Roll No	[redacted]
Registration No	[redacted]
Candidate Name	[redacted]
Module Name	**EARTH ATMOSPHERIC OCEAN AND PLANETARY SCIENCES - 702**
Exam Date	**28-Feb-2025**
Exam Batch	**09:00-12:00**

[redacted]

1) PART A

Question No. 1 / Question ID 18 Marks: 2.00

Which one of the following Venn diagrams is NOT consistent with the following statements?

All *A* are *B*
No *D* is *A*
Some *A* are *C*

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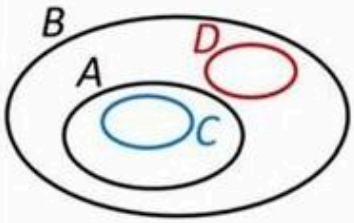
<td> 
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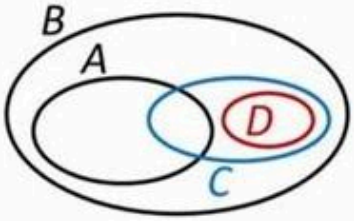
<td> 
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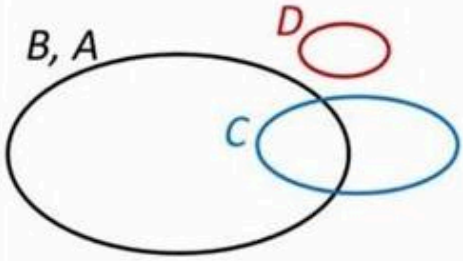
<td> 
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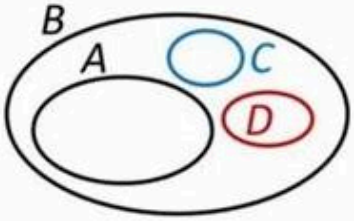
<td> 
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- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 2 / Question ID 3 Marks: 2.00

Fifteen distinct points are randomly placed on the circumference of a circle. How many distinct straight lines at the most can be formed by pairs among these points?

1. 105
2. 455
3. 30
4. 210

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 3 / Question ID 20 Marks: 2.00

A water bottle costs ₹ 20 that includes cost of the bottle. If the water costs ₹ 15 more than the bottle, then what is the cost of the bottle?

1. ₹ 2.50
2. ₹ 5
3. ₹ 7.50
4. ₹ 10

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 4 / Question ID 8 Marks: 2.00

In a board meeting of 20 directors, 6 shook everyone else's hands but the remaining 14 did not shake each another's. The total number of handshakes in the meeting was

1. 26
2. 84
3. 99
4. 190

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 5 / Question ID 10 Marks: 2.00

A spherical ball is placed inside a cubic box. If the diameter of the ball is same as the sides of the box, what approximate percentage of volume will be empty?

1. 12%
2. 24%
3. 36%
4. 48%

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 6 / Question ID 19 Marks: 2.00

A square sheet of 10 cm sides is folded along its diagonal to form an isosceles right triangle, and then hypotenuses are folded successively two times to form isosceles right triangles. What is the length of each equal side after the third folding?

1. 0.625 cm
2. 1.25 cm
3. 2.5 cm
4. 5 cm

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 7 / Question ID 12 Marks: 2.00

The words TEST, EXAM and EAST are coded as 1382, 2182 and 1937 but not necessarily in that order. How would the word MATE be coded?

1. 9321
2. 7321
3. 7312
4. 1982

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 8 / Question ID 4 Marks: 2.00

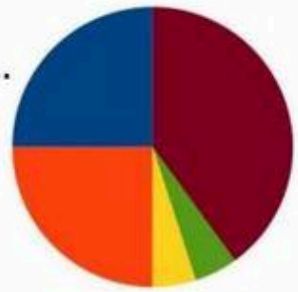
In a population of microbial cells, the initial population is 50, and the growth rate is 0.1 per hour. If the population grows exponentially, what will the approximate size of the population be after 10 hours?

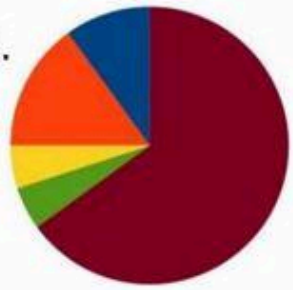
1. 51
2. 82
3. 136
4. 156

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 9 / Question ID 16 Marks: 2.00

Which of the following pie-charts depicts the distribution of students in the five subjects such that physics and chemistry get equal number of students, 40% of the total go to the life sciences and remaining are equally divided into maths and earth sciences?

1. 

2. 

3. 

4. 

- ○ 1
- ○ 2
- ○ 3

○ 4

Question No. 10 / Question ID 11 Marks: 2.00

If I walked east 100 metres, turned right and walked 60 metres, turned left and walked 150 metres and turned left again, I would be facing

1. East
2. North
3. West
4. South

○ 1
○ 2 (Chosen Option)
○ 3
○ 4

Question No. 11 / Question ID 9 Marks: 2.00

Choose the correct chronological order of the following:-
A: match, B: trophy, C: toss, D: result.

1. C, A, D, B
2. A, D, B, C
3. C, B, A, D
4. D, C, B, A

○ 1 (Chosen Option)
○ 2
○ 3
○ 4

Question No. 12 / Question ID 13 Marks: 2.00

All those who pass an entrance test take admission into a certain institute. Out of these, some graduate with a degree in 2 years while some fail and are removed, and all graduates from that institute get jobs in the same year. In 2022, no one took admission in that institute. Which of the following does NOT follow necessarily?

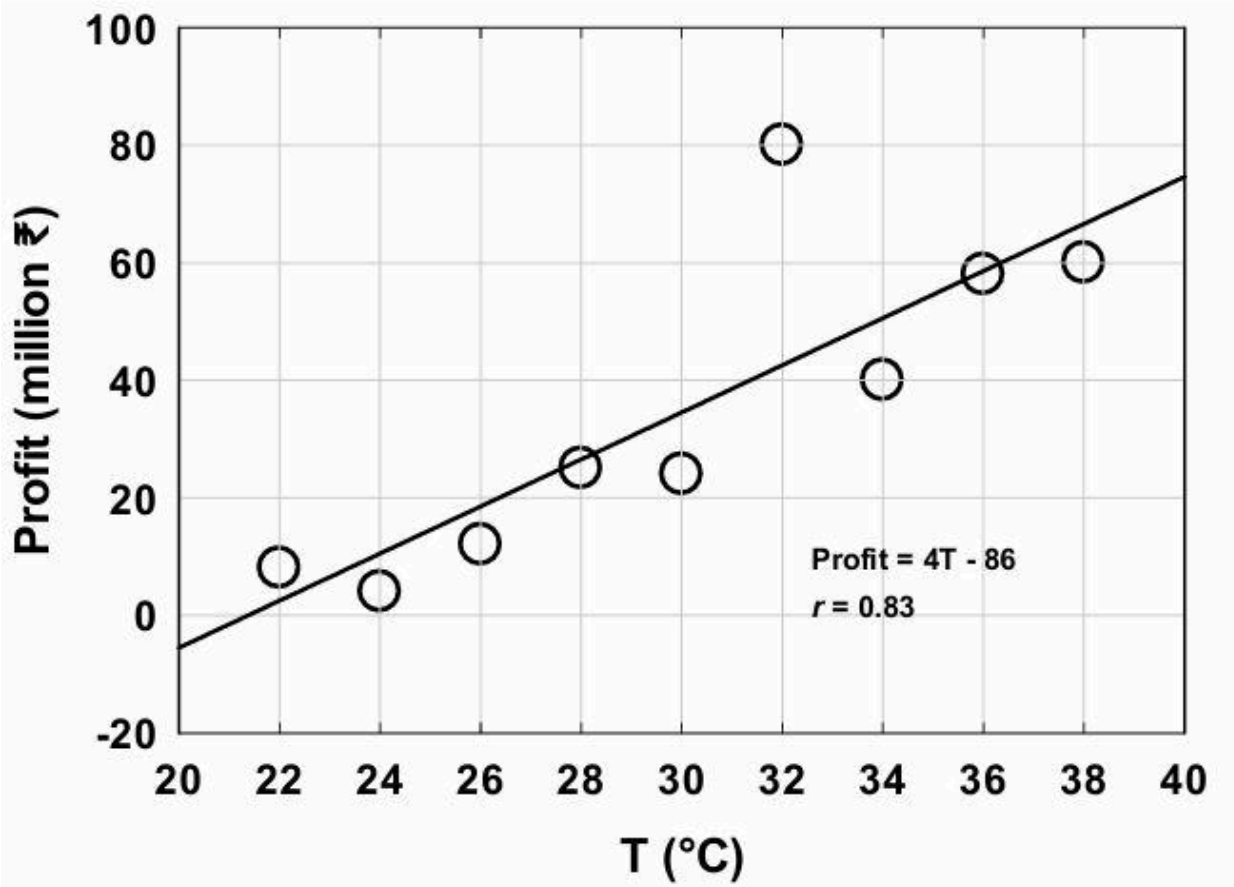
1. No one wrote the entrance test in 2022
2. No one passed the entrance test in 2022
3. No one graduated from the institute in 2024
4. No one got a job from the institute in 2024

○ 1
○ 2

○ 3
○ 4

Question No. 13 / Question ID 5 Marks: 2.00

The given figure shows data points and a line fit by least squares method between profit in ice-cream business and mean temperature (T) for a city. Which one of the following inferences can definitely be drawn? (The correlation coefficient *r* is also given in the figure)



1. The sum of the squared values of differences between the observed and expected values of temperature is the minimum.
2. 83% of the variation in profit is explained by the variation in temperature.
3. Rise in temperature causes profit to increase.
4. At 25°C, estimated profit is 14 million ₹.

