GEOGRAPHY EDUCATION ASSOCIATION TURKEY

THE 2019 INTERNATIONAL EARTH SCIENCE OLYMPIAD TURKEY NATIONAL EXAMINATION

NAME – SURNAME: _____

08 December 2018

INSTRUCTIONS:

The exam consists of 60 multi-choice questions.

Each correct answer is 1 point. 1/3 point will be subtracted for each wrong answers. Blank answers are 0 point

Each of the questions or incomplete statements is followed by four suggested answers or completions. Select the one that is best in each case and then fill in the corresponding oval on the answer sheet.

The response time of the exam is 120 minutes.

You may **not** leave the exam room in the **first 30 minutes** or in the **last 15 minutes**.

GEOGRAPHY EDUCATION ASSOCIATION - TURKEY

THE 2019 INTERNATIONAL EARTH SCIENCE OLYMPIAD
TURKEY NATIONAL EXAMINATION

SECTION I

The Geosphere and Earth Systems

1. Which one of the mineral sequences, arranged in the order of increasing hardness (in Mohs scale) is correct?

(A) Talc, calcite, gypsum, apatite
(B) Orthoclase, topaz, quartz, diamond
(C) Calcite, apatite, orthoclase, quartz
(D) Gypsum, talc, calcite, apatite

2. Which of the following processes is not related to plate tectonics?

(A) Subduction
(B) Mountain building
(C) Rise of mantle plume
(D) Sea floor spreading

3. Density contrast is the maximum across the

(A) crust – mantle boundary
(B) mantle – outer core boundary
(C) outer core and inner core boundary
(D) upper crust and lower crust boundary

4. P and S wawes, from an earthquake, incident on the core-mantle boundary are critically refracted

(A) at the same location
(B) at different location, P being critically refracted closer to the epicentre
(C) at different location, S being critically refracted closer to the epicenter
(D) nowhere

5. If a theoretical ultramafic magma begins to solidify, we can expect

(A) minerals rich in Fe and Mg begin to crystallize
(B) the magma to become more silica-rich, making quartz more likely to form
(C) other minerals form as the magma continues to cool
(D) all of the above

6. Match the following plate boundaries, tectonic processes and geographic examples

Plate boundary		Process		Example	
A	Divergent	D	Subduction/ collision	G	San Andreas Fault
B	Convergent	E	Transform faulting	H	East African rift valley
C	Transform	F	Sea floor spreading/ continental rifting	I	Himalaya

(A) A – D – G; B – F – H; C – E – I
(B) A – F – G; B – D – H; C – E – I
(C) A – E – H; B – D – I; C – F – G
(D) A – F – H; B – D – I; C – E – G

7. Match the following

A.	Calcification	E.	Warm and humid climate
B.	Laterization	F.	Solution in carbonate rocks
C.	Karstification	G.	Potential evapotranspiration equal or greater than precipitation
D.	Podzolization	H.	Cool and moist climate

(A) A – G; B – F; C – E; D – H
(B) A – F; B – E; C – H; D – G
(C) A – G; B – E; C – F; D – H
(D) A – E; B – H; C – F; D – G

8. Magma is generated in subduction zone because of

(A) decrease in melting point of a part of mantle due to decrease in pressure
(B) decrease in melting point due to influx of fluid in the mantle
(C) decrease in melting point of a part of mantle due to convergence of plates
(D) frictional heating of the mantle

9. Away from the epicenter of an earthquake, its

(A) intensity and magnitude remain the same
(B) intensity remains the same, but the magnitude decreases
(C) magnitude remains the same, but intensity decreases
(D) magnitude and intensity decrease

10. Which of the following statements describes the scientific basis of radiometric dating?

(A) The radioactivity of a rock sample is inversely related to the amount of time that has passed since the rock was exposed at Earth's surface.
(B) The proportion of alpha particles to beta particles given off by radioactive elements in a particular rock is a measure of the rock's age.
(C) The concentration of different types of radioactive isotopes in a rock indicates the geologic period in which the rock formed.
(D) The proportion of radioactive parent atoms to daughter atom in a rock is used to calculate the time that has elapsed since the rock formed.

