INSTRUCTIONS

1. This Test Booklet contains one hundred and fifty (250) Part 'A' + 50 Part 'B' + 50 Part 'C' Multiple Choice Questions (MCQs). You are required to answer a maximum of 15, 35 and 25 questions from Part 'A', 'B' and 'C' respectively. In case more than required number of questions are answered, only first 15, 35 and 25 questions in Parts 'A', 'B' and 'C' respectively, will be taken up for evaluation.

2. OMR answer sheet has been provided separately. Before you start filling up your particulars, please ensure that the booklet contains requisite number of pages and that these are not torn or mutilated. If it is so, you may request the Invigilator to change the booklet of the same code. Likewise, check the OMR answer sheet also. Sheets for rough work have been appended to the test booklet.

3. Write your Roll No., Name and Serial Number of this Test Booklet on the OMR answer sheet in the space provided. Also put your signatures in the space earmarked.

4. You must darken the appropriate circles with a black ball pen related to Roll Number, Subject Code, Booklet Code and Centre Code on the OMR answer sheet. It is the sole responsibility of the candidate to meticulously follow the instructions given on the Answer Sheet, failing which, the computer shall not be able to decipher the correct details which may ultimately result in loss, including rejection of the OMR answer sheet.

5. Each question in Part 'A' and 'B' carry 2 marks and Part 'C' questions carry 4 marks each, respectively. There will be negative marking @ 0.50 marks for each wrong answer in Part 'A' and 'B' and 1.00 marks for Part 'C'.

6. Below each question in Part 'A', 'B' and 'C', four alternatives or responses are given. Only one of these alternatives is the ‘correct’ option to the question. You have to find, for each question, the correct or the best answer.

7. Candidates found copying or resorting to any unfair means are liable to be disqualified from this and future examinations.

8. Candidate should not write anything anywhere except on answer sheet or sheets for rough work.

9. Use of calculator is NOT permitted.

10. After the test is over, at the perforating point, tear the OMR answer sheet, hand over the original OMR answer sheet to the Invigilator and retain the carbonless copy for your record.

11. Candidates who sit for the entire duration of the exam will only be permitted to carry their Test booklet.
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2. Marks (out of 30) of seven students in an examination are 4, 15, 6, 7, 5, a and b, where a (>0) and b are prime.

What is the maximum possible value of the difference between the maximum and minimum marks?

1. 25
2. 26
3. 27
4. 29

3. Two persons A and B start walking in opposite directions from a point. A travels twice as fast as B. The speed at which B travels is 1 km/h. If A travels 2 km and turns back and starts walking towards B, at what distance from the starting point will A cross B?

1. 2 km
2. 4 km
3. 6 km
4. 8 km

4. A vehicle goes 60 km/h.

What is the maximum distance it can travel in 1 hour?

1. 60 km/h
2. 90 km/h
3. 120 km/h

1. remains unchanged
2. rises by \( \frac{a^2}{a^2} \)
3. rises by \( \frac{a^2}{a^2} \)
4. rises by \( \frac{a^2}{a^2} \)

1. \( \frac{A}{B} \) be greater than 1
2. \( \frac{A}{B} \) be less than 1
3. \( \frac{A}{B} \) be equal to 1
4. \( \frac{A}{B} \) be greater than 2

1. \( \frac{A}{B} \) is positive
2. \( \frac{A}{B} \) is negative
3. \( \frac{A}{B} \) is zero
4. \( \frac{A}{B} \) is undefined

1. \( \frac{A}{B} \) is a fraction
2. \( \frac{A}{B} \) is a whole number
3. \( \frac{A}{B} \) is a mixed number
4. \( \frac{A}{B} \) is an integer

1. \( \frac{A}{B} \) is a reciprocal
2. \( \frac{A}{B} \) is a divisor
3. \( \frac{A}{B} \) is a factor
4. \( \frac{A}{B} \) is a multiple

1. \( \frac{A}{B} \) is a prime number
2. \( \frac{A}{B} \) is a composite number
3. \( \frac{A}{B} \) is a perfect square
4. \( \frac{A}{B} \) is a perfect cube
4. A person wanted to travel from Charbagh to Alamgir with an average speed of 60 km/h by car. The distance between Charbagh and Alamgir is 2 km. Due to heavy traffic, he could travel at 20 km/h for the first kilometre of his journey. What should his speed be for the remaining journey to achieve his average speed target of 60 km/h?
   1. Cannot achieve his target with any finite speed.
   2. 60 km/h
   3. 90 km/h
   4. 120 km/h

5. The rainfall data from 2003 to 2005 was as follows: 2003: 65 cm, 2004: 63 cm, 2005: 60 cm. What was the average rainfall in 2002?
   1. 55 cm
   2. 60 cm
   3. 54 cm
   4. 53 cm

6. In a four consecutive day schedule, four pilots flew flights each on a different day. Mr. A was scheduled to work on Monday, but he traded with Ms. B who was originally scheduled to work on Wednesday. Ms. C traded with Mr. D, who was originally scheduled to work on Thursday. After all the

switching was done, who worked on Tuesday?
   1. Mr. A
   2. Mr. D
   3. Ms. B
   4. Ms. C

7. After 6 g of carbon is completely burnt in an atmosphere of 40 g of oxygen, the percentage oxygen left is:
   1. 80
   2. 60
   3. 40
   4. 20

8. What fraction of the equilateral triangle shown below with three identical sectors of a circle is shaded?
   1. \(\frac{1}{3}\)
   2. \(\frac{2}{3}\)
   3. \(\frac{4}{3}\)
   4. \(1 - \frac{\sqrt{3}}{2}\)

9. If the third term of a geometric progression is 8 and the fourth term is 16, what is the first term?
   1. 16
   2. 8
   3. 31
   4. 32
9. How many different vegetables can be made from cauliflower, tomatoes, onions, potatoes and carrots?
   1. 16
   2. 28
   3. 31
   4. 32

10. एक इंसान की मात्र 20 मी. की दूरी पर बढ़े स्वाद को 10 सेकंडों में मिलता है।
    उस 20 मीटर की दूरी पर बढ़े स्वाद को लगभग विवश कितने समय में मिलता है?
    1. 20s
    2. 40s
    3. 14s
    4. 60s

10. A bottle of perfume is opened and a person at a distance of 10 m gets the smell after 10 seconds. The time taken for a person 20 m away to get the smell is about
    1. 20s
    2. 40s
    3. 14s
    4. 60s

11. एक शिक्षित में धारकर और सूक्ष्मक गुणधर्म है। घन की भूता की लंबाई नीचे के व्यास के माध्यम से थूँक है। यदि धारकर गुणधर्म एक दब से आधे तरीके हैं और सूक्ष्मक गुणधर्म तल से पूरे तरीके हैं, तो धारकर और सूक्ष्मक गुणधर्मों में रखे तरीके का लगभग अनुसार बना है?
    1. 2:1
    2. 1:1
    3. 1:2
    4. 1:4

11. A mineral contains a cubic and a spherical cavity. The length of the side of the cube is the same as the diameter of the sphere. If the cubic cavity is half filled with a liquid and the spherical cavity is completely filled with liquid, what is the approximate ratio of the volume of liquid in the cubic cavity to that in the spherical cavity?
    1. 2:1
    2. 1:1
    3. 1:2
    4. 1:4

12. 6 रसायनों के समूह में से 3 को एक समूह से अलग बनाम है और संग्रह में फिर को अलग है।
    यदि 6 वें स्थान के समूह से अलग बनाम तो फिर को अलग को
    जिस जगत में निकालकर बनाम है?
    1. 1.
    2. 0.
    3. 1/2.
    4. 1/6.

12. Out of 6 unbiased coins, 5 are tossed independently and they all result in heads. If the 6th is now independently tossed, the probability of getting heads is

13. केंद्र में अगला विचार क्या हो सकता है?

13. What could be the fourth figure in the sequence?

14. A, B, C को जोड़ता आयु 30 है, तथा उनकी आयु का योग x, y, z है। (x ≤ y ≤ z).
    यदि 8 की आयु A की आयु से हो 3 अधिक है,
    तो z का मान निश्चित संख्या मानना क्या है?
    1. 31
    2. 33
    3. 35
    4. 37

14. The average age of A, B and C, whose ages are integers x, y and z respectively (x ≤ y ≤ z), is 30. If the age of B is exactly 5 more than that of A, what is the minimum possible value of z?
    1. 31
    2. 33
    3. 35
    4. 37
15. Percentage-wise distribution of all science students in a university is given in the pie-diagram. The bar chart shows the distribution of physics students in different sub-areas, where a student takes one and only one sub-area. What percentage of the total science students is girls studying quantum mechanics?