○ 1
○ 2 (Chosen Option)
○ 3
○ 4

Question No. 14 / Question ID 15 Marks: 2.00

In the fictional country of Numberia, which of the following provinces is the odd one out?

1. SONECON
2. CUGHUSTER
3. FATWOHUM
4. CAFIVENGUS

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 15 / Question ID 1 Marks: 2.00

If a map is placed in such a manner that southwest becomes east, then what will north become?

1. Northeast
2. Southwest
3. Northwest
4. Southeast

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 16 / Question ID 6 Marks: 2.00

The average of seven numbers is 71. If we exclude one of these numbers, the average becomes 75. What is that number?

1. 75
2. 74
3. 73
4. 47

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 17 / Question ID 7 Marks: 2.00

Choose the option to fill in the blank that will make the following statement logically correct:

THE NUMBER OF OCCURRENCES OF THE LETTER "N" IN THIS SENTENCE IS CORRECTLY COUNTED AS _____ .

1. SIX
2. SEVEN
3. EIGHT
4. NINE

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 18 / Question ID 2 Marks: 2.00

If water of pH 8 is diluted 100 times with neutral water (pH = 7) then it will

1. become acidic.
2. remain basic.
3. become neutral.
4. become heavy.

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 19 / Question ID 14 Marks: 2.00

Frank, Sam, Tom and David came first, second, third and fourth in a race but not necessarily in this order. Only one had first letter of position matching that of his name. If Tom came first and Sam did not come second then

1. David came third
2. Frank came fourth
3. David came fourth
4. Sam came fourth

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 20 / Question ID 17 Marks: 2.00

How many 4-digit numbers can be generated from the digits 1, 2, 3, 4, 5 such that no digit appears more than once, and digit 1 is always somewhere to the left of the digit 2?

1. 72
2. 36
3. 12
4. 6

- ○ 1
- ○ 2
- ○ 3
- ○ 4

2) PART B

Question No. 1 / Question ID 702124 Marks: 2.00

The declination of the Natural Remanent Magnetism of a rock unit is a measure of

1. the latitude of the formation of the rock
2. its longitudinal movement
3. its latitudinal movement
4. amount of rotation about a vertical axis

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 2 / Question ID 702130 Marks: 2.00

The seismic phase which reveals that the inner core of the Earth is solid is _____.

1. PKP
2. SKIKP
3. SKJKS
4. PKIKP

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 3 / Question ID 702115 Marks: 2.00

Which one of the following statements is INCORRECT about Coriolis force (CF)?

1. CF is the cross product between the rotational vector of the Earth and the velocity vector of the moving object
2. CF is the maximum for motions perpendicular to the Earth's axis
3. CF increases with increasing distance from the Earth's axis
4. CF affects west-east winds over the equator to deflect them in vertical direction

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 4 / Question ID 702121 Marks: 2.00

The Earth's gravity field from surface to the centre

1. decreases uniformly
2. increases in the mantle and decreases uniformly in the outer & inner core
3. increases in the mantle and decreases gently in the outer core and sharply in the inner core
4. decreases sharply in the mantle and gently in outer and inner core

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 5 / Question ID 702118 Marks: 2.00

A zone of coalescent deposition from adjacent prograding fans is known as_____.

1. talus cone
2. bajada
3. megafan
4. erg

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 6 / Question ID 702139 Marks: 2.00

Scale height of the Earth's atmosphere for a vertically averaged temperature 250 K is _____.

1. 5.5 km
2. 7.3 km
3. 10.3 km
4. 6 km

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 7 / Question ID 702144 Marks: 2.00

Opal concentration in the sediments is high in the_____.

1. equatorial Pacific and Southern oceans
2. equatorial Atlantic and Arctic oceans
3. Indian Ocean
4. North Atlantic Ocean

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 8 / Question ID 702112 Marks: 2.00

Under weathering-limited environment _____.

1. thick saprolite develops
2. thick debris cover develops
3. no or little soil develops
4. soil formation takes place

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 9 / Question ID 702142 Marks: 2.00

The difference between the *in-situ* temperature and the potential temperature in the ocean _____ with depth.

1. is positive and remains constant
2. is negative and decreases
3. is positive and increases
4. is negative and increases

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 10 / Question ID 702135 Marks: 2.00

Which one of the following factors could reduce the formation of ground-level ozone in an urban atmosphere?

1. Increased emissions of nitrogen oxides (NO_x) from vehicles
2. Increased cloud cover during daytime
3. Higher concentrations of volatile organic compounds (VOCs) from industrial sources
4. Higher ambient temperature during daytime

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 11 / Question ID 702101 Marks: 2.00

A hornblende bearing metamorphic rock formed very close to the surface, within the stability conditions of andalusite. This rock represents _____metamorphism.

1. Amphibolite facies
2. Hornfels facies
3. Granulite facies
4. Greenschist facies

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 12 / Question ID 702116 Marks: 2.00

A transfer of westerly angular momentum takes place from the Earth's surface to the atmosphere in regions of surface_____.

1. easterly
2. westerly
3. northerly
4. southerly

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 13 / Question ID 702147 Marks: 2.00

The thickness of sediment on seafloor at a place 200 km away from spreading center is 250 m. If the sedimentation rate in the area is 5 cm/10^3 year, the rate of seafloor spreading is _____.

1. 4 cm/yr
2. 5 cm/yr
3. 20 cm/yr
4. 2.5 cm/yr

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 14 / Question ID 702145 Marks: 2.00

Eastern boundary currents are colder because they_____.

1. carry deeper water to the surface
2. carry water from high latitudes towards equator
3. cause convective mixing
4. are winter season currents

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 15 / Question ID 702117 Marks: 2.00

Water-layer weathering primarily occurs on _____.

1. shore platforms
2. strath terraces
3. duricrust tops
4. stone pavements

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 16 / Question ID 702102 Marks: 2.00

When did the first multicellular life forms appear on the Earth?

1. ~ 541 Ma
2. ~ 635 Ma
3. ~ 2500 Ma
4. ~ 4500 Ma

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 17 / Question ID 702131 Marks: 2.00

In the absence of Earth's rotation, the flow of air in the lower atmosphere will be _____.

1. parallel to isobars
2. parallel to isolines of pressure tendency
3. from high pressure to low pressure
4. from low pressure to high pressure

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 18 / Question ID 702128 Marks: 2.00

The S-wave velocity for a material with Poisson's ratio of 0.5 is _____.

1. half of the P-wave velocity
2. equal to the P-wave velocity
3. twice the P-wave velocity
4. zero

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 19 / Question ID 702143 Marks: 2.00

The solar radiation at a depth of 50 m in sea is 30% of surface radiation. In that case the extinction coefficient is _____.

1. 0.05 m^{-1}
2. 0.48 m^{-1}
3. 0.25 m^{-1}
4. 0.024 m^{-1}

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 20 / Question ID 702149 Marks: 2.00

Microbial respiration rates decrease in the ocean with increasing depth due to _____.

1. low abundance of organic matter
2. influence of Antarctic bottom water
3. high pressure and low temperature
4. complete darkness

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 21 / Question ID 702137 Marks: 2.00

What happens to moist air parcel rising adiabatically?

1. It cools due to expansion
2. It warms due to compression
3. It becomes drier
4. Its temperature does not change

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 22 / Question ID 702111 Marks: 2.00

The movement of soluble and fine-grained material downward with descending water into soil B horizon, where re-deposition or re-precipitation occurs, is known as

1. Rubification
2. Hydrolysis
3. Sapping
4. Illuviation

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 23 / Question ID 702125 Marks: 2.00

The magnitude measured on a Richter scale _____.

1. is valid for all epicentral distances
2. does not saturate
3. cannot be negative
4. underestimates the magnitude of Great earthquakes

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 24 / Question ID 702138 Marks: 2.00

Wavelength of an atmospheric disturbance that exhibits wavenumber 4 over the equatorial region is _____.

1. 1000 km
2. 10000 km
3. 5000 km
4. 15000 km

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 25 / Question ID 702150 Marks: 2.00

An ocean water sample has $[HCO_3^-] = 1700\ \mu mol/kg$ and $[CO_3^{2-}] = 200\ \mu mol/kg$. How much is the carbonate alkalinity of this water?

1. $1700\ \mu mol/kg$
2. $1900\ \mu mol/kg$
3. $2100\ \mu mol/kg$
4. $2300\ \mu mol/kg$

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 26 / Question ID 702120 Marks: 2.00

Which one of the following is the correct sequence of soil orders with increasing humid conditions?

