

2024-2005

# IIT JAM PYQ

PHYSICAL GEOLOGY



SP GEOLOGY

ADOPT.IMPROVISE. OVERCOME



## MCQ 1 mark

2015

1. Which amongst the following planets has the highest number of known satellites?
  - a. Mars
  - b. Uranus
  - c. Venus
  - d. Mercury

2016

2. The most abundant metal (by weight %) in the Earth's crust is
  - a. Al
  - b. Fe
  - c. Na
  - d. Mg
3. The amplitude of ground motion during an earthquake of magnitude 7 in Richter scale is how many times more than that of a magnitude 5?
  - a. 10
  - b. 100
  - c. 1000
  - d. 10,000
4. The failed arm of a continental rift is called
  - a. hot spot
  - b. horst
  - c. decollement
  - d. aulacogen

2017

5. Conservative plate boundary is represented by
  - a. Normal fault
  - b. Growth fault
  - c. Transform fault
  - d. Reverse fault

2018

6. Which one among the following planets in the Solar system is most similar in size to the Earth?
  - a. Mercury
  - b. Venus
  - c. Neptune
  - d. Uranus
7. In which one of the following tectonic settings are the highest mountain chains and thickest crust found?
  - a. Island arc
  - b. Continental arc
  - c. Continental collision
  - d. Transcurrent



8. The second-most abundant oxide in the Earth's crust is
- $\text{Al}_2\text{O}_3$
  - $\text{SiO}_2$
  - $\text{CaO}$
  - $\text{Na}_2\text{O}$

2019

9. Which of the following is associated with a divergent plate boundary?
- Ridge
  - Trench
  - Island arc
  - Accretionary prism
10. Shear waves do not travel through the
- upper continental crust
  - upper mantle
  - lower mantle
  - outer core

2020

11. A trench is found at a
- divergent plate boundary
  - convergent plate boundary
  - transform boundary
  - passive margin
12. Approximately 71% of the planetary mass in the solar system is concentrated in
- Uranus
  - Mercury
  - Saturn
  - Jupiter
13. The most abundant element in the Earth's continental crust is
- Silicon
  - aluminium
  - oxygen
  - iron

2021

14. The Earth's radius is maximum at which one of the following latitudes?
- $0^\circ$
  - $40^\circ \text{ N}$
  - $60^\circ \text{ S}$
  - $90^\circ$
15. The closest value to the percentage of the Earth's surface covered by the oceans is
- 30%
  - 50%
  - 70%
  - 90%



2022

16. Which one of the following seismic waves involves compression and rarefaction (but not rotation) of the material that it passes through?
- P-waves
  - S-waves
  - Rayleigh waves
  - Love waves

2023

17. The transition from spinel to perovskite structure occurs between \_\_\_\_\_.
- lower mantle and outer core
  - outer core and inner core
  - upper mantle and lower mantle
  - lower crust and upper mantle
18. Crustal thickness is maximum at the \_\_\_\_\_.
- ocean-ocean convergent plate boundary
  - ocean-continent convergent plate boundary
  - continent-continent convergent plate boundary
  - continent-continent divergent plate boundary

2024

19. The plate tectonic setting of Benioff-Wadati zone is
- continental rift
  - subduction zone
  - passive margin
  - mid-oceanic ridge
20. Neutron-rich unstable nuclides undergo
- $\beta^-$  (negatron) decay
  - $\beta^+$  (positron) decay
  - $\alpha$ -decay
  - electron capture

