



Instructions:

1. Please write your name and nationality in English (ALL CAPITAL LETTERS) on the cover page.
2. The time allocated for this examination is TWO hours.
3. Please write your answers legibly with a pen. Illegible answers will be counted as incorrect.
4. Please write your answers only on the test booklet provided.
5. You may respond to questions either in English or your native language, or a combination of both.
6. Please choose the most appropriate answer by encircling the letter that corresponds to the answer. Choosing more than one answer would result in forfeit of point.
7. Read the entire question group carefully before starting to answer. Each question has a point value assigned and indicated on the right hand side of the question for example, (1 or 3).
8. For some questions, you will be asked to provide your answers corresponding to a figure. Please do so carefully.
9. Any inappropriate examination behavior will result in your withdrawal from the IESO.



WRITTEN TEST IN GEOSPHERE

Q.No.	Questions	Points
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Questions 1 to 10 correspond to Figure 1.

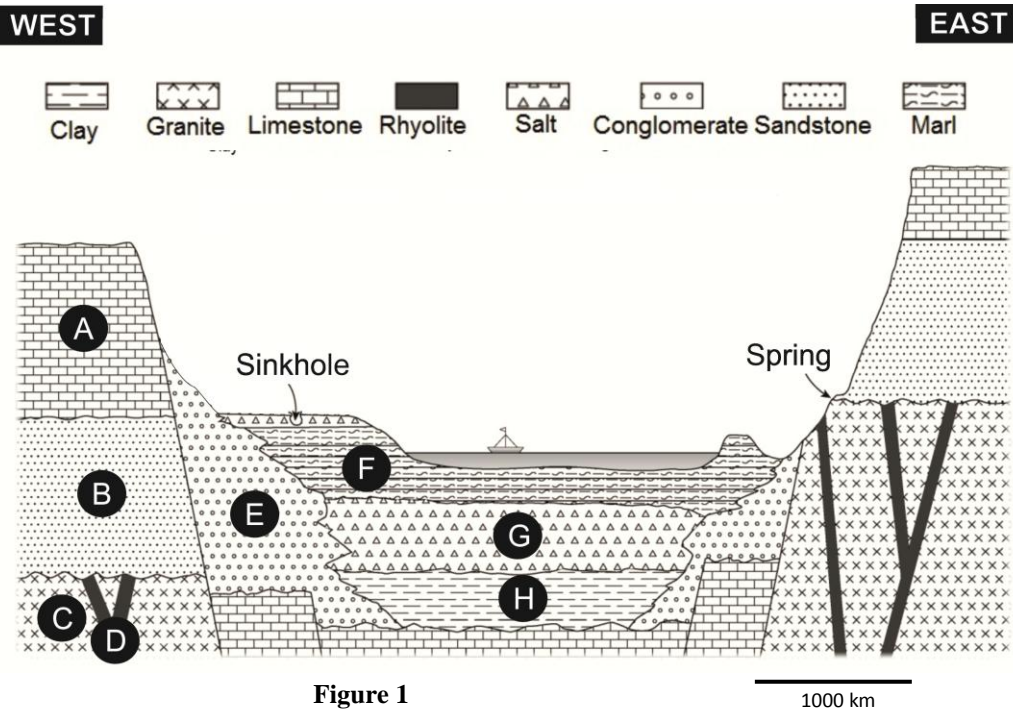


Figure 1

1000 km

- 1 What is the correct order (older to younger) of the formation of the rocks? (3)
 - a) C,D,B,A,E+(H,G,F)
 - b) C,B,E,H,A,F,E,D
 - c) C,F,B,A,E +(H,G,D)
 - d) H,G,F,E,C,D,B,A

- 2 Which types of faults are presented in the Figure 1? (1)
 - a) Reverse faults
 - b) Extension faults
 - c) Transform faults
 - d) Strike slip faults