16. What is the total number of parallelograms in the given diagram?

17. तंग बैतले में एक शहर के तीन खंड (A, B एवं C) के बुनाई परिसरों को दिया गया है। X, Y तथा Z दोनों फार्म भूमि का प्रतिस्तत भी दिया गया है। कौन सा दर्शन ज्ञात है?

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1. Y
2. X
3. Z
4. X एवं Y में बांटी हुई
17. Election results of a city, which contains 3 segments (A, B and C) are given in the Table. Percentage votes obtained by parties X, Y and Z are also shown. Which party won the election?

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1. Y
2. X
3. Z
4. It was a tie between X and Y

18. एक त्रिकोण का मेन्स (किन्टेक्स्ट) की, जिसमें एक सरीता दिख रहे होंगे। दो समानों त्रिकोण हैं, जिन्हें दिखाया गया है। इस त्रिकोण (किन्टेक्स्ट) का अर्थ (उन्नति का) क्या है?

1. 2
2. 3
3. 6
4. 7.2

19. एक वाहन का चालन से एक गांव को अस्तित्व तक वाहन के नाम यात्रा निर्देश है। वाहन से यात्रा आने पर गांव का जिस गांव से पहले यात्रा की जा रही है?

1. v
2. v + v
3. v + 2v
4. v + 4v

20. चार दिन एक पीजा अपस्थम बाद रहे रहे। उन्होंने निश्चित किया कि उन्हें तीन बड़े विद्रोह को पीजा बनाने का एक अभिनव पुनर्जीवित विकल्प। यह कुदरत्व से दो बड़ी बाद रहे जो जिन दो बड़ी महत्ववान बाद्धक लेने शूट है। तेजस्वी, कुदरत्व से एक सीमा बाद रहे हैं। पीजा का एक अभिनव पुनर्जीवित विकल्प है?

1. हुआ
2. तेजस्वी
3. अलिम
4. कुदरत्व

21. Four friends were sharing a pizza. They decided that the oldest friend will get an extra piece of pizza. Bahu is two months older than Kathappa, who in turn is three months younger than Bhalla. Devendra is one month older than Kathappa. Who should get the extra piece of pizza?

1. Bahu
2. Devendra
3. Bhalla
4. Kathappa
21. रुद्रायर्ध से कृष्ण एक दर्शा हिमालय पर्वत सेवन की होती है?
   1. मुगल साक्षात्कार
   2. गंगा-सन्तरी फायव
   3. भूट नादरी फॉल्स
   4. हिमालय कालकार फायव

22. कृष्ण ज्वालामुखी विरोधी संकेत होते हैं जब की कृष्ण विक्रोटक नहीं होते। इसका एक कारण — संकेत होता है।
   1. विक्रोटक ज्वालामुखी के स्तर में एक बड़ी ताप मात्रा
   2. पतल जोड़ा करते विक्रोटक ज्वालामुखी में वायुगतियों की बड़ी मात्रा
   3. विक्रोटक ज्वालामुखी के स्तर के कारण परिवहन में ताप की बड़ी मात्रा
   4. विक्रोटक ज्वालामुखी के स्तर की बड़ी सतह

23. कुछ भारतीय राज्यों में बारिश में बाहरी बारिश रहती है?
   1. काशी-तंदूरी धरियाँ का अवश्यक
   2. काशी-तंदूरी धरियाँ का अवश्यक

24. कृष्ण की स्तर की एक पर्याप्ती के बारे में सहलोग मत करते?
   1. वनीक त्वचा वास्तव
   2. तेजस भुति-किरण पाया
   3. बालू की कणी
   4. पत्तियों की कणी

25. कृष्ण बारी बारी तब ज्वाला-गति — संकेत होता है?
   1. वनीक निगमुख धरियाँ
   2. असतंक निग नहीं होता
   3. का पालीयों रोशी पीओ का ज्वाला-रेखा के संतानपर्वत अनुसूची है?
   4. का विश्व-रोशी रोशी पीओ का ज्वाला-रेखा के संतान-अनुसूची है?

26. बारिश का पानी में गैसेट एकमा पर्याप्त —
   1. दोनों भारी है?
   2. जमा-भारी पानी है?
   3. मूल्य एकमा पानी है?
   4. दोनों है?

22. Some volcanoes are explosive whereas others are not. One of the reasons is related to
   1. the larger heat content in the source of explosive volcanoes
   2. the larger content of volatiles in the melt producing explosive volcanoes
   3. the presence of network of faults in the crust overlying the source of explosive volcanoes
   4. the larger depth of the source of explosive volcanoes

23. What is the major source of alkalinity in the river water?
   1. weathering of carbonate minerals
   2. precipitation of carbonate minerals
   3. weathering of silicate minerals
   4. dissolution of atmospheric CO₂
26. Compared to pyrite, galena and sphalerite are 
1. both denser 
2. denser and lighter, respectively 
3. lighter and denser, respectively 
4. both lighter

27. ईन्हें से कौन एक पुष्करी पर प्रारम्भिक जीवन से विनिमय में एक निश्चित कारण नहीं?
1. UV रेखांश से स्वयं काल की 
2. अविमंत्रण की उपजलायात 
3. पृष्ठ की उपजलायात 
4. उपजलायात के द्वारा उपज की उपजलायात

28. पृथ्वी की उर क्या है?
1. पृथ्वी की उर तो पृथ्वी है।
2. पृथ्वी की उर के स्वरूप 
3. इलाह के उर के विकार 
4. लघु नैसर्गिक जीवन का कुछ उर के विकार

29. ईन्हें से कौन एक वास्तविक प्रति में वापस होता है?
1. निम्नतम आयाम में धातुता है। परती 
2. निम्नतम आयाम में धातुता है। परती 
3. निम्नतम आयाम में धातुता है। परती 
4. निम्नतम आयाम में धातुता है। परती

30. Which one of the following statements correctly depicts the variation of the gravity field inside the Earth?
1. Increases in the lower mantle, but decreases sharply in the outer core 
2. Increases in the lower mantle as well as in the outer core 
3. Decreases in the lower mantle as well as in the outer core 
4. Decreases in the lower mantle, but increases sharply in the outer core

30. Which one of the following is CORRECT?
The plumb line used by a mason gets oriented perpendicular to the...
1. spherical surface and passes through the Earth's centre 
2. non-spherical surface, but does not pass through the Earth's centre 
3. geoidal surface, and passes through the Earth's centre 
4. geoidal surface, but does not pass through the Earth's centre

31. ईन्हें से कौन एक उच्चकोणीय प्रति में जीवन है?
1. सूक्ष्म उच्चकोणीय प्रति 
2. उच्च कोणीय प्रति 
3. ठोस गोलाकारी प्रति 
4. ठोस गोलाकारी प्रति
31. Which one of the following is CORRECT in the tropical Pacific? Later Tropical Convergence Zone (ITCZ) is a region where
1. tropical easterlies and subtropical westerlies meet
2. tropical westerlies and subtropical easterlies meet
3. tropical easterlies of both hemispheres meet
4. tropical westerlies of both hemispheres meet

32. उष्णकटिबंधीय क्षेत्रों के समुद्र — से अभिव्यक्त होते हैं।
1. ज्यादा वाणिज्यकरण शुद्ध ज्यादा वर्ष
2. कम वाणिज्यकरण एवं कम वर्ष
3. व्यापार वाणिज्यकरण परस्पर कम वर्ष
4. कम वाणिज्यकरण शुद्ध ज्यादा वर्ष

32. Oceans in the subtropical region are characterized by
1. high evaporation and high precipitation
2. low evaporation and low precipitation
3. high evaporation but low precipitation
4. low evaporation and high precipitation

33. अगर तने कड़वाना दः॥ पर से पर्यावरणीय वातावरण कम है, तब वायुगति है
1. पूर्णतः निर्भर
2. अदालतीय विश्वा
3. पूर्णतः अविश्वा
4. साधारण वायुगति

33. If the environmental lapse rate is less than the moist adiabatic lapse rate, the atmosphere is...
1. absolutely stable
2. neutrally stable
3. absolutely unstable
4. conditionally unstable