MCQ 2 MARKS

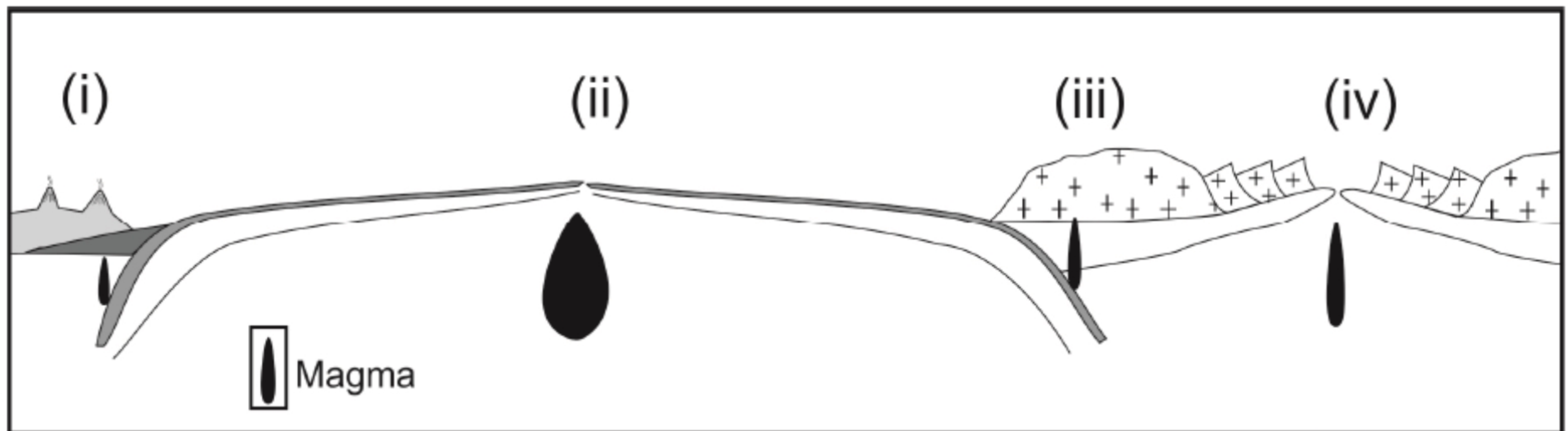
2015

21. Silica-rich viscous magmas often produce:
- Stratovolcano
  - Shield volcano
  - Dome
  - Fissure eruption
22. S- wave is terminated at:
- Crust—Mantle boundary
  - Lithosphere—Asthenosphere boundary
  - Mantle—Core boundary
  - Inner and Outer core boundary



23. Arrange the elements Fe, O, H, He, Si in decreasing order of their abundance in the solar system.
- H > He > O > Si > Fe
  - He > H > Si > O > Fe
  - H > He > O > Fe > Si
  - Si > Fe > H > He > O

24. In the given figure (i), (ii), (iii), and (iv) denote the plate tectonic settings: Mid Oceanic Ridge (M), Island Arc (I), Continental Arc (C) and Rift Zone (R).

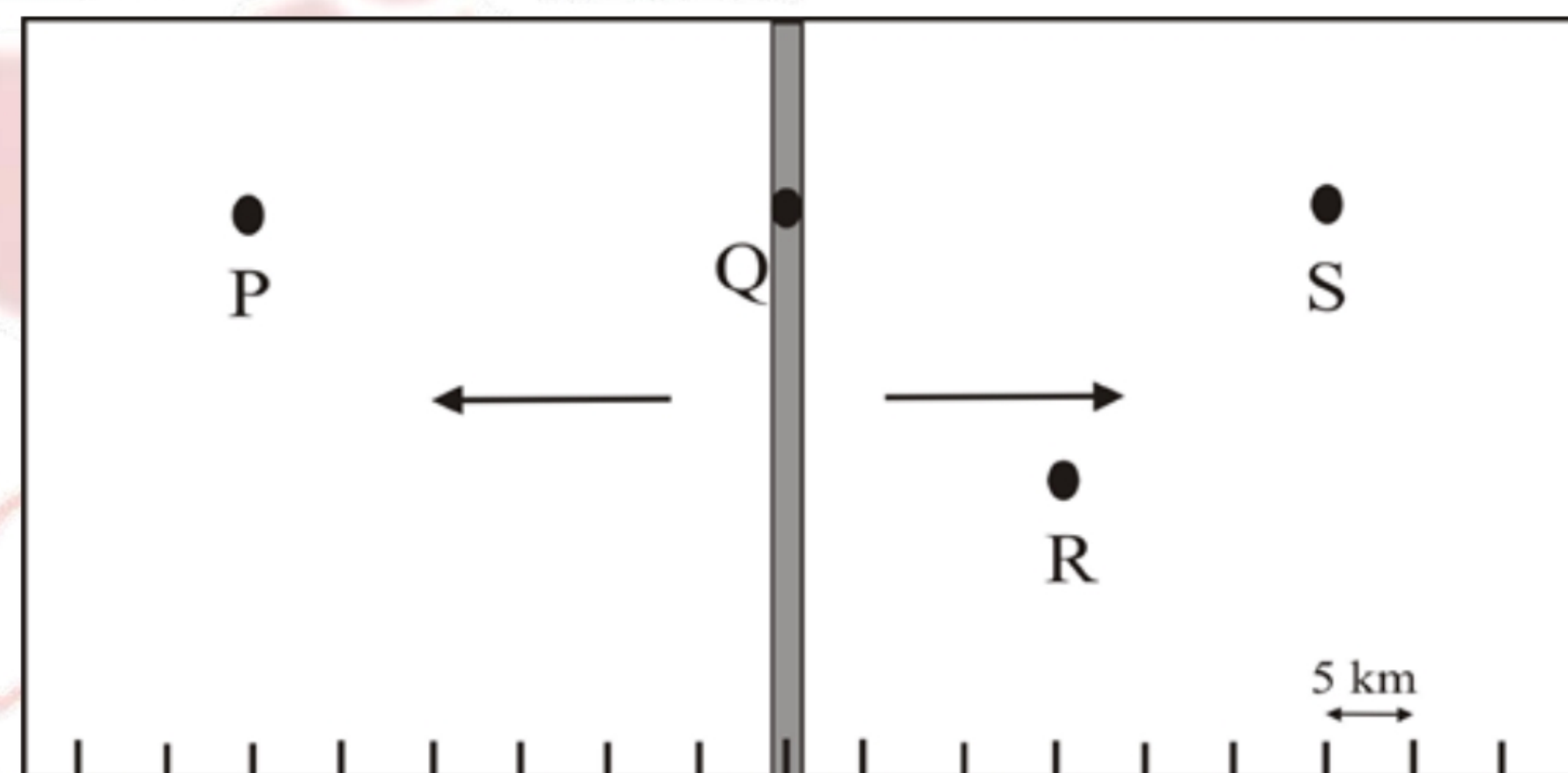


Which one of the following options is correctly matched?

