Theoretical Test
Astronomy

Time: 45 Minutes **Maximum Marks: 28.5**

Instructions:

1. Please write your student code on the cover page as well as on the top right of every page of answer sheet / calculations sheets.
2. Please write your answers legibly. Illegible answers will be counted as incorrect.
3. Please write your final answers in appropriate boxes in the main answer sheet. **For numerical questions, show the calculations on blank calculation sheets provided.**
4. For numerical questions, you may attempt part of the answer even if you don't know the final result. There will be stepwise marking.
5. You can get as many calculations sheets as you want. Just raise your hand to ask for extra sheets. The volunteers will bring extra sheets to your table.
6. Write question number clearly at the top of the calculations sheet.
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.
8. Any inappropriate examination behaviour will result in your withdrawal from the IESO.

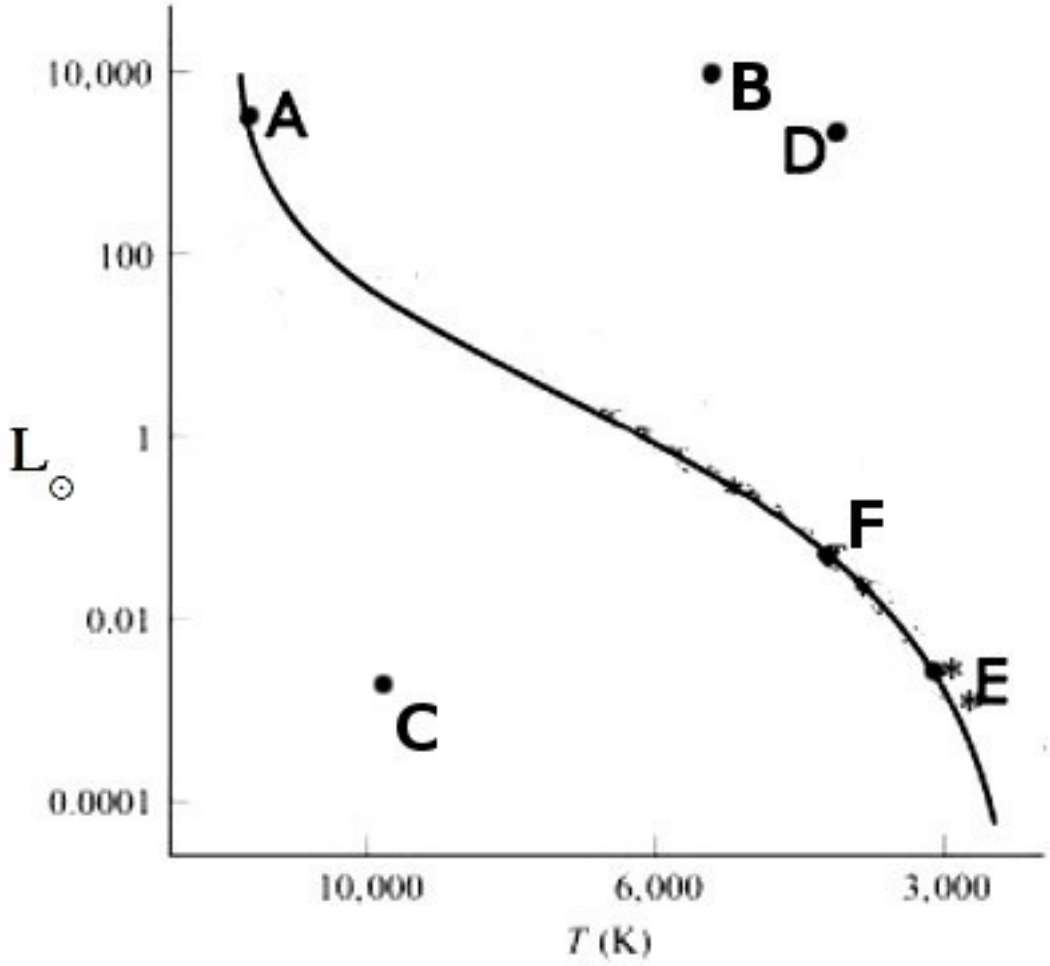
A1. We list a few facts below about temperatures at the surface of Venus, Earth and Mars.
(a) The yearly mean temperatures of planets do not match with their expected black body temperature.
(b) Absolute variation in the temperature during the course of one day differs significantly from one planet to another.
(c) Absolute variation in the temperature during the course of one year at the equator of the planet differs significantly from one planet to another.
(d) On some planets, there is a large latitudinal percentage variation in temperatures.
(e) Mean temperature (averaged over a day) on Earth is different on different days.

In the table given in your answer sheet, we list a number of physical properties related to a planet and its various motions, which may or may not be relevant in explaining the facts above. In the table, tick in appropriate rows those properties which are relevant for each of the facts above. Number of relevant parameters for each row can be none, one or more than one.
Total 10 points for correct tick-marks.
Warning: Every wrong tick mark has penalty of **-0.2 points.**

A2. The maximum altitude of the Sun as seen from Mysore on summer solstice day and winter solstice day are 78° 51' and 54° 17' respectively. Using this information, obtain the inclination of the Earth's axis (ε) and find the latitude of Mysore (ϕ). **(6 points)**

A3. The mass ratio of Pluto and Charon is 8:1. The period of revolution of Charon around Pluto is about 6.387 days. You are given that
$M_{Pluto} = 1.31 \times 10^{22}$ kg, $R_{Pluto} = 1195$ km, $G = 6.672 \times 10^{-11}$ N m^2 kg^{-2}
the Minimum and maximum distance of Pluto from Earth are 4284.7×10^6 km and 7528×10^6 km respectively.
(a) Find the length of the semi-major axis of Charon's orbit of revolution about Pluto. **(3 points)**
(b) Find the ratio a:R_{Pluto}, where 'a' is the distance of the Centre of Mass of the Pluto-Charon system from the center of Pluto . **(2 points)**
(c) Theoretically, what is the minimum diameter of the optical telescope which can resolve the system from Earth? Ignore effects of Earth's atmosphere.**(2 points)**

A4. The diagram on the next page shows the Hertzprung-Russell diagram (H-R diagram) with six positions (A – F) indicated. The y-axis is given in terms of Solar Luminosity ($L_\odot$) and x-axis gives effective surface temperature (T) of stars in Kelvin.
(a) Which letters indicate the position of stars that have the largest and the smallest diameters respectively? **(2 points)**
(b) Which letters indicate the stars with the same spectral class but with different luminosities? **(1 points)**
(c) Which letters indicate the stars that are primarily burning Hydrogen? **(1.5 points)**
(d) Which letter would indicate position of a white dwarf in this diagram? **(1 point)**


10,000
100
1
0.01
0.0001
$L_\odot$
A
B
D
F
E
C
10,000
6,000
3,000
T (K)

Theoretical Test

Astronomy Answer Sheet

A1. Please see next page

A2. Inclination of the Earth's axis is

Latitude of Mysore is

A3. Pluto and Charon:

(a) Semi-major axis =

(b) a:R_{Pluto} =

(c) Diameter =

A4. H-R diagram

(a) Star of Largest Diameter

Star of Smallest Diameter

(b) Give letters of stars

(c) Give letters of stars

(d) White Dwarf letter

Sheet for numerical calculations (write question number clearly)

Statement	Mass of Planet	Radius of Planet	Inclination of Rotation Axis with respect to its Orbital Plane	Rotation Period	Length of Semi-major axis of the orbit	Eccentricity of Orbit	Total Mass of Satellites	Density of Atmosphere	Water Vapour Percentage	Green House Effect	Magnetic Field Strength	Geothermal Activity
The yearly mean temperatures of planets do not match with their expected black body temperature.												
Absolute variation in the temperature during the course of one day differs significantly from one planet to another.												
Absolute variation in the temperature during the course of one year at the equator of the planet differs significantly from one planet to another.												
On some planets, there is a large latitudinal percentage variation in temperatures.												
Mean temperature (averaged over a day) on Earth is different on different days.												