34. एक उष्ण शार गोलाकार गोल पर, हवा —
होती है।
1. तितन रोग से
2. 15 एक० 30 दिनों के बीच चरण पर से
3. तम रोग गोले हार्मोन रेखा को जोर
3. समान रेखाएँ के समानदर
4. समान रेखाएँ के संदर्भ पर

34. On an upper-level weather chart, the wind tends to blow...
1. at constant speed
2. at an angle between 15 and 30 degrees to the contours towards low pressure
3. parallel to the isobars
4. at right angle to the isobars

35. तप-सूककांक आपसी-तापमान पर आधारित होता है जोकि नानु सामान एक का संयोग्य है।
1. ग्रीन वायुप्लेक्स
2. सूकक पद
3. अविश्वसनीय आपसी
4. शीतक्षण

35. The Heat Index (HI) is based on the apparent temperature which is a combination of air temperature and
1. cloud cover
2. wind speed
3. relative humidity
4. solar intensity

36. इन दिनों नरे जैसे ने के लें एक गोल गोल 'गैसीस्ट्रिक्स' गैस नहीं है?
1. नीतिल (CH₄)
2. ताबार (साइक्स एक्स) (CO₂)
3. जलवायु (H₂O)
4. शीतक्षण (CO₂)

36. Which one of the following gases is NOT a greenhouse gas?
1. Methane (CH₄)
2. Carbon dioxide (CO₂)
3. Water vapour (H₂O)
4. Oxygen (O₂)
37. The maximum amount of latent heat is released in a rising saturated parcel of air when it is —— and at a —— altitude.
1. cold, high       2. warm, high       3. cold, low       4. warm, low

38. The following sequence of rocks is observed while taking a traverse across the strike direction in an area:
A-B-C-D-C-B-A
What is the most likely interpretation?
1. The rocks are folded
2. The rocks are faulted
3. Presence of an unconformable sequence
4. The rocks are jointed

39. From the list below, which is the correct sequence of events that led to the formation of A-B-C-D-C-B-A?

40. Which one of the following land surfaces has the minimum water infiltration rate?

41. Identify the following, the homogenous region in India, the summer monsoon rainfall of which is poorly correlated with that of all other regions.

42. From the given list, which is the correct sequence of events that led to the formation of A-B-C-D-C-B-A?

43. Which of the following would a satellite observe relatively lower outgoing longwave radiation?
43. Which one of the following does not undergo photo-dissociation in the troposphere but rises to the stratosphere?
   1. Formaldehyde
   2. Water vapour
   3. Nitrous oxide
   4. Nitric oxide

44. Purobhavi koe abhiman, vandana kie sabh apne anutahak abhiman ek samvasthi cha bhavan shunya shakte. 
   1. vandana kie abhiman ek samvasthi cha bhavan shunya shakte.
   2. purobhavi kie abhiman ek samvasthi cha bhavan shunya shakte.
   3. vandana kie abhiman ek samvasthi cha bhavan shunya shakte.
   4. purobhavi kie abhiman ek samvasthi cha bhavan shunya shakte.

45. Express g and F. Express Purobhavi koe abhiman ek samvasthi cha bhavan shunya shakte.
   1. Express g and F.
   2. Express Purobhavi koe abhiman ek samvasthi cha bhavan shunya shakte.

46. Which of the following in the theory of “Plate Tectonics” is a
   1. fragment of the oceanic crust
   2. fragment of the continental crust
   3. part oceanic & part continental crust
   4. fragment of the lithosphere

47. Purobhavi koe abhiman ek samvasthi cha bhavan shunya shakte.
   1. Purobhavi koe abhiman ek samvasthi cha bhavan shunya shakte.

48. The Moon’s surface receives cosmic rays and solar wind everywhere unlike the Earth’s surface. This is because the
   1. Moon is closer to the Sun.
   2. Moon lies at the centre of the galaxy.
   3. Moon’s gravity is one-sixth of that of the Earth.
   4. Moon does not have a significant magnetic field.

49. If g and F are the Earth’s normal gravity and magnetic fields respectively, then along a geographic latitude
   1. both g and F remain constant.
   2. g remains constant, but F varies.
   3. F remains constant, but g varies.
   4. both g and F vary.

50. Which of the following places would one see the Sun directly overhead at local noon?
   1. The Tropic of Cancer on 22 December.
   2. The Tropic of Capricorn on 21 June.
   3. The Tropic of Cancer on 21 June.
   4. The Arctic circle on 22 December.

51. Harin koe kio sangvahar iti dhamma.
   1. Harin koe kio sangvahar iti dhamma.
   2. Harin koe kio sangvahar iti dhamma.

52. Which one of the following boundaries represents the most devastating mass extinction in geological history?
   1. Cretaceous – Paleogene
   2. Ordovician – Silurian
   3. Devonian – Carboniferous
   4. Permian – Triassic
49. Which of the following minerals is likely to be altered to serpentine?
   1. Plagioclase
   2. Garnet
   3. Olivine
   4. Quartz

50. Which one of the following fabrics is a characteristic feature of the centre of a large pluton?
   1. Randomly oriented & interpenetrating large grains
   2. Preferred orientation of phyllosilicates
   3. Phyllochrysis embedded in a fine-grained groundmass
   4. Alternate bands of mafic and felsic minerals

51. The trace metals of planktonic foraminiferal calcite are used as paleoenvironmental proxies. Match the following elements and the proxies.

| A. Mg   | i) phosphate |
| B. Ba   | ii) temperature |
| C. Cd   | iii) alkalinity |

1. A-i; B-ii; C-iii
2. A-iii; B-ii; C-i
3. A-ii; B-iii; C-i
4. A-ii; B-iii; C-iii

52. The velocity of a tsunami wave is dependent on
   1. the focal depth and epicentre distance from the shore
   2. the focal depth, but not the epicentre distance from the shore
   3. the epicentre distance from the shore, but not the focal depth
   4. neither the epicentre distance nor the focal depth

53. For a paramagnetic material, susceptibility is:
   1. positive and increases with temperature
   2. positive and decreases with temperature
   3. negative and increases with temperature
   4. negative and decreases with temperature
54. Assuming that two atoms of a radioactive isotope with a half-life of 2 hours can be isolated, which of the following statements is CORRECT?
1. Only one of these atoms will remain after 1 hour
2. Both these atoms would definitely decay into their daughter isotopes in 2 hours
3. Half of each of these atoms would decay in 1 hour
4. The decay of both these atoms cannot be predicted precisely

55. The following schematic figures show deformation of a square \( ABCD \) into a parallelogram \( A'B'C'D' \).
57. Amplification of the upward propagating internal atmospheric gravity waves is due to
1. conservation of momentum
2. conservation of energy
3. incompressibility of the atmosphere
4. decrease of gravitational force with height

58. गूढ़ी के अवस्थान को किमों में उनका ग्रहण किया जाता है?
1. अवस्थान की निर्देशन का समानांतर
2. निर्देशन की निर्देशन का समानांतर
3. अवस्थान की निर्देशन का समानांतर
4. अवस्थान की निर्देशन का समानांतर

58. In the Earth's atmosphere, which regions have the temperature profile that supports convection?
1. Troposphere and Stratosphere
2. Mesosphere and Thermosphere
3. Troposphere and Mesosphere
4. Stratosphere and Thermosphere

59. वायुमंडल के अक्षांश एक अवस्था से पूरे आकार में परिवर्तन हो सकता है तथा कभी कभी उसके परिवर्तन का प्रभाव होता है?
1. वायुमंडल के अक्षांश परिवर्तन का प्रभाव होता है
2. वायुमंडल के अक्षांश परिवर्तन का प्रभाव होता है
3. गूढ़ी अवस्थान की रोकथामत
4. गूढ़ी अवस्थान की रोकथामत

59. A sediment core collected off Oman is best suited for studying paleomonsoon because that is the region ...
1. from where the monsoon moisture transport originates
2. where descending arm of the Walker circulation originates
3. where intense oxygen minimum zone is located
4. of monsoon induced upwelling

60. अश्र भारत में रूप विश्व तत्व दिखाई का अर्थ है?
1. पृथ्वी की ओर
2. पृथ्वी की ओर
3. सपना की ओर
4. सपना की ओर

60. In the Arabian Sea, pressure gradient force is from the South to the North. Therefore, the geostrophic flow is
1. Eastward
2. Westward
3. Northward
4. Southward

61. निम्नलिखित गैसों में से कौन सा गैस स्पष्ट रूप से घरेलू मिश्रण से अधिक है?
1. CO (Carbon monoxide)
2. N₂O (Nitraous oxide)
3. CH₄ (Methane)
4. CO₂ (Carbon dioxide)

61. For which one of the following gases is the Henry's law constant the highest?
1. CO (Carbon monoxide)
2. N₂O (Nitraous oxide)
3. CH₄ (Methane)
4. CO₂ (Carbon dioxide)

62. निम्नलिखित गैसों में से कौन सी विद्युत ब्लास्ट के प्रदर्शन केंद्र प्रदर्शनी होती है?
1. pCO₂ का घटना (लक्ष्यण पृथ्वी के संबंधि)
2. pCO₂ का घटना (लक्ष्यण पृथ्वी के संबंधि)
3. पृथ्वी अवस्थान का प्रभाव (लक्ष्यण पृथ्वी के संबंधि)
4. पृथ्वी का प्रभाव (लक्ष्यण पृथ्वी के संबंधि)

62. Which of the following will NOT be caused in the surface seawater by upwelling?
1. Increase of pCO₂ (relative to pre-upwelling)
2. Decrease of pCO₂ (relative to pre-upwelling)
3. Decrease of dissolved oxygen (relative to pre-upwelling)
4. Increase of productivity (relative to pre-upwelling)
63. Which among the following has the least residence time in seawater?

