

Notations :

- 1.Options shown in green color and with ✓ icon are correct.
- 2.Options shown in red color and with ✗ icon are incorrect.

Question Paper Name: GG: GEOLOGY AND GEOPHYSICS 1st Feb shift2
Number of Questions: 95
Total Marks: 100.0

Wrong answer for MCQ will result in negative marks, (-1/3) for 1 mark Questions and (-2/3) for 2 marks Questions.

General Aptitude

Number of Questions: 10
Section Marks: 15.0

Q.1 to Q.5 carry 1 mark each & Q.6 to Q.10 carry 2 marks each.

Question Number : 1 Question Type : MCQ

Choose the appropriate word/phrase, out of the four options given below, to complete the following sentence:

Apparent lifelessness _____ dormant life.
(A) harbours (B) leads to (C) supports (D) affects

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 2 Question Type : MCQ

Fill in the blank with the correct idiom/phrase.

That boy from the town was a _____ in the sleepy village.
(A) dog out of herd (B) sheep from the heap
(C) fish out of water (D) bird from the flock

Options :

- 1. ✗ A
- 2. ✗ B
- 3. ✓ C
- 4. ✗ D

Question Number : 3 Question Type : MCQ

Choose the sentence in which the underlined word is used correctly.

- (A) When the teacher eludes to different authors, he is being elusive.
- (B) When the thief keeps eluding the police, he is being elusive.
- (C) Matters that are difficult to understand, identify or remember are allusive.
- (D) Mirages can be allusive, but a better way to express them is illusory.

Options :

- 1. ✖ A
- 2. ✔ B
- 3. ✖ C
- 4. ✖ D

Question Number : 4 Question Type : MCQ

Tanya is older than Eric.
Cliff is older than Tanya.
Eric is older than Cliff.

If the first two statements are true, then the third statement is:

- (A) True
- (B) False
- (C) Uncertain
- (D) Data insufficient

Options :

- 1. ✖ A
- 2. ✔ B
- 3. ✖ C
- 4. ✖ D

Question Number : 5 Question Type : MCQ

Five teams have to compete in a league, with every team playing every other team exactly once, before going to the next round. How many matches will have to be held to complete the league round of matches?

- (A) 20 (B) 10 (C) 8 (D) 5

Options :

- 1. ✖ A
- 2. ✔ B
- 3. ✖ C
- 4. ✖ D

Question Number : 6 Question Type : MCQ

Increased productivity necessary reflects greater efforts made by the employees.

- (A) Increase in productivity necessary
- (B) Increase productivity is necessary
- (C) Increase in productivity necessarily
- (D) No improvement required

Options :

- 1. ✗ A
- 2. ✗ B
- 3. ✓ C
- 4. ✗ D

Question Number : 7 Question Type : MCQ

Given below are two statements followed by two conclusions. Assuming these statements to be true, decide which one logically follows.

Statements:

- I. No manager is a leader.
- II. All leaders are executives.

Conclusions:

- I. No manager is an executive.
- II. No executive is a manager.

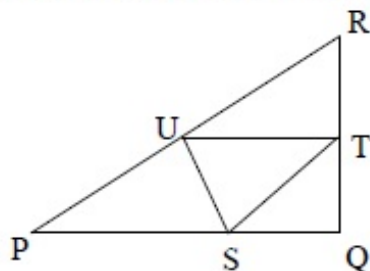
- (A) Only conclusion I follows.
- (B) Only conclusion II follows.
- (C) Neither conclusion I nor II follows.
- (D) Both conclusions I and II follow.

Options :

- 1. ✗ A
- 2. ✗ B
- 3. ✓ C
- 4. ✗ D

Question Number : 8 Question Type : NAT

In the given figure angle Q is a right angle, $PS:QS = 3:1$, $RT:QT = 5:2$ and $PU:UR = 1:1$. If area of triangle QTS is 20 cm^2 , then the area of triangle PQR in cm^2 is _____.



