



GG: Geology & Geophysics

GA - General Aptitude

Q1 - Q5 carry one mark each.

Q.No. 1 The untimely loss of life is a cause of serious global concern as thousands of people get killed _____ accidents every year while many other die _____ diseases like cardio vascular disease, cancer, etc.

- (A) in, of
- (B) from, of
- (C) during, from
- (D) from, from

Q.No. 2 He was not only accused of theft _____ of conspiracy.

- (A) rather
- (B) but also
- (C) but even
- (D) rather than

Q.No. 3 Select the word that fits the analogy:

Explicit: Implicit :: Express: _____

- (A) Impress
- (B) Repress
- (C) Compress
- (D) Suppress

Q.No. 4 The Canadian constitution requires that equal importance be given to English and French. Last year, Air Canada lost a lawsuit, and had to pay a six-figure fine to a French-speaking couple after they filed complaints about formal in-flight announcements in English lasting 15 seconds, as opposed to informal 5 second messages in French.

The French-speaking couple were upset at _____.

- (A) the in-flight announcements being made in English.
- (B) the English announcements being clearer than the French ones.
- (C) the English announcements being longer than the French ones.
- (D) equal importance being given to English and French.

Q.No. 5 A superadditive function $f(\cdot)$ satisfies the following property

$$f(x_1 + x_2) \geq f(x_1) + f(x_2)$$

Which of the following functions is a superadditive function for $x > 1$?

- (A) e^x
- (B) \sqrt{x}
- (C) $1/x$
- (D) e^{-x}

Q6 - Q10 carry two marks each.

Q.No. 6 The global financial crisis in 2008 is considered to be the most serious world-wide financial crisis, which started with the sub-prime lending crisis in USA in 2007. The sub-prime lending crisis led to the banking crisis in 2008 with the collapse of Lehman Brothers in 2008. The sub-prime lending refers to the provision of loans to those borrowers who may have difficulties in repaying loans, and it arises because of excess liquidity following the East Asian crisis.

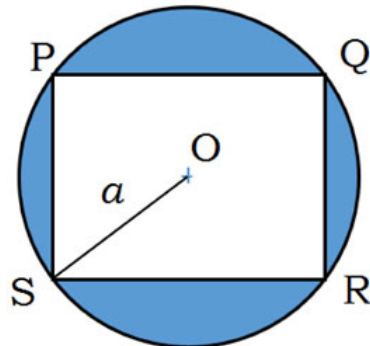
Which one of the following sequences shows the correct precedence as per the given passage?

- (A) East Asian crisis → subprime lending crisis → banking crisis → global financial crisis.
- (B) Subprime lending crisis → global financial crisis → banking crisis → East Asian crisis.
- (C) Banking crisis → subprime lending crisis → global financial crisis → East Asian crisis.
- (D) Global financial crisis → East Asian crisis → banking crisis → subprime lending crisis.

Q.No. 7 It is quarter past three in your watch. The angle between the hour hand and the minute hand is _____.

- (A) 0°
- (B) 7.5°
- (C) 15°
- (D) 22.5°

Q.No. 8 A circle with centre O is shown in the figure. A rectangle PQRS of maximum possible area is inscribed in the circle. If the radius of the circle is a , then the area of the shaded portion is _____.



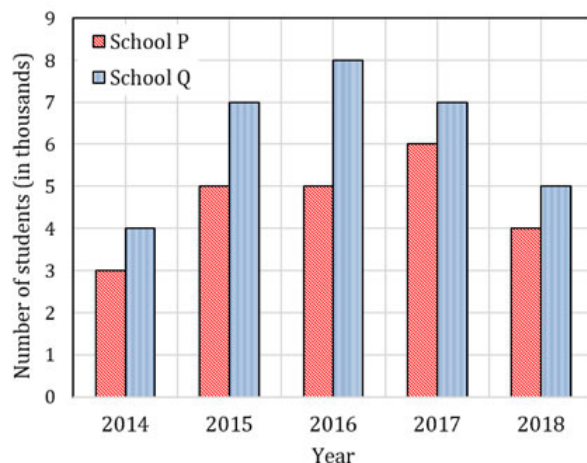
- (A) $\pi a^2 - a^2$
- (B) $\pi a^2 - \sqrt{2}a^2$
- (C) $\pi a^2 - 2a^2$
- (D) $\pi a^2 - 3a^2$

