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(Write Roll Number from left side exactly as in the Admit Card)

Signature of Invigilators

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2718

Question Booklet Series

X

PAPER-II

Question Booklet No.

(Identical with OMR Answer Sheet Number)

Subject Code : 27

EARTH, ATMOSPHERIC, OCEAN & PLANETARY SCIENCES

Time : 2 Hours

Maximum Marks: 200

Instructions for the Candidates

- Write your Roll Number in the space provided on the top of this page as well as on the OMR Sheet provided.
- At the commencement of the examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and verify it:
 - To have access to the Question Booklet, tear off the paper seal on the edge of this cover page.
 - Faulty booklet, if detected, should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.
 - Verify whether the Question Booklet No. is identical with OMR Answer Sheet No.; if not, the full set is to be replaced.
 - After this verification is over, the Question Booklet Series and Question Booklet Number should be entered on the OMR Sheet.
- This paper consists of One hundred (100) multiple-choice type questions. All the questions are compulsory. Each question carries *two* marks.
- Each Question has four alternative responses marked: (A) (B) (C) (D). You have to darken the circle as indicated below on the correct response against each question.
Example: (A) (B) (●) (D), where (C) is the correct response.
- Your responses to the questions are to be indicated correctly in the OMR Sheet. If you mark your response at any place other than in the circle in the OMR Sheet, it will not be evaluated.
- Rough work is to be done at the end of this booklet.
- If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Sheet, except in the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
- Do not tamper or fold the OMR Sheet in any way. If you do so, your OMR Sheet will not be evaluated.
- You have to return the Original OMR Sheet to the invigilator at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are, however, allowed to carry question booklet and duplicate copy of OMR Sheet after completion of examination.
- Use only Black Ball point pen.**
- Use of any calculator or mobile phone etc. is strictly prohibited.**
- There are no negative marks for incorrect answers.**

[Please Turn Over]

EARTH, ATMOSPHERIC, OCEAN & PLANETARY SCIENCES

PAPER II

1. One student is going to date representative samples of amphibolites of older Metamorphic Group (OMG) of Singhbhum. For getting the proper age-data, he should go for
- K-Ar method
 - Rb-Sr method
 - C¹⁴ method
 - Sm-Nd method
2. A sandstone sequence is consisting of erosional-based, fining-upward individual units that characteristically contain large-sized cross-beds in the lower part, and small-sized cross-beds in the upper part. The sequence shows unidirectional palaeocurrent with low variance. The sequence indicates a _____.
- fluvial palaeoenvironment
 - lacustrine palaeoenvironment
 - tidal flat palaeoenvironment
 - deltaic palaeoenvironment
3. Which of the following statements about palaeomagnetism at spreading ridges is TRUE?
- There is no clear palaeomagnetic signal in rocks at spreading ridges.
 - Rocks along spreading ridges show the same palaeomagnetic north direction, no matter how old they are.
 - The palaeomagnetic pattern on one side of a ridge is the mirror image of the pattern on the other side of the ridge.
 - There is evidence that Earth's magnetic poles reverse every 11 years or so.
4. East coast bauxite covers the states of
- Andhra Pradesh and Odisha.
 - Andhra Pradesh and Tamil Nadu.
 - Odisha and Tamil Nadu.
 - Andhra Pradesh, Tamil Nadu and Kerala.
5. Angular sand of 1 to 0.5 mm diameter is known as
- cobble
 - pebble
 - grit
 - coarse sand
6. Nepheline is an example of
- Complete solid solution
 - Eutectic crystallization
 - Incongruent melting
 - Omission solid solution
7. Polycrystalline quartz grains with sutured and stretched internal crystals in a sandstone are indicative of
- an acid igneous provenance.
 - a basic igneous provenance.
 - a metamorphic provenance.
 - a sedimentary provenance.
8. Energy derived from the heat flow rising out of the Earth is called
- hydroelectric energy
 - hydrothermal energy
 - geothermal energy
 - radioactive energy
9. A body of strata in which maximum abundance of a particular species is found is called
- assemblage zone
 - range zone
 - acme zone
 - interval zone

