



## MCQ Section

During the National Round Exam, you should spend about 30 minutes in the MCQ section

1. The figure below shows diamond mine in Russia, what kind of mining is this?



- a) Underground mining
- b) Open-pit mining
- c) Surface mining
- d) Strip-mining

2. Which type of movement is mostly caused by the attraction due to gravity?

- a) Glacier movement
- b) Landslides
- c) Dune movement
- d) Lava movement

3. Which scale would most likely be used to tell how much earthquake damage was done to homes and other buildings?

- a. the Richter scale
- b. the Mercalli Intensity scale
- c. the moment magnitude scale
- d. the seismic scale

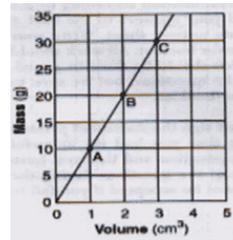
4. Compared to P waves and S waves, surface waves move

- a. Faster
- b. Slower
- c. at the same rate
- d. farther from the epicenter

5. Two streams were initiated at the same elevation of a mountain and have equal volumes of water flowing. Which statement best explains why one stream could be flowing faster than the other stream?

- a. The faster stream contains more dissolved minerals
- b. The streams are flowing in different directions
- c. The faster stream has a much steeper gradient/slope
- d. The water of faster stream has higher temperature than the slower stream.

6. The graph below shows the relationship between mass and volume for three samples, A, B, and C, of a given material. What is the density of this material?



- a) 1.0 g/cm<sup>3</sup>
- b) 20 g/cm<sup>3</sup>
- c) 10 g/cm<sup>3</sup>
- d) 5 g/cm<sup>3</sup>

7. Which event is the best example of erosion?

- a. crumbling of bedrock in one area to form soil
- b. breaking apart of shale as a result of water freezing in a crack
- c. dissolving of rock particles on a limestone gravestone by acid rain
- d. rolling of a pebble along the bottom of a stream

8. If fossils of tropical plants would have found in Antarctica, what would it indicate?

- a. the rotation of Earth has increased, causing cooling of the atmosphere
- b. at one time, Antarctica was located closer to the equator
- c. at one time, Earth's entire surface was a tropical rain forest
- d. catastrophic volcanic eruptions melted the ice and exposed the soil to sunlight

9. Himalayas, the tallest mountains in the world, contain trilobites, brachiopods, and other marine fossils

Which statement best describes the possible reason?

- a. rocks on the seabed have been uplifted to form huge mountains
- b. the fossils were transported there by erosional agents
- c. the rocks containing the fossils were formed by the metamorphism of sedimentary rock deposited in a terrestrial environment during the Cretaceous Period.
- d. these fossilized animals could also be found on land surface.



LITHOSPHERE

## MCQ Section

During the National Round Exam, you should spend about 30 minutes in the MCQ section



HYDROSPHERE

10. If you collect a cup of quartz sand from a beach and pour a saltwater solution into the sand and allow it to evaporate, the mineral residue from the saltwater solution cements the sand grains together, forming a material that is most similar in origin to

- a. an intrusive igneous rock
- b. an extrusive igneous rock
- c. a clastic sedimentary rock
- d. a foliated metamorphic rock

11. The absolute age of a rock is the approximate number of years ago that the rock formed. The absolute age of an igneous rock can best be determined by

- a. comparing the amounts of decayed and undecayed radioactive isotopes in the rock
- b. comparing the sizes of the crystals found in the upper and lower parts of the rock
- c. examining the rock's relative position in a rock outcrop
- d. examining the environment in which the rock is found

12. When two oceanic plates converge, the older, denser plate will

- a. rise above the other plate
- b. sink beneath the other plate
- c. form a mountain range along the plate boundary
- d. drift away towards opposite direction

13. Compared to felsic igneous rocks, mafic igneous rocks contain greater amounts of

- a. Quartz
- b. aluminum
- c. Feldspar
- d. Olivine

14. The point beneath Earth's surface where rock breaks under stress and triggers an earthquake is called the

- a. stress point
- b. fracture
- c. epicenter
- d. focus

16. What percent of all of Earth's water is found in groundwater, streams, lakes, and rivers?

- a) 2%
- b) 2.5%
- c) 3%
- d) 3.5%

17. A layer of rock, sand, or gravel that holds large amounts of groundwater is called \_\_\_\_\_

- a) Aquifer
- b) Aquitard
- c) Leaky aquifer
- d) Aquifuge

18. Canyons are \_\_\_\_\_

- a) Geological features
- b) Geomorphological feature
- c) Structural features
- d) Marine features

