenes
- When determining the most dominant drag force on a moving object, scientists use which of the following?
 - Viscosity
 - Inertial forces
 - Reynold's Number
 - Granville's Index
- The electrode where oxidation takes place is called the:
 - anode
 - cathode
 - cell
 - dry cell
- An early example of forensic science involves fraud by a dishonest goldsmith in ancient Greece, who was suspected of substituting silver for some of the gold in a crown. What naturally occurring compound did Archimedes use to solve the mystery scientifically, without melting down a sacred object of art?
 - salt
 - vinegar
 - hydrochloric acid
 - water
- What spectroscopic evidence can indicate what a nova explosion is like?
 - Red shifted spectral lines
 - Horizontal, thinning spectra
 - Blue-shifted spectral lines
 - Pulsing microwave radiation
- Which of the following terms would you more likely come across while studying trigonometry?
 - Binary
 - Dollars
 - Sine
 - Skew Lines
- An early development in computing was the introduction of which of the following by Herman Hollerith and James Power in the late twentieth century?
 - Ticker Tape
 - Punched Cards
 - Confetti
 - Papier mache
- Everyone's vision is compromised underwater, but some individuals can see better than others. Which of the following individuals would have the clearest underwater vision?
 - a person with vision that requires no correction
 - a person with myopia
 - a person with hyperopia
 - a person with presbyopia
- What factors affect the frequency of a pendulum?
 - Length and gravity
 - Mass and gravity
 - Length and mass
 - Amplitude and period

11. The early calendar of the Romans was a lunar calendar that contained 304 days. Which month began the year on this early calendar?
- Januarius
 - Februarius
 - Junius
 - Martius
12. Which scientist first noted the pattern detected by a radio telescope that led to the discovery of pulsars?
- Jocelyn Bell
 - Walter Baade
 - Fritz Zwicky
 - Annie Jump Cannon
13. A high wire walker often carries a long pole. What does this do for the walker?
- Increases weight, making it easier to balance
 - Decreases moment of inertia and decreases angular acceleration
 - Increases frictional forces between their feet and the cable
 - Increases moment of inertia, decreasing angular acceleration
14. How do bacterial cells divide and reproduce?
- Meiosis II
 - Meiosis I
 - Binary fission
 - Binary fusion
15. Venus has a larger greenhouse effect than Earth. Earth's atmosphere is 0.04% CO₂. What percentage of the atmosphere of Venus is CO₂?
- 1.00%
 - 5.00%
 - 53%
 - 96%
16. The first mathematician to make an accurate measurement of the circumference of the earth worked during the Hellenistic period in what modern-day country?
- Spain
 - Egypt
 - Israel
 - Jordan
17. Which polymer is a condensation polymer?
- PET
 - nylon-6,6
 - orlon
 - teflon
18. Hypatia of Alexandria was the first woman to make a recorded contribution to mathematics. When was she born?
- 470 BC
 - 50 BC
 - 370 AD
 - 1370 AD
19. Which of the following substances can be remolded without changing the chemical makeup?
- bakelite
 - glycine
 - polyethylene
 - propanoic acid
20. What is the direct transfer of genetic material between two bacterial cells that are temporarily joined?
- Transduction
 - Conjugation
 - Transformation
 - Recombination
21. Retroviruses are equipped with which enzyme, that allows them to transcribe DNA from an RNA template?
- Ligase
 - DNA Polymerase
 - Reverse Transcriptase
 - Primase
22. A ball bounced against the ground has greater kinetic energy just before the bounce than just after. In what form does this lost energy end up?
- Elastic potential energy
 - Gravitational potential energy
 - Thermal energy
 - Rotational kinetic energy
23. Scientists use various environmental indicators to gauge the health of an ecosystem. Which of these is NOT considered a key global indicator?
- Biological diversity
 - Average global surface temperature and carbon dioxide concentration
 - Food Production
 - Resource Acquisition
24. The number of atoms in a container is increased by a factor of 2 while temperature is constant. The pressure
- Decreases by a factor of 2
 - Increases by a factor of 2
 - Stays the same
 - Increases by a factor of 4

