



# Geological Society of India, Bangalore-560019

**INTERNATIONAL EARTH SCIENCE OLYMPIAD 2015 – Entrance Test**

**Date: Sunday, February 15, 2015; Time: 10.30 am to 12 noon**

**Name of the Candidate and Registration No.** \_\_\_\_\_

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

**Seal of the Test Centre:** \_\_\_\_\_

**Answer all Questions**

**Maximum Marks: 100**

1. Along the continent continent tectonic boundary there are slices of oceanic crust emplaced on to the continent. These are known as:

- A. Oceanites
- B. Ophiolites
- C. Oncolites
- D. Ophicalcites

2. The India Tibet tectonic boundary zone is characterized by peridotites, gabbros, pillow lavas and cherts and is known as:

- A. Shilakong nappe
- B. Indus Ophiolite Belt
- C. Central Crystallines
- D. Great Boundary Zone

3. In Ladakh Himalaya an island arc type of assemblage is exposed which contain rocks which are volcanic equivalents of syenite and are known as:

- A. Trachyte
- B. Pegmatite
- C. Rhyolite
- D. Basalt

4. Around Cretaceous to Eocene times profuse volcanic eruptions occurred in India and are known as:

- A. Panjal Traps
- B. Sylhette Traps
- C. Deccan Traps
- D. Rajamundri Traps

5. The roots of the Himalaya which constitutes the deep crust is made up of metamorphic rocks which are known as:

- A. Marble
- B. Slate
- C. Granulite
- D. Phyllite

6. Some of the deep crustal rocks are made up of pyroxene and plagioclase and are known as:
- A. Granite
  - B. Pegmatite
  - C. Syenite
  - D. Gabbro
7. In Simla Himalaya metamorphic rock which can be easily cleaved into thin sheets and slabs are exposed. These are known as:
- A. Gneiss
  - B. Marble
  - C. Slate
  - D. Quartzite
8. The crust of the Earth has the following mineral group as its predominant constituent :
- A. Quartz
  - B. Pyroxene
  - C. Feldspars
  - D. Micas
9. Broadly the Himalayan region is a:
- A. Convergent margin
  - B. Divergent margin
  - C. Transform margin
  - D. Transcurrent margin
10. Volcanically derived rocks contain the presence of glass indicating:
- A. Rapid cooling
  - B. Slow cooling
  - C. Magma composition
  - D. constant change in water content
11. Labradorite is common mineral in volcanic rocks belonging to the:
- A. Olivine group
  - B. Pyroxene group
  - C. Plagioclase group
  - D. Mica group
12. Ruby is type of:
- A. Garnet
  - B. Corundum
  - C. Pyroxene
  - D. Feldspar
13. Apatite is:
- A. harder than orthoclase and softer than quartz
  - B. harder than fluorite and softer than orthoclase
  - C. harder than calcite but softer than fluorite
  - D. softer than both orthoclase and fluorite

14. Bright green feldspar is known as:
- A. Celsian
  - B. Amazon stone
  - C. Ruby
  - D. Oriental sapphire
15. Lahar is a type of
- A. sea wave
  - B. wind
  - C. debris flow
  - D. lava flow
16. Permeability is the:
- A. Ability of material to store water.
  - B. Ability of material to transmit water.
  - C. Percentage of pore space in material.
  - D. Percentage of voids in sedimentary rocks.
17. One of the following type of moraines forms where two lateral moraines merge.
- A. End moraine
  - B. Medial moraine
  - C. Ground moraine
  - D. Lateral moraine
18. The sand dunes in sandy deserts are commonly asymmetrical in shape. The gentler windward side
- A. faces the downwind direction
  - B. faces the upwind direction
  - C. is oriented parallel to the wind direction
  - D. is not oriented any particular direction.
19. Which type of trees are commonly found in the monsoon region?
- A. Evergreen
  - B. Conifers
  - C. Broad leaved deciduous
  - D. Thorny bushes
20. Which one of the following coastal features is formed by wave erosion and weathering?
- A. Beach
  - B. Spit
  - C. Coral reef
  - D. Stack
21. Which one of the following is known for the highest tidal range in the world?
- A. Bay of Fundy
  - B. Gulf of Khambhat
  - C. Severn Estuary
  - D. Gulf of Mexico