19. Which is the significant region of biological diversity?

- a) Bogs
- b) Swamps
- c) Marshes
- d) Both (b) and (c)

20. Which % of global water is used in industrial section?

- a) 20%
- b) 15%
- c) 10%
- d) 25%

21. Which of the following criteria is true for tsunami?

- a) short occurrence time
- b) Short wave action
- c) Longer wavelength
- d) Low wave energy

22. Ancient lakes are formed by \_\_\_\_\_

- a) Erosion
- b) Earthquake
- c) Volcanoes
- d) Glaciers



## MCQ Section

During the National Round Exam, you should spend about 30 minutes in the MCQ section



23. Where is the Great Lake is located?

- a) United kingdom
- b) United states
- c) Canada
- d) Switzerland

24. Which stage of river development is known as active stage?

- a) Young stage
- b) Mature stage
- c) Old stage
- d) Both (a) and (b)

25. Which stage of river development forms the floodplain?

- a) Young stage
- b) Mature stage
- c) Old stage
- d) Both (a) and (b)

26. Vertical entry of water through soil horizon is called \_\_\_\_\_

- a) Runoff
- b) Horizontal flow
- c) Infiltration
- d) Overland flow

27. When water seeps (not move from downhill) forms \_\_\_\_\_

- a) Streams
- b) Ponds
- c) Lakes
- d) Both (b) and (C)

28. The famous Horseshoe Falls at Niagara Falls drops over 1,800 cubic meters of water per second, down a cliff nearly 50 meters (170 feet) in height. What is the feeder channel of Niagra Fall?

- a. Great lake
- b. Lake Erie
- c. Amur river
- d. Ob river

29. The coarser sedimentary deposits at the bottom of rivers are known as \_\_\_\_\_

- a) Coarser deposits
- b) Lag deposits
- c) Finer deposits
- d) Fluvial deposits

30. Which zone of subsurface is groundwater recharge zone?

- a) Capillary zone
- b) Zone of saturation
- c) Zone of unsaturation
- d) Soil zone

31. Thunderstorms are common when ground temperature is high & during spring & summer the time is arounda.

- a. Early morning
- b. Noon
- c. Late Afternoon
- d. Night

32. To get the approximate distance of lightning strike, the time duration between the lightning been seen & its sound been heard has to be multiplied by

- a. 1000
- b. 330
- c. 2000
- d. 660

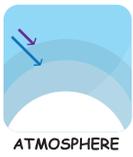
33. What is the most important factor for describing the climate of a location?

- a. Temperature
- b. Pressure
- c. Precipitation
- d. Latitude

34. 1% depletion in the ozone layer can increase the amount of skin cancer

by –

- a. 13-14%
- b. 15-16%
- c. 5-6%
- d. 10-12%



## MCQ Section

During the National Round Exam, you should spend about 30 minutes in the MCQ section

35. Approximately what percentage of lightning bolts strikes the ground?

- a. 20%
- b. 30%
- c. 40%
- d. 50%

36. What is the requisite temperature for hurricane to form.

- a. 25°C
- b. 26°C
- c. 27°C
- d. 28°C

37. Catalytic converters are used in modern cars to reduce the emission of the following harmful gases except –

- a. SO<sub>x</sub>
- b. NO<sub>x</sub>
- c. VOC's
- d. CO

38. High pressure locations are marked all over the world by

- a. Savanna
- b. Rain forest
- c. Dessert
- d. Tropical coast

39. Alpine tundra –

- a. occurs at high altitudes around the globe
- b. is isolated to mid & high latitudes
- c. is isolated to high latitudes
- d. is isolated to low latitudes

40. Climate zones are almost symmetrical and they can be found at same

distance from the equator in both North & South hemisphere excepta.

- a. Tropical moist climate
- b. Dry climate
- c. Continental climate
- d. Polar climate

41. As water droplets in the cloud freeze the positive & negative ions tends to acquire certain position in the droplet

- a. positive in the outside & negative in the inside
- b. positive in the inside & negative in the outside
- c. both positive & negative in the outside
- d. both positive & negative in the inside

42. The image shows which climate zone?



- a. Dry climate
- b. Sub-polar climate
- c. Tropical climate
- d. Continental climate

43. Sunspots are magnetic solar storms on the sun that cause solar radiation

to decrease slightly. What is the cycle period of sunspots?