64. Which among the following has the least residence time in seawater?

65. Antarctic intermediate water mass is
1. warm and highly saline 2. cold and highly saline 3. warm and less saline 4. cold and less saline

66. In ocean remote sensing infrared sensor gives information about
1. sea surface wind 2. sea surface temperature

67. Which of the following groups of organisms CANNOT survive in the aphotic depth?

68. In the middle stretches of most estuaries, the highly likely community of life forms is
1. hypohaline 2. mesohaline 3. stenohaline 4. euhaline

69. Which of the following groups of organisms CANNOT survive in the aphotic depth?
70. Which one of the following methods is not used for dating ice cores?
1. Radiocarbon method
2. Oxygen isotope stratigraphy
3. Lead-210 method
4. $^{87}$Rb-$^{137}$Sr method

71. Two oil production wells were drilled in Bombay High and Cambay Basin. Choose the correct combinations of initial oil saturation ($S_o$) and production decline rate ($P$) for these two wells respectively:
1. High $S_o$, rapid decline ($P$) - Low $S_o$, rapid decline ($P$)
2. Low $S_o$, slow decline ($P$) - High $S_o$, rapid decline ($P$)
3. High $S_o$, Steady ($P$) - Low $S_o$, Low decline ($P$)
4. Low $S_o$, Low decline ($P$) - Low $S_o$, rapid decline ($P$)

72. Which one of the following methods is not used for dating ice cores?
1. Radiocarbon method
2. Oxygen isotope stratigraphy
3. Lead-210 method
4. $^{87}$Rb-$^{137}$Sr method

72. Measured sedimentation rates in drilled cores in the Indus fan are 5cm/10^3 yrs and 120cm/10^3 yrs during the Holocene (H) and Last Glacial Maximum (LGM), respectively. The most plausible cause is:
1. Tectonic activity: high in H and low in LGM
2. Ocean temperature: high in H and low in LGM
3. Biological productivity: low in H and high in LGM
4. Eustatic sea level: high in H and low in LGM

73. The pH of water in the Bahama Bay is ~8 while that in a peat bog in the Ganges Delta is ~4. The carbonate (ionic) species that would be stable in these two environments, respectively, are:
1. $\text{CO}_3^{2-}$, $\text{HCO}_3^-$
2. $\text{HCO}_3^-$, $\text{CO}_3^{2-}$
3. $\text{HCO}_3^-$, $\text{H}_2\text{CO}_3$
4. $\text{H}_2\text{CO}_3^-$, $\text{CO}_3^{2-}$
74. Which of the following pairs satisfies the conditions A, B, C?
A. Skeletons made of polymorphs of CaCO₃
B. Found in Paleozoic benthic ecosystem
C. Morphological planes of symmetry are perpendicular to each other
D. Radiolarians and Diatoms
E. Foraminifera and Ostracods
F. Bivalves and Brachiopods
G. Bivalves and Gastropods

75. Which of the following pairs satisfies the conditions A, B, C?
A. A - a, B - b, C - c, D - d
B. A - b, B - c, C - d, D - a
C. A - a, B - b, C - c, D - d

76. Choose the correct match of primary structures in I with their respective environments in II.
A. Parting Lineation
B. Plane laminated mud
C. Dropstones with faceted pebbles
D. Epsilon cross-bedding

2.8 H
78. Given the following statements (A, B), choose the correct option.
A. The sediment size progressively decreases downstream in spite of the increase in channel size and discharge.
B. The cause of this fining is due to gradual attrition of the clasts and selective entrainment.
1. Both A and B are correct
2. Both A and B are incorrect
3. A is correct but B is incorrect
4. A is incorrect but B is correct

79. Match the following

<table>
<thead>
<tr>
<th>A. Differential weathering or erosion</th>
<th>E. Tafoni</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Exfoliation</td>
<td>F. Pedestal rock</td>
</tr>
<tr>
<td>C. Spheroidal weathering</td>
<td>G. Coresones</td>
</tr>
<tr>
<td>D. Cavernous weathering</td>
<td>H. Domes</td>
</tr>
</tbody>
</table>

1. A - F, B - E, C - G, D - H
2. A - E, B - H, C - G, D - F
3. A - F, B - H, C - G, D - E
4. A - E, B - F, C - H, D - G
81. कया सम्पूर्ण ग्रंथ पर एक नैसटर विभाग के पास 8 प्यार% MgO एवं 10 प्यार% FeO है। जिन का Mg#$ वाला है? जानकारे मक्षिका MgO एवं FeO के पार रणनीति 40 प्यार 72 है।
1. धु 36 2. धु 59 3. धु 72 4. धु 44

82. A basaltic flow at a mid oceanic ridge has 8 wt% MgO and 10 wt% FeO. What is the Mg# of the rock? Assume molecular weights of MgO and FeO to be 40 and 72, respectively.
1. ~36 2. ~59 3. ~72 4. ~44

82. बासल्टिक का प्रयोग पर फिल्म के नये नामांकन वाले प्रयोग का स्वतंत्र इव प्रयोग है।

83. यह यह संख्या विद्वान के लिए 51 के पास फिनिशिंग घोर है। यह उपरोक्त फिल्म की क्षेत्र एवं अतिरिक्त प्रयोग का प्रयोग करते हुए एक प्रतिस्पर्धा रेखा छोटी गई। इस विद्वान का प्रयोग करते हुए सभी विद्वान को पहले...
83. In this graphic correlation, section-1 has the maximum thickness. Using the first and last appearance of all fossil species present, a line of correlation has been drawn. Using this graph, identify the correct statement.

1. Sedimentation rate was initially high and slowed down at the end in section-2
2. Sedimentation rate was initially low and increased at the end in section-1
3. There is a hiatus in section-1
4. There is a hiatus in section-2

84. Which one of the following combination of metamorphic facies, metamorphic facies series, and idealized tectonics settings of a metamorphic terrain is correct?

<table>
<thead>
<tr>
<th>Metamorphic facies</th>
<th>Metamorphic facies series</th>
<th>Tectonics settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. GS→EAM→AM→GR</td>
<td>D. High P/T</td>
<td>F. Oceanic Subduction</td>
</tr>
<tr>
<td>B. GS→AM→GR</td>
<td>E. Medium P/T</td>
<td>Q. Island Arc</td>
</tr>
<tr>
<td>C. PP→BS→EC</td>
<td>F. Low P/T</td>
<td>R. Continental Collision</td>
</tr>
</tbody>
</table>

Abbreviations: GS, Greenschist; EAM, Epidote-Amphibolite; AM, Amphibolite; GR, Granulite; PP, Prehnite-Pumpellyite; BS, Blueschist; EC, Eclogite

1. A-D-P, B-F-Q, C-D-P
2. A-D-P, B-F-Q, C-E-R
3. A-F-R, B-E-Q, C-D-P
4. A-E-R, B-E-P, C-D-P
85. इनमें से कौन एक निम्न लिखित दास्तां को प्रदर्शित करता है?
1. सूक्ष्म का निम्न लिखित एवं धार्मिक विधान को समझ बिना प्रेमाः।
2. प्राचीन पश्चिम विश्व निकाय पुंशा
3. सूक्ष्म दास्तां के निम्न लिखित का समझ बिना प्रेमाः।
4. विश्विविद्यालय रिसर्च निकाय पुंशा

86. Which one of the following represents a suitable condition for the formation of lowstand wedge?
1. Deposition during sea level lowstand and early rise
2. Early falling stage system tract
3. Deposition during sea level lowstand
4. Late falling stage system tract

87. उपर के चित्र में एक समुद्री चोटी के एक विशेष धार्मिक पर पेट्रोलिक निकायों को दिखाया गया है। इस दास्तां के लिए दिये गए व्याख्यानों में से कौन ठीक है?
1. घनी गर्मी विद्वानों से दिखाया गया है।
2. उन्नी शक्तिशाली से घनी गर्मी विद्वानों के लिए दिखाया गया है।
3. पूर्व तथा पश्चिम एक विशेष व्याख्यान के प्राप्त
4. पूर्व तथा पश्चिम एक विशेष व्याख्यान के समय

3-7-14
Which one of the following pairs of points represents principal planes of stress ellipse in the above figure?

