



**Geological Society of India**  
**NATIONAL / INTERNATIONAL EARTH SCIENCE**  
**OLYMPIAD – Entrance Test**



Date: January 22, 2017; Time: 10.30 pm to 12.00 pm

**INSTRUCTIONS**

1. You have to be present in the examination hall well before the commencement of the test.
2. You will not be permitted to enter the examination hall 20 minutes after the commencement of the test.
3. You will not be permitted to leave the examination hall until after 30 minutes of commencement of the test.
4. If you have any paper/chit with you, surrender them to the invigilator.
5. All are multiple-choice questions.
6. Please use a BLACK/BLUE ball point pen to mark your answers. DO NOT use pencil.
7. This sheet should not be folded or crushed
8. Choose the MOST appropriate answer.
9. Darken the circle corresponding to the answer of your choice.
10. Do not use stray marks on the sheet. See the given example below.

Question	Answer			
The shape of the Earth is	A	B	C	D
(A) Spherical      (B) Spheroidal (C) Ovoid          (D) Ellipsoidal	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. Marks will not be awarded if more than one answer is chosen.
12. Your answer must be given only in the answer sheet (overleaf) and handover the answer sheet to the invigilator
13. Please enter your Registration No. and affix your signature on the answer sheet before starting to answer the questions.
14. **The answer keys will be published in MoES Geological Society's**  
**Website: <http://www.geosocindia.org/index.php/ieso> on 24th January 2017**
15. Any complaints about the questions/correction to be sorted out before 25<sup>th</sup> January 2017

*Dear Student,*

*We appreciate your interest in the International Earth Science Olympiad. Please spend a minute to let us know how you learnt about the IESO-Entrance Test (can choose more than one option).*

- ☐ *From my school / college*
- ☐ *IESO Poster*
- ☐ *From a friend*
- ☐ *From MoES / Geological Society's*
- ☐ *Web site From other source, specify*

*Please send your comments on the question paper within a week by email ([hachyuthan@yahoo.com](mailto:hachyuthan@yahoo.com)) with copy endorsed to [gsocind@gmail.com](mailto:gsocind@gmail.com), or by regular mail to: Prof. Hema Achyuthan, Department of Geology, Anna University, Chennai-600025.*



# INTERNATIONAL EARTH SCIENCE OLYMPIAD – Entrance Test

Date: 22 January, 2017, Sunday, Time: 10.30 am to 12.00 noon



Name of the Student: \_\_\_\_\_ Reg. No. \_\_\_\_\_

School Name & address: \_\_\_\_\_

Contact No: \_\_\_\_\_

Name of the Test Centre: \_\_\_\_\_

Students Signature \_\_\_\_\_ Invigilator's name and Signature \_\_\_\_\_

Q.No.	A	B	C	D	Q.No.	A	B	C	D	Q.No.	A	B	C	D	Q.No.	A	B	C	D
1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	26	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	51	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	76	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	27	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	52	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	77	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	29	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	54	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	79	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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23	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	48	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	73	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	98	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	49	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	74	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	99	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	50	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	75	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	100	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Signature & seal:  
Head, Centre co-ordinator.



# Geological Society of India

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**Total Marks 100: No Negative markings**



1. Rift basin is formed by which of the following crustal processes
  - a. Compression
  - b. Extension
  - c. Both a & b
  - d. Thrust
2. Slicked sides are a type of
  - a. Foliation
  - b. Bedding
  - c. Lineation
  - d. Fault plane.
3. Repetition of beds on a geological map may be due to
  - a. Folding
  - b. Erosion
  - c. Unconformity
  - d. (a and b) both
4. Which of the following is associated with fluvial system
  - a. Mud crack
  - b. Ripple marks
  - c. Sand dunes
  - d. Hammada
5. Which show highest strain level value among all the Himalayan thrusts
  - a. Main Boundary Thrust
  - b. Main Central Thrust
  - c. Main Frontal Thrust
  - d. Panjal Thrust
6. Primary foliation forms
  - a. During crystallisation of magma
  - b. After crystallisation of a magma
  - c. During folding
  - d. During jointing
7. If you are flying a plane and you look down at the landscape, you are seeing a ..... view of the earth
  - a. Map
  - b. Cross-sectional
  - c. Lateral
  - d. Horizontal