- a. 7 year
- b. 11 year
- c. 15 year
- d. 19 year

44. Which of the following type of precipitation is resulted from cumulonimbus clouds with strong up-drift?

- a. Frost
- b. Sleet
- c. Glaze
- d. Hail

45. When warm air mass gets trapped between two cold air masses they

create –

- a. cold front
- b. warm front
- c. stationary front
- d. occluded front



## MCQ Section

During the National Round Exam, you should spend about 30 minutes in the MCQ section

46. One of the largest volcano's in our solar system, if not the largest, is named Olympus Mons. Name the planet which has the volcano?

- a) Jupiter
- b) Saturn
- c) Mars
- d) Neptune

47. The time interval between two successive occurrences of a specific type of alignment of a planet (or the moon) with the sun and the earth is referred to as:

- a) a conjunction
- b) an opposition
- c) a sidereal period
- d) a synodic period

48. For what reason was the Schmidt telescope specially built? Was it to serve as:

- a) a sky camera
- b) a radio telescope
- c) an optical telescope
- d) a solar telescope

49. How is the atmospheric pressure of Mars as compared to the atmospheric pressure of the earth? Is it:

- a) about the same as the earth's
- b) about 100 times as great as the earth's
- c) about 1/200th that of the earth's
- d) half as much as that of the earth's

50. A comet's tail points in which direction?

- a) toward the sun
- b) toward the earth
- c) behind the comet in its orbit
- d) away from the sun

51. Which of the following statements is true for BOTH Saturn and Jupiter?

- a) both rotate faster than the Earth
- b) both rotate slower than the Earth
- c) only one rotates rapidly while the other rotates very slowly
- d) their periods of rotation are linked to their period of revolution

52. If you were watching a star collapsing to form a black hole, the light would disappear because it:

- a) is strongly blue shifted
- b) is strongly red shifted
- c) its color suddenly becomes black
- d) none of the above

53. The VISUAL aurora consists of luminous arcs, rays or bands in the night sky, usually confined to high latitudes and located in the:

- a) Troposphere
- b) Stratosphere
- c) Ozonosphere
- d) Ionosphere

54. What percentage of the Sun's mass has been converted to energy?

- a) 50%
- b) 1%
- c) 2%
- d) 0.001%

55. Io, Europa, Ganymede and Callisto are satellites of what planet?

- a) Saturn
- b) Jupiter
- c) Neptune
- d) Uranus

57. Most stars are cooler than the sun. These stars, the planets, interstellar clouds and star-forming regions emit most of their radiant energy in the:

- a) visible
- b) x-ray region
- c) ultraviolet
- d) infrared

58. A day on Saturn takes about 10 Earth hours. Which fact would best explain this short day?

- a) Saturn is less dense than Earth.
- b) Saturn is much farther from the Sun than Earth.
- c) Saturn rotates more rapidly than Earth.
- d) Saturn's orbit has greater eccentricity than Earth's.



BIOSPHERE

## MCQ Section

During the National Round Exam, you should spend about 30 minutes in the MCQ section

59. The Moon is very hot on the side facing the Sun and very cold on the dark side. This extreme temperature difference is primarily due to the Moon's

- a) mineral composition
- b) thin atmosphere.
- c) reflective rocks.
- d) lack of volcanic activity

60. 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.

61. Every ecosystem must have some organisms that produce food in the form of CHEMICAL ENERGY. These producers are extremely important in every ecosystem. They are primarily-

- a. Algae in the oceans
- b. Plants on land
- c. Bacteria at deep sea hot springs
- d. All of these

62. Which of the following word is appropriate in ecological system for making a living as a top carnivore, an animal that eats other animals, but is not eaten by any other animals?

- a. A niche
- b. A predator
- c. A prey
- d. A scavenger

63. Which of the following refers "An animal that kills and eats other animals"?

- a. Scavenger
- b. Predator
- c. Prey
- d. Vertebrate

63. BIOMES are defined as the world's major communities, classified according to the predominant climate and vegetation and characterized by adaptations of organisms to that particular environment. Which of the following may include into World's Biomes?