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

38. यदि \( \sigma_1 \geq \sigma_2 \geq \sigma_3 \) पूर्ण प्रातिस्थल हैं, तब नीचे दिखाए गए से हैं एक प्रातिस्थल का एक-दहींय अवस्था प्रतिरूपित करता है?
1. \( \sigma_1 \geq \sigma_2 \geq \sigma_3 > 0 \)
2. \( \sigma_2 = 0, \sigma_2 \neq 0, \sigma_2 = 0 \)
3. \( \sigma_1 = 0, \sigma_1 = 0, \sigma_2 = 0 \)
4. \( \sigma_1 = \sigma_2 = \sigma_3 = 0 \)

39. If \( \sigma_1 \geq \sigma_2 \geq \sigma_3 \) are the principal stresses, then which one of the following represents a uniaxial state of stress?

1. \( \sigma_1 \geq \sigma_2 \geq \sigma_3 > 0 \)
2. \( \sigma_2 = 0, \sigma_2 \neq 0, \sigma_3 = 0 \)
3. \( \sigma_1 = 0, \sigma_1 = 0, \sigma_2 = 0 \)
4. \( \sigma_1 = \sigma_2 = \sigma_3 = 0 \)

89. Stereograms A, B & C show three different orientations of the principal stresses, \( \sigma_1, \sigma_2 \) and \( \sigma_3 \).

Which one of the following is the correct match of stress orientations in A, B, C with the nature of faulting?

1. A – Normal faulting; B – Strike-slip faulting, C – Thrust faulting
2. A – Strike-slip faulting, B – Normal faulting, C – Thrust faulting
3. A – Thrust faulting, B – Strike-slip faulting, C – Normal faulting
4. A – Strike-slip faulting, B – Thrust faulting, C – Normal faulting

90. नीचे अनुसूचित प्रकार (BSR) का अन्येक्षण — की रेटिंग के तिथि शीर्ष है?

1. भारी पेट्रोल
2. सील गैस
3. तेल बालु
4. गैस इस्ता

90. Bottom Simulating Reflectors (BSR) are investigated for the exploration of

1. Heavy oil
2. Shale gas
3. Oil sand
4. Gas hydrate
91. The maximum extent of glaciers in a valley is best indicated by
1. Erratics and tarm
2. Glacial trough, aretes, and hanging valley
3. Erratics and terminal moraines
4. Cirques, end moraines and tarns

92. Read the following statements and identify the correct answer.
I. Tropical deserts are less common on the east side of the landmass because trade winds carry considerable amounts of moisture onshore.
II. On the west side of the continents in mid-latitudes, higher average precipitation occurs due to convergence of maritime air and orographic intensification.
1. I is correct and II is incorrect
2. I is incorrect and II is correct
3. Both I and II are correct
4. Both I and II are incorrect

93. The Fourier transform of a function is $n \exp(-i\omega t)$. Then its
1. amplitude and phase spectra are both independent of $\omega$.
2. amplitude spectrum is independent of $\omega$, while the phase spectrum is directly proportional to $\omega$.
3. amplitude spectrum is directly proportional to $\omega$, while the phase spectrum is independent of $\omega$.
4. amplitude and phase spectra are both directly proportional to $\omega$.

94. Each band $S$ of the input $U$ passes through a filter $F$ is
1. $\frac{1}{2\pi} \int_0^\infty \left[ U \frac{\partial}{\partial \eta} \left( \frac{\partial}{\partial \eta} + \frac{\partial}{\partial \tau} \right) - \frac{1}{\tau} \frac{\partial}{\partial \tau} \right] d\eta$
94. \( U \) is the gravity potential over a closed surface \( S \) of volume \( V \) enclosing a distribution of matter. \( n \) is the outward normal to \( S \) and \( r \) is the distance from a point \( P \) outside \( S \) to any point on \( S \) or inside \( S \). Then the gravity potential at \( P \) is

\[
\begin{align*}
1. & \quad \frac{1}{4\pi} \int_V \left[ \frac{U}{\partial n/\partial n} (r) - \frac{1}{r} \frac{\partial U}{\partial n} \right] \, dv \\
2. & \quad \frac{1}{4\pi} \int_S \left[ \frac{U}{\partial n/\partial n} (r) - \frac{1}{r} \frac{\partial U}{\partial n} \right] \, ds \\
3. & \quad \frac{1}{4\pi} \int_S \left[ \frac{U}{\partial n/\partial n} (r) + \frac{1}{r} \frac{\partial U}{\partial n} \right] \, ds \\
4. & \quad \frac{1}{4\pi} \int_S \left[ \frac{U}{\partial n/\partial n} (r) + \frac{1}{r} \frac{\partial U}{\partial n} \right] \, ds
\end{align*}
\]

95. वृत्ताकार में चुंबकीय फ़ील्ड के मूल तथा विद्युत रेखासंख्या का समान 5.186 गाल है। यदि वृत्ताकार में चुंबकीय फ़ील्ड की पृष्ठीय गास हर 25% कम कर दी जाए, तो चुंबकीय फ़ील्ड का संदर्भ लगाम —— गाल होगा।

1. 2.54  2. 3.71  3. 3.81  4. 4.30

96. The difference in the Earth's gravity fields at the poles and the equator is at present 5.186 gals. If the velocity of the Earth's rotation is reduced by 25% of its present value, then the difference in the gravity fields would be around (in gals)

\[
\begin{align*}
1. & \quad 2.54 \\
2. & \quad 3.71 \\
3. & \quad 3.81 \\
4. & \quad 4.30
\end{align*}
\]

97. Gravity anomaly values of 1.2, 2.4 and 3.6 in mgals are located at distance coordinates 20, 24 and 28 km, respectively, along a gravity profile across a faulted basement of limited throw. The depth to the basement (in km) is

\[
\begin{align*}
1. & \quad 2 \\
2. & \quad 2\sqrt{2} \\
3. & \quad 2\sqrt{3} \\
4. & \quad 4
\end{align*}
\]

98. A 2.0 km thick elevated land mass of density 2.7 g/cc is associated with a Bouguer anomaly of -176 mgals. The free air anomaly is (assume that \(2\pi G = 42 \text{ mgal/km/g/cc}\))

\[
\begin{align*}
1. & \quad -51 \text{ mgals} \\
2. & \quad 51 \text{ mgals} \\
3. & \quad -88 \text{ mgals} \\
4. & \quad 88 \text{ mgals}
\end{align*}
\]

99. A planet of 70,000 km radius exhibits a magnetic field of 4.2 Oe at its equator. What is the rate of decrease of its magnetic field (in gauss/m) on its surface at the latitude \(\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)\)?

\[
\begin{align*}
1. & \quad 20.5 \\
2. & \quad 4.50 \\
3. & \quad 0.125 \\
4. & \quad 0.0225
\end{align*}
\]
99. Two dykes A and B of the same width and depth strike E-W. Dyke A is vertical, dyke B dips at 60° towards north. The dips of magnetization of A and B are, respectively, 60° and 30° towards north. If the intensity of magnetization in both the cases is the same, then the magnetic anomaly profiles across them are:
1. identical, both in shape and size.
2. similar in shape, but the anomalies due to A are larger.
3. similar in shape, but the anomalies due to B are larger.
4. dissimilar.