10. In a silicate phase diagram, the boundary between one-solid and two-solid fields is known as

- (A) eutectic
- (B) liquidus
- (C) solvus
- (D) solidus

11. Which of the following occurs when two air masses of sharply contrasting densities collide?

- (A) Temperate cyclone
- (B) Tropical cyclone
- (C) Tropical convergence
- (D) Trade winds

12. Most of the beach sands are derived from

- (A) sands carried by river
- (B) sands blown by wind
- (C) erosion of sea cliffs
- (D) debris flow along the shore

13. Which of the following forms of harnessing energy does not involve driving a turbine?

- (A) Nuclear power stations
- (B) Hydroelectric power plants
- (C) Photovoltaic power technology
- (D) Geothermal power stations

14. Oscillatory zoning in plagioclase may be best explained by

- (A) diminishing P_{H_2O} condition in the magma.
- (B) rising P_{H_2O} condition in the magma.
- (C) fluctuating P_{H_2O} condition in the magma.
- (D) liquid immiscibility.

15. A tectonically deformed rock having dominant linear fabric and indicating constrictional type strain is known as the _____.

- (A) Pseudo tachylite
- (B) Boudin
- (C) L-tectonite
- (D) S-tectonite

16. The most viable source of energy in mankind's future, which involves utilizing fission is

- (A) geothermal energy
- (B) solar energy
- (C) fossil fuel energy
- (D) nuclear energy

17. Sandstone comprising 55% quartz, 30% feldspar, 10% rock fragments and 5% cement is known as

- (A) quartz arenite
- (B) arkose
- (C) grit
- (D) graywacke

18. Which among the following rocks has the highest density?

- (A) Peridotite
- (B) Basalt
- (C) Granite
- (D) Andesite

19. Achondrites are

- (A) Stony meteorites
- (B) Stony-Iron meteorites
- (C) Iron meteorite
- (D) Glassy meteorite

20. If a hole is dug into a confined aquifer, the water will rise up to the level of

- (A) aquiclude
- (B) water table
- (C) perched water table
- (D) artesian pressure surface

21. Subduction at an ocean-ocean convergent plate boundary results in the development of a line of volcanic islands called an (1) _____ made up of (2) _____ volcanic rocks.

- (A) (1) archipelago; (2) limestone
- (B) (1) atoll; (2) andesite
- (C) (1) island arc; (2) andesite
- (D) (1) island arc; (2) basalt

22. The temperature of the core of the earth is estimated to be about _____.

- (A) 3000°C
- (B) 6000°C
- (C) 9000°C
- (D) 12000°C

23. For silicate structure that involves sharing of one oxygen atom by two adjacent tetrahedra is known as

- (A) Phyllosilicate
- (B) Nesosilicate
- (C) Sorosilicate
- (D) Tectosilicate

24. The Siwalik Group forms larger part of the sub-Himalayan terrane. Its sediments are mainly deposited by _____.

- (A) fluvial processes
- (B) glacial processes
- (C) shallow marine processes
- (D) deep marine processes

25. It is generally believed the main driving force for plate tectonics is

- (A) tidal forces between the Earth, Sun and Moon.
- (B) lavas pushing through the crust at mid-ocean ridges.
- (C) shrinking of the Earth as it cools.
- (D) convection in the mantle.

26. Which of the following sentences is *not true* regarding the oceans?

- (A) The floor of Atlantic Ocean is dominated by siliceous oozes.
- (B) The floor of Pacific Ocean is dominated by siliceous oozes.
- (C) Carbonate Compensation Depth (CCD) in the Atlantic Ocean is deeper than that in the Pacific Ocean.
- (D) There could be 'lakes' and/or 'rivers' of denser water in the deeper parts of the oceans.

27. Formation of Layered Igneous complexes are favoured at

- (A) active fault zone
- (B) subduction zone
- (C) shear zone
- (D) tectonically quiescent condition

28. Which of the following statements is *not true* regarding the continental shelves?

- (A) Continental shelves are oceanward extensions of the continental crust.
- (B) Continental shelves are landward extensions of the oceanic crust.
- (C) Passive continental margins generally have wider shelves than the active continental margins.
- (D) The widest continental shelf lies north of Siberia, in Arctic ocean.