22. What is the term that is used for the layer of loose, heterogeneous weathered material lying on top of rocky hillslopes?
- A. Soil
  - B. Laterite
  - C. Regolith
  - D. Alluvium
23. Which one of the following pairs of surface ocean currents transport warm water from low to higher latitudes?
- A. Peru and Canary Currents
  - B. Labrador and Benguela Currents
  - C. Gulf Stream and Kuroshio Currents
  - D. Falkland and Brazil Currents
24. Which one of the following is a great circle
- A. Tropic of Cancer
  - B. Tropic of Capricorn
  - C. Prime Meridian
  - D. Ring of fire
25. Relative humidity is "relative" to \_\_\_\_\_
- A. Moisture
  - B. Temperature
  - C. Water vapour pressure
  - D. Altitude
26. Temperature inversion commonly occurs
- A. during early morning
  - B. during late afternoon
  - C. late evening
  - D. at night
27. The term 'heat island' is used in connection with a
- A. Volcano.
  - B. Hotspot
  - C. City
  - D. Road intersection
28. Contours which close in a circular manner and show decreasing values towards the inner side represent a
- A. Hill
  - B. Depression
  - C. Valley
  - D. Sand dune
29. Hurricanes are not similar to
- A. Cyclones
  - B. Typhoons
  - C. Willy-willies
  - D. Thunderstorms

30. Excessive \_\_\_\_\_ in soil will result in poor drainage.

- A. Gravel
- B. Sand
- C. Silt
- D. Clay

31. Large streamlined, wind-sculpted ridges that are parallel to the prevailing wind in deserts are known as

- A. Yardangs
- B. Deflection hollows
- C. Barchans
- D. Parabolic dunes

32. Which one of the following will have the lowest value at the center of the Earth?

- A. Temperature
- B. Density
- C. Pressure
- D. Gravity

33. The right ascension of the celestial objects which culminate at midnight on December 21 should be

- A.  $0^h$
- B.  $6^h$
- C.  $12^h$
- D.  $18^h$

34. The critical mass of a star to burn hydrogen in its core is

- A. 1 solar mass
- B. 0.5 solar mass
- C. 0.08 solar mass
- D. 0.25 solar mass

35. The Kepler's 3<sup>rd</sup> Laws states that

(where  $P$  = *orbital period* and  $a$ =*semi-major axis* of a planet)

- A.  $\frac{P^3}{a^2} = \frac{4\pi}{G(m_1 + m_2)}$
- B.  $\frac{P^2}{a^3} = \frac{4\pi^2}{G(m_1 * m_3)}$
- C.  $\frac{P^3}{a^2} = \frac{4\pi^2}{G(m_1 + m_2)}$
- D. none of the above

36. Which nuclear reaction is the energy source of low mass main sequence stars?

- A. Fission
- B. pp-chain
- C. CNO cycle
- D. Triple alpha

37. The pressure (P) in a white dwarf which is dominated by non-relativistic degenerate electrons. Its equation of state is given by (where  $\rho$  denotes density)

- A.  $P \propto \rho T$
- B.  $P \propto \rho^{5/3}$
- C.  $P \propto \rho^{4/3}$
- D.  $P \propto \rho$

38. In Charge Coupled Device (CCD), to have uniform response and to correct for pixel to pixel variations, one has to take which of the following frame.