- 3 Which type of tectonic setting is presented in the Figure 1? (1)
a) Subduction
b) Collision
c) Rifting
d) Transform
- 4 Which type of fossil should NOT be expected in unit A? (1)
a) Stromatolite
b) Fossil wood
c) Ammonite
d) Echinoderms
- 5 Which mineral is expected to be found in layer G? (1)
a) Halite
b) Calcite
c) Quartz
d) Clay
- 6 The red sandstone in layer B is cemented by: (1)
a) Copper
b) Quartz
c) Calcite
d) Iron
- 7 Cross bedding is most likely to be expected in layers: (1)
a) A
b) B
c) C
d) D
- 8 Which of the following rocks is a result of interaction between the Hydrosphere and the Biosphere: (2)
a) Sandstone
b) Salt
c) Limestone
d) Granite



- 9 The hydrosphere processes that affect various rocks in the section is seen in : (2)
- All the rocks
 - All the rocks except granite and rhyolite
 - Limestone, marl and salt
 - Sandstone, conglomerate and limestone
- 10 Which of the earth systems (spheres) is active in producing salt deposits? (2)
- Hydrosphere and biosphere
 - Geosphere, hydrosphere and atmosphere.
 - Geosphere, hydrosphere and biosphere
 - Atmosphere, biosphere and geosphere

Questions 11 to 13 corresponds to Figure 2.

This is a schematic diagram of a typical cross-section of an ocean

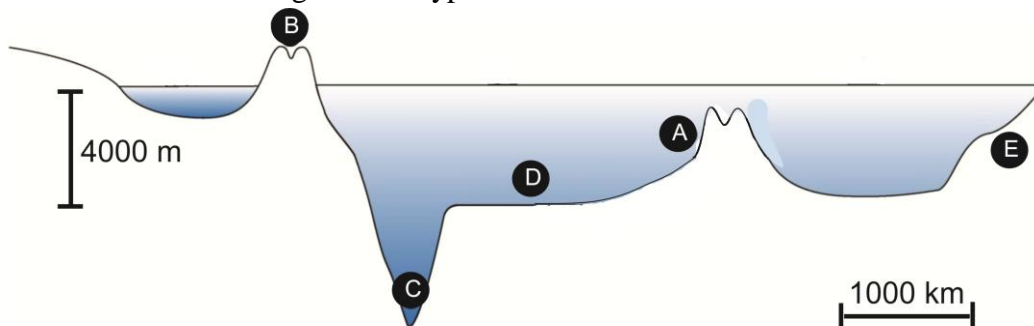


Figure 2

- 11 How many plates are present in the Figure above? (2)
- 1
 - 2
 - 3
 - 4
- 12 Which type of rock could be formed in Region A? (1)
- Basalt, obsidian and chert
 - Sandstone and basalt
 - Clay and chert
 - Mostly basalt



- 13 Beneath which regions of the section can one expect volcanism? (1)
- C and E
 - A and C
 - B and D
 - B and A

Questions 14 to 19 corresponds to Figure 3.

Shown in the Figure 3 are sedimentary rock sections from two different continents X and Y. The names of the rock strata are provided at the left. Different symbols represent fossils as shown in the legend at the right. The fossils are given hypothetical names. Each type of fossil represents a specific geologic time.

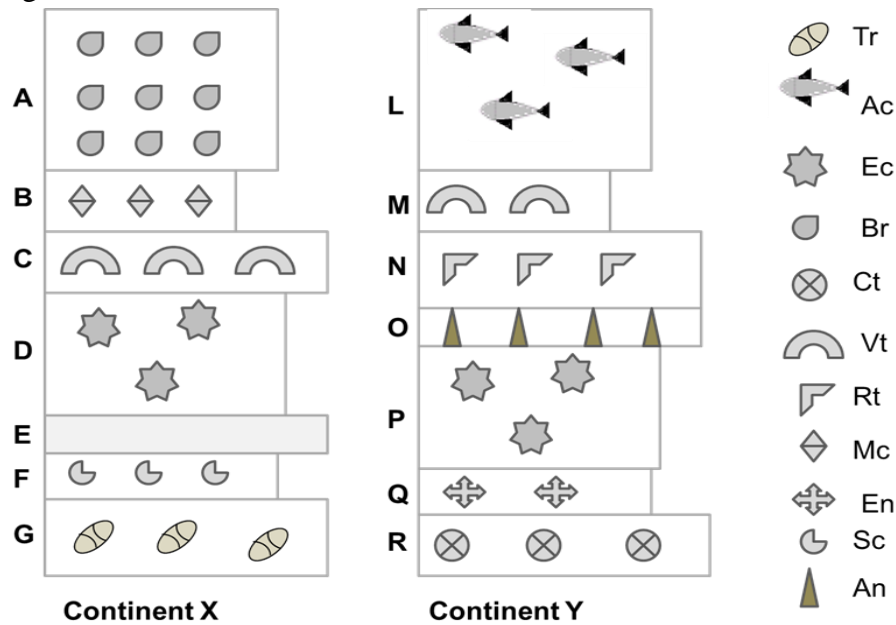


Figure 3

- 14 Which of the following pair represents similar age: (2)
- G and R
 - A and L
 - D and P
 - B and P