- a. Deserts & Grasslands
- b. Aquatic & Tundra
- c. Rainforests & Grasslands
- d. All of these

64. At the bottom of the ocean, at deep-sea hot springs known as hydrothermal vents, a few types of bacteria break down chemicals to produce food energy WITHOUT using any SUNLIGHT. This process is known as-

- a. Decomposition
- b. Photosynthesis
- c. Chemosynthesis
- d. Osmosis

65. One type of consumers acts as recyclers. They break apart dead organisms or the waste material of living organisms, make nutrients and return the nutrients to the ecosystem. So which type of consumers those could be?

- a. Producers
- b. Decomposers
- c. Herbivores
- d. Carnivores

66. Which of the followings have the ability to take the inorganic carbon in carbon dioxide and make it into organic carbon?

- a. Plants
- b. Human
- c. Algae
- d. Both (a) & (c)

67. Which one does not enter the atmosphere, remaining mostly on land and in rock and soil minerals?

- a. Carbon dioxide
- b. Phosphorus
- c. Oxygen
- d. Nitrogen

## MCQ Section

During the National Round Exam, you should spend about 30 minutes in the MCQ section



BIOSPHERE

68. When excess fertilizers run off into freshwater ecosystems, algae growth explodes on water resulting in ALGAL BLOOMS which prevent sunlight to reach plants under water and the amount of dissolved oxygen deplete consequently. This process is referred as “Eutrophication” and it devastates the total aquatic ecosystems. Which one is responsible for this?

Human interference in the -

- a. Phosphorus cycle
- b. Carbon cycle
- c. Sulfur cycle
- d. Oxygen cycle

69. Which one lowers the pH of the soil and aquatic ecosystems causing damage to fish and other aquatic animals and removes nutrients from the soil?

- a. Eutrophication
- b. Greenhouse effect
- c. Water pollution
- d. Acid rain

70. Non-renewable resources are resources that renew themselves at such slow rates that, practically, they cannot be regenerated. Which one is NOT a non-renewable resource?

- a. Coal
- b. Oil
- c. Wind
- d. Natural gas



## Analytical Section

During the National Round Exam, you should spend about 30 minutes in the Analytical section

A volcano is a vent through which molten rock and gas from beneath the Earth's Surface escape.  
(answer question a and b considering the following figure)

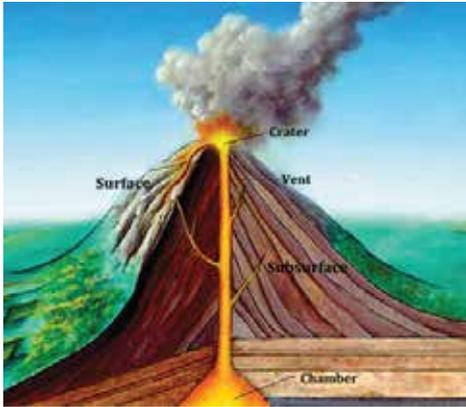


Figure: Volcano

a) Distinguish between Lava and Magma. Of these two, which will take comparatively less time to solidify into rocks and why? (1 + 0.5)

b) Why do extrusive igneous rocks usually have smaller crystals than intrusive igneous rocks?

Granite is a coarse-grained, light-colored igneous rock which is composed mainly of quartz and feldspar with minor amounts of mica, amphiboles and other minerals. In the figure above, where do you expect Granite to form? (1 + 0.5)

c) To meet the definition of "mineral", a substance must meet five requirements:

- naturally occurring
- inorganic
- homogenous solid
- definite chemical composition
- ordered atomic structure

Do you consider coal a mineral? Explain your reasoning.

(1.0)



## Analytical Section

During the National Round Exam, you should spend about 30 minutes in the Analytical section

d) The figure below portrays Geologic Time Scale

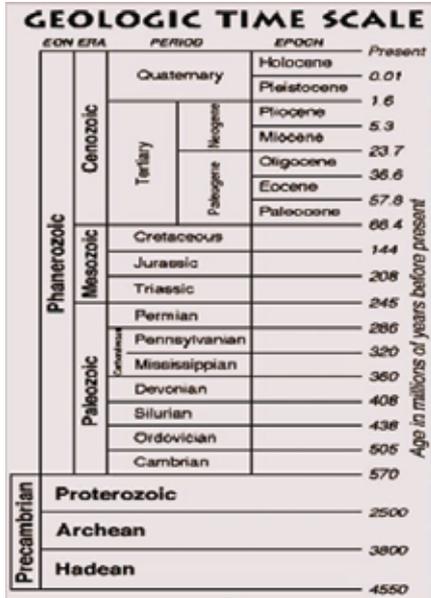
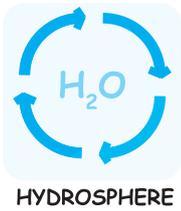