8. Which of the following tectonic forces tend to push the objects in such a way so that they slide past one another
- Tensional
  - Compressive
  - Shearing
  - Extension
9. At convergent plate boundaries one would expect to find
- Folds
  - Faults
  - Folds and faults
  - Neither folds nor faults
10. Upfolds or arches of layered rocks are called
- Antiforms
  - Faults
  - Synforms
  - Unconformities
11. Chemical weathering of rocks will produce
- Granite
  - Limestone
  - Bauxite
  - Sandstone
12. Most appropriate example of Geomagnetic reversal is imprinted on the
- Rift basins
  - Orogenic belts
  - MORs
  - Trenches
13. In case of a structural basin, dips are
- Centripetal
  - Centrifugal
  - Vertical
  - Horizontal
14. The ability of a rock to transmit water is known as
- Infiltration
  - Percolation
  - Porosity
  - Permeability
15. Cooling joints are ..... in cross-section
- Hexagonal
  - Circular
  - Rectangular
  - Pentagonal

16. Which of the following process is not associated with diagenesis
- Albitization
  - Burial
  - Cementation
  - Recrystallization
17. Isoclinal folds have an interlimb angle of
- $80-90^{\circ}$
  - $50-60^{\circ}$
  - $0-10^{\circ}$
  - $0-40^{\circ}$
18. Continental drift theory was given by
- Harry Hess
  - A. Wagner
  - Vine and Mathews
  - W. Condie
19. Meandering of rivers takes place in the
- Young stage
  - Mature stage
  - Old stage
  - Both (a and b)
20. The planet Mercury is nearest to the sun, its revolution period is.
- 66 days
  - 77 days
  - 88 days
  - 99 days
21. Arrange the following in increasing order of grain size
- Sand b. Boulder c. Pebble d. Silt
  - a,c,d,b
  - b,c,a,d
  - d,a,c,b
  - d,a,b,c
22. Which of the following sedimentary structure can be used as Plaeocurrent direction indicator
- Rainprints
  - Mud cracks
  - Flute marks
  - Symmetric ripples
23. A right side up sedimentary sequence will have
- Coarse grains at the top
  - Mixed grain size throughout the sequence
  - Finest at the top
  - Fossils at the top

24. Symmetric folds with straight limbs and sharp hinges are called
- Kink folds
  - Chevron folds
  - Ptygmatic folds
  - Recumbent folds
25. Lithospheric plates are composed of
- Crust
  - Mantle
  - Crust and Mantle both
  - Crust mantle and core
26. During evaporation, ocean
- gets fresher
  - gets saltier
  - salt concentration does not change
  - salt concentration doubles
27. Deep ocean circulation is driven by:
- Winds
  - temperature and salinity
  - Coriolis force
  - Gravitational force
28. Density of mean ocean water
- is maximum at 8°C
  - is maximum at 4°C
  - is minimum at 4°C
  - does not show an anomalous behavior
29. Which of the following colors penetrate deepest in the open ocean
- Red
  - Green
  - Blue
  - Yellow
30. Oxygen concentration at the intermediate ocean (between 200-500 m) is lower in the Pacific than that in the Atlantic, because
- Pacific water is older than Atlantic
  - Pacific water is newer than Atlantic
  - Pacific is productive than Atlantic
  - Deep water of the Pacific is warm
31. Which of the followings is not a stable isotope:
- $^{12}\text{C}$
  - $^{13}\text{C}$
  - $^{14}\text{C}$
  - $^{15}\text{N}$

32. Smaller phytoplankton has advantage over bigger phytoplankton in oligotrophic (less nutrient) waters, because:
- a. Surface area of smaller phytoplankton is less than the bigger phytoplankton
  - b. volume of smaller phytoplankton is less than the bigger phytoplankton phytoplankton
  - c. surface area: volume ratio of smaller phytoplankton is less than the bigger phytoplankton
  - d. surface area: volume ratio of smaller phytoplankton is more than the bigger phytoplankton
33. Pressure at 750 m ocean depth is
- a. 750 bar
  - b. 750 mbar
  - c. 76 bar
  - d. 75 bar
34. Oceanic Mixed Layer Depth (MLD) increases when
- a. rainfall occurs
  - b. sea surface temperature increase
  - c. wind speed over the ocean increases
  - d. primary production increases
35. Approximately how much fraction of the surface organic matter production reaches to the sea floor:
- a. 50%
  - b. 25%
  - c. 10%
  - d. 1%
36. Pycnocline refers to
- a. vertical salinity gradient
  - b. vertical temperature gradient
  - c. vertical density gradient
  - d. vertical nutrient gradient
37. Coriolis force
- a. is applied on the objects only at the poles
  - b. zero at the equator
  - c. decreases with increasing speed
  - d. zero at the poles
38. Geostrophic flow conditions occur when
- a. Coriolis force is zero
  - b. Pressure gradient force is zero
  - c. Pressure gradient force is balanced by Coriolis force
  - d. Pressure gradient force and Coriolis force are in imbalance
39. The major atmospheric constituents that are homogeneously distributed in the lower atmosphere are
- a. N<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>O
  - b. N<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>
  - c. N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>
  - d. N<sub>2</sub>, O<sub>2</sub>, Ar