- 15 Which of the following statement is true? (2)
- a) O is younger than D
 - b) A is older than L
 - c) N and C are of same age
 - d) O is older than D
- 16 Which of the following animal group appeared earliest in the history of these continents? (1)
- a) Ac
 - b) Tr
 - c) Mc
 - d) An
- 17 Vt represents a terrestrial animal that cannot swim. How would you explain the occurrence of Vt fossil in both the continents, if there is a vast ocean between continent X and Y today? (2)
- a) Vt appeared independently in both the continents
 - b) The continents were connected when Vt was alive
 - c) Vt developed an ability of swimming and later lost it.
 - d) b and c
- 18 E represents an ash layer containing a radioactive isotope with half life of 100 Ma (million years). The ratio of parent to daughter isotope is found to be 1/8 in E. What is the age of the strata E? (3)
- a) 200 Ma
 - b) 300 Ma
 - c) 400 Ma
 - d) 800 Ma
- 19 If the absolute age of each strata is denoted by t_{strata} . Please find out which of the following statement is true? (> means greater than) (3)
- a) $t_C > t_D > t_F$
 - b) $t_D > t_N > t_L$
 - c) $t_P > t_Q > t_R$
 - d) $t_O > t_D > t_Q$



Questions 20-21 correspond to figure 4.

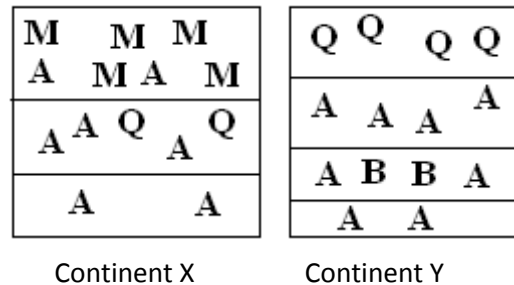


Figure 4

- 20 A, B, M and Q are fossils occurring in rock strata of Continent X and Continent Y. If you want to correlate these two rock successions which fossil would you choose as the best index fossil? (2)
- A
 - B
 - M
 - Q
- 21 What makes it the best index fossil? (2)
- It is present in one rock unit only
 - It is present in more than one rock unit
 - It is present in rocks of both continents,
 - a and c
- 22 What part of the timescale does a rock represent if it contains fish fossil, trilobites and brachiopod? (1)
- Paleozoic
 - Mesozoic,
 - Proterozoic,
 - Cenozoic



- 23 Rivers carry salt and deposit them to the ocean at a specific rate R_{Salt} per year. (3)
The concentration of salt in one unit of ocean water is C_{Salt} . The evaporation rate is R_{Evap} , the total volume of ocean water is V_{Ocean} , the total volume of river water is V_{River} . If you want to calculate the age of the ocean, which of the following data are necessary?
- a) $R_{\text{Salt}}, C_{\text{Salt}}, V_{\text{Ocean}}$
 - b) $R_{\text{Evap}}, V_{\text{River}}, C_{\text{Salt}}$
 - c) $R_{\text{Evap}}, V_{\text{River}}, R_{\text{Salt}}$,
 - d) $R_{\text{Salt}}, C_{\text{Salt}}, R_{\text{Evap}}$,
- 24 Global warming causes sea level increase because it facilitates the following (1)
factor.
- a) Melting of floating ice berg
 - b) Melting of continental ice sheet
 - c) Increasing the oceanic circulation
 - d) a and b
- 25 As we move away from mid-oceanic ridge under the sediment, we encounter (1)
progressively –
- a) Younger and lighter rocks
 - b) Older and lighter rocks
 - c) Older and denser rocks
 - d) Denser rocks of same age
- 26 Which of the following DOES NOT qualify as a mineral – (1)
- a) Halite,
 - b) Sugar crystal,
 - c) Natural ice crystal,
 - d) Pyroxene
- 27 The volcanic eruptions are commonly situated along subduction zones. The most (1)
common composition of the magma here is
- a) Andesitic
 - b) Basaltic
 - c) Rhyolitic
 - d) Peridotitic