- (i) – M, (ii) – I, (iii) – C, (iv) – R
- (i) – R, (ii) – I, (iii) – M, (iv) – C
- (i) – I, (ii) – R, (iii) – M, (iv) – C
- (i) – I, (ii) – M, (iii) – C, (iv) – R

2016

25. A schematic diagram of a divergent plate boundary, with arrows indicating directions of plate movement, is given below. Which one of the following statements is NOT true for points P, Q, R and S, if the spreading rate for both the plates is uniform and same through time and space?



- The rocks at P and S have the same age
- The rocks at S are twice as old as those at R
- The age of rocks at Q is 0 Ma
- The age of the rocks decreases progressively from P to S

2017

26. Pressure (1GPa=10Kbar) and temperature at the centre of the earth are estimated to be
- 360 GPa, 2600K
  - 450 GPa, 6000K
  - 360 GPa, 6000k



d. 450 GPa, 2600K

27. Match the earth layers (Group-I) with corresponding approximate thickness (Group-II)

Group-I	Group-II
P- Lithosphere	1- 2900km
Q-Mantle	2-2250km
R- Outer Core	3-1200km
S-inner core	4-100km

- a. P-4 Q-1 R-2 S-3
- b. P-4 Q-1 R-3 S-2
- c. P-4 Q-3 R-1 S-2
- d. P-3 Q-2 R-1 S-4

2018

28. Isostasy involves \_\_\_\_\_ continental mountain belts.

- a. compensation in
- b. creation of
- c. destruction of
- d. thrusting in

29. Identify the pair from the following list that is NOT correctly matched.

- a. Caldera – stratovolcano
- b. Pillow basalt – subaerial eruption
- c. Ropy lava – pahoehoe flow
- d. Amygdales – filled vesicles

30. Wilson orogenic cycle in continents is initiated by

- a. collision
- b. rifting
- c. drifting
- d. subduction

2020

31. Match the seismic discontinuity in Group I with their occurrence in Earth's interior in Group II

Group I	Group II
P. Conrad	1. Between lower mantle and outer core
Q. Mohorovičić	2. Between crust and upper mantle
R. Gutenberg	3. Between inner and outer core
S. Lehmann	4. Between lower and upper crust

- a. P-4 Q-2 R-1 S-3
- b. P-4 Q-2 R-3 S-1
- c. P-3 Q-2 R-3 S-1
- d. P-2 Q-4 R-1 S-3

2021

32. Which one of the following tectonic plates has the maximum average velocity?



- a. Eurasian
- b. Pacific
- c. African
- d. North American

2022

33. Match the countries in Group I with the plate tectonic features in Group II that cause seismic activity in them.

Group I	Group II
P. Iceland	1. Subduction Zone
Q. Indonesia	2. Transform Fault
R. Nepal	3. Mid-Oceanic Ridge
S. New Zealand	4. Continental Collision

- a. P-3, Q-1, R-4, S-2
  - b. P-3, Q-1, R-2, S-4
  - c. P-1, Q-3, R-4, S-2
  - d. P-2, Q-1, R-4, S-3
34. Which one of the magnitude scales given below DOES NOT saturate while estimating size of earthquakes?
- a. Local magnitude scale ( $M_L$ )
  - b. Body wave magnitude scale ( $M_b$ )
  - c. Surface wave magnitude scale ( $M_s$ )
  - d. Moment magnitude scale ( $M_w$ )

2023

35. Which one of the following is a gently sloping ( $< 10^\circ$ ) volcanic landform resulting from eruption of basaltic lava?
- a. Shield volcano
  - b. Composite volcano
  - c. Lava dome
  - d. Caldera
36. On the magnetic polarity time scale, the present-day epoch/chrono is called \_\_\_\_\_.
- a. Matuyama
  - b. Gilbert
  - c. Gauss
  - d. Bruhnes
37. Which one of the following options is the CORRECT sequence of seismic waves in order of arrival time recorded on a seismogram after an earthquake?
- a. P-waves, S-waves, Rayleigh waves, Love waves
  - b. P-waves, Rayleigh waves, S-waves, Love waves
  - c. S-waves, P-waves, Love waves, Rayleigh waves
  - d. P-waves, S-waves, Love waves, Rayleigh waves