29. Which one of the following statements is correct regarding the GPS satellites?

- (A) The normal altitude is about 20,200 km.
- (B) The inclination of axis satellite is 55°.
- (C) The satellites transmit two L band signals (L1 with 1575.42 MHz and L2 with 1276.6 MHz).
- (D) All of the above

30. You are examining a thin section of unstrained quartz (between crossed polars) with the help of a microscope. During 360° stage rotation, the quartz grain will show extinction for

- (A) only once
- (B) four times
- (C) twice
- (D) thrice

31. In ferromagnetic metals, the atoms occupy lattice positions that are close enough to allow the exchange of electrons between neighbouring atoms. The exchange interaction produces a very strong molecular field within the metal, which aligns the atomic magnetic moments in _____.

- (A) exactly parallel directions
- (B) exactly antiparallel directions
- (C) slightly inclined parallel directions
- (D) slightly inclined antiparallel directions

32. The type of landslide that involves slow sliding of sediment above a concave slip surface is called

- (A) a slump
- (B) a rock slide
- (C) a mud flow
- (D) a debris avalanche

33. For trace element, mineral-melt distribution co-efficient (K_d) should be expressed as

- (A) $\frac{\text{Concentration of the trace element in the mineral (ppm)}}{\text{Concentration of the trace element in the liquid (ppm)}}$
- (B) Concentration of the trace element (ppm) in melt + that of liquid.
- (C) $\frac{\text{Concentration of the trace element in the melt (ppm)}}{\text{Concentration of the trace element in the chondrite (ppm)}}$
- (D) Concentration of the trace element (ppm) in the melt $\times 100$.

34. Which of the following types of waves are characteristically found in deeper parts of seas/oceans?

- (A) Oscillatory waves
- (B) Translatory waves
- (C) Littoral waves
- (D) Lateral waves

35. When seismic waves from an earthquake reach the boundary between the mantle and the liquid outer core

- (A) all of the body waves get refracted.
- (B) all of the body waves get reflected, but none are refracted.
- (C) all P-waves stop because they are unable to move through the outer core.
- (D) all S-waves vanish because they cannot move through a liquid.

36. You are planning for construction of a dam and for that you are required to know sub-surface data. For this purpose you will go for following geophysical method.

- (A) Self-potential method
- (B) Gravity method
- (C) Seismic Reflection method
- (D) Seismic Refraction method

37. Typhoons cause heavy rains over continents as well as oceans. They develop and mature _____

- (A) inside the deeper oceans only.
- (B) just near the surface of open oceans only.
- (C) over the oceans only.
- (D) over the continents only.

38. What is the typical depth of the epicenter of an earthquake?

- (A) A few km.
- (B) Up to 700 km.
- (C) The same depth as the focus
- (D) Zero (at the surface)

39. Presence of the element Se in the Gossan zone indicates

- (A) Auriferous vein
- (B) Auriferous lode
- (C) Sulphides of epigenetic origin
- (D) Presence of water bodies in the sub-surface

40. Of the following major river systems of the peninsular India, which one has the maximum drainage basin area?

- (A) Mahanadi
- (B) Godavari
- (C) Cauvery
- (D) Krishna

41. A well dug into an unconfined aquifer will

- (A) dry up during the dry season.
- (B) develop a cone of depression around the well.
- (C) immediately develop into an artesian well.
- (D) fill up with water to the level of the water table.

42. Which of the following statements is true regarding the heatwaves?

- (A) It is defined as a period of abnormally and uncomfortably hot and usually humid weather.
- (B) It is a long period of time when unusually fast and abnormally hot winds flow.
- (C) It is a long period of abnormally hot and extremely dry weather.
- (D) Heatwaves occur only between 45°N and 45°S latitudes.

43. Regions that are underlain by limestone rocks are prone to the development of _____ as a result of dissolution by ground water.