7th INTERNATIONAL EARTH SCIENCE OLYMPIAD

वसुधैव कुटुम्बकम्
The Earth is indeed a family

HYDROSPHERE + ATMOSPHERE

WRITTEN TEST

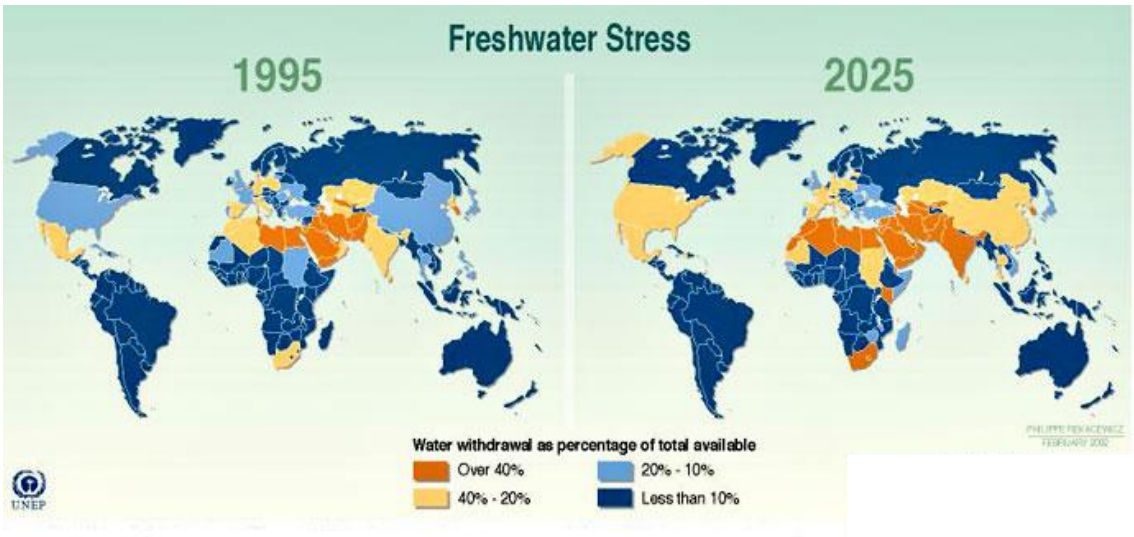
Student's Name and Code:

Instructions:

1. Please write your name and nationality in English on the cover page.
2. The time allocated for this examination is 75 minutes.
3. Please write your answer legibly, illegible answer will be counted as incorrect.
4. Please write your answer only on **this test booklet (English version only)**. For countries needing translation, additional question paper in their mother tongue is provided for reference only.
5. Please circle the most appropriate answer/answers among the given options.
6. Read the entire question group carefully before starting to answer. Marks for each sub-question are indicated on the right.
7. Some questions need the correct answer/s to be picked, some are true/false type, some are fill in blanks, and some expect short answers. Answer appropriately.
8. Any inappropriate examination behavior will result in disqualification.

Time allotted: 75 minutes **Total Marks: 61**

1. The figure below shows global freshwater withdrawal as a percentage of total available (see legend for color code) in the year 1995 and a model projection for the year 2025CE.



Answer the following questions by choosing the correct option: **(5 min)**

(i) One of the countries in which there is no significant change in water stress between 1995 and 2025 CE is

A. Egypt. **1 mark**

B. USA.

C. India.

D. China.

(ii) The reason for the answer of (i) above is **2 marks**

A. This country is located near the equator.

B. This country has already limited water resources.

C. This country has the largest population in the world.

D. This country has a relatively higher growth rate of population.

(iii) Out of the three continents in the southern hemisphere, the most affected is Africa, the reason being, the continent as a whole **2 marks**

A. has the largest fraction of desert area among the three.

B. receives the least rainfall among the three.

C. has the highest population among the three.

D. has more runoff through rivers such as Nile and Congo.

2. Weathering of rocks increases with temperature when more CO_2 is added to the Earth's atmosphere. What would happen when there is no volcanic eruption on the Earth for millions of years: **5 min**

(i) In addition to the long term climate change caused by changes in the Earth's orbital parameters, **2 marks**

A. the Earth would gradually become warmer because of CO_2 accumulation.

B. the Earth would gradually cool because of consumption of CO_2 for weathering of rocks.

C. there would be no additional change in the Earth's temperature.

(ii) Water is able to weather rocks because **2 marks**

A. it is present in all the three states of matter (i.e., solid ice, liquid water and water vapour) on the Earth.

B. it is the most abundant compound on the Earth's surface.

C. it can dissolve silicates, when it is pure.

D. it is a polar molecule, and in addition, dissolved carbon dioxide makes it acidic.

(iii) In the past (Neoproterozoic times), the whole Earth is believed to have cooled into a 'snowball'. A possible reason could be that **1 mark**

A. there were more frequent solar eclipses reducing incoming solar radiation.

B. there were frequent volcanic eruptions throwing aerosols into Earth's atmosphere, cooling the Earth.

C. changes in the orbital parameters of the Earth were more severe.

D. there were no volcanic eruptions for a long time, while weathering continued to consume the atmospheric carbon dioxide.

3. At present the Earth's surface is 70% oceans and 30 % land. If it were 100% oceans and no land, mark the following sentences as True (**T**) or False (**F**) **4 x 1.25 = 5 marks; 5 min**

(i) There will be no land breeze and sea breeze (**T** / **F**)

(ii) There will be sea breeze, but no land breeze (**T** / **F**)

(iii) There will be seasonal rainfall in the tropics, but much weaker than at present (**T** / **F**)

(iv) Both hemispheres will have the same season (e.g. summer) at the same time (**T** / **F**)

4. Nansen observed that ice floating in the Arctic Ocean moves at an angle of 45° to the right of the wind and not along the direction of the wind. Which forces in balance govern the movement of ice?