Q.No. 9 a, b, c are real numbers. The quadratic equation $ax^2 - bx + c = 0$ has equal roots, which is β , then

- (A) $\beta = b/a$
- (B) $\beta^2 = ac$
- (C) $\beta^3 = bc/(2a^2)$
- (D) $b^2 \neq 4ac$

Q.No. 10

The following figure shows the data of students enrolled in 5 years (2014 to 2018) for two schools P and Q. During this period, the ratio of the average number of the students enrolled in school P to the average of the difference of the number of students enrolled in schools P and Q is _____.



- (A) 8 : 23
- (B) 23 : 8
- (C) 23 : 31
- (D) 31 : 23

Part A - Compulsory Section For All Candidates

Q1 - Q25 carry one mark each.

Q.No. 1 A plagioclase with $\frac{Na^+}{Na^+ + Ca^{2+}} = 0.8$ is

- (A) albite
- (B) anorthite
- (C) oligoclase
- (D) bytownite

Q.No. 2 Tillite is an important constituent of the

- (A) Talchir Formation
- (B) Barakar Formation
- (C) Pachmarhi Formation
- (D) Lameta Formation

Q.No. 3 If the ratio of gravity to total magnetic field at the equator of the Earth is X , then the ratio of gravity to total magnetic field at the pole of the Earth will be close to

- (A) $2X$
- (B) $\frac{X}{2}$
- (C) $4X$
- (D) $\frac{X}{8}$

Q.No. 4 Which of the following is NOT a point group?

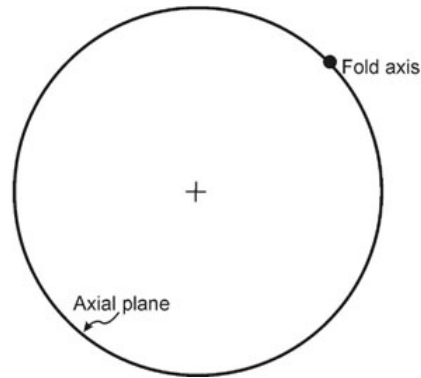
- (A) 222
- (B) 422
- (C) 432
- (D) 632

Q.No. 5 Mississippian is an Epoch within the

- (A) Permian Period
- (B) Carboniferous Period
- (C) Triassic Period

(D) Jurassic Period

Q.No. 6 The given stereoplot of the axial plane and the axis of a fold represents an/a



- (A) upright fold
- (B) vertical fold
- (C) reclined fold
- (D) recumbent fold

Q.No. 7 A siliciclastic sedimentary rock with <5% matrix and QFL composition of 60% quartz, 30% rock fragments and 10% feldspar, is called

- (A) quartz wacke
- (B) lithic arenite
- (C) quartz arenite
- (D) feldspathic wacke

Q.No. 8 Which one of the following pairs of geophysical methods is most suitable to delineate chromite ore deposits occurring at a shallow depth in a granitic terrain?

- (A) Gravity and Electrical methods
- (B) Electrical and Electromagnetic methods
- (C) Seismic and Gravity methods
- (D) Seismic and Magnetic methods

Q.No. 9 The ratio of bridging to non-bridging oxygen atoms is zero in case of

- (A) nesosilicates
- (B) inosilicates
- (C) phyllosilicates
- (D) tectosilicates

Q.No. 10 Lahar is a geomorphic feature associated with

- (A) wind activity
- (B) river activity
- (C) glacial activity
- (D) volcanic activity

Q.No. 11 Kepler's second law of planetary motion follows the principle of conservation of

- (A) energy
- (B) momentum
- (C) angular momentum
- (D) moment of inertia

Q.No. 12 Which one of the following options shows the internal structural units of the Earth arranged in the CORRECT sequence of increasing volume?