- 28 The most violent of the volcanic eruptions are commonly related to the _____ magma. (1)
- e) Andesitic
 - f) Basaltic
 - g) Rhyolitic
 - h) Peridotitic
- 29 The Figure 5 below represents a map with volcanoes. Volcano A is active today and volcano H is the oldest. The volcanoes in between follow the similar age progression. If the volcanoes are a result of hotspot on a moving plate, what is the right progression of movement of this particular plate? (2)



Figure 5

- a) N-NE-NW
- b) SE-SW-S
- c) S-SW-SE
- d) NW-NE-N



- 30 Figures 6 a to c represent different degrees of sorting and rounding of grains in a sedimentary rock indicative of distance of transport. Which of the answers is correct? (1)

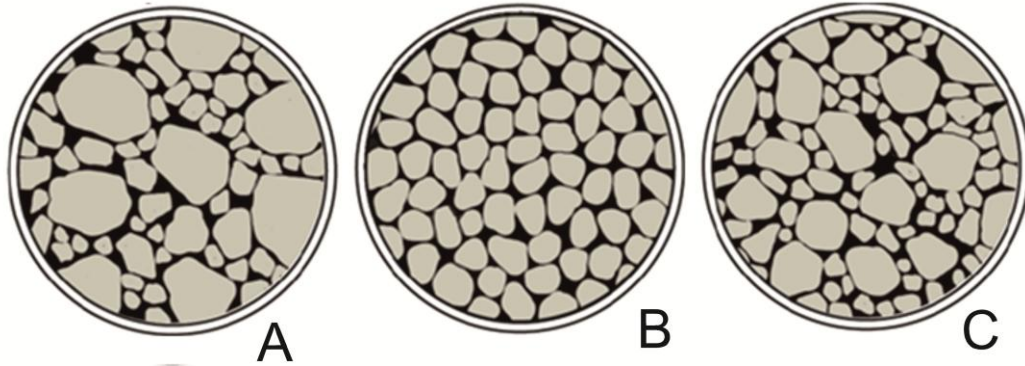


Figure 6

- a) A is transported over longer distance than B and C respectively.
 b) B is transported over longer distance than C and A respectively.
 c) C is transported over longer distance than B and A respectively.
- 31 Why was Wegener's continental drift theory initially **rejected**? (1)
- a) Absence of data on deep sea features
 b) Absence of a mechanism for motion of continents
 c) Ignorance of distribution of volcanoes
 d) Absence of paleomagnetic data
- 32 It is a well established fact that Earth is constantly cooling. Where is the heat flow maximum? (1)
- a) Mid-oceanic ridges
 b) Subduction zones
 c) Fold mountains
 d) Precambrian Shield areas
- 33 Following the above question, which of the processes is responsible for heat loss? (1)
- a) Under thrusting of plates
 b) Formation of mountains
 c) Pouring out of lava
 d) Metamorphism



- 34 This crystalline rock contains coarse grains of feldspar, quartz and mica - (1)
- i. Name the rock
- a) Gabbro
 - b) Granite
 - c) Basalt
 - d) Diorite
- 35 It is glassy, has conchoidal fracture, it comes in different colours and it is extrusive in nature. What is it? (1)
- a) Basalt
 - b) Pumice
 - c) Obsidian
 - d) Chert

The upper mantle and the crust make up a major tectonic feature of our earth. Answer the following questions in relation to this feature.