11. The upwelling of magma in an active volcano has the greatest potential for producing a dangerous pyroclastic flow if the magma:

(A) contains a high concentration of dissolved gases and a high silica content.
(B) is basaltic and contains very little water vapor.
(C) contains low levels of volatile gases and erupts at a relatively high temperature.
(D) is andesitic and has a relatively low viscosity.

12. The formation of karst topography in regions underlain by limestone occurs when:

(A) calcium carbonate combines with water molecules to form a hydrated compound that is easily dissolved.
(B) alkaline groundwater saturates and erodes cracks within the bedrock due to a rise in the elevation of the water table.
(C) carbonic acid in groundwater reacts with calcite, forming calcium bicarbonate, a soluble mineral.
(D) Tectonic uplift exposes marine sediments to physical weathering that breaks up carbonate rocks along bedding planes.

13. Some volcanoes as in Indonesia are explosive in nature while some as in Hawaii are non-explosive, this is because

(A) the larger content of volatiles in the subduction zone related volcanoes makes them explosive
(B) tropical region receives larger heat and humidity making the volcanoes present there explosive
(C) volcanoes in Indonesia are situated within plate that in Hawaii are at a plate boundary
(D) Hawaiian non-explosive volcanoes are submerged below water while Indonesian volcanoes are above water level

14. Which of the following procedures would be best for remediating the effects of soil salinization?

(A) Application of broad-spectrum biocides to kill microorganisms
(B) Application of superphosphate to increase soil fertility
(C) Addition of clay to increase soil water-holding capacity
(D) Addition of large amounts of water to leach out salts

15. The Mesozoic Era was the Age of Dinosaurs, and the current Cenozoic Era is the Age of

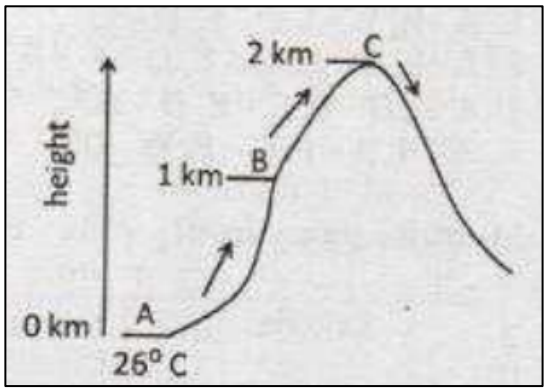
(A) Mammals
(B) Humans
(C) Birds
(D) Ice

GO ON TO THE NEXT SECTION

Atmosphere and Earth Systems

16. In which set of the following atmospheric layers, the temperature increases with altitude?
(A) Thermosphere and troposphere
(B) Stratosphere and troposphere
(C) Mesosphere and troposphere
(D) Stratosphere and thermosphere

17. Ozone depletion in the stratosphere causes
(A) increase in greenhouse effect
(B) cooling of the earth-atmosphere system
(C) increase of infrared radiation in the troposphere
(D) increase of ultraviolet radiation in the troposphere



18. Air rises from point A to C. At the point C it reaches dew point and starts subsiding on the leeward side because it is cooler than the surroundings. What happens to the temperature of subsiding air?
(A) remain the same
(B) starts rising
(C) starts decreasing
(D) decreases to dew point

19. Rainbows are formed due to
(A) passage of light in a non-uniform medium
(B) diffraction and dispersion of light in a raindrops
(C) refraction and internal reflection of light in raindrops
(D) refraction and diffraction in clouds

20. Which winds blow towards the poles and work to create the Ferrell cells?
(A) The easterlies
(B) The westerlies
(C) The Doldrums
(D) The Hadleys

21. The climatic conditions under which chemical weathering would be most rapid are:
(A) cold and dry
(B) hot and humid
(C) cold and moist
(D) hot and dry