- A. Flat field frame
- B. Dark frame
- C. Bias frame
- D. Object frame

39. The (B-V) color index is Zero for stars of spectral type

- A. A0
- B. B0
- C. F0
- D. G5

40. A clear sheet of polaroid is placed on top of a similar sheet so that their polarizing axes make an angle of  $30^\circ$  with each other. The ratio of the intensity of emerging light to incident unpolarized light is:

- A. 1:4
- B. 1:3
- C. 1:2
- D. 3:8

41. All the ground-based Telescopes with apertures above 5 meter use which of the following kind of mounts

- A. Alt-azimuth
- B. Symmetric Equatorial
- C. Asymmetric Equatorial
- D. None

42. Atmospheric Cherenkov detector is mostly used in detection of which of the following: wavelength photons.

- A. UV photon
- B. X-ray photon
- C. Both UV & X-ray photons
- D. High energy Gamma-ray photon

43. Due to precession, longitude of a star appears to be increasing per year at a rate of

- A. 50.3 arc seconds
- B. 50.3 arc minutes
- C. 50.3 degrees
- D. 0.53 arc minutes

44. Barnard's star has largest proper motion than that of any star, which is about

- A. 10.3 arc seconds/year
- B. 1.03 arc seconds/year
- C. 1.03 arc minutes/year
- D. 10.3 arc minutes/year

45. Which of these places is the coldest in December?

- A. Perth
- B. Santiago
- C. Johannesburg
- D. New Delhi

46. Which of the following regions of India gets the maximum precipitation during the northeast monsoon?

- A. Western Ghats
- B. North-east India
- C. Tamil Nadu
- D. Rajasthan

47. Western Disturbance occurs

- A. Over southern India during summer
- B. Over northern India over summer
- C. Over northern India during winter
- D. Over southern India during winter

48. The Rainfall distribution in two regions P and Q is shown in the Table Monthly Rainfall (mm)

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
P	2	0	1	0	0	125	300	450	250	75	10	7
Q	98	99	102	101	100	115	100	95	105	99	101	105

Pick out the correct statement/s.

- A. The interannual variability of rainfall is more at P than at Q.
- B. The intra-annual variability of rainfall is more at P than Q.
- C. The average monthly rainfall is about 120 mm at Q.
- D. The averages of monthly rainfall at P and Q are very different.

49. At present the Earth's surface is 70% oceans and 30 % land. If it were 100% oceans and no land,

- A. there will be no land breeze or sea breeze
- B. there will be sea breeze, but no land breeze
- C. there will no monsoons
- D. both hemispheres will have the same season (e.g. summer) at the same time

50. The most turbulent zone of the Earth's atmosphere is

- A. Thermosphere
- B. Troposphere
- C. Stratosphere
- D. Mesosphere

51. Coriolis force on air parcels is due to
- A. pressure gradients
  - B. temperature gradients
  - C. Earth's revolution around the Sun
  - D. Earth's rotation about its own axis
52. When is the relative humidity maximum over India?
- A. January
  - B. March
  - C. July
  - D. December
53. During the day when do you expect to get the maximum air temperature?
- A. 6.00 am
  - B. 12. 00 am
  - C. 12.00 pm
  - D. 2.00 pm
54. A plane, a ship, a car and a bullock cart are moving westwards at  $25^{\circ}\text{N}$ . Which of them will have a bigger acceleration pulling them to the north?
- A. Ship
  - B. Plane
  - C. Bullock cart
  - D. Car
55. Which of the following oceans covers the most surface area of the Earth?
- A. The Pacific Ocean
  - B. The Southern Ocean
  - C. The Indian Ocean
  - D. The Atlantic Ocean
56. What is the average salinity of the Ocean?
- A. 35 g/kg
  - B. 35 kg/g
  - C. 35 kg/kg
  - D. 35 g/g
57. Which of the following seas has the maximum density?
- A. The Arabian Sea
  - B. The Bay of Bengal
  - C. The Red Sea
  - D. The Dead Sea
58. Which is the warmest region in the Oceans?
- A. The Bay of Bengal barrier layer
  - B. The Indo-Pacific warm pool
  - C. The Arabian Sea seasonal warm pool
  - D. The Dead Sea