2 marks ;2 min

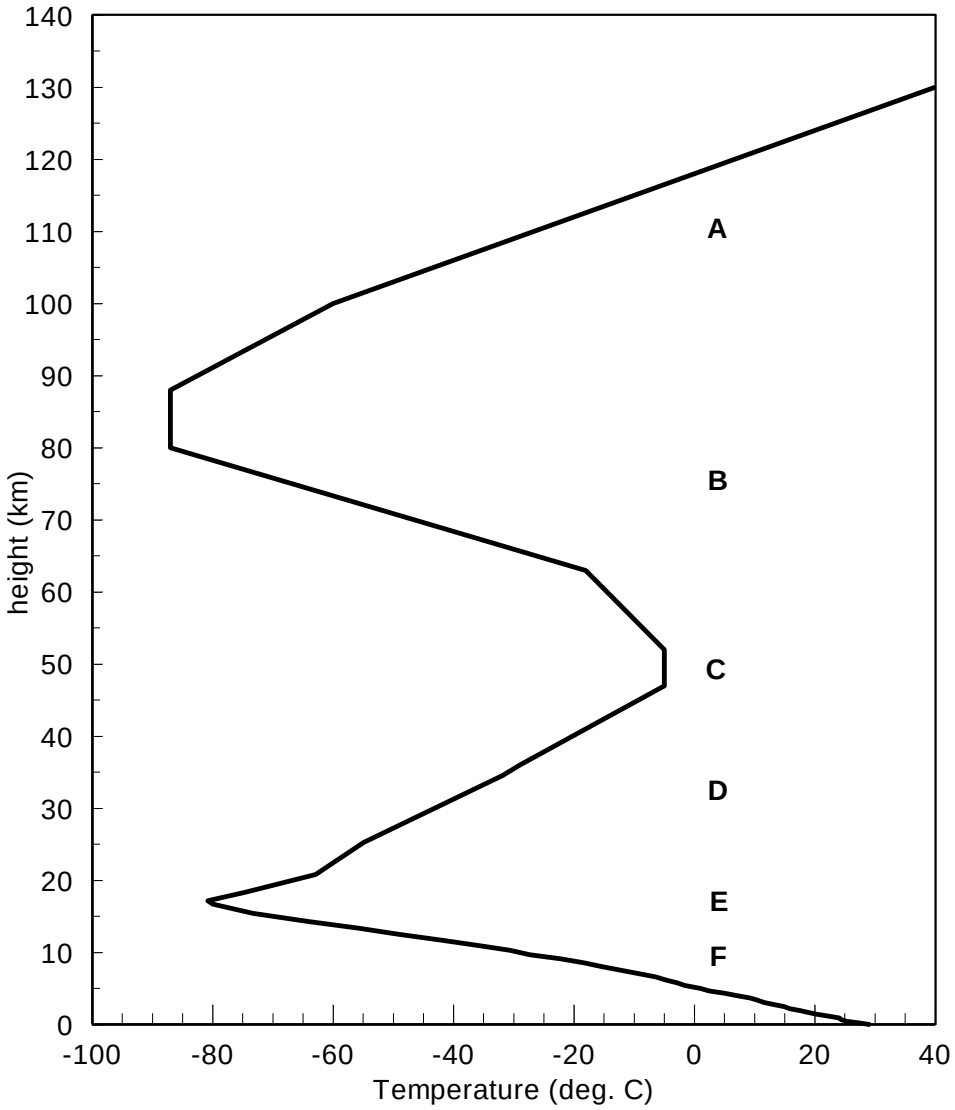
A. attraction of sun, moon and earth

B. wind force, friction and Coriolis force

C. pressure gradient, gravity and Coriolis force

D. winds, molecular friction and gravity

5. The figure below shows the variation of temperature with height. **6 x 1 = 6 marks; 5 min**



Write the names of the various layers (as marked A to F in the figure above and Column I in Table in the next page) such as troposphere, stratosphere, ionosphere, mesosphere, stratopause and tropopause, in Column II. Fill each row in column III with one or more of the following (you can leave it blank if there is

no appropriate option given): Cumulus clouds, cirrus clouds, top of cumulonimbus clouds, noctilucent clouds, aurorae, and UV absorption by ozone.

I	II	III
A		
B		
C		
D		
E		
F		

6. (i) The graph below shows a schematic of the evolution of gases H_2, O_2, N_2 and CO_2 in the Earth's atmosphere. Match the curves against the gases in the Table in the next page.

4 x 1 = 4 marks; 7 min

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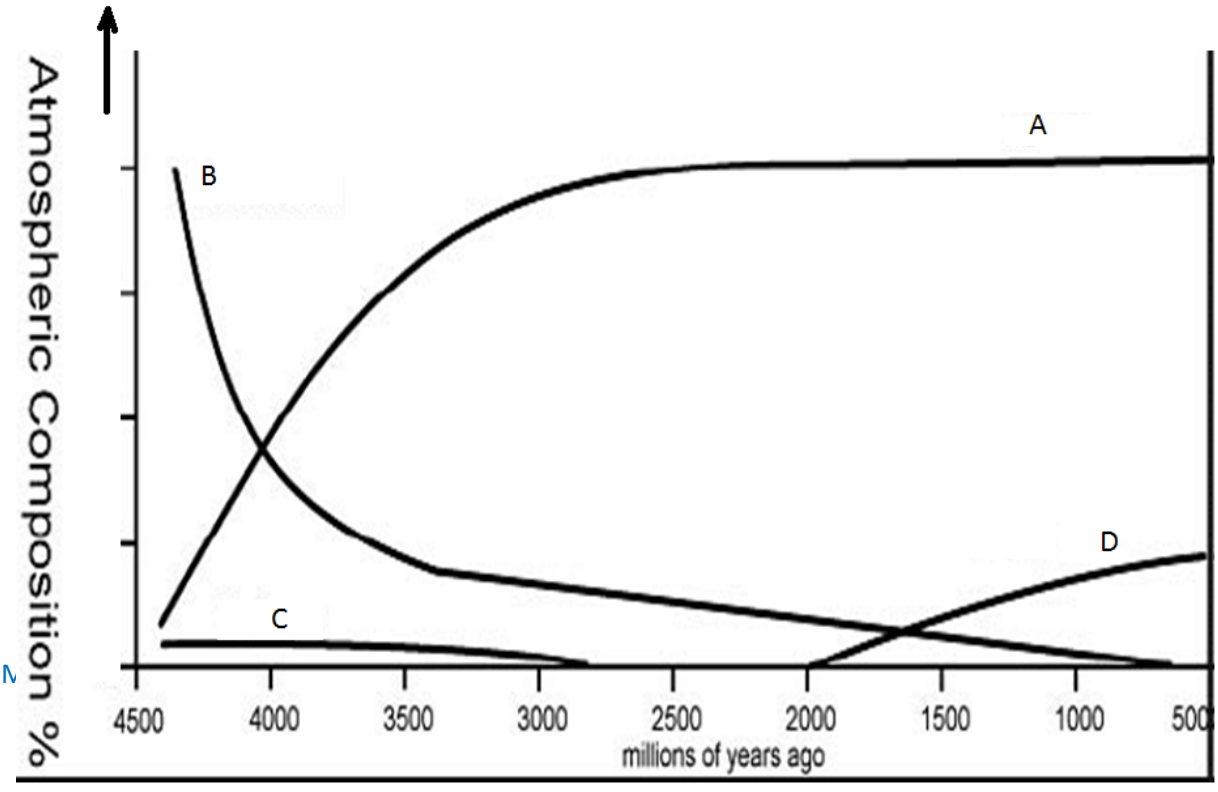