22. Which of the following clouds is most likely to produce hail?
(A) Cirrocumulus
(B) Cumulonimbus
(C) Stratocumulus
(D) Altostratus

23. Albedo is the fraction of which of the following?
(A) Radiation reflected by the Earth
(B) Momentum and energy received by the atmosphere
(C) Moisture and water content of the atmosphere
(D) Greenhouse gas and oxygen in the atmosphere

24. The Inter Tropical Convection Zone (ITCZ) is farthermost from the equator over the

(A) African region during January
(B) Indian region during July
(C) African region during July
(D) Indian Ocean region during January

25. Sea surface temperature (SST) is more easily retrieved using atmospheric window channels as compared to land surface temperature (LST) because

(A) SST has a higher value than LST
(B) sea is more homogeneous than land with much lower horizontal temperature gradients
(C) over the sea there is a less likelihood of cloud formation, which ensures that the satellite radiometer measures SST and not the cloud top temperature
(D) over infrared wavelengths, sea is a better blackbody than land

26. In the year following the major eruption of the Mount Pinatubo volcano in the Philippines, a drop in mean global temperature was recorded. Which of the following factors was primarily responsible for this drop in global temperature?

(A) emission of sulfuric gases from the volcano into the lower stratosphere
(B) above-average precipitation in tropical regions
(C) ejection of particulates into the lower troposphere by the volcano
(D) increased levels of smog-forming nitrogen oxides in the troposphere

27. During *El Nino*, which of the following does NOT occur?

(A) Strengthening of the trade winds
(B) Warming of the surface waters in tropical eastern Pacific
(C) Decrease in the strength of Walker circulation
(D) Reduced or no upwelling at the Peruvian Margin

28. Albedo of Earth's surface is increases during

(A) increased volcanic activity
(B) expansion of ice sheets
(C) increase in solar radiation
(D) sea level rise

29. Precipitation is not closely associated with cirrus clouds because

(A) water vapor is generally low at high altitudes
(B) air temperature is generally low at high altitudes
(C) they are thin and contain appreciable ice crystals
(D) all of the above

30. The two major processes involved in the carbon cycle are

(A) fixation and denitrification
(B) erosion and deposition
(C) photosynthesis and respiration
(D) evaporation and transpiration

GO ON TO THE NEXT SECTION

Hydrosphere and Earth Systems

31. Which of the following ecosystem has the greatest biomass?
(A) Oceans
(B) Grasslands & Croplands
(C) Forests
(D) Freshwater

32. With reference to water in the hydrologic cycle, its residence time is the maximum in
(A) atmosphere and rivers
(B) rivers and ice sheets
(C) groundwater and soils
(D) groundwater and ice sheets

33. Ocean western boundary currents are
(A) Warm currents in both the hemispheres
(B) Cold currents in both the hemispheres
(C) Warm currents in the Northern and cold currents in the Southern Hemisphere
(D) Cold currents in the Northern and warm currents in the Southern Hemisphere

34. Which of the following is a FALSE statement about floodplains?
(A) They are wide and level bottom of the valley
(B) They are present in the youth stage of a stream valley.
(C) They are formed during the maturity stage
(D) They designate where water will flow if a stream floods.

35. Which is a land feature created by alpine glaciers?
(A) Hanging valleys
(B) Continental sheets
(C) Icebergs
(D) Basal sliding

36. In which of the following environments do sediments show the poorest sorting?
(A) Eolian
(B) Coastal
(C) Fluvial
(D) Glacial

The following table shows the half hourly rainfall recorded by an automatic rain gauge located in a watershed in the Himalaya.