- (A) artesian wells
- (B) sinkholes
- (C) swamps
- (D) marble

44. As per the Köppen classification of climates, Kolkata has _____.

- (A) Af climate
- (B) Aw climate
- (C) Am climate
- (D) Bw climate

45. In a glacial landscape, which of the following is not an erosional landform?

- (A) Drumlin
- (B) Roché Moutonnée
- (C) Arête
- (D) Cirque

46. The Earth has a magnetic field because

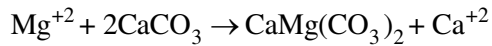
- (A) magnetic minerals are common at temperatures above the Curie point.
- (B) it has a magnetic iron-nickel core.
- (C) the liquid outer core creates an electric current which induces a magnetic field.
- (D) All of the above

47. The altitudinal distance of a geostationary satellite from the earth is about

- (A) 26,000 km
- (B) 30,000 km
- (C) 36,000 km
- (D) 44,000 km

48. The GPS space segment consists of Navigation Satellite Timing and Ranging whose number is
- (A) 8
 - (B) 12
 - (C) 16
 - (D) 24
49. Which of the following is an accurate definition of the term tsunami?
- (A) It is a type of earthquake that occurs under the ocean.
 - (B) It is a type of seismic wave that causes a lot of damage to tall buildings.
 - (C) It is a water wave generated in the ocean as a result of an earthquake.
 - (D) It is an ancient Japanese method of studying earthquakes.
50. The mineral stibnite is an example of
- (A) Sulphate
 - (B) Sulphide
 - (C) Oxide
 - (D) Silicate
51. Which of the following is the warm oceanic current of the 'Pacific ocean'?
- (A) Kuroshio current
 - (B) California current
 - (C) Peru current
 - (D) Oyashio current
52. Which of the following statements about mineral is incorrect?
- (A) Vitreous, resinous and greasy are all types of luster.
 - (B) Crystal faces and cleavage planes are the same thing.
 - (C) Minerals with no cleavage break with a conchoidal fracture.
 - (D) Mineral hardness is controlled by the strength of the atomic bonds.
53. Most faults in the Himalaya are
- (A) transform
 - (B) normal
 - (C) strike-slip
 - (D) thrust
54. In a neutrally stable atmosphere, the lapse rate is
- (A) more than dry adiabatic.
 - (B) between dry and moist adiabatic.
 - (C) negative.
 - (D) equal to dry adiabatic.
55. Epirogenic activity is related to
- (A) horizontal movement.
 - (B) large scale strike-slip fault.
 - (C) vertical movement.
 - (D) movement which was initially horizontal then became inclined.
56. Which of the following coast has a subduction zone?
- (A) East African Coast
 - (B) West African Coast
 - (C) East-South American Coast
 - (D) West-South American Coast
57. The earthquake scale that measures energy release by considering the physical characteristics of motion along the fault, such as amount of fault slip and the size of the fault that ruptured, is called the
- (A) Richter scale
 - (B) moment magnitude scale
 - (C) modified Mercalli scale
 - (D) intensity scale

58. What is the name of the geological process for the following chemical reaction?



- (A) Lithification
- (B) Recrystallization
- (C) Cementation
- (D) Dolomitization

59. The depth zones of the ocean from land mass to open sea are

- (A) abyssal–bathyal–neritic–littoral
- (B) neritic–bathyal–abyssal–littoral
- (C) neritic–bathyal–littoral–abyssal
- (D) littoral–neritic–bathyal–abyssal

60. During magmatic crystallization, the early formed plagioclase is calcic (rather than sodic) because

- (A) Na cation prefers assimilation.
- (B) Ca cation prefers assimilation.
- (C) Ca cation is bigger than Na cation.
- (D) Ca cation has greater charge than Na cation.

61. The grain size of constituent minerals of pegmatite are very coarse; this is because of

- (A) Volatile–controlled prolonged crystallization.
- (B) Liquid immiscibility controlled crystallization.
- (C) Quenching of magma due to very fast crystallization.
- (D) Liquid immiscibility controlled crystallization followed by assimilation.

62. Read carefully the following three statements regarding the Ekman spiral:

1. It is generated by winds.
2. It conceptualizes horizontal movements of water in a layered water column.
3. It explains that water in some parts of seas/oceans spirals downward to generate whirlpool motion.

Which of these statements is correct?