- 36 i. What is it called? (1)
- a) Lithosphere
 - b) Asthenosphere
 - c) Mesosphere
- 37 ii. What is the physical state of this layer of the Earth? (1)
- a) Solid
 - b) Liquid
 - c) Plastic
 - d) Brittle

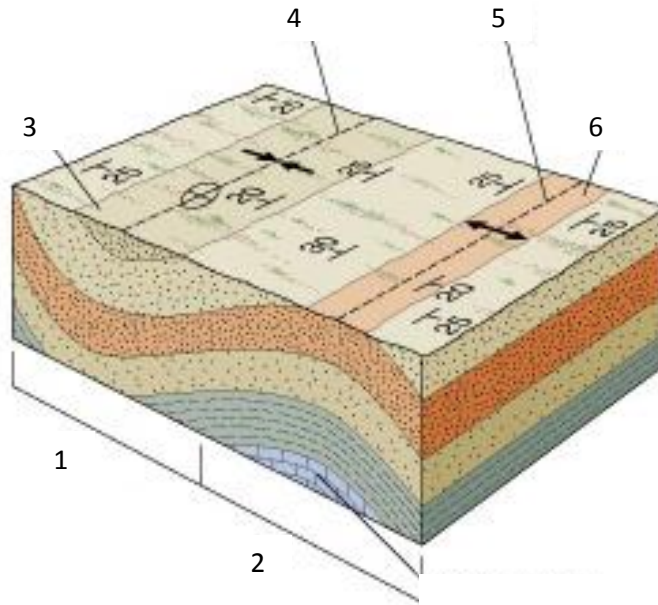


Figure 7

38 Match the numbered features of geologic structures (in normal position) in Figure 7 to the correct terms on the right. (3)

1	
2	
3	
4	
5	
6	

List of Answers

- A Hinge line of anticline
- B Hinge line of syncline
- C Anticline
- D Youngest rock exposed on surface
- G Oldest rock exposed on surface
- I Syncline

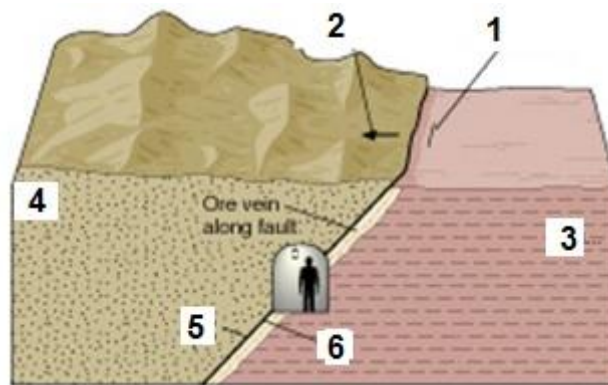


Figure 8

- 39 Match the numbered features of geologic structures in Figure 7 to the correct terms on the right. (3)

1	
2	
3	
4	
5	
6	

List of Answers

- A Footwall block
- B Hanging Wall
- C Strike of fault plane
- D Hanging Wall block
- E Footwall
- F Dip direction of the fault plane



- 40 Based on the various processes acting on different rocks that is indicated on the arrows, mark the type of rocks in the boxes given in Figure 9. (3)

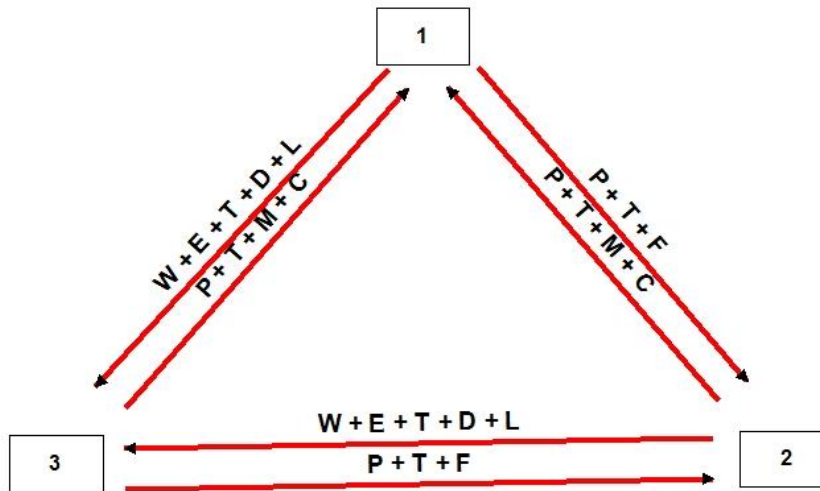


Figure 9

W – Weathering, E – Erosion, T – Transportation, D – Deposition,
L – Lithification, T – Temperature, P – Pressure, F – Fluid, M – Melting,
C – Crystallization