59. What is the typical density of the oceans?
- A. 1.07 g/cc
  - B. 1.27g/cc
  - C. 1.027 g/cc
  - D. 1.0027 g/cc
60. Warm ocean currents such as the Gulf Stream are known to mainly cause
- A. less rains over the adjoining continent
  - B. desertification in the adjoining continent
  - C. grasslands to form in the adjoining continent
  - D. warming in the adjoining continent
61. The Ocean basin which is mostly isolated from the rest of the Ocean is
- A. The Southern Ocean
  - B. The Bay of Bengal
  - C. The South China Sea
  - D. The Mediterranean Sea
62. Mixing in the ocean is most rapid
- A. In the vertical direction
  - B. In the horizontal direction
  - C. Along the surfaces of equal density
  - D. Along the latitude circles
63. Which of the following is responsible for deep ocean circulation?
- A. Winds
  - B. Earth tremors
  - C. Migration of whales
  - D. Temperature and salinity differences
64. How much is a knot, the unit of speed of ships? (choose the nearest correct value)
- A. ~1.8 km/h
  - B. ~1.8 km/min
  - C. ~1.8 m/hr
  - D. ~18 m/min
65. Pick the correct statement:
- A. The oceans are heated from below and the atmosphere is heated from above
  - B. Both the ocean and the atmosphere are heated from above
  - C. Both the ocean and the atmosphere are heated from below
  - D. The ocean is heated from above and the atmosphere is heated from below
66. The velocity of sound propagation
- A. Increases with temperature and is more in seawater than in air
  - B. Decreases with temperature and is more in seawater than in air
  - C. Increases with temperature and is less in seawater than air
  - D. Decreases with temperature and is more in sea water than air

67. Marine algae which do photosynthesis are adversely affected by the presence of
- A. cadmium
  - B. zinc
  - C. phosphorus
  - D. Heavy metals
68. Biological oxygen demand is maximum at a depth of
- A. 0-100 m
  - B. 100-1000 m
  - C. 1000-3000 m
  - D. 3000-4000 m
69. Identify the rivers with highest sediment yield
- A. Indus
  - B. Huang He
  - C. Nile
  - D. Amazon
70. About 90 percent of the atmosphere's total mass lies between the ground surface and a height of about
- A. 5 km
  - B. 10 km
  - C. 50 km
  - D. 110 km
71. Rocks containing fossils of one of the following would be the oldest
- A. Dinosaur bones
  - B. Trilobites
  - C. Bird bones
  - D. Woolly mammoth bones
72. Volcanic eruptions in Iceland are not likely to be associated with
- A. Landslide
  - B. Flood
  - C. Hurricane
  - D. Earthquake
73. Himalia is the name of a
- A. Peak in Nepal Himalaya
  - B. Peak in Grand Canyon
  - C. Satellite of Jupiter
  - D. Mountain on Mars
74. Hadley cell is a circulation associated with
- A. Ocean
  - B. Atmosphere
  - C. Groundwater
  - D. River

75. The average depth of the world ocean is close to
- A. 2 km
  - B. 3 km
  - C. 4 km
  - D. 5 km
76. Floating ice of the oceans formed by direct freezing of ocean water is known as
- A. Sea ice
  - B. Ocean ice
  - C. Iceberg
  - D. Ice island
77. The minimum reading of air temperature typically occurs
- A. just after sunset
  - B. about mid-night
  - C. around 2:00 am
  - D. close to sunrise
78. Which is NOT a correct association of earth components and properties?
- A. Hydrosphere—lakes, oceans
  - B. Atmosphere—oxygen—ozone screening layer
  - C. Lithosphere—source of mineral elements
  - D. Atmosphere—78% oxygen, 21% nitrogen
79. The proven phenomenon where visible and U-V radiation is absorbed at the earth's surface and re-emitted as longer infrared wavelengths that are then absorbed by water vapor, carbon dioxide, and methane, is known as
- A. The ozone layer
  - B. The greenhouse effect
  - C. Global warming
  - D. The Gaia hypothesis
80. The present concern over the apparent increase in the temperature of the biosphere is a "greenhouse effect" caused primarily by the
- A. Decrease in the human population on earth
  - B. Increase in carbon dioxide in the atmosphere from the burning of fossil fuels
  - C. Increased photosynthesis from increased carbon dioxide
  - D. Conversion of grasslands to farmlands
81. A terrestrial environment represented by a major biotic unit consisting of a characteristic and easily recognized variety of plant life is called
- A. A zoogeographical realm
  - B. An ecocline
  - C. An ecosphere
  - D. A biom