- (A) Only 1 is correct
- (B) Only 1 is incorrect
- (C) Only 3 is incorrect
- (D) All, 1, 2 and 3, are correct

63. The only two places on earth that have continental glaciers today are

- (A) the north pole and the south pole.
- (B) Greenland and Ice land.
- (C) Alaska and Antarctica.
- (D) Antarctica and Greenland.

64. Bauxite is mainly formed by

- (A) Residual concentration process.
- (B) Mechanical concentration process.
- (C) Magmatic concentration process.
- (D) Supergene enrichment process.

65. Heavy mineral indicolite suggests the existence of

- (A) acid pegmatite in provenance.
- (B) basic igneous rock in provenance.
- (C) low-rank metamorphic rock in provenance.
- (D) high-rank metamorphic rock in provenance.

66. Which of the following statements is *not true* regarding the gyres?

- (A) These are caused by the Coriolis Effect of the earth's rotation.
- (B) There are five major ocean-wide gyres in the world.
- (C) The most powerful gyre occurs at the equator.
- (D) These influence the climate of continents.

67. Which of the following Himalayan faults/thrusts is seismically the most active?

- (A) Himalayan Frontal Fault/Thrust
- (B) Main Boundary Thrust
- (C) Main Central Thrust
- (D) South Tibetan Detachment

68. Choose the correct statement about troposphere.

- (A) The thickness of the troposphere is the greatest at the equator.
- (B) It is densest of all the layers.
- (C) It is responsible for creating the climatic and weather conditions on the earth's surface.
- (D) All of the above

69. The Mn nodules in the deep sea are formed due to

- (A) organic reactions of the deep sea sediments.
- (B) inorganic reactions of the deep sea sediments.
- (C) inorganic and organic both reactions of the deep sea sediments.
- (D) transportation of the rivers and stream sediments.

70. Thickening and thinning of beds at crests and troughs are seen in

- (A) open fold
- (B) similar fold
- (C) parallel fold
- (D) concentric fold

71. Following area is famous for copper deposit:

- (A) Malanjkhand
- (B) Kolar
- (C) Sukinda
- (D) Jadugoda

72. RADAR Interferometry can be used to _____.

- (A) infer focal depth of an earthquake
- (B) measure crustal deformation caused by an earthquake
- (C) estimate energy released by an earthquake
- (D) predict recurrence period of an earthquake

73. Kennelly–Heaviside layers in the atmosphere refer to

- (A) ozonosphere
- (B) troposphere
- (C) mesosphere
- (D) ionosphere

74. Which mineral of the following is having variable hardness?

- (A) Graphite
- (B) Magnesite
- (C) Kyanite
- (D) Quartz

75. Solar rays penetrate in the ocean water up to a depth of

- (A) 20m
- (B) 100m
- (C) 200m
- (D) 400m

76. In the following list, the granulite belt is represented by

- (A) Eastern Ghats
- (B) Dalma
- (C) Dhanjori
- (D) Cuddapah

77. Which of the following landform exemplifies the 'sudden modification' in a fluvial landscape evolution?

- (A) A long stretch of palaeochannel.
- (B) A perfect oxbow lake adjoining a meandering channel.
- (C) A crevasse splay.
- (D) A submerged channel bar.

78. The clouds of gas and volcanic ash are known as

- (A) nuée ardent
- (B) col
- (C) bergschrund
- (D) None of the above

79. Amorphous variety of magnesite is found in

- (A) Salem Distt., Tamil Nadu
- (B) Pithoragarh, Uttarakhand
- (C) Almora, Uttarakhand
- (D) Keonjhor, Odisha

80. When the isobars are circular or elliptical in shape and the pressure is lowest at the centre, the system is called

- (A) cyclone
- (B) anticyclone
- (C) doldrum
- (D) monsoon trough

81. The concept of isostasy can be regarded as

- (A) Floating equilibrium amongst different crustal blocks.
- (B) Intense disequilibrium amongst different crustal blocks.
- (C) Faulting and folding between adjacent crustal blocks.
- (D) Shearing movement involving the most dense unit of the crustal block.