2024

38. Which of the following is the correct decreasing order of abundance of elements in our solar system?
- O > H > Fe > He
  - O > Fe > H > He
  - H > O > Fe > He
  - H > He > O > Fe

MSQ

2016

39. The value of gravity at the Earth's surface is dependent on
- latitude
  - altitude
  - composition of underlying material
  - relative position of Sun–Earth

2017

40. P and S waves originate at earthquake focus and travel through the earth. Which of the following statements for these waves is /are correct?
- S-wave shadow zone is  $154^\circ$  wide
  - P-wave shadow zone  $49^\circ$  wide
  - P-wave velocity abruptly increase downward at mantle core boundary
  - P-wave velocity abruptly drops downward at mantle core boundary

2019

41. Which of the following statement(s) is/are correct for a plot of  $(^{87}\text{Sr}/^{86}\text{Sr})$  versus  $(^{87}\text{Rb}/^{86}\text{Sr})$  of a rock which has evolved in a closed system?
- The slopes of the lines of evolution for the minerals in the rock are all equal and positive
  - The slopes of the lines of evolution for the minerals in the rock are all equal and negative
  - The slope of the isochron is identical in direction to the slope of the lines of evolution for the minerals in the rock
  - The slope of the isochron is opposite in direction to the slope of the lines of evolution for the minerals in the rock

2020

42. Which of the following statements in relation to the solar system is/are correct?
- The most abundant elements are H and He.
  - The abundances of elements with atomic numbers 1-50 show an overall decreasing trend.
  - The abundances of heavier elements (atomic number >50) are mostly higher than that of lighter elements (atomic number <50).
  - Elements having odd atomic numbers are more abundant than their immediate neighbours



2022

43. The acceleration due to gravity on the Earth's surface depends on
- latitude
  - longitude
  - elevation
  - topography of the surrounding terrain

NAT 1 MARK

2015

44. A radioactive isotope has 1024 atoms. How many atoms will remain after 4 half-lives?

2018

45. A crustal rock is at a lithostatic pressure of 3 kbar and a temperature of 275°C. If the lithostatic pressure increases at a uniform rate of 0.3 kbar/km, and the surface temperature is 25°C, the geothermal gradient (in °C/km) is \_\_\_\_\_ (answer in one decimal place).
46. The number of alpha ( $\alpha$ ) particles emitted to produce a daughter isotope of  $^{206}\text{Pb}$  from a parent isotope of  $^{238}\text{U}$  by radioactive decay is \_\_\_\_\_.

2019

47. The intensity of an earthquake of magnitude 8 on the Richter scale is greater than the intensity of an earthquake of magnitude 5 on the same scale by \_\_\_\_\_ times

2020

48. In an ocean basin, a 4 Ma old oceanic crust lies 40 km away from the ridge axis. The average velocity (in cm/yr) of the oceanic lithosphere is \_\_\_\_\_

2022

49. The radius of the Earth's circular orbit round the Sun is  $149 \times 10^6$  km. The Earth takes 365 days to orbit the Sun. The tangential velocity of the Earth is \_\_\_\_\_ km/hour. ( $\pi = 3.14$ )  
Ans-106817.0 to 106818.0
50. A P-ray arrives at the mantle-core boundary at an angle  $25^\circ$  with respect to the normal. At what angle to the normal does it enter the core? (P-wave velocity in the lower mantle is 13.7 km/s and outer core is 8.1 km/s) (Round off to two decimal places)
51. The mass of the Earth is 80 times that of the Moon while the radius of the Earth is four times that of the Moon. The surface gravity of the Earth is \_\_\_\_\_ times that of the Moon? (In integer)  
Ans:-5

2023

52. The amplitude recorded at a station for a magnitude 5 earthquake is  $x$ . If another earthquake recorded at the same station has an amplitude of  $15x$ , then the magnitude of this earthquake is \_\_\_\_\_. (Round off to two decimal places)