40. Highest mean annual temperatures is observed
- over the tropics during the summer in respective hemispheres
  - near the tropics over the oceans
  - at the equator over land
  - at the equator over oceans
41. Earth's biosphere is protected from cosmic ray bombardment from outer space because it has
- ozone layer in the atmosphere
  - greenhouse gases
  - thick atmosphere
  - magnetic field
42. During the glacial times, the average salinity of the ocean
- increased relative to the interglacial stage
  - decreased relative to the interglacial stage
  - did not change from that in the interglacial stage
  - initially decreased then increases
43. Inversion layer in the tropical ocean forms during
- summer when low salinity surface water is warmed.
  - summer when high salinity surface water is warmed.
  - winter when low salinity surface water is cooled.
  - winter when high salinity surface water is cooled
44. Off Spain in the Atlantic, a distinct water mass can be observed around 1000 m depth in a T-S (temperature-salinity) diagram. This water mass belongs to the
- Mediterranean water
  - Antarctic Intermediate water
  - Gulf Stream water
  - Baltic low salinity water
45. El Nino Southern Oscillation (ENSO) is an
- ocean process
  - atmospheric process
  - ocean-atmosphere process
  - ocean-atmosphere-land process
46. Earth is a dynamic planet because
- there is water on Earth
  - there is life on Earth
  - there is heat energy inside the Earth
  - the Earth rotates and revolves around the Sun
47. Mountain building process generally takes place at
- convergent plate boundary
  - divergent plate boundary
  - transform faults
  - interior of a plate



48. Earthquakes do not originate deeper than 700 km because
- material is liquid at that depth
  - there are no rocks at that depth
  - material is not brittle at that depth
  - because those earthquakes cannot be detected at the surface
49. Some volcanoes as in Indonesia are explosive in nature while some as in Hawaii are non-explosive, this is because
- the larger content of volatiles in the subduction zone related volcanoes makes them explosive
  - tropical region receives larger heat and humidity making the volcanoes present there explosive
  - volcanoes in Indonesia are situated within plate while that in Hawaii are at a plate boundary
  - Hawaiian non-explosive volcanoes are submerged below water while Indonesian volcanoes are above water level.
50. The demarcation of crust and mantle and mantle and core inside the Earth is generally done based on
- change in temperature
  - change in pressure
  - change in velocities of seismic waves
  - presence of exotic minerals
51. Consider the following statements about the Earth's magnetic field:
- It magnetizes the rocks when they are forming and rocks can preserve remnant magnetization for millions of years.
  - It reverses periodically and such polarity reversals of Earth's magnetic field have occurred several times during Earth's history.
  - It is much like a dipole magnetic field.
  - it is due to dense and permanently magnetised material at the center.
- Which of the above is/are **NOT true**?
- (a) iii      b. i and ii      c. iii and iv      d. iv
52. It is observed in the field that a limestone is intruded by a dolerite dyke. A volcanic flow overlies the limestone. Which of the following statements is more likely to be true?
- Limestone is chemically precipitated simultaneous to an underwater volcanic eruption that emplaced dolerite dyke and volcanic flow
  - Limestone is the oldest rock of the three while the volcanic flow is the youngest.
  - dolerite dyke and volcanic flow occurred simultaneously prior to the limestone deposition
  - Dolerite dyke is the youngest rock while the volcanic flow is the oldest.
53. Elevation of Earth's crust is bimodal on an average- continents being above sea-level and oceanic crust is below sea level. This is because:
- There are mountains on the continents, while there are no such high elevation regions on oceans
  - Oceanic crust is denser while the continental crust is lighter
  - oceanic crust has depressions caused by meteorite impacts during the early history of the Earth
  - oceans are formed by melting of continental glacial
54. The mantle convection is caused by
- Plate movements
  - rotation of the Earth
  - temperature and density difference
  - upwelling of pressurized liquid mantle