100. A strongly magnetic spherical specimen, when exposed to a magnetic field of 18.8 Oe exhibited an induced magnetism of 2.1 gauss. The susceptibility of the specimen (in oeg units) is:
1. 0.21
2. 0.16
3. 0.13
4. 0.10

101. Read the following statements and choose the correct answer.
Statement A: When an increase in rainfall causes an increase in overland flow, the outcome is accelerated soil erosion.
Statement B: The above is an example of negative feedback.
1. Both A and B are correct.
2. Both A and B are incorrect.
3. A is correct but B is incorrect.
4. A is incorrect but B is correct.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>एक दिनु द्राक्ष</td>
<td>विभिन्न परिवर्तन</td>
<td>परिवर्तन</td>
<td>एक</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>C</td>
<td>प्रभावी ओवरलैंड</td>
<td>परिवर्तन</td>
<td>परिवर्तन</td>
<td>एक</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>D</td>
<td>एक दिनु द्राक्ष</td>
<td>विभिन्न परिवर्तन</td>
<td>परिवर्तन</td>
<td>एक</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
</tbody>
</table>

Note: The table contains some text in Hindi. The translation is as follows:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>एक</td>
<td>दिनु</td>
<td>द्राक्ष</td>
<td>उपर</td>
<td>बेहतर</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>B</td>
<td>एक</td>
<td>दिनु</td>
<td>द्राक्ष</td>
<td>उपर</td>
<td>बेहतर</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>C</td>
<td>एक</td>
<td>दिनु</td>
<td>द्राक्ष</td>
<td>उपर</td>
<td>बेहतर</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>D</td>
<td>एक</td>
<td>दिनु</td>
<td>द्राक्ष</td>
<td>उपर</td>
<td>बेहतर</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
</tbody>
</table>
102. Match the following

<table>
<thead>
<tr>
<th>A. Sub-aerial residual or exhumation features</th>
<th>E. Pediplain</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Selective transport by wind</td>
<td>F. Yardangs</td>
</tr>
<tr>
<td>C. Coalescence of sediments</td>
<td>G. Desert pavements</td>
</tr>
<tr>
<td>D. Definition and abrasion by unidirectional wind</td>
<td>H. Inselbergs</td>
</tr>
</tbody>
</table>

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

103. The diagram shows the development of X- and Y- axes. Identify the soil development processes. X-axis is water input and Y-axis is drainage.

1. A - वजालन, B - पौधा रूढ़ि, C - वजालन, D - धाने कोलोगीजिक
2. A - पौधा रूढ़ि, B - वजालन, C - धाने कोलोगीजिक, D - वजालन
3. A - वजालन, B - पौधा रूढ़ि, C - वजालन, D - पौधा रूढ़ि
4. A - वजालन, B - पौधा रूढ़ि, C - वजालन, D - पौधा रूढ़ि

104. A lake with a uniform pH 3.0 has dissolved zinc and sulfate. The zinc concentration increases significantly in the bed sediments of the stream flowing out of the lake. Which one of the following is a likely lithology through which the stream flows?

1. Sandstone
2. Granite
3. Limestone
4. Basalt

105. Identify the soil development processes. X-axis is water input and Y-axis is drainage.

1. A - वजालन, B - पौधा रूढ़ि, C - वजालन, D - धाने कोलोगीजिक
2. A - पौधा रूढ़ि, B - वजालन, C - धाने कोलोगीजिक, D - वजालन
3. A - वजालन, B - पौधा रूढ़ि, C - वजालन, D - पौधा रूढ़ि
4. A - वजालन, B - पौधा रूढ़ि, C - वजालन, D - पौधा रूढ़ि
105. Which of the following is characteristic of a typical hurricane?
1. Strong winds with heavy rainfall, and warm core
2. Weak winds with no rainfall, and cold core
3. Calm winds with heavy rainfall, and warm core
4. Strong winds with heavy rainfall, and cold core

106. इनमें से कौन सा भिन्नता नहीं है?

<table>
<thead>
<tr>
<th>उत्तर</th>
<th>प्रति न</th>
<th>अपवास ने कोड तापस</th>
<th>प्राप्तिकर</th>
<th>जूनून नवमा निवास</th>
<th>साइकिली नवमा निवास</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>0.58 - 0.68</td>
<td>या उष्ण</td>
<td>सुषमा विनाश</td>
<td>अस्मात</td>
<td>साइकिली नवमा निवास</td>
</tr>
<tr>
<td>B.</td>
<td>0.725 - 1.10</td>
<td>नियंत्रण</td>
<td>जलवायु</td>
<td>अनुपात</td>
<td>साइकिली नवमा निवास</td>
</tr>
<tr>
<td>C.</td>
<td>3.55 - 3.93</td>
<td>अपवास</td>
<td>वायुविद्या</td>
<td>अवमान</td>
<td>साइकिली नवमा निवास</td>
</tr>
<tr>
<td>D.</td>
<td>10.30 - 11.30</td>
<td>अपवास</td>
<td>वायुविद्या</td>
<td>अवमान</td>
<td>साइकिली नवमा निवास</td>
</tr>
</tbody>
</table>


107. Which one is NOT a character of a tide-dominated shoreline?
1. Bars making high angle to shoreline
2. Bars almost parallel to shoreline
3. Double mud drapes layers within cross-stratification
4. Common occurrence of reactivation surfaces

108. इनमें से कौन सा भिन्नता नहीं है?

<table>
<thead>
<tr>
<th>उत्तर</th>
<th>प्रति न</th>
<th>अपवास ने कोड तापस</th>
<th>प्राप्तिकर</th>
<th>जूनून नवमा निवास</th>
<th>साइकिली नवमा निवास</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>0.58 - 0.68</td>
<td>या उष्ण</td>
<td>सुषमा विनाश</td>
<td>अस्मात</td>
<td>साइकिली नवमा निवास</td>
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<tr>
<td>B.</td>
<td>0.725 - 1.10</td>
<td>नियंत्रण</td>
<td>जलवायु</td>
<td>अनुपात</td>
<td>साइकिली नवमा निवास</td>
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<tr>
<td>C.</td>
<td>3.55 - 3.93</td>
<td>अपवास</td>
<td>वायुविद्या</td>
<td>अवमान</td>
<td>साइकिली नवमा निवास</td>
</tr>
<tr>
<td>D.</td>
<td>10.30 - 11.30</td>
<td>अपवास</td>
<td>वायुविद्या</td>
<td>अवमान</td>
<td>साइकिली नवमा निवास</td>
</tr>
</tbody>
</table>


109. Which of the following is a MISMATCH?

<table>
<thead>
<tr>
<th>Wavelength</th>
<th>Description</th>
<th>Examples of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. 0.58 - 0.68</td>
<td>Visible</td>
<td>Human habitation</td>
</tr>
<tr>
<td>B. 0.725 - 1.10</td>
<td>Near-infrared</td>
<td>Land, Water, Water vapor, Penetrates haze</td>
</tr>
<tr>
<td>C. 3.55 - 3.93</td>
<td>Infrared</td>
<td>Temperature difference, cloud height</td>
</tr>
<tr>
<td>D. 10.30 - 11.30</td>
<td>Infrared</td>
<td>Thermal mapping, water vapor correction</td>
</tr>
</tbody>
</table>


110. Which one of the following combinations of clays is best suited for the weathering product of a granite rock under the mean annual precipitation of around 1500 mm?
1. smectite – kaolinite – illite
2. kaolinite – illite – vermiculite – gibbsite
3. smectite – kaolinite – vermiculite
4. illite – aluminium and iron hydroxides
109. तालिका में दिए गए पदों जल व्यापार (सुन्दर तौर पर) एवं उसके आसपास क्षेत्र में आपूर्ति आपूर्तियों के संबंध में कौन एक वही है?

<table>
<thead>
<tr>
<th>व्यापारी</th>
<th>नाम</th>
<th>आपूर्ति (gm/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>रासियालिस्ट</td>
<td>E &gt; 250</td>
</tr>
<tr>
<td>B</td>
<td>नायरहार्दिक</td>
<td>F 40 - 250</td>
</tr>
<tr>
<td>C</td>
<td>वृत्त पृष्ठ</td>
<td>G 20 - 40</td>
</tr>
<tr>
<td>D</td>
<td>वायु हौसर</td>
<td>H &lt; 20</td>
</tr>
</tbody>
</table>

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

110. Which one of the matches is correct for the river water chemistry (Total Dissolved Solids) and rock weathering in their catchment, given in the following table?