2024

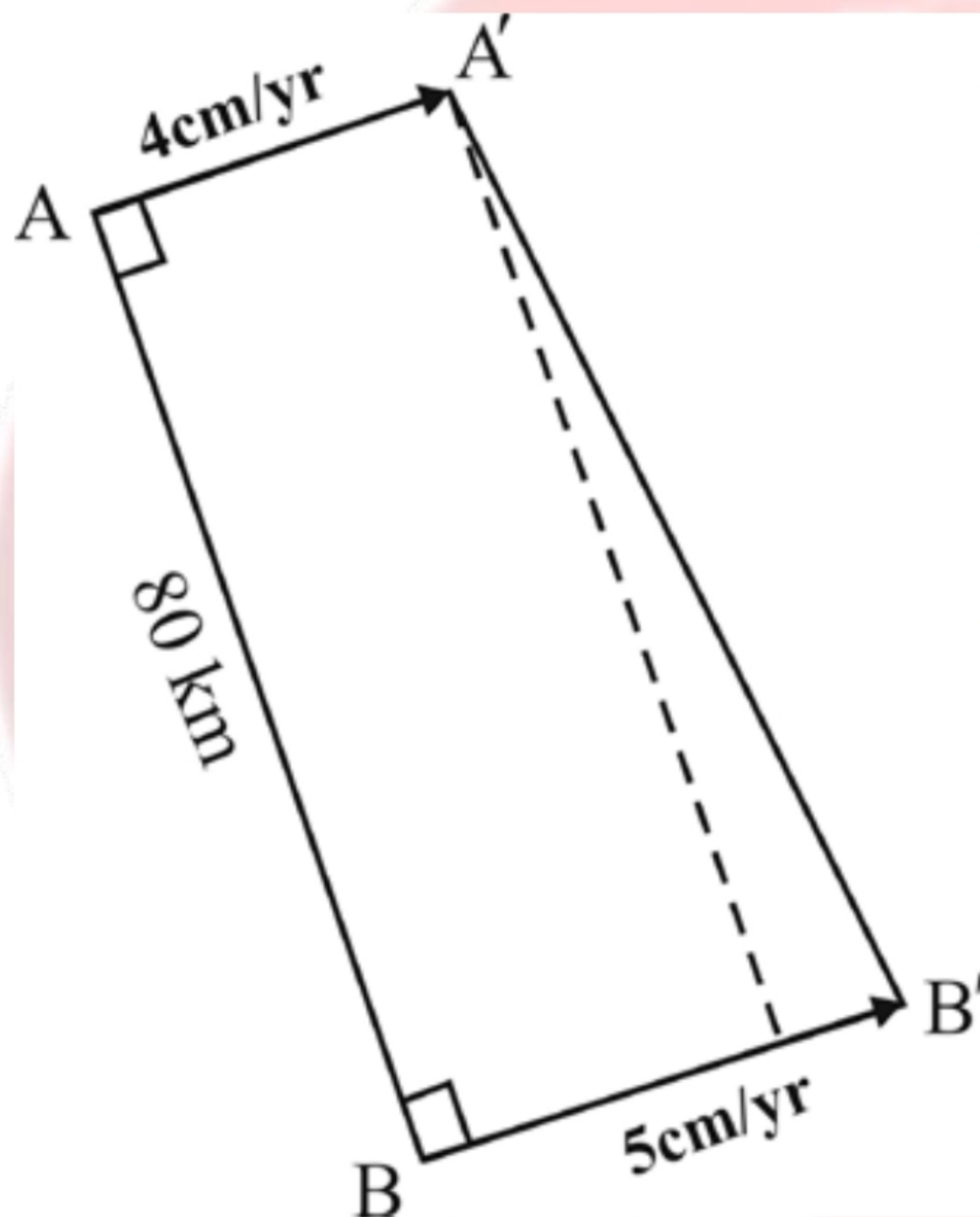
53. The geothermal gradient in the continental crust is  $0.02^\circ\text{C}/\text{m}$ . If the surface temperature is  $25^\circ\text{C}$ , the temperature at a depth of 18 km from the surface is \_\_\_\_\_ °C. (In integer)



## NAT 2marks

2016

54. The half-life of a radionuclide A is double that of a radionuclide B. The fraction of A remaining when B is reduced to 1/64 is \_\_\_\_\_. Give answer in three decimal places.
55. The temperature at the Earth's surface is 25°C. The temperature at the base of the Earth's crust (30 km thick), if the geothermal gradients are 25°C/km up to 15km depth and 15°C/km further down, is \_\_\_\_\_°C.
56. Two localities A and B on a continental plate as shown in the figure below, are separated by a distance of 80 km. The plate velocities measured at A and B are 4 cm/yr and 5 cm/yr, respectively. Assuming no faulting in the area, the new distance between A and B will be \_\_\_\_\_ km in one million years. Give answer in two decimal places