55. Magmatism takes place at divergent plate boundary because of
- Decompression of mantle below the diverging plates
  - percolation of sea-water into the mantle
  - frictional heat during divergence of plates
  - generation of mantle plume
56. Which of the following layers inside the Earth is dominantly liquid?
- Upper mantle
  - Lower mantle
  - Outer core
  - Inner core
57. The density of materials inside the Earth
- Increases with increase in depth
  - decreases with increase in depth
  - is maximum in mantle
  - remains unchanged with depth
58. A given mass weighs slightly different at pole and equator of the Earth. This is because of
- the combined effect of Earth's oblate shape and its rotation, gravity is slightly more at equator than at pole resulting in higher weight at equator
  - the combined effect of Earth's oblate shape and its rotation, gravity is slightly less at equator than at pole resulting in lower weight at equator
  - the presence of polar ice of lower density, gravity is less at pole resulting in lower weight at poles
  - the convergence of magnetic lines at poles, the weight is measured more at pole.
59. Which of the following minerals is not a silicate?
- Quartz
  - Corundum
  - Garnet
  - Feldspar
60. Cations such as  $Mg^{2+}$  and  $Fe^{2+}$  replace each other in certain minerals like olivine and pyroxene. It is possible because of
- change in chemical composition in the surrounding environment of these minerals
  - similar charge and size of these cations
  - these minerals lack a fixed crystal structure
  - larger abundance of these elements in these minerals
61. Two different primary igneous rocks undergo metamorphism at same pressure and temperature. Both these rocks, subsequent to metamorphism would have
- Identical mineral assemblage reflecting the metamorphic facies characteristic to that pressure and temperature
  - different mineral assemblage because of difference in their bulk chemical composition
  - no change in their mineral assemblage but their bulk chemical composition would have changed
  - identical bulk composition but different mineral assemblage
62. Which of the following minerals is most suited for U-Pb dating?
- Quartz

- b. Feldspar
  - c. Zircon
  - d. Topaz
63. Which of the following minerals is a major constituent of marble?
- a. Serpentine
  - b. quartz
  - c. feldspar
  - d. calcite
64. Which of the following is an aluminum ore?
- a. Bauxite
  - b. Hematite
  - c. Ilmenite
  - d. Rutile
65. Which of the following mineral is a major constituent of china clay?
- a. Leucite
  - b. Kaolinite
  - c. Anorthite
  - d. Olivine
66. Seasons on Earth occur because of:
- a. Disproportionate distribution of land mass in northern and southern hemispheres
  - b. Tilt of the Earth's axis of rotation
  - c. Changes in the specific heat of water and land mass and the wind circulation that is a consequence of the changes in the temperature
  - d. Changes in the circulation and transport of greenhouse gases
67. Which is the third most abundant gas in the atmosphere
- a. Nitrogen
  - b. Water vapour
  - c. Argon
  - d. Carbon dioxide
68. How many total number of air molecules in one cubic meter of air
- a.  $2.6 \times 10^{19}$
  - b.  $2.6 \times 10^{21}$
  - c.  $2.6 \times 10^{23}$
  - d.  $2.6 \times 10^{25}$
69. What is the average scale height of air
- a. 8 cm
  - b. 8 m
  - c. 8 km
  - d. 80 km
70. Which is the most important natural greenhouse gas in the atmosphere
- a. Oxygen
  - b. Water vapour
  - c. Carbon dioxide
  - d. Ozone

71. Scale height is
- the height at which the density of the atmosphere decreases by  $1/2$
  - the height at which the height of the atmosphere decreases by  $1/e$
  - the height at which the pressure of the atmosphere decreases by  $1/e$
  - the height at which the density of the atmosphere decreases by  $1/e$
72. When the scale height of a minor constituent (e.g., ozone, etc.) is equal to the atmospheric scale height then
- the constituent is not well mixed and its mixing ratio is constant with altitude
  - the constituent is well mixed and its mixing ratio is constant with altitude
  - the constituent is not well mixed and its mixing ratio varies with altitude
  - the constituent is well mixed and its mixing ratio varies with altitude
73. The residence time of aerosols increases as a function of altitude. This statement
- is true for all types of aerosols
  - is false for all types of aerosols
  - is true for sulfate aerosols only
  - is false for carbonaceous aerosols only
74. The heterosphere is so called because of
- varying chemical composition of atmospheric gases in that region
  - constant chemical composition of atmospheric gases in that region
  - varying chemical composition of only atmospheric trace gases in that region
  - constant chemical composition of only atmospheric trace gases in that region
75. Almost all of the Earth's atmosphere lies in a layer thinner than
- 10 percent of the radius of the Earth
  - 5 percent of the radius of the Earth
  - 1 percent of the radius of the Earth
  - 25 percent of the radius of the Earth
76. Ozone in the troposphere is called as
- good ozone as it absorbs harmful ultraviolet radiation
  - bad ozone as it causes harmful effects in the atmosphere
  - good ozone as it reduces pollution
  - good ozone as it reduces global warming
77. Geopotential height is
- nearly identical to height in the heterosphere
  - nearly identical to height in the homosphere
  - nearly identical to height in homosphere and heterosphere
  - nearly identical to height in the tropics
78. The peak wavelength at which Sun radiates emission is
- $0.48\ \mu\text{m}$
  - $0.68\ \mu\text{m}$
  - $10.0\ \mu\text{m}$
  - $1.0\ \mu\text{m}$