A	
B	
C	
D	

(ii) Fill in the blank:
According to this, banded iron formation (deposition of iron oxide in the form of bands) in the Earth's History started after around ..... million years ago 1 mark

7. The mean temperature of the Earth is governed by the overall radiation energy balance, i.e., net solar radiation absorbed equals the radiation back to space. If S_o is the solar constant, T the mean temperature, α the albedo, and σ the Stefan-Boltzmann constant, then, which of the following is the correct representation of this? 2 marks; 3 min

A. $(1-\alpha)\, S_o = \sigma T^4$

B. $S_o = 4\,\sigma\,(1-\alpha) T^4$

C. $(1-\alpha)\, S_o = 2\,\sigma T^4$

D. $(1-\alpha)\, S_o = 4\,\sigma T^4$

8. The Rainfall distribution in two regions P and Q is shown in the Table. **4 min**

Monthly Rainfall (mm)

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
P	2	0	1	0	0	125	300	450	250	75	10	7
Q	98	99	102	101	100	115	100	95	105	99	101	105

Pick out the correct statement/s. **2 marks**

A. The interannual variability of rainfall is more at P than at Q.

B. The intra-annual variability of rainfall is more at P than at Q.

C. The average monthly rainfall is about 120 mm at Q.

D. The averages of monthly rainfall over one year at P and Q are the same.

9. Earth is warming due to CO_2 increase. In the tropical belt 30°S to 30°N, which among the following statements are true? **2 x 2 = 4 marks; 5 min**

A. Largest warming occurs in the atmospheric layer 10-14 km above the surface.

B. Largest warming occurs in the stratosphere.

C. The entire atmospheric column from surface to 50 km height warms.

D. Lower troposphere warms and stratosphere cools.

E. Warming is at the surface and rest of the atmosphere is unaffected.

10. Write the name the clouds shown below in the Table below **4 x 0.5 = 2 marks; 2 min**

A

B

C

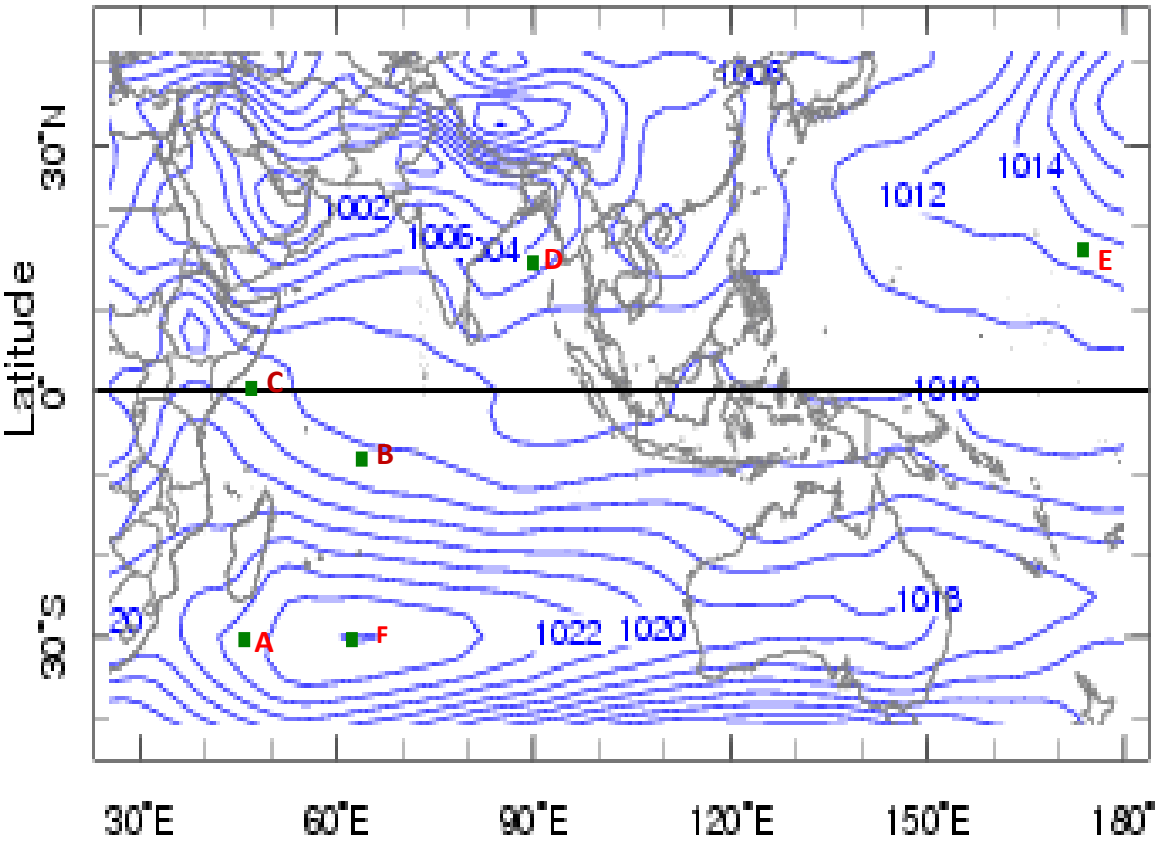
D

A	
B	
C	
D	

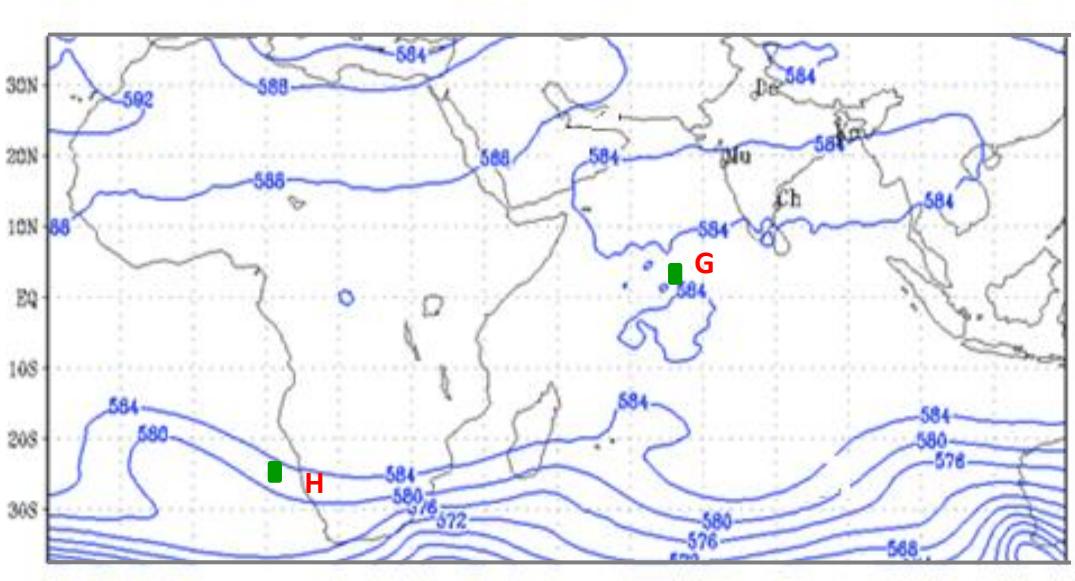
11. The figure below shows the sea level pressure chart and the figure in the next page, the geopotential height of 500 hPa level (arbitrary units). Indicate the wind directions *by marking arrows* at locations A, B, C, D, and E in the figure below, and G and H in figure in the next page.