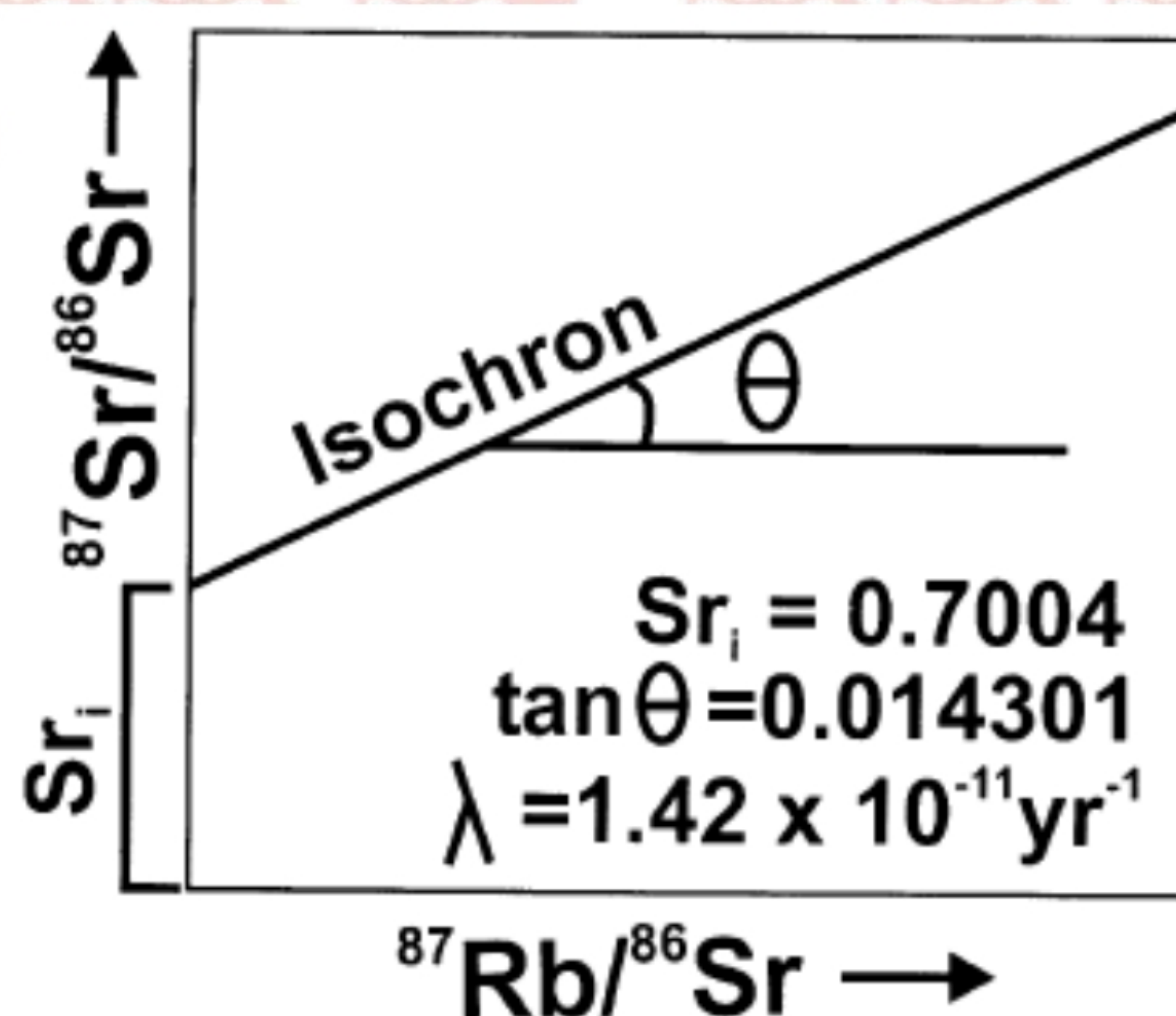


2017

57. Age of granitic rocks can be determined using Rb-Sr whole rock radioactive dating method and the following age equation,

$$\left(\frac{{}^{87}\text{Sr}}{{}^{86}\text{Sr}}\right)_t = \left(\frac{{}^{87}\text{Sr}}{{}^{86}\text{Sr}}\right)_0 + \left(\frac{{}^{87}\text{Rb}}{{}^{86}\text{Sr}}\right)_t (e^{\lambda t} - 1)$$

For a suite of representative co-magmatic granitic rocks, the Rb-Sr whole rock isochron plot and relevant data are shown in the diagram. The age of granite is calculated at \_\_\_\_\_ Ga (1 Ga 10<sup>9</sup> yrs, give answer in one decimal place).