Rain Fall (mm)	Time	Rain Fall (mm)	Time
0	8.00AM	8	12.00
8	8.30	9	12.30PM
0	9.00	7	1.00
3	9.30	4	1.30
5	10.00	0	2.00
6	10.30	2	2.30
8	11.00	0	3.00
0	11.30	0	3.30

37. When is the maximum erosivity of rainfall during the day?
(A) 10.00 – 11.00 AM
(B) 10.30 – 11.30 AM
(C) 12.00 – 01.00 PM
(D) 11.30 – 12.30 PM

38. A meandering river typically does NOT develop where

(A) gradient is zero
(B) discharge to sediment load ratio is low
(C) discharge to sediment load ratio is high
(D) the topography is subdued

39. Which region of the global ocean has absorbed the maximum amount of anthropogenic carbon dioxide and why?

(A) North Atlantic, because of deep water formation
(B) Southern Ocean, because of low temperatures
(C) Western Arabian Sea and Peru margin, because of high biological productivity
(D) Bay of Bengal, because of lower surface salinity.

40. During which of the following phase changes would the greatest amount of energy per gram of water be released to the environment?

(A) Water evaporates from a reservoir on a hot and dry day.
(B) On a cold fall morning, frost forms on a lawn.
(C) Ice sublimates on a very cold and dry day.
(D) On an early summer morning, dew forms on a field.

41. Along the curve of a stream, the maximum velocity of water occurs

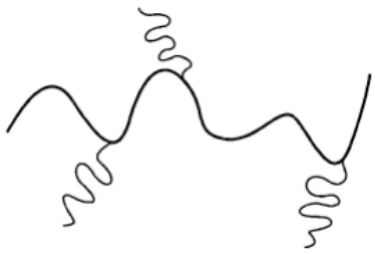
(A) near the inner bank of the curve
(B) near the outer bank of the curve
(C) in the center, on the surface
(D) in the center, below the surface

42. Which of the following correctly explains what happens to the level of oxygen dissolved in water when organic waste is put in the water?

(A) The levels would increase because of the availability of nutrients to animal that live in the water.
(B) The levels would increase because of higher temperatures of the water.
(C) The levels would decrease because of the waste absorbing the oxygen.
(D) The levels would decrease because of the bacteria feeding off the waste and using the oxygen to live.

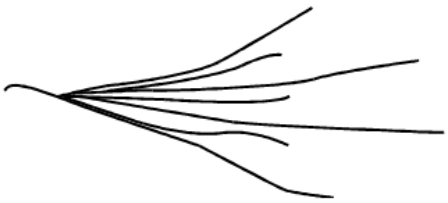
43. A mature river system with a gentle grade flowing over coastal plain sediments is likely to have a configuration most similar to which of the following illustrations?

(A)

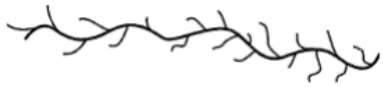


(B)

(C)



(D)



44. Of the following, which is the best example of a point source of water pollution?

(A) Factory effluent
(B) Acid precipitation
(C) Agricultural runoff
(D) Residential pesticide runoff

45. Which is NOT true about groundwater?

(A) It begins at the water table
(B) It is affected by gravity
(C) It moves very fast
(D) It moves down the hydraulic gradient

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The Planetary System and Earth Systems

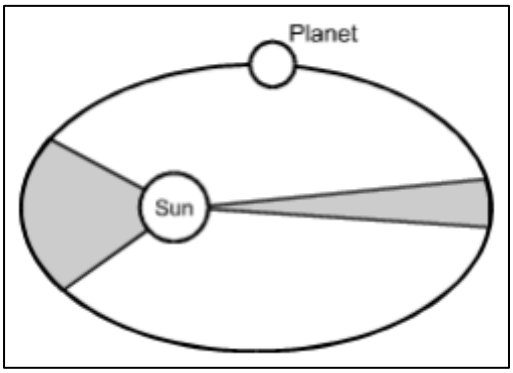
46. What is the third most abundant element (after H and He) in the solar system?
(A) O (B) Fe (C) Si (D) Ni

47. Two planets A and B orbit around their Sun, B being four times farther away than A from their Sun. Then the length of the year on B, compared to that A, would be
(A) the same,
(B) twice
(C) four times
(D) eight times.