<table>
<thead>
<tr>
<th>Predominant rock type</th>
<th>Total Dissolved Solids (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Regolith</td>
<td>E &gt; 250</td>
</tr>
<tr>
<td>B. Siliceous sedimentary rocks</td>
<td>F 40 - 250</td>
</tr>
<tr>
<td>C. Limestone</td>
<td>G 20 - 40</td>
</tr>
<tr>
<td>D. Evaporites</td>
<td>H &lt; 20</td>
</tr>
</tbody>
</table>

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

111. संयुक्त संध्याकाल एवं हवाओं में दोनों के वन के परिस्थितियों का प्रयुक्त तरीक़ा कौन सा है?

1. दास पृष्ठभूमि वन
2. गुप्तस्वाभिमान वन
3. क्रियाविशिष्ट वन
4. भ्रमण वन

111. In the equation for conservation of momentum, which of the following forces CANNOT act to change the speed of the wind?

1. Pressure gradient force
2. Gravitational force
3. Coriolis force
4. Frictional force
112. The wind speed at a location is 50 m s\(^{-1}\). What is the maximum distance in km that a particle could travel in 5 hours if there is no air resistance or other forces acting on it?

- 1. 20 km
- 2. 50 km
- 3. 100 km

112. For numerically forecasting a tropical cyclone in the Bay of Bengal with wind maximum of 50 m s\(^{-1}\), a mesoscale model might be used with horizontal grid size of 5 km. What is the maximum time step (\(\Delta t\)) allowed for a leapfrog version of advection?

- 1. 120 s
- 2. 90 s
- 3. 110 s
- 4. 100 s

113. A certain ocean current is estimated to be 1 cm s\(^{-1}\). What is the volume flow rate in m\(^3\) s\(^{-1}\)?

- 1. 10 m\(^3\) s\(^{-1}\)
- 2. 100 m\(^3\) s\(^{-1}\)
- 3. 1000 m\(^3\) s\(^{-1}\)
- 4. 10000 m\(^3\) s\(^{-1}\)

113. Which combination of the following conditions applies to the positive Indian Ocean Dipole events?

(i) colder than normal sea surface temperatures in the western tropical Indian Ocean.
(ii) These events are seen from May to October.
(iii) shoaling of thermocline in the eastern equatorial Indian Ocean.

- 1. (i), (ii) and (iii)
- 2. Only (i) and (ii)
- 3. Only (i) and (iii)
- 4. Only (ii) and (iii)

114. The average solar radiation incident at the top of the Earth's atmosphere is 342 W m\(^{-2}\). The global planetary albedo is 0.31 and 67 W m\(^{-2}\) of the incident radiation is absorbed by the atmosphere. On an average, 390 W m\(^{-2}\) is lost from Earth's surface of which 83% is absorbed by the Earth's atmosphere. If the global average sensible heat flux away from surface is 24 W m\(^{-2}\), the global latent heat flux would be

- 1. ~79 W m\(^{-2}\)
- 2. ~145 W m\(^{-2}\)
- 3. ~267 W m\(^{-2}\)
- 4. ~102 W m\(^{-2}\)

115. Which of the following best describes the increase in 

- 1. 1
- 2. 2
- 3. 3
- 4. 4
115. How many water masses can be traced in the following graph?

![Graph showing salinity vs. temperature]

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

116. At last water at latitudes of 30°N and 30°S move towards equator. Which process best describes this movement?

1. Vertical circulation
2. Horizontal circulation
3. Tidal circulation
4. Circumventricular circulation

117. During winter, the West India Coastal Current (WICC) flows:

1. towards north carrying low salinity water
2. towards south carrying low salinity water
3. towards north carrying high salinity water
4. towards south carrying high salinity water

118. Which of the following combinations of coast and wind, given in the diagram, will lead to upwelling of water in the southern hemisphere?

![Diagram showing wind and coast directions]

1. (A) east (B) west
2. (C) north (D) south
3. (A) north (D) south
4. (B) east (C) west

119. Which of the following combinations of coast and wind, given in the diagram, will lead to upwelling of water in the southern hemisphere?
119. Identify the correct representation for following profiles in tropical oceans:

- A - Oxygen, B - Nitrate, C - Chlorine, D - Thorium
- A - Thorium, B - Nitrate, C - Chlorine, D - Oxygen
- A - Chlorine, B - Oxygen, C - Thorium, D - Nitrate
- A - Nitrate, B - Oxygen, C - Chlorine, D - Thorium

120. The sulphate-chlorinity ratio, in estuaries and anoxic basins, as compared to that in the average seawater, is:
1. higher
2. lower
3. higher in estuaries and lower in anoxic basins
4. lower in estuaries and higher in anoxic basins

121. The mixed layer (OMZ) has a depth (DO) of 85 µmol kg⁻¹. It is observed that the DO concentration is 220 µmol kg⁻¹ in the upper layer, which is composed of the following chemical: 

- (CH₂O)₅O(NH₂)₅(H₃PO₄)
121. The water of the oxygen minimum zone (OMZ) has dissolved oxygen (DO) of 85 μmol kg⁻¹. By assuming a surface DO concentration of 220 μmol kg⁻¹ and phytoplankton molecular formula of \((\text{CH}_2\text{O})_4\text{O}(\text{NH}_2)_2\text{H}_2\text{PO}_4\), how much phytoplankton was mineralized and, what is the nitrate concentration by assuming that the photic layer: OMZ ventilation rate is 2:1?
1. 10 μmol C, 10 μmol kg⁻¹
2. 10 μmol C, 20 μmol kg⁻¹
3. 100 μmol C, 30 μmol kg⁻¹
4. 100 μmol C, 60 μmol kg⁻¹

122. Anthropogenic activity has increased the atmospheric pCO₂ by 80 ppmv relative to the pre-industrial concentration. Calculate its increased flux by assuming that the surface pCO₂ increased by 2 mmol m⁻³ and using the stagnant surface film model.

\[ \text{Data } K_a(\text{CO}_2) = 30 \text{ mmol m}^{-2} \text{ atm}^{-1}; \]
Diffusion coefficient of CO₂ = \(2 \times 10^{-5} \text{ cm}^2 \text{s}^{-1}\); Film thickness = 20 μm; Consider 1 kg = 1 Litre
1. 0.05 μmol m⁻² s⁻¹
2. 0.4 μmol m⁻² s⁻¹
3. 1.0 μmol m⁻² s⁻¹
4. 0.1 μmol m⁻² s⁻¹

123. Using the given information from the graphical model (below) depicting responses of corals, algal grazers (sea urchins), and fish to fishing pressure, deduce the ideal condition that enables increased coral growth/cover.

Fish numbers increasing
Coral/algae ratio increasing
Increasing (more coral)

1. Practice during the same day of harvesting
2. Encourage the cultivation of corals in the reef
3. Encourage the cultivation of corals in the reef
4. Encourage the cultivation of corals in the reef
1. Abundant sea urchins and reduced fishing
2. Higher removal of sea urchins and increased fishing
3. Preponderant urchins and dominance of fishes
4. Prolonged survival of urchins without fishing pressure

124. The fish in the figure with point C (on the x-axis) has a significant increase in number of fish grains of fish species (A) among the species (B). Does this affect the health of marine life? The number of fish species (A) and biomass (B) are shown in the figure.

125. Identify the correct sequence of trophic cascade from the following sets of marine organisms:
1. kelps → sea urchins → killer whales → sea otters
2. killer whales → sea urchins → sea otters
3. sea urchins → sea otters → killer whales
4. sea otters → sea urchins → killer whales
126. Which one of the following sets of marine fauna best represents bacteriivory?
1. foraminifera, coccolithophores, radiolarians
2. barnacles, bryozoans, brittle stars
3. tintinids, ciliates, heterotrophic nanoflagellates
4. isyvaceans, anthozoans, ancerones

127. Which one of the following microorganisms is the best catalyst for biogas production?

128. The biogenic sediments of the seafloor are of calcite or opal. Identify the correct combination in the following regarding preservation (P) and dissolution (D) in the water column.