82. Which is a correct description of the air circulation patterns of the earth?
- A. Warm air rises at the equator and moves all the way to the poles where it cools and sinks
  - B. In the Northern Hemisphere the surface air moving north east from 30 to 60 degrees is moist and encounters cold air moving south to form a stormy region
  - C. Air evaporating at the equator is dry and therefore causes deserts when it sinks at 30 degrees north
  - D. The polar cells are cold and cause rainfall as they descend to the equator
83. It is thought that the northern landmass that resulted from the division of Pangaea fragmented and gave rise to
- A. North America, most of Eurasia, and Greenland
  - B. North America and Central and South America
  - C. Eurasia, Africa, and Australia
  - D. South America, Antarctica, and Australia
84. The recent Mangalayan expedition of the ISRO is to explore
- A. Remote sensing of Pluto
  - B. Surface exploration of Jupiter and its moon.
  - C. Surface exploration of Saturn
  - D. Exploration of the Mars.
85. Why does continental drift theory not help explain the distribution of placental mammals?
- A. Placental mammals were agile enough to cross all continental barriers
  - B. Placental mammals evolved after the breakup of the major plates
  - C. Their fossils were subject to more deformation
  - D. We just haven't located enough fossils of them
86. When a land bridge was reestablished between North and South America at the end of the Pliocene, what happened?
- A. Nothing happened because the major mammal groups had not evolved differently since the previous connection had been broken
  - B. Only the porcupine, armadillo, and opossum invaded from the south and survived
  - C. Many hoofed animals moved north and displaced North American fauna
  - D. There was an enormous exchange of species in both directions
87. The mass dinosaurs extinction took place around Myrs in India.
- A. 20-5 Myrs ago
  - B. 40-23 Myrs go
  - C. 65-63 Myrs ago
  - D. 74-70 Myrs ago
88. The stromatolites are:
- A. Layered biochemical accretionary structures
  - B. Earliest live forms on the earth
  - C. Red brown algae.
  - D. Associated commonly with granite

89. Arsenic contamination in the groundwater is widely prevalent in India in the state of
- A. Goa and Himachal Pradesh
  - B. Andhra Pradesh
  - C. Tamil Nadu
  - D. West Bengal
90. Diamonds occur in--- rocks
- A. Sandstone
  - B. Granite gneiss
  - C. Kimberlite
  - D. Basalt and limestone
91. The characteristics that allow a rock to hold fluids and gases is known as:
- A. Virtuosity
  - B. Capacity
  - C. Porosity
  - D. Elasticity
92. Size, shape and arrangement of component minerals determine the property of a rock known as:
- A. Structure
  - B. Texture
  - C. Composition
  - D. Strength
93. Sedimentary rocks are characterized by:
- A. Schistosity
  - B. Bedding
  - C. Foliation
  - D. Lineation
94. Coal and Petroleum are generally encountered in:
- A. Metamorphic rocks
  - B. Igneous rocks
  - C. Sedimentary rocks
  - D. Cataclastic rocks
95. The deepest trench on the ocean floor is known as:
- A. Owens trench
  - B. Mariana Trench
  - C. San Andreas Trench
  - D. Carlsberg Trench
96. The green colour of the ocean and sea waters is due to the presence of:
- A. Colour of water
  - B. Colour of algae
  - C. Colour of ocean floor
  - D. colour of sun light

97. Which ocean has the largest quantity of polymetallic nodules:
- A. Atlantic
  - B. Pacific
  - C. Indian
  - D. Antarctic
98. Weathering of rocks under warm and alternating wet and dry climatic conditions leaves behind a residue known as:
- A. Latite
  - B. Laterite
  - C. Le chatelierite
  - D. Levinsonite
99. Gypsum deposits are:
- A. Clastic deposits
  - B. Evaporite deposits
  - C. Supergene deposits
  - D. Bog deposits
100. If one travels from Tibet to India, that is from North to South across the Himalaya: What type of tectonic boundary does one come across between Tibet and India in modern times:
- A. Subduction zone
  - B. Mid-ocean ridge
  - C. Island arc
  - D. Collisional boundary

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