Correct Answer :

280

Right triangle PQR is to be constructed in the xy - plane so that the right angle is at P and line PR is parallel to the x -axis. The x and y coordinates of P, Q, and R are to be integers that satisfy the inequalities: $-4 \leq x \leq 5$ and $6 \leq y \leq 16$. How many different triangles could be constructed with these properties?

- (A) 110 (B) 1,100 (C) 9,900 (D) 10,000

Options :

1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

Question Number : 10 Question Type : MCQ

A coin is tossed thrice. Let X be the event that head occurs in each of the first two tosses. Let Y be the event that a tail occurs on the third toss. Let Z be the event that two tails occur in three tosses. Based on the above information, which one of the following statements is TRUE?

- (A) X and Y are not independent (B) Y and Z are dependent
(C) Y and Z are independent (D) X and Z are independent

Options :

1. ✖ A
2. ✔ B
3. ✖ C
4. ✖ D

Part A

Number of Questions: 25
Section Marks: 25.0

Q.11 to Q.35 carry 1 mark each & Q.36 to Q.65 carry 2 marks each.

Question Number : 11 Question Type : MCQ

The shape of the earth is best described as

- (A) spheroid (B) prolate ellipsoid
(C) ellipsoid (D) oblate spheroid

Options :

1. ✖ A
2. ✖ B
3. ✖ C
4. ✔ D

Question Number : 12 Question Type : MCQ

Which one among the following is the CORRECT attitude of a bed?

- (A) $221^\circ, 95^\circ$ (B) $N45^\circ W, 40^\circ SE$ (C) $090^\circ / 20^\circ W$ (D) $089^\circ, 75^\circ S$

Options :

1. ✖ A
2. ✖ B
3. ✖ C
4. ✔ D

Question Number : 13 Question Type : MCQ

Hawaiian Island chain is the result of

- (A) collision of two oceanic plates
 (B) intraplate hot spot activity
 (C) divergence of two oceanic plates
 (D) interplate hot spot activity

Options :

1. ✖ A
2. ✔ B
3. ✖ C
4. ✖ D

Question Number : 14 Question Type : MCQ

In which one of the following configurations the electrodes are uniformly spaced?

- (A) Schlumberger array
 (B) Pole-dipole array
 (C) Wenner array
 (D) Pole-pole array

Options :

1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

Question Number : 15 Question Type : MCQ

In Triclinic crystal system, the three crystallographic axes a , b , c are of

- (A) equal lengths with angle between b and c as 90°
 (B) equal lengths with angle between a and $c \neq 90^\circ$
 (C) unequal lengths with angle between a and $c \neq 90^\circ$
 (D) unequal lengths with angle between b and c as 90°

Options :

1. ✖ A
2. ✖ B
3. ✔ C

Question Number : 16 Question Type : MCQ

A landform that results from free fall of rocks is called

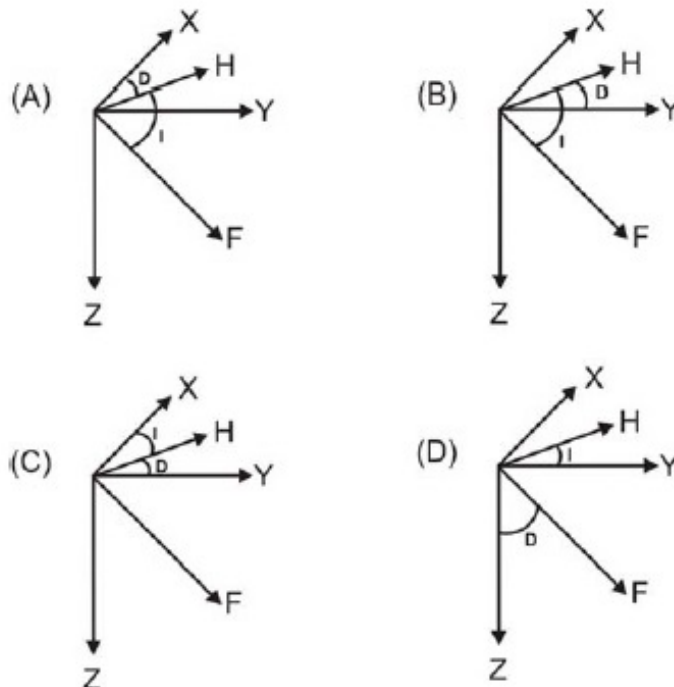
- (A) talus slope (B) eskers (C) alluvial fan (D) debris flow