- (A) Outer core < Inner core < Upper mantle < Lower mantle

- (B) Outer core < Inner core < Lower mantle < Upper mantle
- (C) Inner core < Outer core < Upper mantle < Lower mantle
- (D) Inner core < Outer core < Lower mantle < Upper mantle

Q.No. 13 Which one of the following is NOT an earthquake intensity scale?

- (A) Richter scale
- (B) JMA scale
- (C) Modified Mercalli scale
- (D) Rossi-Forel scale

Q.No. 14 The dimension of transmissivity of an aquifer is

- (A) $M^0L^1T^{-1}$
- (B) $M^0L^0T^0$
- (C) $M^1L^{-1}T^{-2}$
- (D) $M^0L^2T^{-1}$

Q.No. 15 During 'K-capture' nuclear transmutation process

- (A) both atomic number and atomic mass increase
- (B) atomic number decreases but atomic mass remains the same
- (C) atomic number increases but atomic mass remains the same
- (D) both atomic number and atomic mass decrease

Q.No. 16 Which one amongst the following logs has the maximum depth of investigation?

- (A) Neutron log
- (B) Natural Gamma-ray log
- (C) Lateral log
- (D) Density log

Q.No. 17 The scale factor of an aerial photo of a planar ground surface, taken vertically downwards by a camera with a focal length of 300 mm, from a flying height of 3000 m is _____.

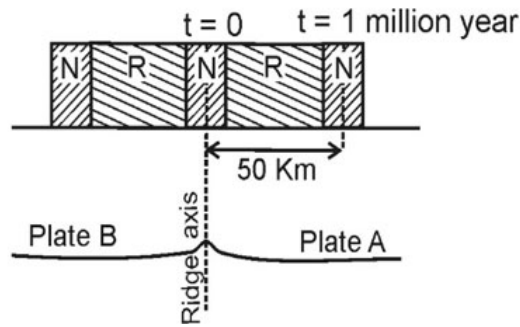
Q.No. 18 In a soil sample, specific gravity of soil particles is 2.5 and the void ratio is 0.5. The density of the soil sample when it is fully saturated with water is _____ kg/m³. (Assume density of water = 1000 kg/m³, and no volume change of the soil sample with saturation)

Q.No. 19 Nuclide **A** decays to nuclide **B** exclusively through α and β decay, such that the mass number is reduced by 32 and the atomic number is reduced by 10. The number of β particles emitted during the decay of nuclide **A** to nuclide **B** is _____.

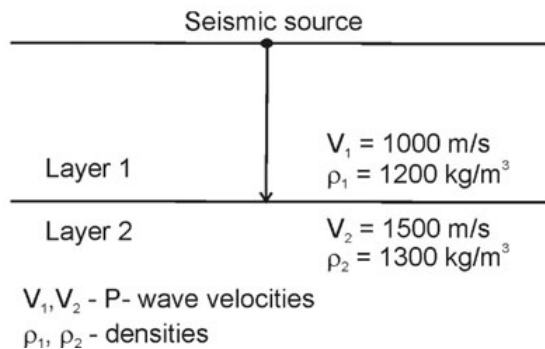
Q.No. 20 A cylindrical specimen (diameter = 54.7 mm; length = 110 mm) of basalt shows linear elastic behavior under uniaxial compression. At an axial stress of 100 Mega-Pascal (MPa), the absolute value of the measured axial strain is 0.2%. The Young's modulus is calculated to be _____ Giga-Pascal (GPa).