Figure: Geologic time scale showing both relative and numeric ages (Ages in millions of years are approximate)

Mountains which were formed >100 million years ago are called 'old mountains' and mountains that formed <100 million years ago are 'young mountains'. The formation of Himalaya was initiated during Miocene epoch. What type of mountain is Himalaya? (1.0)

e) A certain type of fossil was found in several outcrops which are located in different continents. The fossils are only found in specific rock layers. What type of fossils are these and what do they indicate? (0.5 + 0.5)



## Analytical Section

During the National Round Exam, you should spend about 30 minutes in the Analytical section

The water on Earth moves about the Earth in what is known as the water cycle. Water cycle maintains the water balance.

The numerical expression of water balance is:  $W=I+P-E-S-ET$

Here, W=water balance

P=precipitation

E=evaporation

ET=Evapotranspiration

S=surface runoff

In Comilla  $W=260\text{mm}$ ,  $P=150\text{mm}$ ,  $I=50\text{mm}$ ,  $E=20\text{mm}$ ,  $ET=15\text{mm}$ ,

In Tangail  $W=300\text{mm}$ ,  $P=175\text{mm}$ ,  $I=65\text{mm}$ ,  $E=15\text{mm}$ ,  $ET=16\text{mm}$ ,

In Narshingdi  $W=206\text{mm}$ ,  $P=125\text{mm}$ ,  $I=30\text{mm}$ ,  $E=12\text{mm}$ ,  $ET=19\text{mm}$

a) What is the average surface run-off in the following areas? (3)

b) What is the major significance of atmosphere to Water cycle? (1)



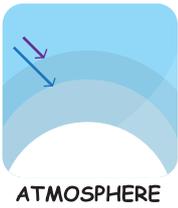
## Analytical Section

During the National Round Exam, you should spend about 30 minutes in the Analytical section

- c) Our planet could be called “Water” instead of Earth. Do you agree with this statement? If so, mention the cause? (1)

The Earth is the only planet in the Solar System in which water exist in the three states.

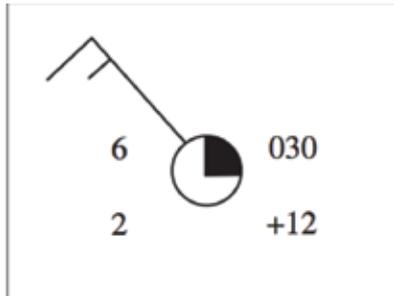
- d) What would be the changes in state of water if the distance between Sun and Earth changes? (1)



# Analytical Section

During the National Round Exam, you should spend about 30 minutes in the Analytical section

Answer question I & II based on the following weather station data



I. The wind at the weather station is blowing from the

- a. northeast.
- b. southeast.
- c. northwest.
- d. southwest.

II. What is the temperature at the weather station?

- a. 2°C
- b. 6°C
- c. 12°C
- d. 30°C

Answer question III & IV based on the following image

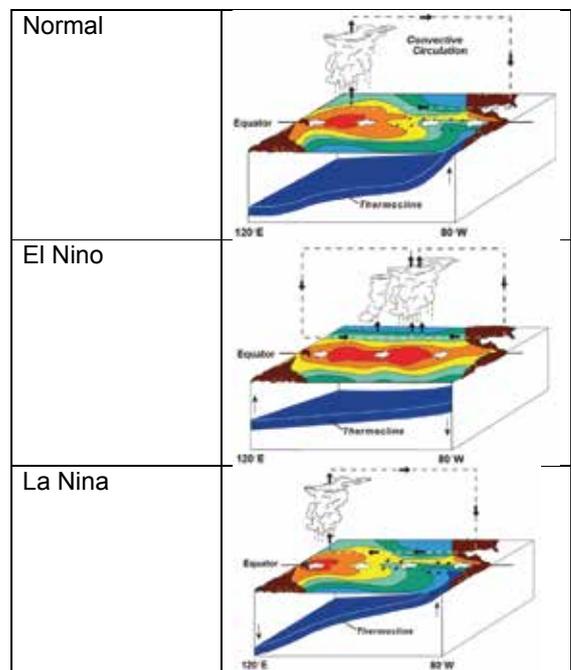
III. Which city is experiencing the lowest air pressure?