<table>
<thead>
<tr>
<th>CaCO₃</th>
<th>Opal</th>
<th>CaCO₃</th>
<th>Opal</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 km</td>
<td>P</td>
<td>D</td>
<td>P</td>
</tr>
<tr>
<td>3 km</td>
<td>P</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>3 km</td>
<td>D</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>3 km</td>
<td>D</td>
<td>P</td>
<td>P</td>
</tr>
</tbody>
</table>

128. Match the appropriate deep-sea sediments types in Box A with those in Box B.

<table>
<thead>
<tr>
<th>Box A</th>
<th>Box B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A    Calcareous muds with CaCO₃ &gt; 30%</td>
<td>N   Chert</td>
</tr>
<tr>
<td>B    Volcanic muds with CaCO₃ &lt; 30%</td>
<td>O   Sapropelite</td>
</tr>
<tr>
<td>C    Pelagic clays with CaCO₃ &lt; 30%</td>
<td>P   Feldspar</td>
</tr>
<tr>
<td>D    Terrigenous muds with CaCO₃ &lt; 30%</td>
<td>Q   Radiolarian oozes</td>
</tr>
<tr>
<td>E    Silicified claystones</td>
<td>R   Chalk</td>
</tr>
<tr>
<td>F    Carbonaceous clay</td>
<td>S   Pelagonite</td>
</tr>
</tbody>
</table>
129. Which of the following sedimentary features can be used to identify a deep water debris flow product (debrisite) in the continental slope?
1. Ripple marks and inverse grading
2. Floating clasts and massive sands
3. Normal grading and dish structure
4. Slump folds and sheets

131. What will be the ratio of rates of energy released by two otherwise identical blackbodies. one of which is at $0^\circ C$ and the other at $273^\circ C$?
1. $\sim 62.5$  2. $\sim 0.625$
3. $\sim 0.0625$  4. $\sim 6.25$

132. The specific heat capacity of mercury is 0.035 J/g°C. How much heat energy is required to raise the temperature of 100 g of mercury from 20°C to 40°C?
1. 7.0 J  2. 70 J
3. 700 J  4. 7000 J
132. The existence of the tropical easterly jet stream over the Chennai latitudes during the Indian summer monsoon is due to:
1. poleward decrease of air temperature at 850 hPa over the Indian region.
2. the presence of the eastern gluts along the east coast of India.
3. the anticyclonic outflow from the Tibetan high pressure.
4. the northward migration of the subtropical westerly jet stream in the northern hemisphere.

133. दक्षिणी गोलार्ध में 45° उत्तरांतर पर, दक्षिण क्षेत्र के साथ दोहराए में, धीरे प्रवेशकेतु क्षेत्र — होगा।
1. 45°
2. 21.5°
3. 68.5°
4. 0°

134. At a latitude of 45° in the northern hemisphere, the solar zenith angle at noon on the winter solstice is:
1. 45°
2. 21.5°
3. 68.5°
4. 0°

134. इसमें से जो दक्षिण वर्षाकालीन दक्षिणी दिशा की दिशा में निकलाने वाला क्षेत्र कौन है?
1. उनके प्रवेशकेतु क्षेत्र एवं उनके उपयोग क्षेत्र दक्षिणी दिशा में हैं, परंतु उनके आधार क्षेत्र वर्तमान क्षेत्र नहीं है।
2. उनके प्रवेशकेतु क्षेत्र एवं उनके उपयोग क्षेत्र समान दिशा में हैं, परंतु उनके आधार क्षेत्र वर्तमान क्षेत्र नहीं है।
3. उनके प्रवेशकेतु क्षेत्र एवं उनके उपयोग क्षेत्र दक्षिणी दिशा में हैं, परंतु उनके आधार क्षेत्र वर्तमान क्षेत्र नहीं है।
4. उनके प्रवेशकेतु क्षेत्र एवं उनके उपयोग क्षेत्र समान दिशा में हैं, परंतु उनके आधार क्षेत्र वर्तमान क्षेत्र नहीं है।

135. भारतीय सागरों में भारतीय शीतल नवनुत्य के साथ ऊत्तर युग के नवनुत्य के प्रवेशकेतु क्षेत्र के दर्शन नहीं हैं, कारण
1. CISK प्रक्षेपण नहीं करता है।
2. भारतीय सागर के ऊपर बलीकेतु वर्तमान चाल सामान्य स्थायी नहीं है।
3. यह पूर्वोत्तर वताव्य का एक अटूलकक्ष कारक है।
4. भारतीय सागरों में अवस्थान आयाम का परिवर्तन होता है।

135. Tropical cyclones of the severe category are not observed over the Indian seas during the Indian summer monsoon season because
1. The CISK mechanism does not operate.
2. The observed sea surface temperatures over the Indian seas are not conducive.
3. There exists a very strong vertical shear of the horizontal winds.
4. Excessive humidity is observed over the Indian seas.
136. What is the virtual temperature of an unsaturated air parcel with temperature of 35°C and mixing ratio of 30 g water vapour kg⁻¹ dry air?
1. 39.5°C  
2. 40.5°C  
3. 41.7°C  
4. 38.9°C

137. Find out the buoyant force acting on a tropical tropospheric air parcel of unit mass at temperature 20°C in an environment of temperature 15°C.
1. 0.07 m s⁻²  
2. 0.17 m s⁻²  
3. 0.27 m s⁻²  
4. 0.37 m s⁻²

138. A Mesoscale Convective Complex (MCC) in tropical atmosphere is actually...
1. a rapidly rotating toradic cyclone inside a massive thunderstorm
2. Individual thunderstorms that grow into a large, long-lasting weather system
3. a complex display of lightning from distant thunderstorms
4. a family of tornadoes that do a great deal of damage

139. There are two cloud layers above you. The lower cloud layer is moving westward, while the upper cloud layer is moving northwestward. From this observation you conclude that the wind is with height and advection is occurring between the cloud layers.
1. veering, warm
2. veering, cold
3. backing, warm
4. backing, cold

140. What is the direction of movement of a thunderstorm that is moving northwestward?
1. northwest
2. west
3. northwest
4. northwest
140. The upper part of a thunderstorm cloud is normally ______ charged, and the middle and lower parts are ______ charged.

1. negatively, negatively
2. positively, negatively
3. positively, positively
4. negatively, positively

141. Statement I: Sakthi Urang PKP phase is refracted twice at the mantle core boundary, while the PKIKP phase is refracted twice at the inner-outer core boundary as well.

Statement II: Both the PKP and PKIKP phases are not recorded in the shadow zone.

1. Statements I and II are true
2. Statement I is true, but II is false
3. Statement I is false, but II is true
4. Statements I and II are false

142. The following Vertical Electrical Sounding (VES) curves is possible over a 5-layered horizontally stratified Earth? Assume each layer to be isotropic and homogeneous.

1. KOK
2. HAH
3. KHK
4. QHH

143. What will be the thickness of a moving oceanic lithosphere at a distance of 100 km from the mid-oceanic ridge, given the average plate velocity of 1 mm/yr?

1. less than 50 km
2. between 50 and 100 km
3. between 100 and 150 km
4. more than 150 km

144. A 2-D seismic reflection survey is carried out over a two layered medium with a dipping interface between them. The dipping interface in the migrated section appears:

1. shallower and steeper
2. deeper and steeper
3. shorter and deeper
4. longer and deeper

145. Dye injection from gas reservoirs is to be performed by injecting gas along a fault line. If the gas is to be injected at a depth of 3 km/sec, find the time required.
145. A $P$ wave is incident at an angle of $30^\circ$ upon a horizontal interface separating two media which are both Poisson's solids. If the $P$ wave velocity of the first layer is $3$ km/sec and the critical angle is $60^\circ$, then the angle of refraction of the shear wave is

1. $\sin^{-1}(1/6)$
2. $\sin^{-1}(1/4)$
3. $\sin^{-1}(1/3)$
4. $\sin^{-1}(1/2)$

147. It is required to measure daily variations of electric field at the surface of the Earth. Considering the thermal diffusivity $= 10^{-4}$ m$^2$·s$^{-1}$, the top of the electrodes should be buried at

1. 5 cm
2. 15 cm
3. 25 cm
4. 35 cm

148. A sandstone has a porosity of 10% which is filled with water. The velocity of the $P$ wave in the matrix of the sand grain is 4 km/s. The average $P$ wave velocity in the rock is

1. $\frac{2}{3}$ km/s
2. $\frac{4}{3}$ km/s
3. $2\frac{2}{3}$ km/s
4. $3\frac{1}{3}$ km/s

149. In a cooling tower of a power plant, water flows in a pipe of inner diameter 0.2 m with a velocity of 0.1 m s$^{-1}$. Assume water's coefficient of viscosity and density are $8 \times 10^{-3}$ kg m$^{-1}$ s$^{-1}$ and $1000$ kg m$^{-3}$ respectively.
150. Consider the following picture of dry adiabatic lapse rate (dashed line) and vertical temperature structure in the ambient atmosphere:

Which of the above represents the temperature inversion condition and lofting behavior of the plume from a stake (a)?

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