8 x 0.5 = 4 marks; 7 min

Sea level pressure (hPa)



500 hPa geopotential



12. If the rise in global mean sea level is 55 m due to the melting of Antarctic ice, estimate the approximate volume of ice. Take the radius of Earth to be ~6720 km. (Assume that the area of the oceans does not change with sea level and ignore the small difference in densities of ice and water) **5 marks 10 min**

13. **In an ocean where the temperature of the water column increases only by solar radiation, by what amount the temperature of a uniformly mixed column of water of depth 100 m would increase for 50 W m^{-2} of radiation incident for a period of 10 hours? The specific heat of water is 4200 J/kg and density is 1025 kg/m^3** **2 marks; 3 min**

14. **Cricket or baseball players are not concerned about Coriolis force deflecting the ball. But an ocean current flowing from the equator to mid-latitude is deflected by the Coriolis force because:**

2 marks; 2 min

A. the cricket ball or baseball is smaller than the Earth.

B. the time of flight of the ball is much shorter than the period of Earth's rotation.

C. the Earth is attracted by the sun and the moon, but the cricket ball or baseball is not.

D. the shape of the Earth is not exactly spherical, but the ball is almost spherical.

15. **A tropical cyclone, when moving over tropical ocean becomes more intense, whereas when it moves over land, it becomes weaker mainly because:** **1 mark; 1 min**

A. trees and buildings obstruct cyclone movement.

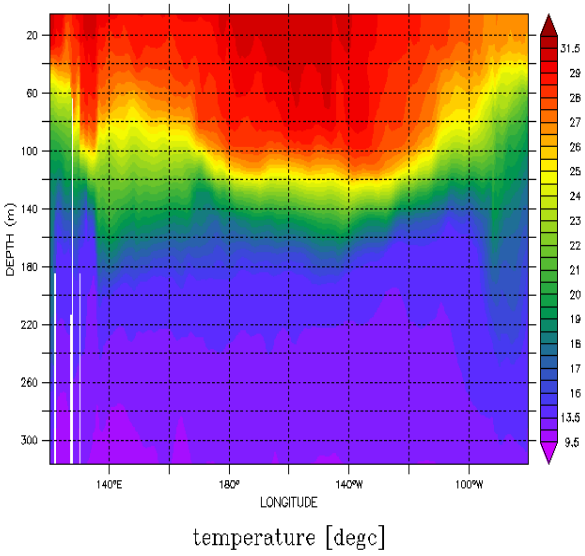
B. evaporation from the sea surface is higher.

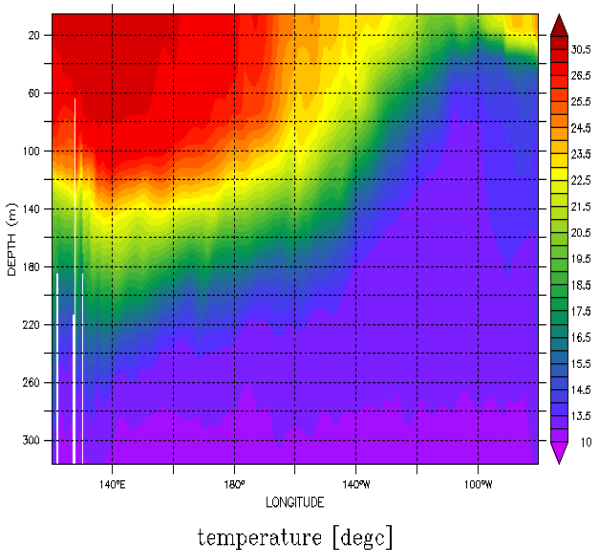
C. of higher wind speed over land.

D. of higher precipitation over land.

16. Consider an ocean current that is 200 km wide and 200 m deep flowing with a uniform speed of 1 m s^{-1}. How much water is carried by this current in one year? **2 marks; 3 min**

17. Given below two zonal distributions of vertical thermal structure of the equatorial Pacific. (figures on left and right). Identify which figure corresponds to an El Nino and which is a non-El Nino year. **2 marks;, 2 min**





Left Panel	
Right panel	

18. Interactions of the atmosphere, cryosphere, hydrosphere, lithosphere and the biosphere among them lead to many positive and negative feedbacks in the climate system. A positive feedback is one which helps the agent which caused it to increase and a negative feedback is one which works against the agent which caused it. Identify the following observations into positive (+), negative (–) feedback and no feedback (0). 3 x 1 = 3 marks; 3 min

(i) Higher temperature leading to higher evaporation and so more water vapour in the troposphere (**+ / – / 0**)

(ii) Additional ice formation in the polar regions, increasing Earth's albedo. (**+ / – / 0**)

(iii) Addition of CO_2 to the Earth's atmosphere (e.g., by volcanism), and increasing the temperature and weathering rate of rocks. (**+ / –/ 0**)