Q.No. 21

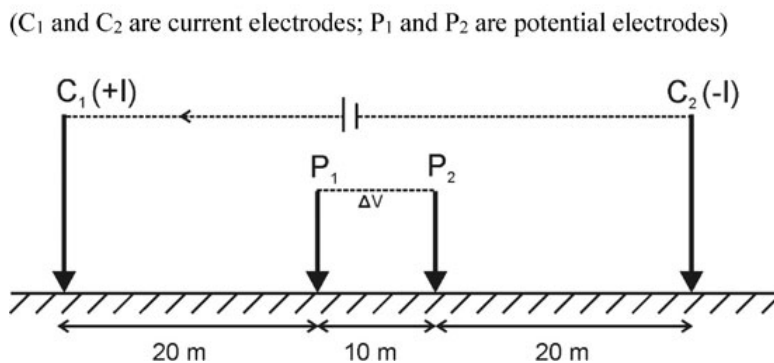
A Mid-Oceanic-Ridge has symmetric magnetic anomalies about the ridge axis as shown below. Using the information given in the figure, the average relative velocity between the Plates A and B is calculated to be _____ cm/year.



- Q.No. 22 The transmission coefficient for the vertically incident seismic wave at the interface between Layer 1 and Layer 2 given in the figure is _____.
(Round off to 2 decimal places)



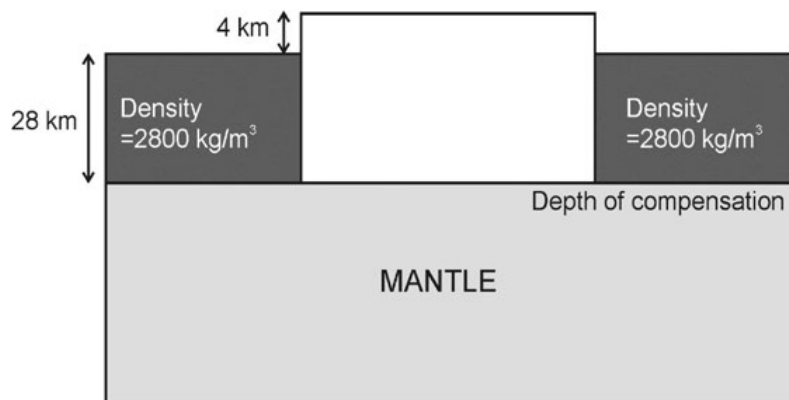
- Q.No. 23 The 'geometrical factor' for the electrode configuration given below will be _____ m. (Round off to 2 decimal places) (Use $\pi = 3.14$)



- Q.No. 24 In an electromagnetic measurement, the resultant field shows a phase lag of 30° with respect to the primary field at the receiver coil. The ratio of Inphase to Quadrature component of the resultant field is _____. (Round off to 2 decimal places)

Q.No. 25

A 4 km-high plateau is isostatically compensated as shown in the figure. Assuming Pratt's hypothesis of isostasy, the calculated density of the plateau is _____ kg/m³.

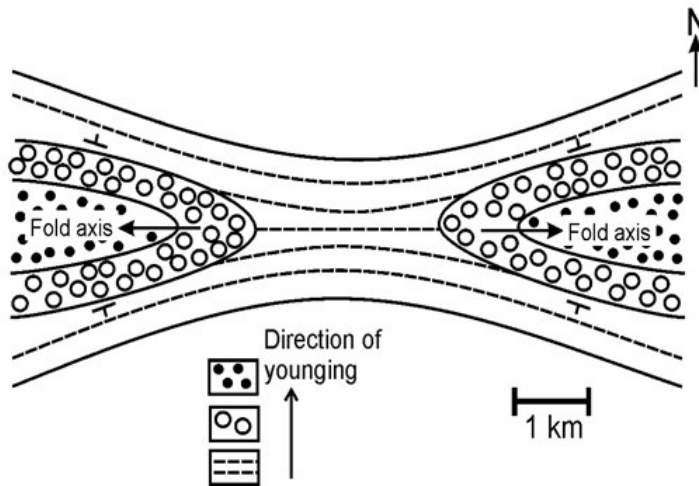


Part B (Section 1): For Geology Candidates Only

Q1 - Q30 carry two marks each.