1. vertisols > mollisols > spodosols > oxisols
2. mollisols > vertisols > spodosols > oxisols
3. vertisols > mollisols > oxisols > spodosols
4. mollisols > vertisols > oxisols > spodosols

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 27 / Question ID 702122 Marks: 2.00

Which one of the following combinations of radioisotopes produces the bulk of the heat generated within the Earth's continental crust?

1. ^{235}U, ^{14}C and ^{137}Cs
2. ^{238}U, ^{147}Sm and ^{240}Th
3. ^{238}U, ^{232}Th and ^{40}K
4. ^{235}U, ^{40}K and ^{234}U

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 28 / Question ID 702113 Marks: 2.00

Which one of the following is used in remote sensing to detect soil moisture?

1. Microwave
2. Optical
3. Thermal
4. Hyperspectral

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 29 / Question ID 702107 Marks: 2.00

The rake of slickenlines on a thrust fault plane 250°, 40° NW was measured to be 90°. The plunge amount of the slickenlines is_____.

1. 10°
2. 20°
3. 30°
4. 40°

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 30 / Question ID 702133 Marks: 2.00

In an incompressible atmosphere _____ wave does not exist.

1. Kelvin
2. Rossby
3. Gravity
4. Acoustic

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 31 / Question ID 702146 Marks: 2.00

In the oceans, subsurface secondary nitrite maxima are generated by_____.

1. nitrogen fixation
2. anaerobic ammonia oxidation
3. nitrification
4. denitrification

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 32 / Question ID 702106 Marks: 2.00

Kamacite and Taenite are dominant constituents of which group of meteorites?

1. Iron meteorite
2. Achondrite
3. SNC meteorite
4. Carbonaceous chondrite

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 33 / Question ID 702132 Marks: 2.00

The magnitude of Rossby radius of deformation of atmosphere at 45°N latitude is _____.

1. 300 km
2. 3000 km
3. 6000 km
4. 10000 km

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 34 / Question ID 702129 Marks: 2.00

Continent-continent collision zone is characterized by _____.

1. shallow focus earthquakes
2. intermediate and deep focus earthquakes
3. shallow, intermediate and deep focus earthquakes
4. deep focus earthquakes

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 35 / Question ID 702104 Marks: 2.00

If the half life of ^{14}C is 5730 years, then what would be its mean life?

1. 16529 years
2. 8264 years
3. 4132 years
4. 12100 years

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 36 / Question ID 702136 Marks: 2.00

A saturated air parcel rises in an environment with a lapse rate of 6.5 K/km. The parcel's lapse rate is 5 K/km. At 3 km, the parcel's temperature is 0°C. What is the temperature of the environment at 3 km?

1. - 2.5°C
2. - 4.5°C
3. - 3.0°C
4. 0°C

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 37 / Question ID 702110 Marks: 2.00

The Euler pole of the Cenozoic plate motion of the Indian plate is located in_____.

1. Australia
2. India
3. Africa
4. North America

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 38 / Question ID 702141 Marks: 2.00

How much phosphorus is required to sustain a primary productivity of 1272 mg C m^{-3} d^{-1}? (Assume Redfield ratio)

1. 1 mmol L^{-1} d^{-1}
2. 1 μmol L^{-1} d^{-1}
3. 1272 μg L^{-1} d^{-1}
4. 106 μmol L^{-1} d^{-1}

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 39 / Question ID 702103 Marks: 2.00

What is the main characteristic of the Cryogenian period?

1. The appearance of the first land plants and animals
2. The occurrence of extreme global glaciations known as Snowball Earth
3. The rise of the first oxygen-rich atmosphere
4. The extinction of all marine life

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 40 / Question ID 702108 Marks: 2.00

Which one of the following oil-fields belongs to the Cambay Basin?

1. Geleki
2. Lakwa
3. Charali
4. Kalol

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 41 / Question ID 702140 Marks: 2.00

Restoring force that supports the existence of gravity waves in the atmosphere is _____.

1. buoyancy
2. compressibility
3. rotation of the earth
4. sphericity of the earth

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 42 / Question ID 702105 Marks: 2.00

A mixture of diopside and anorthite begins to melt at a temperature of 1274°C at a fixed pressure of 0.1 MPa. The degree of freedom representing this system state is _____.

1. 0
2. 2
3. 1
4. Non unique value

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 43 / Question ID 702126 Marks: 2.00

The orbital period of Mars is 687 Earth days. Then, the distance of Mars from the Sun in AU is _____.
[1 AU = distance of the Earth from the Sun]

1. 1.5
2. 1.8
3. 2.2
4. 2.6

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 44 / Question ID 702123 Marks: 2.00

If F, V and H are the Earth's magnetic field and its vertical and horizontal components, respectively at Colombo, then

1. F > H > V
2. F > V > H
3. V > F > H
4. H > V > F

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 45 / Question ID 702114 Marks: 2.00

The zoogeographic transition zone called Wallacea is bounded by _____ .

1. Wallace's line to the east and Weber's line to the west
2. Wallace's line to the west and Weber's line to the east
3. Wallace's line to the east and Lydekker's line to the west
4. Wallace's line to the west and Lydekker's line to the east

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 46 / Question ID 702127 Marks: 2.00

Choose the INCORRECT statement from the following

1. The geoid is an equipotential surface
2. The reference spheroid is an equipotential surface
3. The geoid is an undulating surface
4. The reference spheroid and geoid refer to the same surface

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 47 / Question ID 702134 Marks: 2.00

Which of the following is NOT a state function for a non-adiabatic process?

1. Enthalpy
2. Internal energy
3. Work
4. Entropy

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 48 / Question ID 702148 Marks: 2.00

Precipitation of $CaCO_3$ from the ocean leads to _____.

1. reduction in dissolved inorganic carbon and alkalinity
2. increase in dissolved inorganic carbon and alkalinity
3. reduction in dissolved inorganic carbon and increase in alkalinity
4. increase in dissolved inorganic carbon and decrease in alkalinity

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 49 / Question ID 702119 Marks: 2.00

Which one of the following is the correct arrangement in up-slope order?

1. glacial table - kettle lake – bergschrund - firn
2. kettle lake – firn - bergschrund -glacial table
3. kettle lake – glacial table - firn - bergschrund
4. glacial table - firn - kettle lake – bergschrund

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 50 / Question ID 702109 Marks: 2.00

Which one of the following sediments compact at the fastest rate during shallow burial?

1. Quartz arenite
2. Mudstone
3. Arkose
4. Grainstone

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

3) PART C

Question No. 1 / Question ID 702190 Marks: 4.00

The P-wave time data corresponding to an earthquake are fit with two line segments having slopes p_1=0.5 s/km. p_2=0.33 s/km and intercepts times (delay times) $\tau_1 = 0\ s$ and $\tau_2 = 1.5\ s$, respectively, leading to a two layered crust. Then, the thickness of the top layer is

1. 0.5 km
2. 1 km
3. 1.5 km
4. 2 km

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 2 / Question ID 702212 Marks: 4.00

"Aliasing" error occurs while solving the equation_____.

1. $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ (wave equation)
2. $\frac{\partial u}{\partial t} = -u \frac{\partial u}{\partial x}$ (one dimensional advection equation)
3. $\frac{\partial u}{\partial t} = -Au$ (Dissipation equation with A as constant)
4. $\frac{\partial u}{\partial t} = -F$ (x component of Newtonian equation formation with F as external force)

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 3 / Question ID 702219 Marks: 4.00

In the ocean, if the characteristic velocity and length scale are 10 cm/s and 100 km, respectively, then choose the correct option [given Coriolis parameter f = $10^{-4}s^{-1}$, Angular velocity of Earth = Ω]

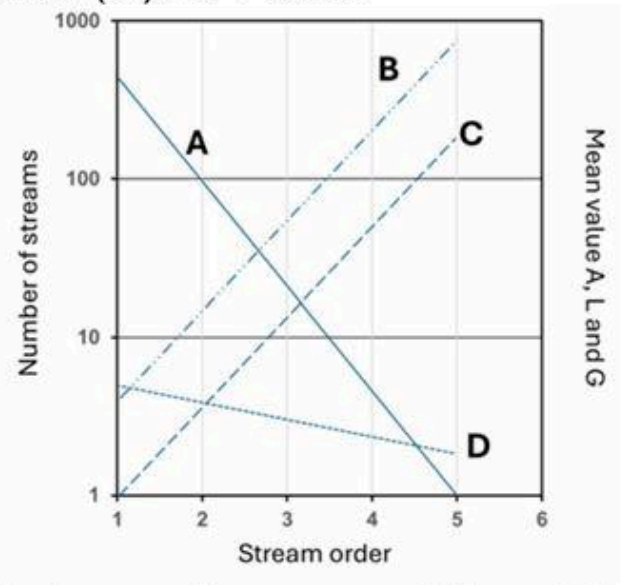
1. Rossby number is $10^{-1}\Omega$ and inertial force dominates the flow
2. Rossby number is 10^{-1} and inertial force dominates the flow
3. Rossby number is $10^{-2}\Omega$ and Coriolis force dominates the flow
4. Rossby number is 10^{-2} and Coriolis force dominates the flow

- ○ 1
- ○ 2

○ 3
○ 4

Question No. 4 / Question ID 702169 Marks: 4.00

The following plot shows the relationship between stream order on X-axis and the number of streams, channel length (L), mean value of basin area (A) and gradient (G) on Y-axis.