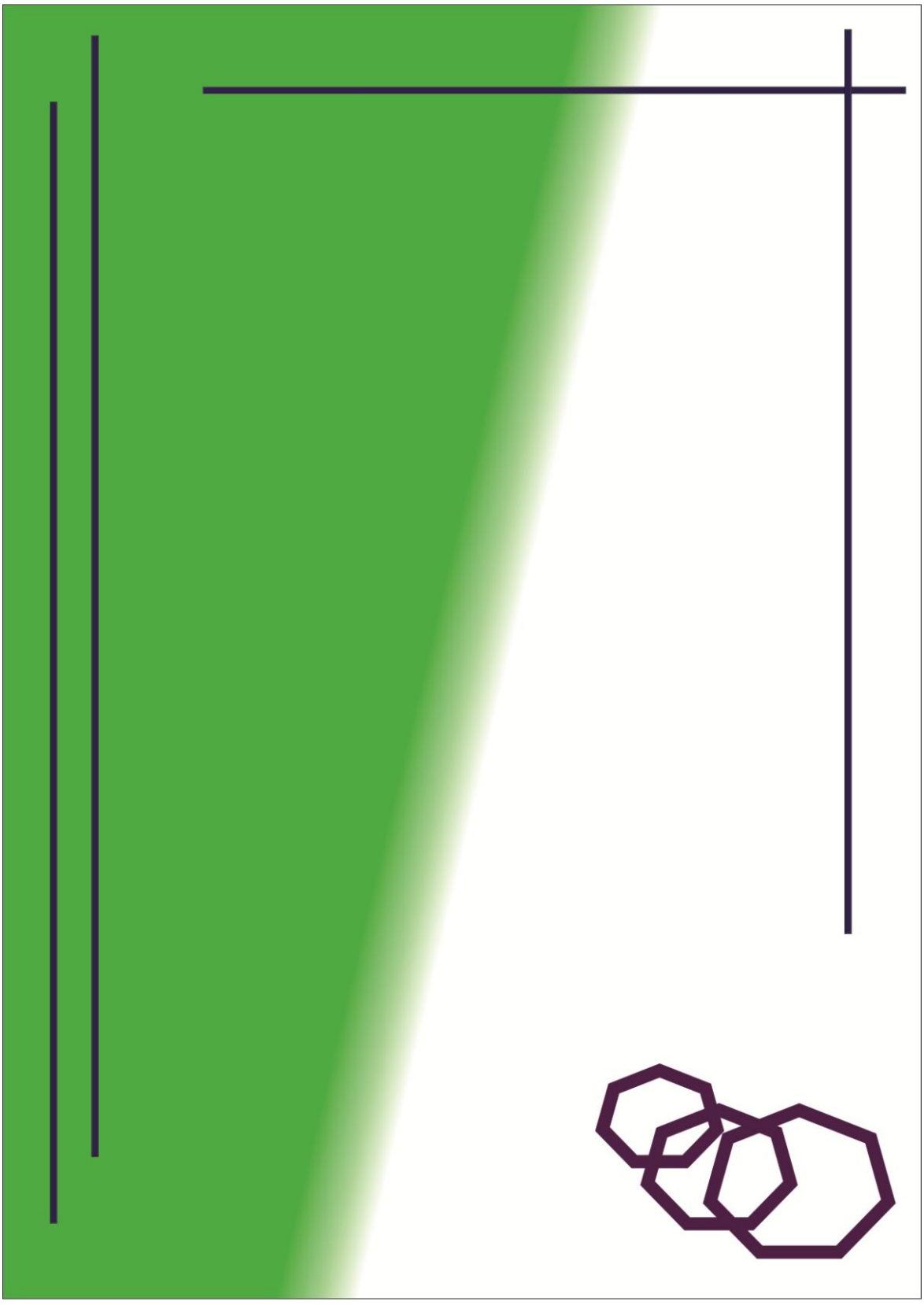
19. The CO_2 that reaches deep parts of the ocean takes about /_____ / to return to atmosphere because_____\ 2 marks; 2 min

A. /10 years/, \of El Nino and La Nina\

B. /6 months to one year/, \of monsoons\

C. /10000 years/, \there are no currents in the deep ocean\

D. /1000 years/, \deep ocean circulation is slow\



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

Questions 1 to 10 correspond to Figure 1.

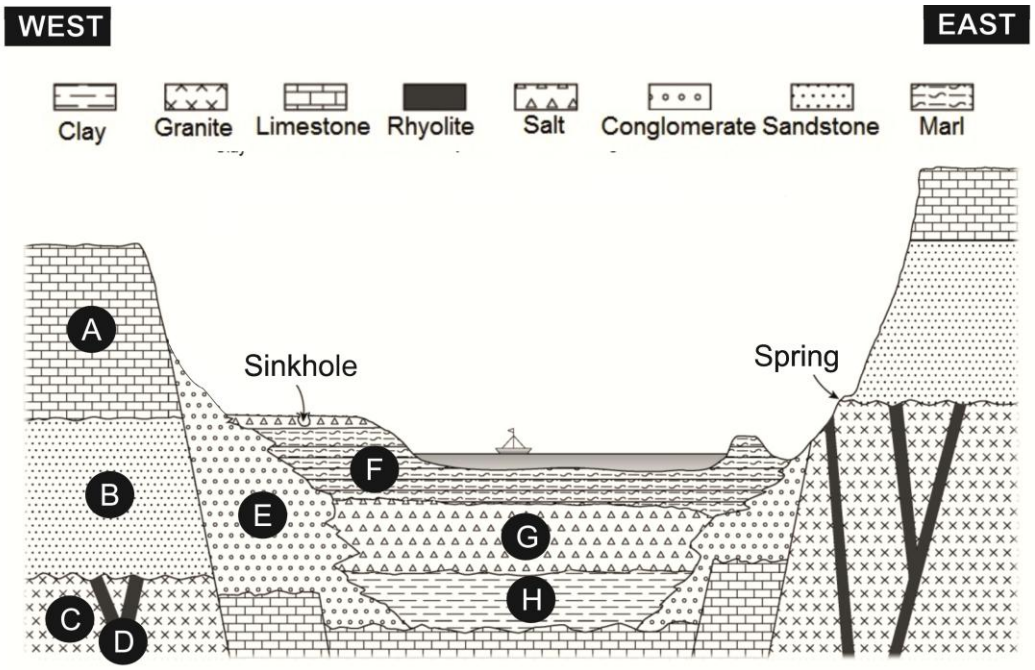


Figure 1

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)**

a) All the rocks
b) All the rocks except granite and rhyolite
c) Limestone, marl and salt
d) Sandstone, conglomerate and limestone

10 Which of the earth systems (spheres) is active in producing salt deposits? **(2)**

a) Hydrosphere and biosphere
b) Geosphere, hydrosphere and atmosphere.
c) Geosphere, hydrosphere and biosphere
d) 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

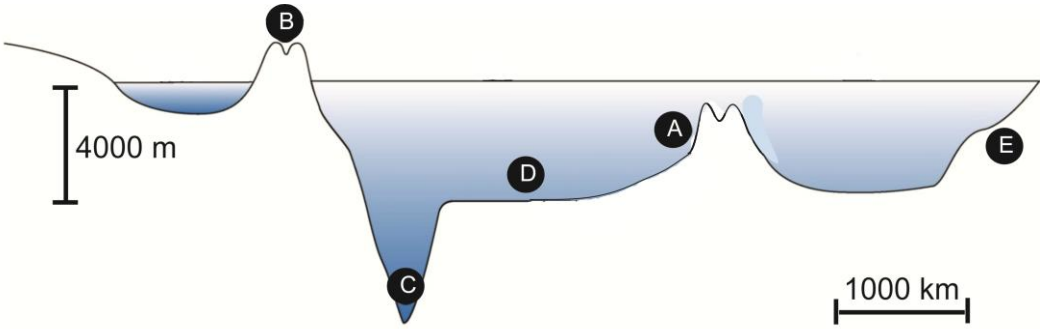


Figure 2

11 How many plates are present in the Figure above? **(2)**

a) 1
b) 2
c) 3
d) 4

12 Which type of rock could be formed in Region A? **(1)**

a) Basalt, obsidian and chert
b) Sandstone and basalt
c) Clay and chert
d) Mostly basalt

13 Beneath which regions of the section can one expect volcanism? **(1)**

a) C and E
b) A and C
c) B and D
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.