25. When children learn to count, what set of numbers are they learning for the first time?
- Rational numbers
 - Natural numbers
 - Transcendental numbers
 - Eponymous numbers
26. Which of the following cannot be the structure of the genes of a virus?
- Single stranded DNA
 - Double stranded DNA
 - Double stranded RNA
 - A strand composed of both RNA & DNA
27. What type of molecule is the capsid surrounding the virus made of?
- DNA
 - Cellulose
 - RNA
 - Protein
28. Iron based rocks mixed in with granite that accumulate along subduction zones wedged in between granite are called
- Greenstone Belts
 - Granite Markers
 - Subduction accretion wedges
 - Cratonic Inserts
29. Passive Continental Margins are often the site of
- Volcanoes
 - Mountain building
 - Formation of igneous rock
 - Thick sedimentary debris fields
30. An electron collides with an atom in its ground state. The atom then emits a photon of energy E_{photon} . In this process, the change in the electron's energy, E_{elec} , is
- Greater than E_{photon}
 - Less than E_{photon}
 - Greater than or equal to E_{photon}
 - Less than or equal to E_{photon}
31. _____ covalent bonds are formed in compounds in which the difference in electronegativity is high.
- polar
 - ionic
 - nonpolar
 - metallic
32. Whose formula for triangles says that the square of the hypotenuse is equal to the sum of the squares of the other two sides?
- Plato
 - Pythagoras
 - Hypotenuse
 - Triangulas
33. The Romans used the abacus for counting purposes. What were the beads running along the wires of an abacus called?
- Ferculi
 - Additae
 - Computae
 - Calculi
34. During what type of reaction is ATP broken down to form ADP?
- endothermic
 - condensation
 - exothermic
 - fermentation
35. Which of the following is not a tectonic plate?
- Pacific Plate
 - African Plate
 - Atlantic Plate
 - Arabian Plate
36. A balloon is at a height of 5.0 km and is descending at a constant rate. The buoyancy force is directed _____; the drag force is directed _____.
- Up, up
 - Down, down
 - Down, up
 - Up, down
37. Rene Descartes studied analytic geometry during which of the following centuries?
- 1600s
 - 1700s
 - 1800s
 - 1900s
38. What was the first virus ever discovered?
- Epstein-Barr Virus
 - HIV
 - Tobacco mosaic virus
 - Rhinovirus

39. To find the distance to a galaxy, astronomers must search among stars and nebulae for familiar objects whose luminosity and diameter they know. These objects are called
- Spatial indicators
 - Standard Candles
 - Distance Scales
 - Luminosity Pathways
40. What is the reproductive cycle of a phage virus called in which the virus's DNA is combined with the host cell's DNA to form a prophage?
- Lysogenic cycle
 - Meiosis I
 - Lytic cycle
 - Mitosis
41. A voltaic cell converts _____ energy to _____ energy.
- kinetic, potential
 - potential, kinetic
 - electrical, chemical
 - chemical, chemical
42. Why are boron or cadmium rods used in a nuclear fission reactor?
- to absorb the neutrons produced
 - to absorb the alpha emissions
 - to protect people from radiation
 - to provide chemical combustion
43. Which of the following is true of a set of parallel lines?
- they cross only once
 - they never meet
 - they are never the same distance apart
 - they eventually touch
44. Identify the type of reaction by which ethyl chloride is converted to ethene and hydrogen chloride.
- addition
 - elimination
 - oxidation
 - substitution
45. What is the major component of the bacterial genome?
- One double stranded, linear DNA molecule
 - One double stranded, circular DNA molecule
 - One single stranded, circular RNA molecule
 - None of the above
46. What process of the water cycle does deforestation interfere with?
- Interception and infiltration
 - Evaporation
 - Cloud Formation
 - Precipitation
47. Increasing global temperatures cause ocean temperatures to rise. This in turn causes more sea ice to melt exposing more ocean to sunlight which increases the ocean temperature more. This causes even more sea ice to melt, which exposes more water to the sun, which increases ocean temperature, causing more sea ice melting etc. This is an example of a
- Positive Feedback Loop
 - Negative Feedback Loop
 - Neutral Feedback Loop
 - Steady State
48. Who was the world renowned French mathematician who devised what is thought to be the first digital computer in 1642?
- Rene Descartes
 - Isaac Newton
 - Blaise Pascal
 - John Napier
49. What are the tiny molecules of naked circular RNA that infect plants called?
- Tobacco mosaic virus
 - Prions
 - Viroids
 - RNA viruses
50. Radioactive decay of ^{81}Rb involves _____, resulting in the formation of ^{81}Kr and the emission of an X-ray photon.
- beta decay
 - electron capture
 - gamma emission
 - positron emission