- 1=Igneous rock, 2=Metamorphic rock, 3=Sedimentary rock
- 3=Igneous rock, 2=Metamorphic rock, 1=Sedimentary rock
- 2=Igneous rock, 3=Metamorphic rock, 1=Sedimentary rock

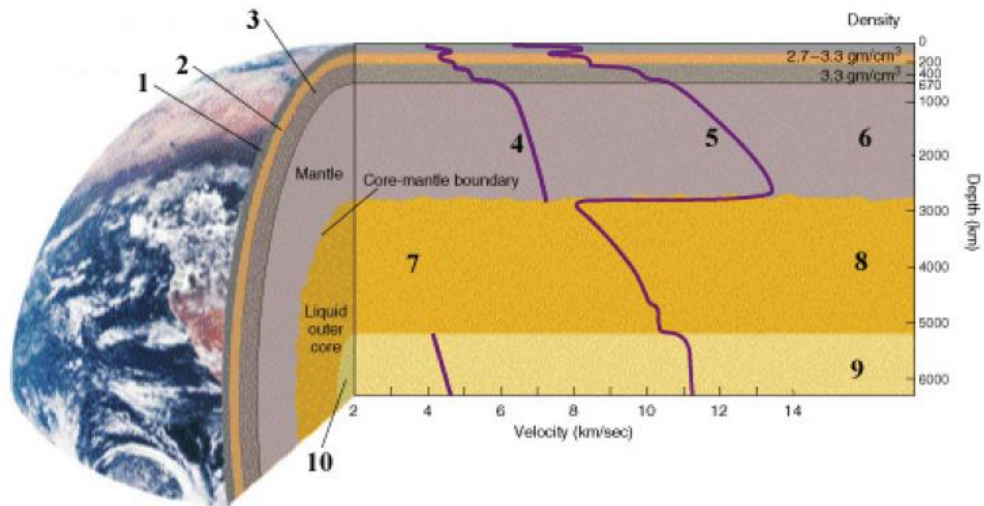


Figure 10

- 41 Match the numbers on the Figure 10 above to the appropriate terms or descriptions below.

1	Region indicated by #1	
2	Region indicated by #2	
3	Region indicated by #3	
4	Type of Seismic Waves	
5	Another type of Seismic Waves	
6	Density of region #6	
7	Phenomenon observed in region#7	
8	Density of the Outer C ore	
9	Density of the Inner C ore	
10	Region #10	

(10)

List of Answers

- A S-Waves
- B P-Waves
- C Low-Velocity Zone
- D 5.5 gram per cubic centimeter
- E 10 - 12 gram per cubic centimeter
- F 12 - 13 gram per cubic centimeter
- G Solid Inner C ore
- H Upper Mantle
- I Lithosphere
- J S-waves cannot penetrate liquid outer core



- 42 Which one of the following statements is true? (2)
- Both gravity and magnetic field decreases with increase in the latitude.
 - Both gravity and magnetic field increases with increase in the latitude.
 - Gravity field increases with the latitude whereas the magnetic field decreases with latitude
 - Gravity field decreases with the latitude whereas the magnetic field increases with latitude
- 43 Which one of the following statements is true? (>means greater than and < means less than respectively.)
- Conductivity of ocean water < Conductivity of ground water < conductivity of rain water
 - Conductivity of ocean water < Conductivity of ground water > conductivity of rain water
 - Conductivity of ocean water > Conductivity of ground water < conductivity of rain water
 - Conductivity of ocean water > Conductivity of ground water > conductivity of rain water
- 44 With respect to the Figure 11 which of the following options is correct? (> means greater than and < means less than) (1)