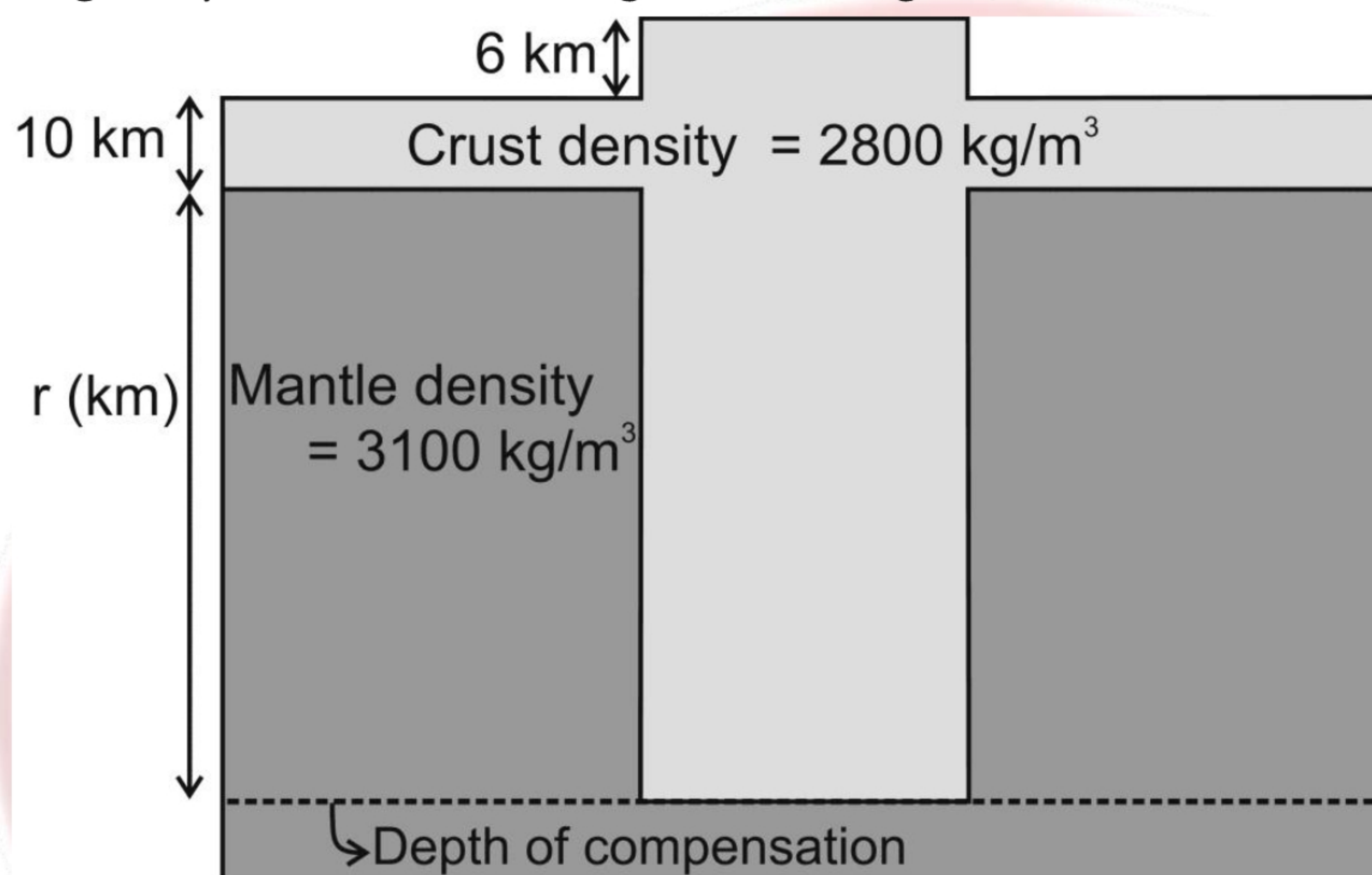


2018

58. Assuming the Earth to be an ideal sphere, the volume % of the core relative to the total volume of the Earth is \_\_\_\_\_ (answer in one decimal place).

2019

59. In the given diagram, a 6 km high plateau is supported by a crustal root of thickness  $r$ . The system is in isostatic equilibrium as per Airy's hypothesis of isostasy. Densities of the crust and the mantle are  $2800 \text{ kg/m}^3$  and  $3100 \text{ kg/m}^3$ , respectively. Assuming the acceleration due to gravity to be same throughout the region, the thickness of the root ( $r$ ) is \_\_\_\_\_ km.



2021

60. If the activity of a radioactive mineral falls from 800 counts/s to 500 counts/s in 80 minutes, half-life of the mineral is \_\_\_\_\_ minutes. (Round off to two decimal places).

2022

61. Using Airy's hypothesis, calculate the thickness of the root beneath a 4 km high mountain in isostatic equilibrium with a 40 km thick continental crust of density  $2800 \text{ kg/m}^3$  and a mantle of density  $3300 \text{ kg/m}^3$ . Express your answer in km. (Round off to one decimal place)
62. Assume that  $^{218}\text{Po}$ , with a half-life of 138 days, is in secular equilibrium with  $^{238}\text{U}$  whose half-life is  $4.5 \times 10^9 \text{ y}$ . How many grams of  $^{218}\text{Po}$  will be present for each gram of  $^{238}\text{U}$  in the mineral? Express your answer in logarithm (to the base 10). (Round off to two decimal places)

2023

63. The  $^{143}\text{Nd}/^{144}\text{Nd}$  and  $^{147}\text{Sm}/^{144}\text{Nd}$  ratios of a rock are 0.516 and 0.389, respectively. The rock evolved as a closed system. As per the exact parent-daughter relationship equation, the  $^{143}\text{Nd}/^{144}\text{Nd}$  ratio of the rock  $4.6 \times 10^9$  years ago was \_\_\_\_\_. (Round off to three decimal places) (Use decay constant for  $^{147}\text{Sm} = 6.54 \times 10^{-12} \text{ y}^{-1}$ )