- Q.No. 1 "Point Group" in crystallography is characterized by a set of symmetry operations such that
- (A) all points in a crystal are affected by it
 (B) no point in a crystal is affected by it
 (C) at least one point in a crystal is affected by it
 (D) at least one point in a crystal is unaffected by it
- Q.No. 2 What are the Miller indices of a plane that intercepts each of the crystallographic axes X, Y and Z, at 20 Å? (Assume a primitive unit-cell with the dimensions $a = 5$ Å, $b = 2$ Å and $c = 4$ Å.)
- (A) (111)
 (B) (524)
 (C) (425)
 (D) (542)
- Q.No. 3 Which one of the following processes is associated with the emission of X-rays?
- (A) alpha decay
 (B) beta decay
 (C) electron capture decay
 (D) positron decay
- Q.No. 4 Which one of the following radioisotopes has the longest half-life?
- (A) ⁸⁷Rb
 (B) ¹⁴⁷Sm
 (C) ²³²Th
 (D) ²³⁸U
- Q.No. 5

The given geological map represents



- (A) culmination of an antiformal anticline
- (B) culmination of an antiformal syncline
- (C) depression of a synformal anticline
- (D) culmination of a synformal syncline

Q.No. 6 On a fault plane, the net slip is parallel to the bedding trace. Then, the apparent movement will be recognizable

- (A) both in horizontal and vertical sections
- (B) in horizontal, but not in vertical section
- (C) in vertical, but not in horizontal section
- (D)

Q.No. 7 The CORRECT sequence of the given electromagnetic radiations in order of increasing wavelength is

- (A) Ultraviolet < Gamma Rays < Radiowave < Near-Infrared
- (B) Gamma Rays < Ultraviolet < Near-Infrared < Radiowave
- (C) Gamma Rays < Radiowave < Ultraviolet < Near-Infrared
- (D)

Q.No. 8

- (A)
- (B)
- (C)
- (D)

Q.No. 9

- (A)
- (B)
- (C)
- (D)

Q.No. 10

- (A)
- (B)
- (C)
- (D)

Q.No. 11

- (A)
- (B)
- (C)

(D)

Q.No. 12

(A)

(B)

(C)

(D)

Q.No. 13

(A)

(B)

(C)

(D)

Q.No. 14

(A)

(B)

(C)

(D)

Q.No. 15

(A)

(B)

(C)

(D)

Q.No. 16

(A)

(B)

(C)

(D)

Q.No. 17

(A)

(B)

(C)

(D)

Q.No. 18

(A)

(B)

(C)

(D)

Q.No. 19

Q.No. 20

Q.No. 21

Q.No. 22

Q.No. 23

Q.No. 24

Q.No. 25

Q.No. 26

Q.No. 27

Q.No. 28

Q.No. 29

Q.No. 30

PART B (Section 2): For Geophysics Candidates Only

Q1 - Q30 carry two marks each.

Q.No. 1

- (A)
- (B)
- (C)
- (D)

Q.No. 2

- (A)
- (B)
- (C)
- (D)

Q.No. 3

- (A)
- (B)
- (C)
- (D)

Q.No. 4

- (A)
- (B)
- (C)
- (D)

Q.No. 5

- (A)
- (B)
- (C)
- (D)

Q.No. 6

- (A)
- (B)
- (C)
- (D)

Q.No. 7

- (A)
- (B)
- (C)
- (D)

Q.No. 8

- (A)
- (B)

- (C)
- (D)

Q.No. 9

- (A)
- (B)
- (C)
- (D)

Q.No. 10

- (A)
- (B)
- (C)
- (D)

Q.No. 11

- (A)
- (B)
- (C)
- (D)

Q.No. 12

- (A)
- (B)
- (C)
- (D)

Q.No. 13

- (A)
- (B)
- (C)
- (D)

Q.No. 14

- (A)
- (B)
- (C)
- (D)

Q.No. 15

- (A)
- (B)
- (C)
- (D)

Q.No. 16

- (A)
- (B)
- (C)
- (D)

Q.No. 17

- (A)
- (B)
- (C)
- (D)

Q.No. 18

- (A)
- (B)
- (C)
- (D)

Q.No. 19

Q.No. 20

Q.No. 21

Q.No. 22

Q.No. 23

Q.No. 24

Q.No. 25

Q.No. 26

Q.No. 27

Q.No. 28

Q.No. 29

Q.No. 30