Identify the lines that correctly represent the relationship of stream order with number of streams and gradient, respectively

1. B and C
2. A and B
3. A and D
4. C and D

○ 1
○ 2
○ 3
○ 4

Question No. 5 / Question ID 702166 Marks: 4.00

A tunnel is to be excavated along the dip direction in a sandstone with bedding attitude of 30°, 270°.

	Parameter	Rating
A.	Strength of intact rock	7
B.	RQD (%)	8
C.	Joint Spacing	10
D.	Condition of Joints	10
E.	Groundwater	7

Given the ratings of the different parameters tabulated above, the rock mass rating (RMR) relevant for the tunnel excavation (including the tunnel adjustment) is

1. 42
2. 40
3. 38
4. 36

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 6 / Question ID 702206 Marks: 4.00

Invoking potential vorticity conservation in northern hemisphere leads to

1. manifestation of wave like pattern of easterly air current over an orographic barrier on the leeward side.
2. manifestation of purely zonal flow without any wavy pattern of westerly air current over an orographic barrier on the leeward side.
3. formation of gravity wave.
4. Sverdrup meridional transport.

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 7 / Question ID 702217 Marks: 4.00

Which one of the following does NOT represent cold periods?

1. Dansgaard-Oeschger Events
2. Heinrich Events
3. Younger Dryas
4. Bond Events

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 8 / Question ID 702154 Marks: 4.00

In a pelitic bulk composition, biotite appears at 400° and 0.5 GPa. At what pressure, the rock will start metamorphosing under UHT conditions? Assume the thermal gradient of metamorphism to remain constant during the process.

1. 1.125 GPa
2. 11.25 GPa
3. 0.1125 GPa
4. 0.25 GPa

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 9 / Question ID 702179 Marks: 4.00

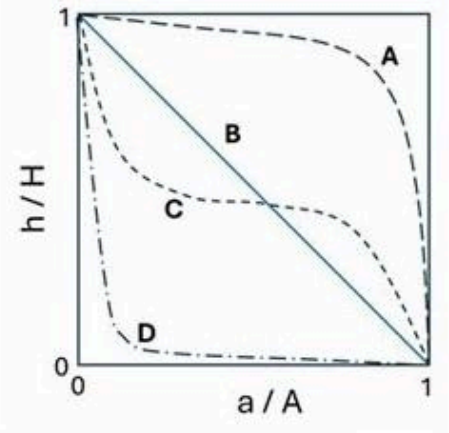
Which among the following shows the correct arrangement of landfall sites of the cyclonic storms from north to south since 2022?

1. Remal- Biparjoy- Asani- Dana-Mandous
2. Biparjoy- Remal -Dana- Asani- Mandous
3. Dana- Asani- Mandous- Biparjoy-Remal
4. Asani-Remal-Biparjoy-Mandous-Dana

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 10 / Question ID 702172 Marks: 4.00

Which one of the following hypsographic curves represents a landscape with very low relief and a few isolated hills?



1. A
2. B
3. C
4. D

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 11 / Question ID 702216 Marks: 4.00

Unsorted sediments of large grain size variation without fabric are

1. volcanic marine sediments.
2. turbidities.
3. windblown sediments.
4. ice-rafted sediments.

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 12 / Question ID 702201 Marks: 4.00

The angle between the effective gravity force and the Newtonian gravitational force is maximum over

1. Equator
2. North pole
3. South pole
4. 45° latitude

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 13 / Question ID 702183 Marks: 4.00

Consider the following statements regarding Geoid, an equipotential surface

Statement A: The gravity field denotes the rate of change of gravity potential.

Statement B: The gravity field on the geoid is everywhere zero.

Choose the correct option.

1. Both A and B are valid, B can be explained by A.
2. Both A and B are valid, but B cannot be explained by A
3. A is inaccurate, but B is valid
4. A is inaccurate and B is invalid

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 14 / Question ID 702203 Marks: 4.00

Consider 500 hPa geopotential field associated with a wavy disturbance in the westerlies in northern hemisphere.

Choose correct option related to advection of relative and planetary vorticity

1. In the region upstream of 500 hPa trough, advection of relative vorticity tends to increase the local relative vorticity.
2. In the region upstream of 500 hPa trough, advection of planetary vorticity tends to increase the local relative vorticity.
3. In the region downstream of 500 hPa trough, advection of relative vorticity tends to decrease the local relative vorticity.
4. In the region downstream of 500 hPa trough, advection of planetary vorticity tends to increase the local relative vorticity.

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 15 / Question ID 702197 Marks: 4.00

If the S-wave vector potential is given by Ψ, then which one of the following identities suggests that shear deformation preserves volume?

1. $\nabla \cdot (\nabla \times \Psi) = 0$
2. $\nabla \cdot \Psi = 0$
3. $\nabla \times \nabla \times \Psi = 0$
4. $\nabla \times \Psi = 0$

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 16 / Question ID 702157 Marks: 4.00

A triangular block ABC is being explored for base metal mineralization. If AB= 25m, BC= 30m, and AC=32m and the thickness of the ore body intersected at A, B, and C are 4m, 5m and 8m, respectively. What is the tonnage of the deposit (in metric ton) if the specific gravity of the ore is 4.95?

1. 162.8 mt
2. 16.28 mt
3. 52.35 mt
4. 523.5 mt

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 17 / Question ID 702185 Marks: 4.00

(F_A, g_A) and (F_B, g_B) are the Free Air and Bouguer anomalies due to two isostatically compensated elevated masses of thicknesses 1.0 km and 2.0 km, respectively. Then

1. $F_B = F_A$, $g_B = g_A$
2. $F_B = F_A$, $g_B = 2g_A$
3. $F_B = 2F_A$, $g_B = 2g_A$
4. $F_B = 2F_A$, $g_B = g_A$

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 18 / Question ID 702210 Marks: 4.00

Estimate the sea level rise due to the thermal expansion for a 2.5°C warming of a 4.5 km deep ocean.
(Thermal expansion coefficient is $1.5X10^{-4}$ $°C^{-1}$)

1. 1.3 m
2. 1.5 m
3. 1.7 m
4. 1.9 m

- ○ 1
- ○ 2
- ○ 3

○ 4

Question No. 19 / Question ID 702196 Marks: 4.00

Seismic diffractions appear in stacked sections as

1. hyperbolae
2. parabolae
3. points
4. straight lines

○ 1
○ 2
○ 3
○ 4

Question No. 20 / Question ID 702163 Marks: 4.00

Which one of the following combinations of sedimentary structures do NOT occur together on a single bed?

1. Groove cast and convolute lamination
2. Prod mark and Wave ripple
3. Double mud drape and rain imprint
4. Desiccation crack and current ripple

○ 1
○ 2
○ 3
○ 4

Question No. 21 / Question ID 702178 Marks: 4.00

Assertion (A): Upper section of a macrotidal estuary gets sedimented due to ebb dominance of tidal current
Reason (R): Sediment entrainment and deposition depend on the speed of tidal currents

Choose the correct option

1. Both (A) and (R) are true and (R) is the correct explanation
2. Both (A) and (R) are true but (R) is not the correct explanation
3. (A) is true and (R) is false
4. (A) is false and (R) is true.

○ 1

- ○ 2
- ○ 3
- ○ 4

Question No. 22 / Question ID 702164 Marks: 4.00

Which one of the following formations listed below dominantly comprises of carbonate rocks?

1. Rohtas Formation
2. Srisailam Formation
3. Gulcheru Formation
4. Rabanapalli Formation

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 23 / Question ID 702195 Marks: 4.00

A gas-sand layer is overlain by a shale layer. Both the acoustic impedance and Poisson's ratios for shale are higher than those for gas-sand. Then, the AVO class for the shale-gas-sand interface is

1. Class 1
2. Class 2
3. Class 3
4. Class 4

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 24 / Question ID 702161 Marks: 4.00

Which of the following is NOT a cause of Milankovitch cycles?

1. Changes in Earth's axial tilt
2. Variation in Earth's orbital eccentricity
3. Changes in the Sun's energy output
4. Precession of the Earth's rotation axis

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 25 / Question ID 702209 Marks: 4.00

Consider a large ice sheet where surface temperature remains at the freezing point. What is the rate at which the thickness of the ice sheet decreases owing to the surface melting if the ice sheet were subjected to an additional downward heat flux of 5 Wm^{-2} from the atmosphere associated with global warming?
(Density of ice, $\rho_i = 0.9X10^3$ kg m^{-3}; Latent heat of freezing ice, $L_f = 3.34 X 10^5$ J kg^{-1})

1. 0.5 m/yr
2. 0.2 m/yr
3. 1 m/yr
4. 0.01 m/yr

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 26 / Question ID 702171 Marks: 4.00

Match the following

Column-I		Column-II	
A.	Post-deposition changes in sediments	E.	Speleogenesis
B.	Soil formation	F.	Orogenesis
C.	Cave network development	G.	Morphogenesis
D.	Building of mountains by the forces of plate tectonics	H.	Diagenesis
		I.	Pedogenesis

Choose the correct option

1. A-H, B-I, C-E, D-F
2. A-H, B-F, C-E, D-I
3. A-C, B-I, C-H, D-E
4. A-G, B-I, C-G, D-E

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 27 / Question ID 702214 Marks: 4.00

The total wavenumber (m^{-1}) of a stationary barotropic Rossby wave at 45° N embedded in a westerly mean flow of speed 15 ms^{-1} is _____.