- a. Sudbury
- b. Churchill
- c. Winnipeg
- d. Saskatoon

IV. The weather station (of question I & II) represents the conditions at which city?

- a. Sudbury
- b. Churchill
- c. Winnipeg
- d. Saskatoon

V. Match the conditions with the appropriate picture





## Analytical Section

During the National Round Exam, you should spend about 30 minutes in the Analytical section

Suppose that a group of hostile aliens passed through our solar system and decided to convert our moon into a black hole!

A body with the mass of our moon (about 7 million trillion tons!) would be compressed into a black hole with a diameter of only 0.2 millimeters!

Problem 1– In the space below, draw a black disk 0.2 millimeters in diameter to represent the size of Black Hole Moon.

Problem 2- The Earth as a black hole would have a radius of 8.7 millimeters. In the space below, draw a circle the size of Black Hole Earth.

Problem 3- If the distance to the moon is 356,000 kilometers, how far from our Black Hole Earth would the new Black Hole Moon be located if its diameter were only 0.2 millimeters



BIOSPHERE

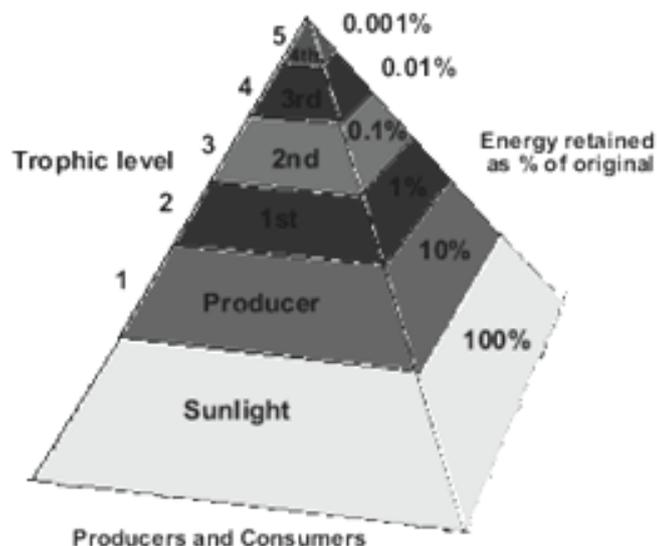
## Analytical Section

During the National Round Exam, you should spend about 30 minutes in the Analytical section

Energy flows through an ecosystem in only one direction. It enters the ecosystem with the producers passed from organisms at one trophic level or energy level, to organisms in the next trophic level.

Now read this paragraph carefully!

An average of 90% of the energy that reaches a trophic level is used to power the organisms at that trophic level. They need it for locomotion, heating themselves, and reproduction. So animals at the second trophic level have only about 10% as much energy available to them as do organisms at the first trophic level. They use about 90% of what they receive, and so those at the third level have only 10% as much available to them as those at the second level. This 10% rule continues up the trophic levels.



SUPPOSE an organism at first trophic level has energy of 1500 J (joule). It may use 90% of this energy for itself and transfers only 10% to the next trophic level.

So what would be the amount of energy that the organisms of second and third trophic level receive respectively?

(Answer only the amount of energy they might RECEIVE in the second and third trophic level, NOT THEY USE OR TRANSFER)

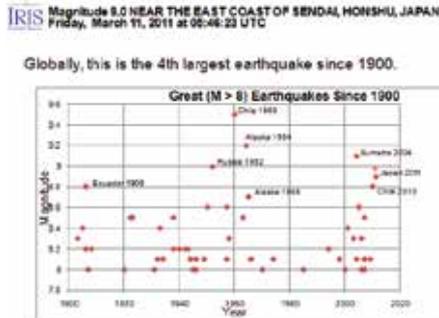


LITHOSPHERE

# Analytical Section

During the National Round Exam, you should spend about 30 minutes in the Analytical section

1. The figure below shows the distribution of major earthquakes with their magnitudes from the year 1900 to most recent time.