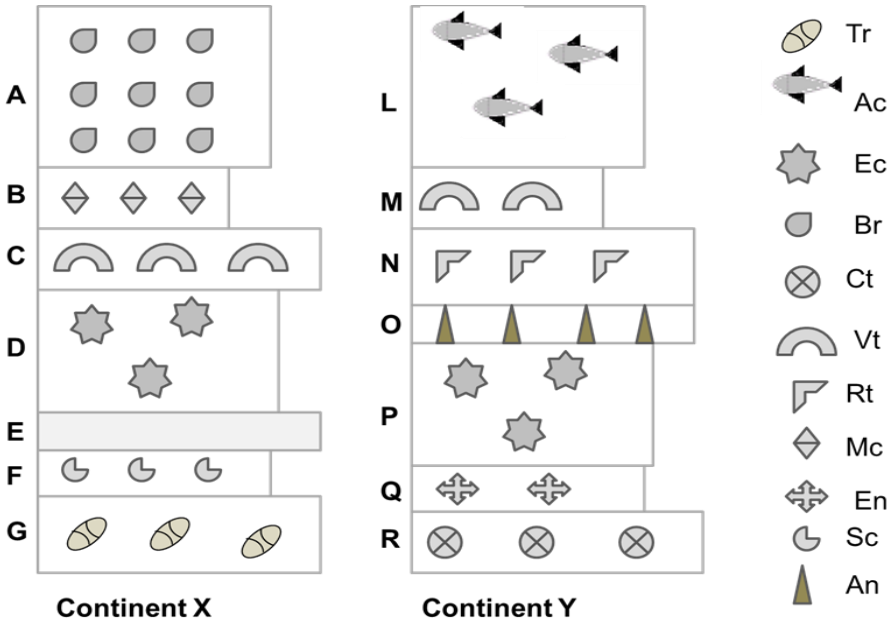


Figure 3

14 Which of the following pair represents similar age: **(2)**

a) G and R
b) A and L
c) D and P
d) 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.

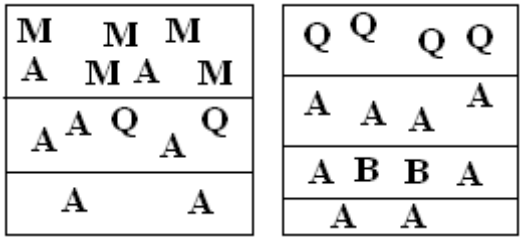


Figure 4

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) A
b) B
c) M
d) Q

21 What makes it the best index fossil? **(2)**

a) It is present in one rock unit only
b) It is present in more than one rock unit
c) It is present in rocks of both continents,
d) a and c

22 What part of the timescale does a rock represent if it contains fish fossil, trilobites and brachiopod? **(1)**

a) Paleozoic
b) Mesozoic,
c) Proterozoic,
d) Cenozoic

23 Rivers carry salt and deposit them to the ocean at a specific rate R_{Salt} per year. 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? **(3)**

a) $R_{Salt,}$ $C_{Salt,}$ V_{Ocean}
b) $R_{Evap,}$ $V_{River,}$ C_{Salt}
c) $R_{Evap,}$ $V_{River,}$ $R_{Salt,}$
d) $R_{Salt,}$ $C_{Salt,}$ $R_{Evap,}$

24 Global warming causes sea level increase because it facilitates the following factor. **(1)**

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 progressively – **(1)**

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 common composition of the magma here is **(1)**