Options :

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Question Number : 17 Question Type : MCQ

Which one of the following figures correctly depicts the geomagnetic declination (D) and inclination (I) angles ? (X: Geographic North; Y: Geographic East; Z: Vertical direction; H: Geomagnetic North; F: Total Field direction)



Options :

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Question Number : 18 Question Type : MCQ

Which one of the following logging methods is NOT used to determine porosity?

- (A) Sonic (B) SP (C) Neutron (D) Gamma-gamma

Options :

1. ✗ A
2. ✓ B

Question Number : 19 Question Type : MCQ

PcP and ScS phases are reflected from

- (A) crust - mantle boundary
- (B) core - mantle boundary
- (C) inner core - outer core boundary
- (D) lithosphere - asthenosphere boundary

Options :

- 1. ✖ A
- 2. ✔ B
- 3. ✖ C
- 4. ✖ D

Question Number : 20 Question Type : MCQ

Identify the CORRECT sequence of the electromagnetic waves in their increasing frequency

- (A) radio wave, micro-wave, infrared, visible, ultra violet, X-ray
- (B) radio wave, infrared, micro-wave, visible, ultra violet, X-ray
- (C) micro-wave, radio wave, infrared, visible, X-ray, ultra violet
- (D) infrared, visible, micro-wave, radio wave, X-ray, ultra violet

Options :

- 1. ✔ A
- 2. ✖ B
- 3. ✖ C
- 4. ✖ D

Question Number : 21 Question Type : NAT

Considering the Airy isostatic compensation for a mountain having elevation of 2.0 km above the mean sea level at a point P , the thickness of its root below P would be _____ km. (consider densities of crustal rocks and upper mantle as 2.7 gcm^{-3} and 3.3 gcm^{-3} respectively).

Correct Answer :

9

Question Number : 22 Question Type : NAT

The reflection coefficient at the interface separating sandstone ($V_p = 2000 \text{ ms}^{-1}$; $\rho = 1.5 \text{ gcm}^{-3}$) underlain by shale ($V_p = 2500 \text{ ms}^{-1}$; $\rho = 2.0 \text{ gcm}^{-3}$) is _____.

Correct Answer :

0.25

Question Number : 23 Question Type : MCQ

Gardner's formula relates the seismic P-wave velocity (V_p) to

- | | |
|------------------|---------------|
| (A) density | (B) porosity |
| (C) permeability | (D) lithology |

Options :

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Question Number : 24 Question Type : MCQ

Which one of the following sedimentary basins is related to extension?

- | | |
|---------------|-----------------|
| (A) foredeep | (B) half-graben |
| (C) piggyback | (D) fore-arc |

Options :

1. ✗ A
2. ✓ B
3. ✗ C
4. ✗ D

Question Number : 25 Question Type : MCQ

In a seismic section, paraconformity is marked by

- | | |
|--------------------------|-----------------|
| (A) onlap | (B) downlap |
| (C) erosional truncation | (D) concordance |

Options :

1. ✗ A
2. ✗ B
3. ✗ C
4. ✓ D

Question Number : 26 Question Type : MCQ

Match the entries listed in Group I with its attributes listed in Group II.