1. $10^{-6}\ m^{-1}$
2. $10^{-5}\ m^{-1}$
3. $10^{-7}\ m^{-1}$
4. $10^{-4}\ m^{-1}$

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 28 / Question ID 702175 Marks: 4.00

Match the Column-I with Column-II

Column-I		Column-II	
A.	Heliophytes	P.	Plants growing in acidic soils
B.	Psammophytes	Q.	Plants growing under direct sunlight
C.	Chasmophytes	R.	Plants growing in sandy soils
D.	Oxilophytes	S.	Plants growing in crevices of rocks

Choose the correct option

1. A-P, B-S, C-Q, D-R
2. A-P, B-Q, C-R, D-S
3. A-Q, B-R, C-P, D-S
4. A-Q, B-R, C-S, D-P

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 29 / Question ID 702153 Marks: 4.00

Match the following:

Column I (Wilson cycle stages)		Column- II (Examples)	
A.	Embryonic	P.	Red Sea, Africa
B.	Juvenile/young	Q.	Arabian Sea
C.	Mature	R.	Mediterranean Sea
D.	Terminal	S.	Basin and Range Province, USA

1. A-S, B-P, C-Q, D-R
2. A-P, B-Q, C-R, D-S
3. A-Q, B-R, C-S, D-P
4. A-R, B-S, C-P, D-Q

- ○ 1
- ○ 2 (Chosen Option)
- ○ 3
- ○ 4

Question No. 30 / Question ID 702189 Marks: 4.00

A near surface earthquake of magnitude 4.0 is recorded by broadband stations A, B and C which are located at local, regional and teleseismic distance. Assuming the recorded event duration at the stations A, B and C to be denoted as E_A, E_B and E_C, respectively, then

1. $E_A > E_B > E_C$
2. $E_A = E_B = E_C$
3. $E_A < E_B > E_C$
4. $E_A < E_B < E_C$

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 31 / Question ID 702199 Marks: 4.00

Consider a ring of air, initially at rest, around the equator moving poleward with a constant speed 15 m/s. What will be the approximate eastward speed when the air reaches 30°N? (Given the radius of the Earth is 6371 km)

1. 130 m/s
2. 150 m/s
3. 70 m/s
4. 30 m/s

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 32 / Question ID 702165 Marks: 4.00

Which one of the following microfossils occurs exclusively in marine depositional environment?

1. Ostracoda
2. Diatom
3. Dinoflagellate
4. Radiolaria

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 33 / Question ID 702167 Marks: 4.00

Consider the following statements

A. The mean velocity of flow in an open channel is directly related to the hydraulic radius but inversely related to channel gradient and roughness value.
B. Hydraulic radii is obtained by dividing the wetted perimeter of the channel by the cross-section area of the channel.

Choose the correct option

1. Both A and B are true
2. Both A and B are false
3. A is false, but B is true
4. A is true, but B is false

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 34 / Question ID 702227 Marks: 4.00

ALL members of which of the following sets of marine organisms do NOT use silicon to make their skeletal structure on cell wall?

1. Diatoms, Silicoflagellates, radiolarian, sponges
2. Coccolithophores, diatoms, polychaeta, dinoflagellate
3. Pteropoda, foraminifera, radiolarian, sponges
4. Foraminifera, dinoflagellate, coccolithophores, polychaetes

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 35 / Question ID 702192 Marks: 4.00

'R' and 'T' are the reflection and transmission coefficients in electrical prospecting. then which is the correct sequence of minimum and maximum values of R and T given in corresponding brackets?

1. R (0, +1), T (0, +1)
2. R (-1, 0), T (0, +1)
3. R (-1, +1), T (0, +2)
4. R (0, +2), T (0, -1)

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 36 / Question ID 702230 Marks: 4.00

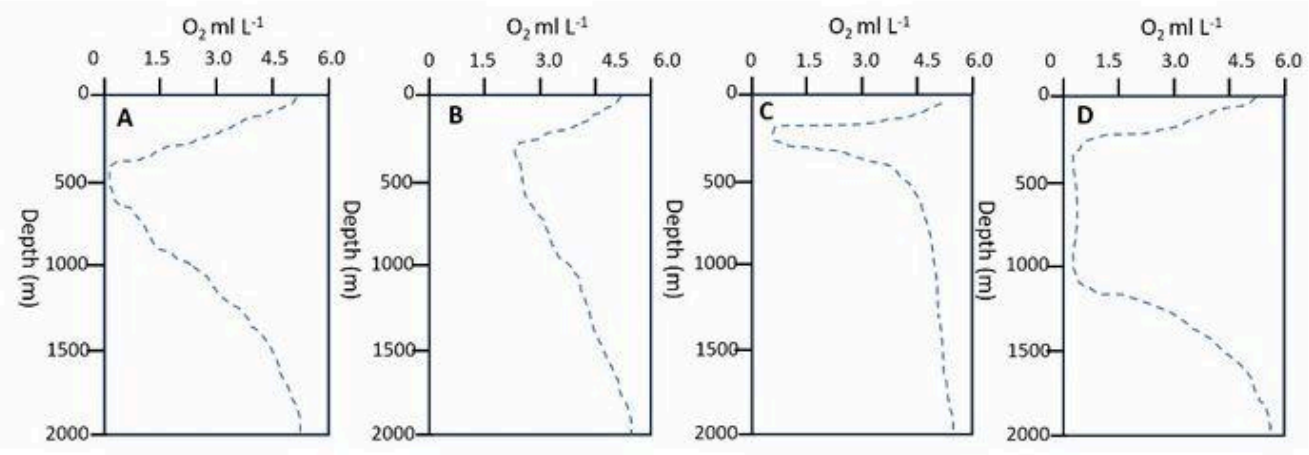
Which of the following biological processes occurring in the ocean leads to the production of oxyluciferin?

1. Anaerobic ammonia oxidation
2. Methane oxidation
3. Bioluminescence
4. Nitrite oxidation

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 37 / Question ID 702225 Marks: 4.00

Considering similar physical states of the sea, which one of the following oxygen profiles indicates the highest primary production at the surface?



1. A
2. B
3. C
4. D

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 38 / Question ID 702182 Marks: 4.00

Match Column I with Column II

Column – I (DEM Product)		Column-II (Satellite)	
A.	ALOS	P.	Endeavor
B.	SRTM	Q.	Terra
C.	ASTER	R.	TanDem X
D.	Copernicus	S.	Daichi
		T.	Cartosat 3

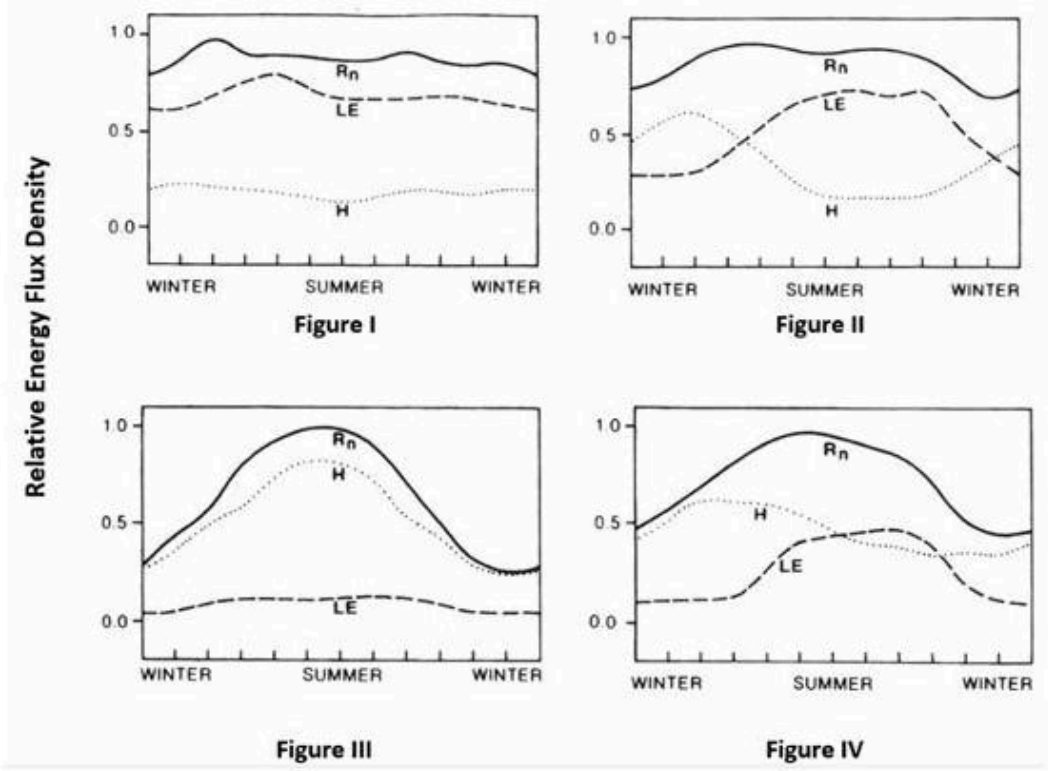
Chose the correct option

1. A – R, B – S, C – P, D - Q
2. A – T, B – Q, C – T, D - S
3. A – S, B – P, C – S, D - T
4. A – S, B – P, C – Q, D – R

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 39 / Question ID 702176 Marks: 4.00

Following figures depict the annual energy balance for 4 climatic types. The source energy flux density (on Y-axis) is normalized to the maximum radiation (Rn). Months of the year are shown on X-axis. H and LE refer to sensible heat flux and latent heat flux, respectively.