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)**

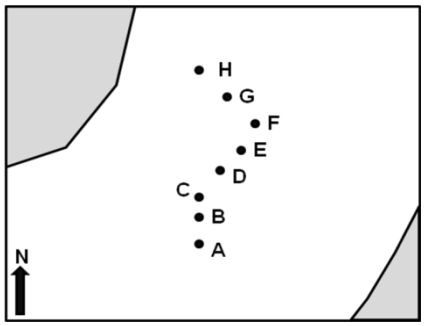


Figure 5

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)**

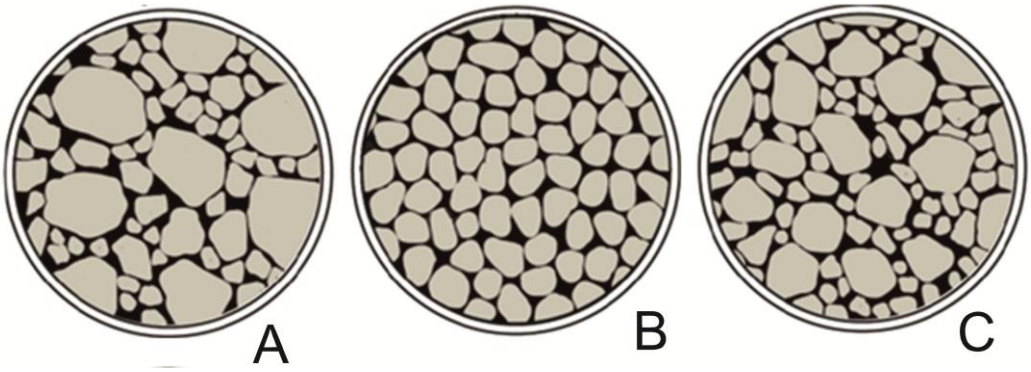


Figure 6

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 -

i. Name the rock **(1)**

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

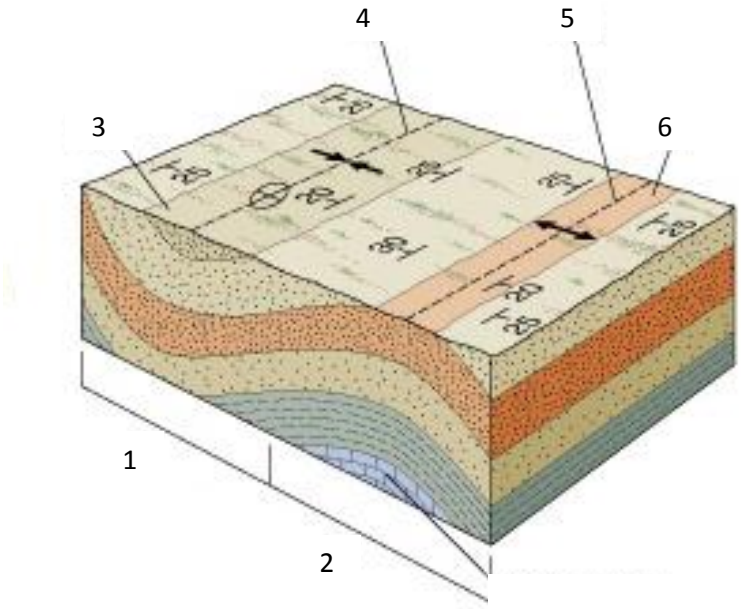


Figure 7

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

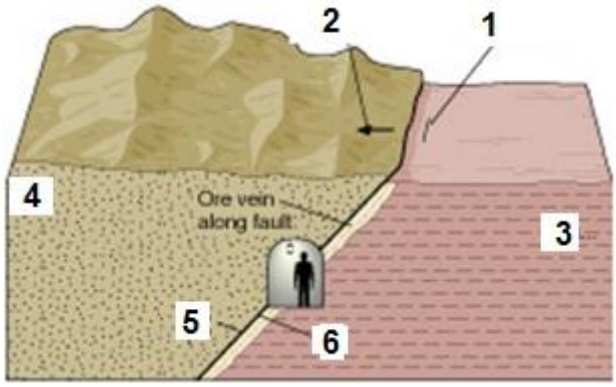


Figure 8

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)**

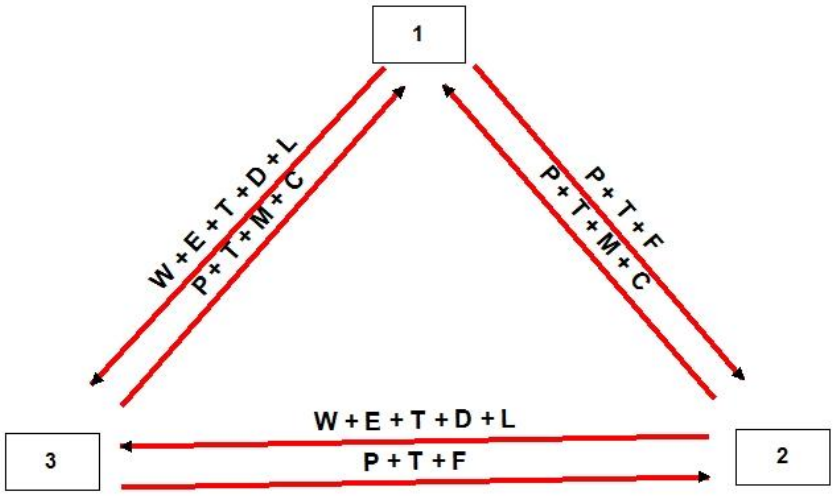


Figure 9

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

a) 1=Igneous rock, 2=Metamorphic rock, 3=Sedimentary rock
b) 3=Igneous rock, 2=Metamorphic rock, 1=Sedimentary rock
c) 2=Igneous rock, 3=Metamorphic rock, 1=Sedimentary rock

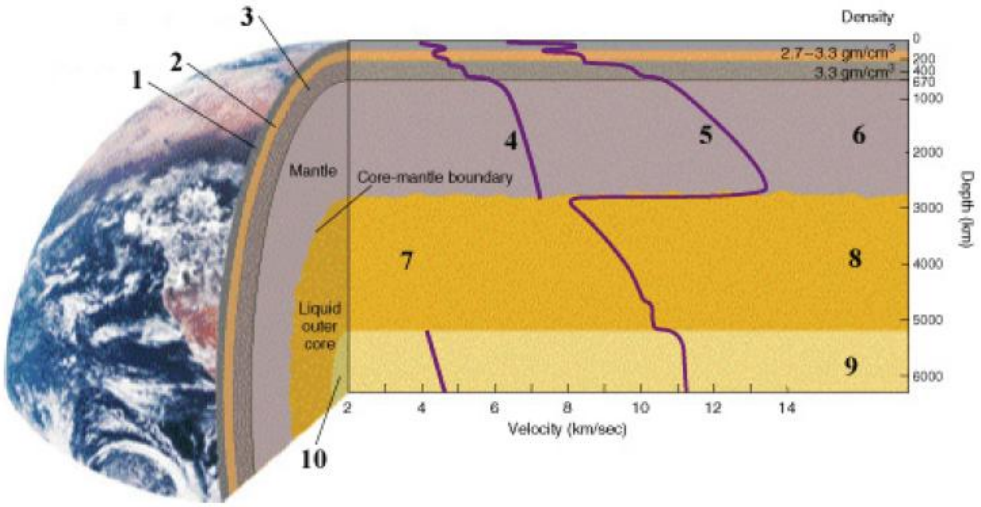


Figure 10

41 Match the numbers on the Figure 10 above to the appropriate terms or descriptions below. **(10)**

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	

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)**

a) Both gravity and magnetic field decreases with increase in the latitude.
b) Both gravity and magnetic field increases with increase in the latitude.
c) Gravity field increases with the latitude whereas the magnetic field decreases with latitude
d) 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.)

a. Conductivity of ocean water < Conductivity of ground water < conductivity of rain water
b. Conductivity of ocean water < Conductivity of ground water >conductivity of rain water
c. Conductivity of ocean water > Conductivity of ground water < conductivity of rain water
d. 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)**

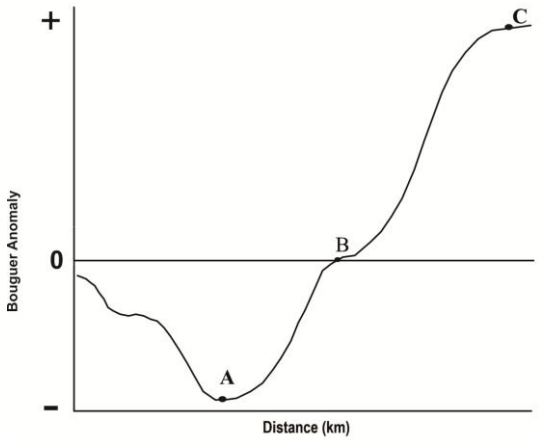


Figure 11

a) Elevation at A > Elevation at B > Elevation at C
b) Elevation at A > Elevation at B < Elevation at C
c) Elevation at A < Elevation at B > Elevation at C
d) 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)**

a. Magnitude is less at station X whereas intensity is more at station X
b. Magnitude and intensity are more at station X than at station Y
c. Magnitude is same at both the stations whereas intensity is more at station X
d. 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)**

a. Increase by 10 times
b. Increases by 100 times
c. Decrease by 10 times
d. 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)**

a. Statements I and II are correct , Statement II follows Statement I
b. Statements I and II are correct , Statement I follows Statement II
c. Statements I and II are incorrect
d. Only statement I is correct

48 If the moon had never existed, one of the following statements is **INCORRECT**. **(1)**

a) The length of the day would have been shorter
b) The tilt of the Earth's axis would vary more
c) There would be no tides on Earth
d) It would be much darker at night all the year round

49 The summer in the northern hemisphere is warmer than the southern hemisphere, in spite of the fact that the Earth is farthest from the sun. This is because: **(1)**

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 shape to **(1)**

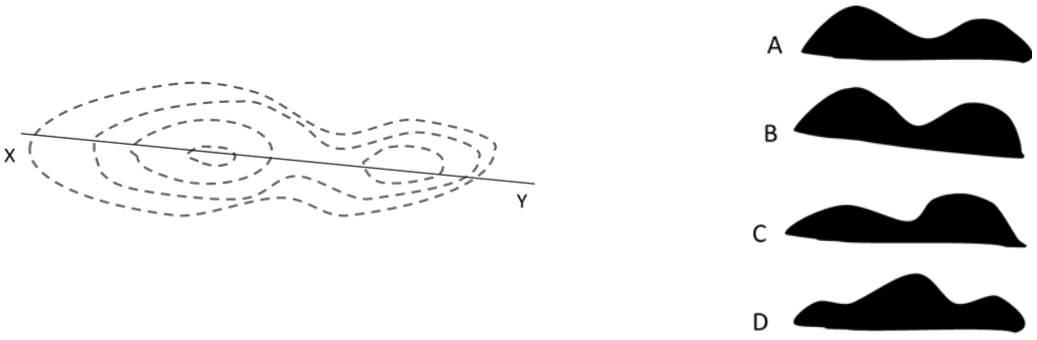


Figure 12

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