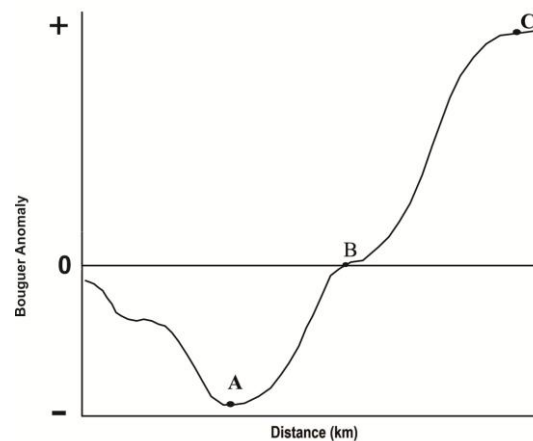


Figure 11

- Elevation at A > Elevation at B > Elevation at C
- Elevation at A > Elevation at B < Elevation at C
- Elevation at A < Elevation at B > Elevation at C
- Elevation at A < Elevation at B < Elevation at C



- 45 An earthquake was recorded at stations X, and Y which are at 50 km, and 200 km respectively from the epicenter. Which of the following statement is correct? (1)
- Magnitude is less at station X whereas intensity is more at station X
 - Magnitude and intensity are more at station X than at station Y
 - Magnitude is same at both the stations whereas intensity is more at station X
 - Magnitude is same at both the stations whereas intensity is more at station Y
- 46 If the depth is reduced from 10 km to 1 km the hydrostatic pressure will (1)
- Increase by 10 times
 - Increases by 100 times
 - Decrease by 10 times
 - Decreases by 100 times
- 47 Statement I: Earth is not a perfect sphere
Statement II: Gravitational acceleration would not be constant over the earth's surface (1)
- Statements I and II are correct , Statement II follows Statement I
 - Statements I and II are correct , Statement I follows Statement II
 - Statements I and II are incorrect
 - Only statement I is correct
- 48 If the moon had never existed, one of the following statements is **INCORRECT**. (1)
- The length of the day would have been shorter
 - The tilt of the Earth's axis would vary more
 - There would be no tides on Earth
 - It would be much darker at night all the year round



- 49 The summer in the northern hemisphere is warmer than the southern hemisphere, (1)
in spite of the fact that the Earth is farthest from the sun. This is because:
- A. During northern summer the North Pole is tilted toward the sun.
 - B. There is more land in the northern hemisphere.
 - C. Earth moves slowly at aphelion than at perihelion.
 - D. During northern summer the days are shorter than in winter.

Choose the correct answer from the following options.

- a) A and B are correct
 - b) C and D are correct
 - c) B and C are correct
 - d) A and D are correct
- 50 If a topographic profile is drawn along line X-Y, the profile will be similar in (1)
shape to

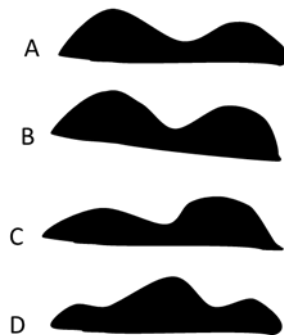
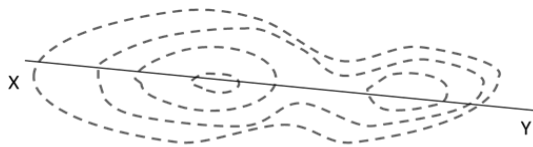


Figure 12

- a) A
- b) B
- c) C
- d) D

GEOSPHERE WRITTEN TEST ANSWER KEY

Q. No.	Answer	Marks
1	A	3
2	B	1
3	C	1
4	B	1
5	A	1
6	D	1
7	B	1
8	C	2
9	A	2
10	B	2
11	C	2
12	D	1
13	D	1
14	C	2
15	A	2
16	B	1
17	B	2
18	B	3
19	B	3
20	D	2
21	D	2
22	A	1
23	A	3
24	B	1
25	C	1
26	B	1
27	A	1
28	C	1
29	D	2
30	B	1
31	B	1
32	A	1
33	C	1
34	B	1
35	C	1
36	A	1
37	A	1
38	1 I	3
	2 C	
	3 D	
	4 B	
	5 A	
	6 G	

39	1	C	3
	2	F	
	3	A	
	4	D	
	5	B	
	6	E	
40		A	3
41	1	I	10
	2	C	
	3	H	
	4	A	
	5	B	
	6	D	
	7	J	
	8	E	
	9	F	
	10	G	
42		B	2
43		D	1
44		A	1
45		C	1
46		C	1
47		A	1
48		C	1
49		C	1
50		A	1
TOTAL			84