Match Column I with Column II

Column I		Column II	
A.	Fig I	P.	Warm steppe climate
B.	Fig II	Q.	Arid climate
C.	Fig III	R.	Tropical wet climate
D.	Fig IV	S.	Tropical wet summer and dry winter climate

Choose the correction option

1. A-R, B-S, C-Q, D-P
2. A-R, B-S, C-P, D-Q
3. A-P, B-Q, C-R, D-S
4. A-P, B-Q, C-S, D-R

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 40 / Question ID 702207 Marks: 4.00

While deriving the mean average Reynolds equation of motion for an incompressible turbulent fluid flow, identify the equation that does not have additional terms in the mean averaged Reynolds equation of motion.

1. Zonal momentum equation
2. Meridional momentum equation
3. Thermodynamic energy equation
4. Continuity equation

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 41 / Question ID 702193 Marks: 4.00

Consider the following statements about Very Low Frequency (VLF) EM method.

Statement I: VLF method has the highest depth of investigation among EM methods based on EM induction principle.
Statement II: VLF method uses the frequency range 5 kHz to 30 kHz.

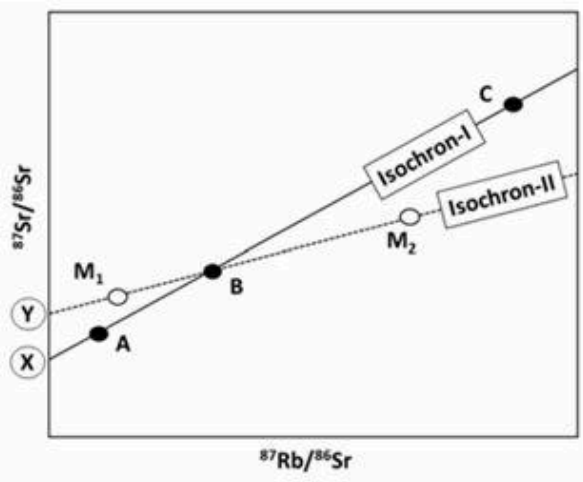
Choose the correct option

1. Both statements are correct.
2. Statement I is correct but statement II is incorrect.
3. Statement I is incorrect but statement II is correct.
4. Both statements are incorrect.

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 42 / Question ID 702156 Marks: 4.00

Consider the five statements related to the figure depicting two Rb-Sr isochrons, one defined by three metaigneous rocks A, B, and C (Isochron-I), and the other by rock B and its minerals M_1 and M_2 (Isochron-II).



P. Isochron-I dates igneous emplacement while Isochron-II dates the metamorphic overprint
Q. Isochron-II dates igneous emplacement while Isochron-I dates the metamorphic overprint.
R. Intercept X is the $^{87}Sr/^{86}Sr$ ratio of the source.
S. Intercept Y is the $^{87}Sr/^{86}Sr$ ratio of the source.
T. Rock A may be mafic and rock C may be felsic in composition.

Identify the option that lists the correct statements.

1. P, R, T
2. Q, S, T
3. P, S
4. Q, R

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 43 / Question ID 702218 Marks: 4.00

Which one of the following values of oxygen isotopic composition ($\delta^{18}O$) is NOT possible?

1. 1500 ‰
2. –1500 ‰
3. 1×10^{99} ‰
4. – 500 ‰

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 44 / Question ID 702213 Marks: 4.00

Choose the INCORRECT option.

Spectral models are preferred over finite difference model due to

1. handling of aliasing arising due to quadratic nonlinear term.
2. all higher derivatives are exact in spectral models
3. Polar singularity is automatically taken care of in the spectral models
4. Spectral models require less configuration time

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 45 / Question ID 702224 Marks: 4.00

Based on the given statements, choose the correct option:

Statement A: Marine phytoplankton are controlled by nutrients, light, and vertical stability of the water column, but not by CO_2 concentration.
Statement B: The Biological pump does not sequester any anthropogenic carbon.

1. Both the statements are correct, but A does not explain B.
2. Both the statements are correct, and A explains B.
3. A is correct, B is incorrect.
4. A is incorrect, B is correct.

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 46 / Question ID 702158 Marks: 4.00

The following statements refer to two characteristic rock types of the Precambrian continental crust.

I. It is characterized by a texture defined by crisscrossing sheafs of acicular olivine crystals.
II. It is originated by partial melting of mantle at greater depth (> 100 km) and extruded on to the surface.
III. It may occur as layers in layered gabbroic intrusions or may form large massifs essentially composed of plagioclase.
IV. It commonly contains aluminous bronzite.

Given the above statements, choose the correct option.

1. I, II, and IV are about komatiite and III is about anorthosite
2. I and IV are about komatiite and II and III are about anorthosite
3. I and II are about komatiite and III and IV are about anorthosite
4. I is about komatiite and II, III and IV are about anorthosite

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 47 / Question ID 702168 Marks: 4.00

Identify the INCORRECT pairs

A. Till – glacial deposit
B. Tufa – limestone deposit
C. Ventifact – glacial erosion
D. Wind gap – Wind erosion
E. Yardang – streamlined by water erosion
F. Hamada – desert pavement

Choose the correct option

1. C, D and E
2. B, D and E
3. A, B and F
4. D, E and F

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 48 / Question ID 702205 Marks: 4.00

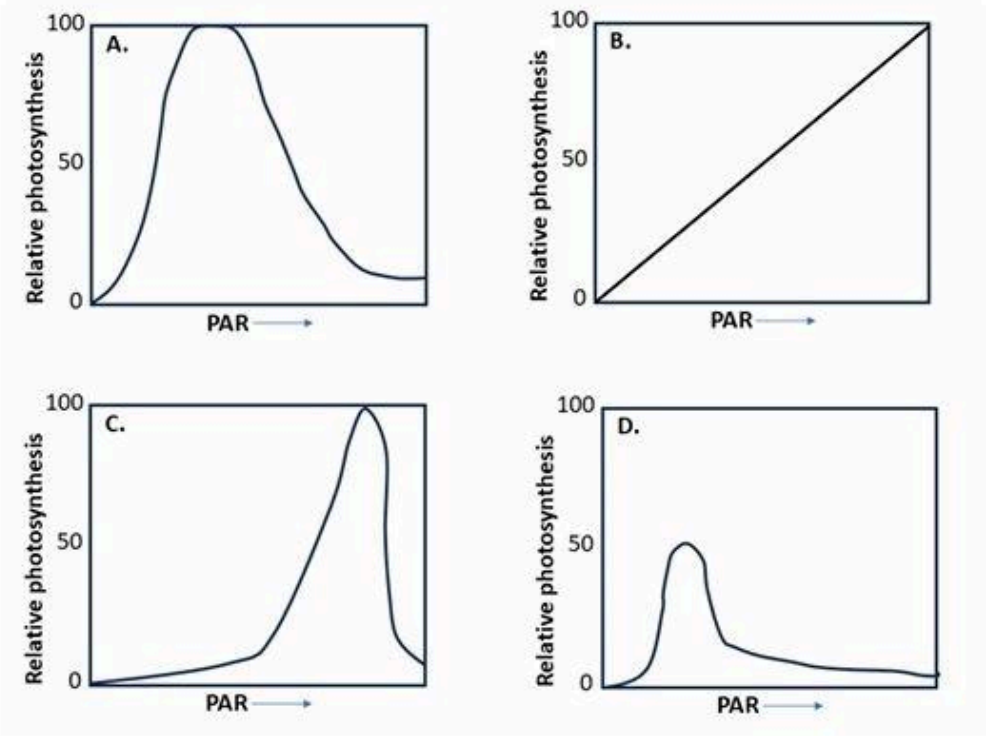
What is the cross-isobaric wind induced vertical velocity at the top of the Ekman boundary layer at 45°N, provided that the geostrophic zonal wind varies by 10 m/s over 1000 km in latitudinal direction? (eddy viscosity coefficient, $K_m = 5\ m^2/s$)

1. 2 mm/s
2. 0.5 m/s
3. 5 cm/s
4. 2 cm/s

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 49 / Question ID 702228 Marks: 4.00

Considering the influence of light in the ocean on primary production, how the responses of primary producers to increasing light level would be ? (PAR: Photosynthetically Active Radiation)



Choose the correct option

1. A
2. B
3. C
4. D

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 50 / Question ID 702229 Marks: 4.00

Choose the right option showing the correct combination of various oceanic parameters (Column I) and their respective measuring methods (Column II).