79. Mercury in a barometer should raise to what height to balance an atmospheric pressure of 1000 mbar (density of mercury is  $13558 \text{ kg m}^{-3}$ ) ?
- 0.71 m
  - 0.95 m
  - 8 km
  - 10 m
80. 50% of the atmosphere lies below an altitude of
- 100 km
  - 48 km
  - 18 km
  - 5.5 km
81. The density of dry air at 300K and 1010 mbar is ( $R'$ , the gas constant, is  $2.8704 \text{ m}^3 \text{ kg}^{-1} \text{ K}^{-1}$ )
- $1.5 \text{ kg m}^{-3}$
  - $1.0 \text{ kg m}^{-3}$
  - $1.2 \text{ kg m}^{-3}$
  - $100 \text{ kg m}^{-3}$
82. The partial pressure of water vapour is 10 mbar and the temperature is  $20^\circ\text{C}$  (saturated vapour pressure of water is 25 mbar), what is the relative humidity?
- 100%
  - 50%
  - 40%
  - 20%
83. If the observed temperature cools 15K between the ground and 3 km above the ground, the environmental lapse rate will be
- less than the dry adiabatic lapse rate
  - higher than dry adiabatic lapse rate
  - same as the dry adiabatic lapse rate
  - negative of the dry adiabatic lapse rate
84. The energy contained in the violet spectrum is ..... the energy contained in the green spectrum.
- smaller than
  - larger than
  - equal to
  - 100 times more
85. Temperature in the stratosphere is higher
- air at stratospheric altitudes is more dense
  - because of ozone absorption
  - because of water vapour absorption
  - because of more solar radiation
86. The energy for sun comes from
- Nuclear fission
  - Nuclear fusion
  - chemical reactions
  - Burning

87. Age of the solar system is about
- 4.5 million years
  - 4.5 billion years
  - 450 million years
  - 450 thousand years
88. Stars have different colours because
- They have different temperature
  - They are at different distances
  - The interstellar medium changes their colour
  - They belong to different regions of the galaxy
89. Our galaxy is called
- Andromeda Galaxy
  - M31 Galaxy
  - W25 Galaxy
  - Milky Way galaxy
90. How many times bigger than the Earth is the Sun?
- 100,000 times
  - 10,000 times
  - 300,000 times
  - 500,000 times
91. The nearest star to earth is
- Series
  - Polaris
  - Proxima Centauri
  - Orion
92. The biggest planet in the solar system is
- Jupiter
  - Uranus
  - Saturn
  - Earth
93. One light year is about
- $10^{16}$  km
  - $10^{13}$  km
  - $10^{10}$  km
  - $10^7$  km
94. At its closest, which is the planet closest to Earth
- Venus
  - Mercury
  - Mars
  - Jupiter
95. In size, which planet is most similar to Earth?
- Mars
  - Pluto

- c. Venus
  - d. Mercury
96. Amongst the planets, which planet has the strongest magnetic field
- a. Earth
  - b. Mercury
  - c. Mars
  - d. Jupiter
97. The planet with lowest density in the solar system is
- a. Jupiter
  - b. Saturn
  - c. Uranus
  - d. Pluto
98. The Main sequence on HR diagram classifies stars by
- a. Their distance from us
  - b. Their surface temperature
  - c. Their mass
  - d. Their location within Milky Way galaxy
99. The colour of a giant star away from the main sequence will typically be
- a. Red
  - b. Blue
  - c. White
  - d. Violet
100. At the top of Earth's atmosphere, Sunlight is most intense in terms of photons/m<sup>2</sup> in
- a. Infrared range
  - b. Ultraviolet range
  - c. X-ray range
  - d. Optical range
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