48. If the angle of axial tilt of the Earth doubles, then one of the following possibilities is <u>unlikely</u>:
(A) The lengths of summer and winter days and nights will increase greatly
(B) Extreme temperature differences would occur from winter to summer
(C) This would cause well-defined climatic zones
(D) In December more of the northern hemisphere would have 24 hours of darkness

49. If both the Sun-Earth distance and the temperature of the Sun's photosphere decrease by 50%, then the solar constant
(A) decreases to 25% of its original value
(B) increases to 400% of its original value
(C) decreases to 50% of its original value
(D) remains unchanged

50. Which of the following physical characteristics of a main-sequence star is the most important factor in determining its luminosity?
(A) total mass
(B) size of the corona
(C) chemical composition
(D) strength of the magnetic field



51. The diagram above shows the distance traveled by a planet at two different intervals in its solar orbit. The astronomer Johannes Kepler compared the two shaded gray areas of the ellipse in order to determine the:
(A) mass of planets with different orbital periods.
(B) Diameter of the orbits of other planets.
(C) Gravitational pull that the planet exerts on other objects.
(D) Changing speeds at which a planet orbits the sun.

52. The large dark areas of the moon known as mares are easily visible from Earth. Which of the following explains the presence of these dark areas?

(A) Massive volcanic eruptions emptied underlying magma caverns, causing their collapse and the formation of calderas.
(B) Shortly after the moon's formation, Earth's strong gravitational pull on the moon caused the release of magma from fissures in the crust.
(C) Large meteorites excavated huge craters that filled with low-viscosity basalt flowing from the fractures created in the underlying crust.
(D) When the moon was still semi-molten, thin areas of crust collapsed due to tectonic activity, creating low areas that trapped sediments.

53. Which of the following statements best describes how the planets of the solar system formed?

(A) They are condensed rings of matter thrown off by the young Sun.
(B) They are the remains of an exploded star once paired with the Sun.
(C) The Sun captured them from smaller, older nearby stars.
(D) They formed from a nebular cloud of dust and gas.

54. Although many ancient civilizations designated certain patterns of stars as constellations, they never included planets in their constellations. What feature of planets, as opposed to stars, explains this?

(A) They look bigger than stars.
(B) They are more difficult to see than stars.
(C) There are not enough of them to form a constellation.
(D) They do not maintain fixed positions relative to other planets or stars.

55. The Sun is an average yellow star in the Milky Way galaxy, which is described as

(A) a dwarf galaxy.
(B) a spiral galaxy.
(C) an elliptical galaxy.
(D) an irregular galaxy.

56. The clouds that surround Venus are so thick that the planet actually absorbs less sunlight than the Earth. Nevertheless, Venus has a surface temperature of more than 400°C. Which of these best explains this high surface temperature?

(A) The bright surfaces of the clouds reflect sunlight back on the planet.
(B) The strong winds in the atmosphere produce friction.
(C) The thick clouds in the atmosphere prevent heat from escaping.
(D) The sulfuric acid in the clouds releases heat energy.

57. The best evidence for an expanding universe is

(A) the realization that if star explode, the universe does as well
(B) increasing distances between the stars in the Milky Way
(C) the universal red shift
(D) the decrease in the speed of light at large stellar distances

58. The Earth's upper atmosphere near its magnetic poles can interact with energy from the Sun to cause

(A) spicules
(B) auroras
(C) sunspots
(D) coronal mass ejections

59. The two properties of a star that are plotted on an H-R (Hertzsprung-Russell) diagram are

(A) brightness and temperature
(B) size and distance
(C) distance and brightness
(D) size and temperature

60. The basic premise of the Heliocentric model of the Universe is that

(A) the Earth is at the center of the Universe
(B) the Sun is at the center of the Solar System
(C) the Earth is at the center of the Solar System and the Sun is at the center of the Universe
(D) the Sun is at the center of the Universe and the solar system revolves around it

END OF EXAM

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