A

I	II
Phytopigments	ADCP
Phyto cell density	Flow cytometer
Ocean currents	HPLC
PAR	Radiometer

B

I	II
Phytopigments	HPLC
Phyto cell density	Flow cytometer
Ocean currents	Radiometer
PAR	ADCP

C

I	II
Phytopigments	HPLC
Phyto cell density	Flow cytometer
Ocean currents	ADCP
PAR	Radiometer

D

I	II
Phytopigments	Radiometer
Phyto cell density	ADCP
Ocean currents	Flow cytometer
PAR	HPLC

1. A
2. B
3. C
4. D

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 51 / Question ID 702160 Marks: 4.00

Weathering of albite releases cations and anions in water as per the reaction given below:

$$2NaAlSi_3O_8 + 2CO_2 + 3H_2O = Al_2Si_2O_5(OH)_4 + 2Na^+ + 2HCO_3^- + 4SiO_2$$

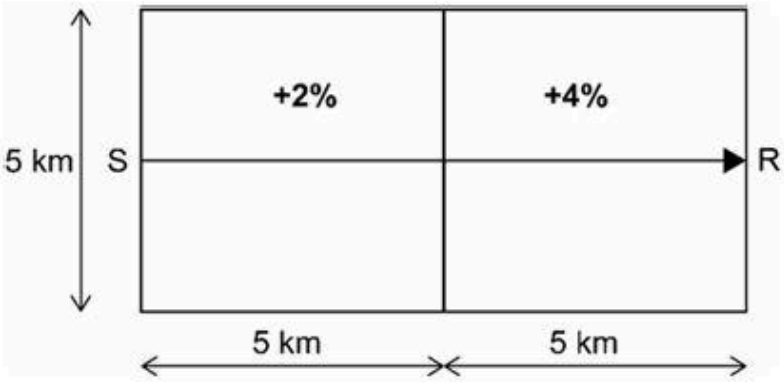
Na^+ concentration in a water sample is measured to be 100 μmol/L. If 90% of it is derived from albite, how much albite is dissolved in 1L of water? (Assume molecular weight of albite to be 262 g/mol)

1. 26.2 mg
2. 23.6 mg
3. 11.8 mg
4. 47.2 mg

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 52 / Question ID 702187 Marks: 4.00

A seismic wave propagates through a medium with velocity perturbations (%) with respect to a reference velocity of 5 km/sec as shown in the figure. The travel time residual (%) at the receiver R is



1. – 0.5
2. – 0.9
3. – 1.9
4. – 2.9

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 53 / Question ID 702184 Marks: 4.00

A magnetic anomaly profile across a dyke-like body records a maximum anomaly of 640 gammas and minimum anomaly of –320 gammas. The anomaly (in gammas) at a point above the position of the dyke is expected to be

1. 480
2. 320
3. 0
4. –160

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 54 / Question ID 702170 Marks: 4.00

At-a-station hydraulic geometry equations of a river give values of 'b' and 'f' as 0.27 and 0.62. What is the expected value of 'm' ?

1. 0.31
2. 0.21
3. 0.11
4. 0.01

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 55 / Question ID 702174 Marks: 4.00

Match the Column I with Column II

Column I		Column II	
A.	Podzol	P.	Thick and humus rich A horizon and accumulation of $CaCO_3$ in lower B or beneath B horizon
B.	Laterite	Q.	Accumulation of soluble salts
C.	Chernozem	R.	A_2 Horizon is light colored due to removal of iron oxides and colloidal humus by leaching
D.	Solonchak	S.	Relative enrichment of sesquioxides of iron and aluminum at or near the surface due to removal of silica

Choose the correct option

1. A-R, B-S, C-Q, D-P
2. A-R, B-S, C-P, D-Q
3. A-Q, B-P, C-S, D-R
4. A-Q, B-P, C-P, D-S

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 56 / Question ID 702151 Marks: 4.00

An unconfined aquifer has two horizontal isotropic layers. If the thicknesses of the two layers are 12m and 15m and their respective hydraulic conductivities are 8.6m/day and 5.2m/day, then what would be the approximate equivalent horizontal hydraulic conductivity?

1. 1.60 m/day
2. 1.01 m/day
3. 7.09 m/day
4. 6.71 m/day

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 57 / Question ID 702200 Marks: 4.00

What will be the approximate thickness of an atmospheric layer between two pressure levels namely, 1000 hPa and 900 hPa having a mean virtual temperature of 280 K (Given Rd = 287 J/kg K and g = 9.8 m/s^2)

1. 925 m
2. 760 m
3. 1000 m
4. 860 m

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 58 / Question ID 702188 Marks: 4.00

Match the well log observations in Column A with their corresponding causes in Column B

Column-A		Column-B	
P.	Decrease in formation factor	1.	Wet, shaly sandstone bed
Q.	PSP	2.	Presence of gas
R.	Decrease in neutron porosity	3.	Over pressured zone
S.	Decrease in sonic velocity	4.	Increase in permeability

Choose the correct option.

1. P – 1, Q – 4, R – 3, S – 2
2. P – 4, Q – 1, R – 2, S – 3
3. P – 4, Q – 1, R – 3, S – 4
4. P – 1, Q – 4, R – 2, S – 3

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 59 / Question ID 702220 Marks: 4.00

Observed current at an ocean mooring in the northern Bay of Bengal (18°N) shows 30-days periodicity. The mooring is located at the interior basin away from the boundary.

Choose the correct option

1. Kelvin wave forced at the equatorial Indian Ocean can contribute to the observed variability.
2. Rossby wave forced in the eastern part of the basin can contribute to the observed variability.
3. Both Kelvin wave and Rossby wave cannot influence variability at the location.
4. Rossby wave can influence, but Kelvin wave cannot at this location I

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 60 / Question ID 702204 Marks: 4.00

A satellite sensor measures a radiance of 9.7 W m^{-2} μm^{-1} sr^{-1} at a wavelength of λ= 10 μm. Assuming the emissivity of the sea surface is ϵ= 0.98, what is the approximate value of sea surface temperature (SST) in Kelvin that will be retrieved from the measurement?
Given: Planck constant, λ = 6.626×10^{-34}Js; Boltzaman constant, k = 1.38×10^{-23}J/K; Speed of light, C = 3×10^{8} m/s

1. 298 K
2. 288 K
3. 305 K
4. 278 K

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 61 / Question ID 702194 Marks: 4.00

Which is the correct statement about the origin of signals used in natural source electromagnetic method?

1. Signals in frequency range (1 – 10^4 Hz) are generated by thunderstorm while signals in frequency range (10^{-4} – 1Hz) are generated by ionospheric current.
2. Signals in frequency range (1 – 10^4 Hz) are generated by ionospheric current while signals in frequency range (10^{-4} – 1 Hz) are generated by thunderstorm activity.
3. Signals in the entire frequency range (10^{-4} – 10^4 Hz) are generated by ionospheric current.
4. Signals in the entire frequency range (10^{-4} – 10^4 Hz) are generated by thunderstorm activity.

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 62 / Question ID 702222 Marks: 4.00

EICC (East India Coastal Current) is strongest and

1. Poleward during Boreal Spring
2. Equatorward during Boreal Spring
3. Poleward during Boreal Summer
4. Equatorward during Boreal Summer

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 63 / Question ID 702221 Marks: 4.00

Assume westerly winds increase with latitude in an oceanic region in northern hemisphere and meridional wind is zero. Provided other conditions remain the same, choose the correct option.

1. Thermocline shallows and surface chlorophyll increases
2. Thermocline deepens and surface chlorophyll increases
3. Thermocline shallows and surface chlorophyll decreases
4. Thermocline deepens and surface chlorophyll decreases

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 64 / Question ID 702152 Marks: 4.00

If a body under a mean stress of 4 kbars requires a shear stress of 2.5 kbars for shear failure, the differential stress developed in the body is _____kbars.

1. 1.5
2. 2.0
3. 2.5
4. 3.0

- ○ 1 (Chosen Option)
- ○ 2
- ○ 3
- ○ 4

Question No. 65 / Question ID 702198 Marks: 4.00

The auto correlation of a random signal with infinite length produces a

1. random signal
2. unit step signal
3. unit sample signal [(δn)]
4. a signal that is identically zero

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 66 / Question ID 702155 Marks: 4.00

Match the critical metals with their ore minerals

Critical Metal		Ore Mineral	
A.	Li	I	Bastnäsite
B.	U	II	Columbite
C.	La	III	Pitchblende
D.	Nb	IV	Spodumene

Choose the correct option.

1. A-II, B-IV, C-I, D-III
2. A-I, B-IV, C-II, D-III
3. A-III, B-IV, C-II, D-I
4. A-IV, B-III, C-I, D-II

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 67 / Question ID 702208 Marks: 4.00

The maximum possible ratio of the normal anticyclonic gradient wind speed to the geostrophic wind speed for the same pressure gradient in the northern hemisphere is

1. 8
2. 2
3. 4
4. 16

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 68 / Question ID 702223 Marks: 4.00

Consider the following statements about Ekman transport

Statement A: Ekman transport is always 90° to the right of wind stress in the northern hemisphere, where the Coriolis parameter f is negative.
Statement B: Ekman transport can lead to upwelling and not downwelling.
Statement C: Ekman transport can give rise to upwelling through the blowing of winds near the equator.