2024

64. The fraction of  $^{24}\text{Na}_{11}$  atoms remaining after a decay interval of 5.0 hours will be \_\_\_\_\_. (Round off to three decimal places) (Use  $t_{1/2} = 15.0$  hours)



## 2014-2005

### 2014

65. The Gutenberg discontinuity lies between
- crust and mantle
  - lithosphere and asthenosphere
  - outer core and lower mantle
  - inner core and outer core
66. Airy's model of isostasy
- requires mountains to have higher density than the oceanic crust
  - requires mountains to have lower density than the oceanic crust
  - requires mountains to have the same density as oceanic crust
  - does NOT consider the densities of mountain and oceanic crust

### 2013

67. The oldest rocks the present ocean floor have age in the range
- 4.-4.6 billion years
  - 2.0-2.5 billion years
  - 185-200 million years
  - 60-65 million years

### 2012

68. Which one of the following features is NOT associated with an oceanic subduction?
- Sea-mount
  - Benioff zone
  - Back-arc
  - Fore-arc
69. The term isostasy refers to
- gravitational equilibrium
  - thermal equilibrium
  - magnetic equilibrium
  - electrical equilibrium

### 2011

70. The mean density of Earth is about
- 2650 kg m<sup>-3</sup>
  - 2750 kg m<sup>-3</sup>
  - 4400 kg m<sup>-3</sup>
  - 5500 kg m<sup>-3</sup>
71. The surface slope of shield volcano is gentle, but strato-volcano is steep-sided. This is due to variation in
- environment of eruption
  - duration of eruption
  - viscosity of magma
  - position with respect to latitude



2010

72. Asteroids are minor planetary bodies located between
- Earth and Mars
  - Jupiter and Saturn
  - Mars and Jupiter
  - Mercury and Venus

2008

73. Match the tectonic units listed in Group I with their geographical locations in Group II.

Group I	Group II
P. Continent — oceanic lithosphere convergence	1. Himalayas
Q. Continent — continent collision	2. Andes
R. Continental Rift system	3. Japanese islands
S. Oceanic — oceanic lithosphere convergence	4. East Africa

a. P-2, Q- 1, R-4, S-3  
b. P-2, Q-3, R-4, S- 1  
c. P-3, Q-4, R - 1, S-2  
d. P-4, Q- 1, R -2, S-3

74. Gutenberg Discontinuity in the interior of the Earth occurs at the depth of
- 35 km
  - 800 km
  - 2900 km
  - 5200 km

2007

75. Isostasy involves
- eustatic change
  - gravitational balance
  - magnetic reversal
  - thermal balance
76. The basaltic lava flow having ropy and wavy surface is known as
- aa
  - pahoehoe
  - tuff
  - volcanic breccia
77. A geomorphic feature produced at divergent plate boundary is
- folded mountain belt
  - guyot
  - island arc
  - oceanic ridge



## 2006

78. The method applied for isotope dating of the Holocene rocks involves
- K – Ar
  - $C^{14}$
  - U – Pb
  - Rb – Sr

## 2005

79. The lithosphere of the earth is made up of
- crust
  - crust and upper mantle
  - crust and part of the upper mantle
  - upper mantle
80. Reversal of magnetic polarity in strips of ocean floor basalt parallel to ridge axis, results due to
- bimodal volcanism
  - seafloor spreading
  - transform faults
  - alteration of seafloor basalt
81. The amplitude of seismic waves in an earthquake of magnitude 2 on the Richter scale is larger than that of an earthquake of magnitude 1 by
- 100 times
  - 10 times
  - 2 times
  - 1000 times

**GEOLOGY**



Question no	Answer	Question no	Answer
1.	b	47.	1000
2.	a	48.	1
3.	b	49.	106817.0 to 106818.0
4.	d	50.	14.35 to 14.50
5.	a	51.	5
6.	b	52.	6.15 to 6.19
7.	c	53.	385
8.	a	54.	0.125
9.	a	55.	625
10.	d	56.	80.62 to 80.63
11.	b	57.	0.9-1.1
12.	d	58.	14-18
13.	c	59.	56
14.	a	60.	117.40 to 118.00
15.	c	61.	22.4
16.	a	62.	-10.08 to -10.07
17.	c	63.	0.502 to 0.506
18.	c	64.	0.792 to 0.796
19.	b	65.	c
20.	a	66.	c
21.	a	67.	c
22.	c	68.	a
23.	a	69.	a
24.	d	70.	d
25.	d	71.	c
26.	c	72.	c
27.	b	73.	a
28.	a	74.	c
29.	b	75.	b
30.	b	76.	b
31.	a	77.	d
32.	b	78.	b
33.	a	79.	c
34.	d	80.	b
35.	a	81.	b
36.	d		
37.	d		
38.	d		
39.	abcd		
40.	abd		
41.	bd		
42.	ab		
43.	abcd		
44.	64		
45.	25		
46.	8		