82. Piggy-back basins form on _____.

- (A) hanging wall of normal faults
- (B) footwall of normal faults
- (C) hanging wall of reverse faults
- (D) footwall of reverse faults

83. In a stress-strain binary diagram where the ordinate represents the increasing stress and the abscissa represents the increasing strain, a line almost parallel to the abscissa is characteristic of

- (A) plastic material
- (B) brittle material
- (C) elastoplastic material
- (D) ductile material

84. Gondite rocks in India are associated with the deposit of

- (A) Iron
- (B) Manganese
- (C) Pb-Zn
- (D) Magnesite

85. The total annual insolation is greatest at

- (A) equator
- (B) tropic of cancer
- (C) tropic of capricorn
- (D) arctic circle

86. 'Norm' in an igneous rock refers to

- (A) theoretically possible minerals.
- (B) actually existing minerals.
- (C) chemical composition of the rock.
- (D) density of the rock.

- 87.** Which planet is nearest to the Earth?
 (A) Mercury
 (B) Venus
 (C) Mars
 (D) Jupiter
- 88.** Width of outcrop of a bed on the ground depends upon
 (A) thickness of the bed.
 (B) dip of the bed.
 (C) slope of the ground.
 (D) All of the above
- 89.** What happens when fresh water from an underground source oozes out into a sea/ocean?
 (A) It 'floats' on the sea/ocean water.
 (B) It 'sinks' down the sea/ocean water.
 (C) It immediately mixes with the sea/ocean water and thus no issue of 'floating' or 'sinking' arises.
 (D) It cannot at all ooze out into sea/ocean.
- 90.** Brazilian test is used to determine
 (A) crushing strength
 (B) shear strength
 (C) tensile strength
 (D) transverse strength
- 91.** Leucite is an example of
 (A) Feldspathoid
 (B) Feldspar
 (C) Pyroxene
 (D) Olivine
- 92.** Ground-penetrating Radar is a powerful instrument used for near-surface geophysical exploration. It produces images through reflections of targeted electromagnetic energy having frequencies in the range of
 (A) 1 MHz to 100 MHz
 (B) 100 MHz to 1 GHz
 (C) 1 GHz to 10 GHz
 (D) 10 GHz to 100 GHz
- 93.** Which instrument is used to measure the wind velocity?
 (A) Photometer
 (B) Barometer
 (C) Anemometer
 (D) Lysimeter
- 94.** What are the essential properties should be present in a mineral for the formation of placer deposit?
 (A) High specific gravity, durability and chemically resistant.
 (B) Low specific gravity, durability and chemically resistant.
 (C) Low specific gravity, friable and chemically resistant.
 (D) High specific gravity, durability and chemically very reactive.
- 95.** The Poisson's ratio is the ratio of
 (A) lateral strain to longitudinal strain.
 (B) tangential stress to shearing strain.
 (C) confining stress to lateral strain.
 (D) stress to strain.
- 96.** In the Diopside-Albite-Anorthite system (1 atm dry), along the cotectic line
 (A) only Diopside is crystallizing.
 (B) Plagioclase and Diopside both show exsolution.
 (C) Plagioclase and Diopside crystallize together.
 (D) Diopside and Plagioclase react with each other.

97. The correct ascending order of the atmospheric layers, from the earth, is

- (A) troposphere, stratosphere, mesosphere, thermosphere, exosphere.
- (B) stratosphere, troposphere, mesosphere, thermosphere, exosphere.
- (C) troposphere, thermosphere, stratosphere, mesosphere, exosphere.
- (D) thermosphere, troposphere, mesosphere, stratosphere, exosphere.

98. In calcite the refractive index for the ordinary ray is (1) _____ and for extraordinary ray is (2) _____.

- (A) (1) 1.52 (2) 1.69
- (B) (1) 1.66 (2) 1.89
- (C) (1) 1.66 (2) 1.49
- (D) (1) 1.72 (2) 1.98

99. As compared to clay, fine grained sandstone has

- (A) lower porosity and higher permeability.
- (B) higher porosity and higher permeability.
- (C) lower porosity and lower permeability.
- (D) higher porosity and lower permeability.

100. The largest single contributor to the planetary albedo of the Earth is

- (A) clouds
 - (B) snow
 - (C) oceans
 - (D) volcanic dust
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2718-II

X-14

ROUGH WORK

X-15

2718-II

ROUGH WORK

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X-16

ROUGH WORK