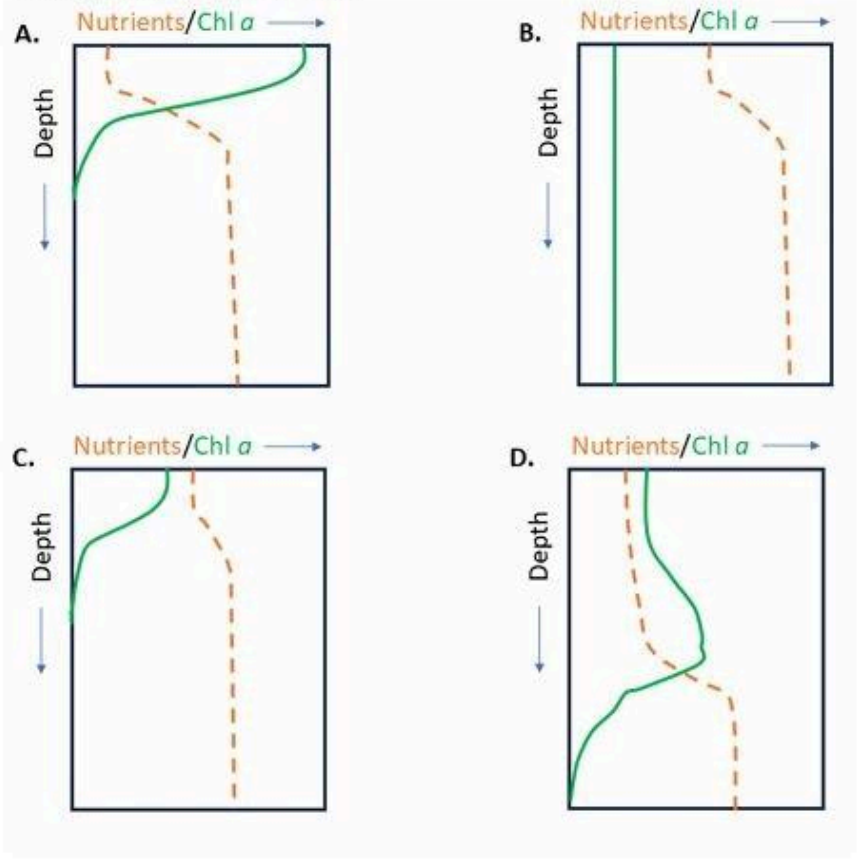
Choose a correct option

1. Only A is correct
2. Only B is correct
3. Only C is correct
4. All the three are correct

- ○ 1
- ○ 2
- ○ 3 (Chosen Option)
- ○ 4

Question No. 69 / Question ID 702226 Marks: 4.00

In the stratified temperate ocean, phytoplankton bloom progresses with seasonality. Below four different bloom scenarios are shown along with nutrient level (dashed orange line). Select the correct sequence of the bloom from winter to summer.



1. A → B → C → D
2. B → C → A → D
3. D → A → C → B
4. C → B → D → A

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 70 / Question ID 702177 Marks: 4.00

A and B are two stars of equal size and equidistant from the earth. The peak wavelengths coming from A and B are 965 nm and 482 nm, respectively. How many times brighter (in terms of energy) is the star B than star A?

1. 2
2. 4
3. 8
4. 16

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 71 / Question ID 702173 Marks: 4.00

Consider the following assertion and reason

Assertion (A): Oligotrophic lakes in colder climate regions have high dissolved oxygen levels near the surface

Reason (R): There is high productivity in oligotrophic lakes

1. A and R are correct, R explains A
2. A and R are correct, R does not explain A
3. A is correct, R is incorrect
4. A is incorrect, R is correct

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 72 / Question ID 702202 Marks: 4.00

A tornado rotates with constant angular velocity (ω). Assuming constant temperature (T) in the tornado and pressure p_0 at a distance r_0 from the centre of tornado, what will be the pressure at the centre of the tornado? (R is specific gas constant for dry air)

1. $p_0 \exp\left(\frac{\omega^2 r_0^2}{2RT}\right)$
2. $p_0 \exp\left(\frac{\omega r_0^2}{2RT}\right)$
3. $p_0 \exp\left(-\frac{\omega^2 r_0^2}{2RT}\right)$
4. $p_0 \exp\left(-\frac{\omega^2 r_0}{2RT}\right)$

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 73 / Question ID 702181 Marks: 4.00

The correct sequence of bed forms, as the Froude Number decreases from >1 to < 1, is

1. Ripples – Dunes – Plane bed – Antidunes
2. Dunes – Ripples – Plane bed – Antidunes
3. Plane bed – Antidunes – Dunes – Ripples
4. Antidunes – Plane bed – Dunes – Ripples

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 74 / Question ID 702162 Marks: 4.00

Match the events of the Quaternary period in column-I with their timings in column-II.

Column-I		Column-II	
A.	Last Glacial Maximum (LGM)	P.	300,000 – 200,000 years ago
B.	Younger Dryas	Q.	1,170 – 770 years ago
C.	Medieval Warming	R.	26,000 – 20,000 years ago
D.	Appearance of modern Humans (Homo Sapiens)	S.	12,900 – 11,700 years ago

Choose the correct answer.

1. A-R, B-S, C-Q, D-P
2. A-S, B-R, C-P, D-Q
3. A-P, B-Q, C-R, D-S
4. A-Q, B-P, C-S, D-R

- ○ 1
- ○ 2
- ○ 3
- ○ 4 (Chosen Option)

Question No. 75 / Question ID 702191 Marks: 4.00

Frequency effect measured in Induced Polarization survey is 0.20. If the apparent resistivity computed at low frequency is 100 Ωm, then what will be the apparent resistivity at the high frequency measured in the survey?

1. 80 Ωm
2. 83.33 Ωm
3. 120 Ωm
4. 120.33 Ωm

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 76 / Question ID 702186 Marks: 4.00

From the position of the maximum anomaly, the gravity anomaly of a horizontal circular cylindrical body, at depth z, is reduced to one-third its maximum value at a distance of

1. Z
2. $\sqrt{3}\,Z/2$
3. $\sqrt{2}\,Z$
4. $\sqrt{3}\,Z$

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 77 / Question ID 702215 Marks: 4.00

Which one of the following is NOT correct regarding oxygen isotopic composition ($\delta^{18}O$) of foraminifera?

1. $\delta^{18}O$ of benthic foraminifera shows glacial-interglacial variability
2. The difference between $\delta^{18}O$ of planktic and benthic foraminifera is greater at high latitude
3. The difference between $\delta^{18}O$ of planktic and benthic foraminifera is greater at low latitude
4. The $\delta^{18}O$ of planktic foraminifera is more negative than that of benthic foraminifera

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Question No. 78 / Question ID 702211 Marks: 4.00

Assume that the sun is directly overhead and is at zenith. Choose the INCORRECT statement.

1. Single scattering albedo of the aerosols (w_o) is same over ocean and land
2. Albedo of the underlying surface (A_s) is same over ocean and land
3. Incident solar flux (F_0; Wm^{-2}) is same over ocean and land
4. Transmittance of the atmosphere (Ta) is same over ocean and land

- 1
- 2
- 3
- 4

Question No. 79 / Question ID 702180 Marks: 4.00

Match the regions with the impact structures

Region		Impact structure	
A.	Bundelkhand	L.	Shiva
B.	Kota Plateau	M.	Luna
C.	Arabian Sea shelf	N.	Ramgarh
D.	Buldhana	O.	Dhala
		P.	Lonar

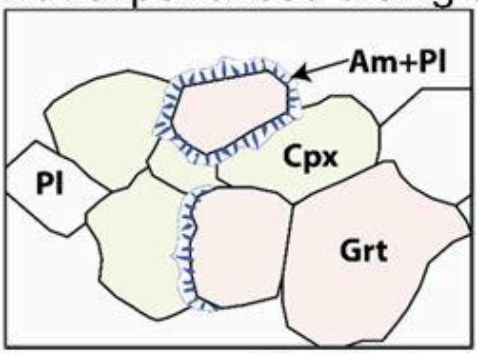
Choose the correct option.

1. A – O, B – N, C – L, D – P
2. A – O, B – P, C – N, D – P
3. A – N, B – M, C – O, D – O
4. A – P, B – L, C – M, D – L

- 1
- 2
- 3
- 4

Question No. 80 / Question ID 702159 Marks: 4.00

The given sketch shows the mineral assemblage and textural relations of a meta basic rock that experienced a single tectonothermal event.



(Grt- garnet, Cpx- Clinopyroxene, Pl- plagioclase, and Am- amphibole)

Consider the following statements.

A. Grt + Cpx constitute the peak metamorphic assemblage
B. The rock experienced eclogite facies metamorphism
C. The Am + Pl reaction texture does not represent a symplectite texture
D. The Am +Pl reaction texture require hydration during its formation

Based on the above figure and statements, choose the correct option

1. Only statement A is correct
2. Statements A and B are correct
3. Statements A, C, and D are correct
4. Statements A and D are correct

- ○ 1
- ○ 2
- ○ 3
- ○ 4