- Which is the most recent Great Earthquake (greatest in magnitude) in the 21st century? Mention its magnitude. (Excluding Japan)
- In which year the highest energy released from an earthquake?
- The table shows magnitude versus ground motion and energy-

Magnitude Change	Ground Motion Change (Displacement)	Energy Change
1.0	10.0 times	about 32 times
0.5	3.2 times	about 5.5 times
0.3	2.0 times	about 3 times
0.1	1.3 times	about 1.4 times

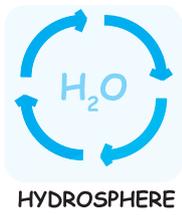
On the Chile (1960) great earthquake energy released was equivalent to 56,000,000,000,000 kilograms of explosives. Calculate around how many kilograms of explosives required for the release of energy in Alaska (1964) earthquake?

d) From 1960 to 2000, how many great earthquakes occurred annually?

Descriptor	Magnitude	Average Annually
Great	8 and higher	1 <sup>1</sup>
Major	7 - 7.9	17 <sup>2</sup>
Strong	6 - 6.9	134 <sup>2</sup>
Moderate	5 - 5.9	1319 <sup>2</sup>
Light	4 - 4.9	13,000 (est.)
Minor	3 - 3.9	130,000 (est.)
Very Minor	2 - 2.9	1,300,000 (est.)

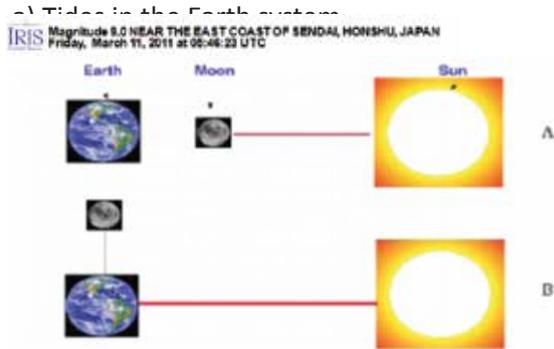
<sup>1 2</sup> Based on observations since 1900.  
Number of earthquake per day -- 50

e) Differentiate between earthquake intensity and magnitude.



## Analytical Section

During the National Round Exam, you should spend about 30 minutes in the Analytical section



The Figure illustrates two (labelled A and B) different configurations of the Earth-moon-sun system. What is the interpretation of configuration A and configuration B?

b) Our Earth is mostly water. Approximately 70% of the Earth's surface is water and 30% of the Earth's surface is land.

Draw the percentages of water distribution in earth.

c) Our planet could be called "Water" instead of Earth. Do you agree with this statement? If so, mention the cause?



## Analytical Section

During the National Round Exam, you should spend about 30 minutes in the Analytical section

Black holes are so incredibly dense that enormous amounts of matter can be compressed into their very small volumes. No known physical event can make black holes smaller than the mass of a small star.

But because black holes are a product of gravity, at least theoretically, there is no limit to how big or how small they can be.

The table below gives the predicted radius of black holes containing various amounts of matter. None of these black holes have been observed, but their sizes have been determined from their stated masses. The masses are all given in terms of the mass of our Earth,  $5.7 \times 10^{24}$  kilograms so that '2.0' means a black hole with twice the mass of our Earth.

Mass	Radius
2.0	16.8 cm
3.2	26.9 cm
5.0	42.0 cm
7.5	63.0 cm
8.7	73.1 cm
11.0	96.6 cm

- Graph the data in the table.
- From the graph, use any method to calculate the slope,  $S$ , of the data. What are the physical units for the value of this slope?
- From the table, calculate the slope,  $S$ , of the data.
- Write a linear equation of the form  $R(M) = R_0 + S M$  that expresses the black hole Mass-Radius Law.
- To the nearest tenth of a meter, what would you predict as the radius of a black hole with the mass of the planet Jupiter, if the mass of Jupiter is 318 times the mass of Earth?



BIOSPHERE

## Analytical Section

During the National Round Exam, you should spend about 30 minutes in the Analytical section

Many ocean creatures use calcium carbonate ( $\text{CaCO}_3$ ) to make their shells or to make the reef material where coral animals live.

When algae die, their organic material becomes part of the ocean sediments, which may stay at the bottom of the ocean for many and many years.

Over millions of years, those same ocean sediments can be forced down into the mantle when oceanic crust is consumed in deep ocean trenches.

As the ocean sediments melt and form magma, **one type of gas** is eventually released while volcanoes erupt and come into the atmosphere.

So, which type of gas it could be? And which ecological cycle it may complete? What do you think?