Group I

- P. Carlsberg Ridge
- Q. Ninetyeast Ridge
- R. Pranhita-Godavari basin
- S. Makran Coast

Group II

- 1. Aseismic
- 2. Subduction
- 3. Spreading
- 4. Transform
- 5. Rift

(A) P-5; Q-3; R-1; S-4

(C) P-3; Q-4; R-1; S-2

(B) P-3; Q-1; R-5; S-2

(D) P-1; Q-3; R-5; S-4

Options :

1. ✖ A

2. ✔ B

3. ✖ C

4. ✖ D

Question Number : 27 Question Type : MCQ

In India, bituminous coal occurs at

(A) Panandhro

(B) Palana

(C) Neyveli

(D) Jharia

Options :

1. ✖ A

2. ✖ B

3. ✖ C

4. ✔ D

Question Number : 28 Question Type : MCQ

On the Earth, all conditions being same, the time period of a simple pendulum will be maximum at the

(A) Poles

(B) Tropic of Cancer

(C) Tropic of Capricorn

(D) Equator

Options :

1. ✖ A

2. ✖ B

3. ✖ C

4. ✔ D

Question Number : 29 Question Type : MCQ

The two most abundant elements in the Earth are

(A) oxygen and iron

(B) iron and magnesium

(C) oxygen and silicon

(D) iron and silicon

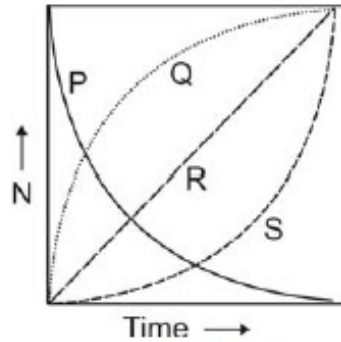
Options :

1. ✔ A

2. ✖ B
3. ✖ C
4. ✖ D

Question Number : 30 Question Type : MCQ

The pair of curves that depicts the radioactive decay and growth of a parent-daughter pair in the following figure is (N – Number of nuclides, Time in multiples of half-life).



- (A) P, Q
(C) P, S

- (B) P, R
(D) S, Q

Options :

1. ✔ A
2. ✖ B
3. ✖ C
4. ✖ D

Question Number : 31 Question Type : NAT

A drainage basin with an area of $2.0 \times 10^6 \text{ m}^2$ receives continuous rainfall for 48 hours at a uniform rate of 3 mmh^{-1} . The volume of precipitation is _____ m^3 of water.

Correct Answer :

288000

Question Number : 32 Question Type : MCQ

The main source of error in computing the orientation of planar features from drill cores is

- (A) rotation of the core during extraction
(B) cylindrical shape of the core
(C) non-vertical orientation of the drill axis
(D) staining during drilling operations

Options :

1. ✔ A
2. ✖ B
3. ✖ C
4. ✖ D

Question Number : 33 Question Type : MCQ

Which combination of sorting and roundness of sand grains results in highest permeability?

- (A) well sorted, poorly rounded
- (B) well sorted, well rounded
- (C) poorly sorted, poorly rounded
- (D) poorly sorted, well rounded

Options :

- 1. ✖ A
- 2. ✔ B
- 3. ✖ C
- 4. ✖ D

Question Number : 34 Question Type : MCQ

Amongst the different gases in the atmosphere, which one of the following pairs DOES NOT contribute to heating of the atmosphere?

- (A) CO₂, H₂O
- (B) N₂, O₂
- (C) H₂O, CH₄
- (D) H₂O, O₃

Options :

- 1. ✖ A
- 2. ✔ B
- 3. ✖ C
- 4. ✖ D

Question Number : 35 Question Type : MCQ

The data of which one of the following active electromagnetic techniques can be used to correct static shift effect in magnetotelluric apparent resistivity data?

- (A) Slingram
- (B) Turam
- (C) VLF
- (D) TEM

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✖ C
- 4. ✔ D

Geology

Number of Questions: 30
Section Marks: 60.0

Question Number : 36 Question Type : MCQ

Which one of the following statements describing aspects of partial melting behavior of a binary eutectic system is NOT TRUE?

- (A) Melting is complete at temperature just above the liquidus temperature.
- (B) Two solid phases and one liquid phase co-exist at eutectic temperature.
- (C) The lowest temperature at which partial melting occurs is independent of the chemical composition.
- (D) The composition of the first liquid to form depends on the composition of the sample.

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✖ C
- 4. ✔ D

Question Number : 37 Question Type : MCQ

Find the CORRECT statement amongst the following.

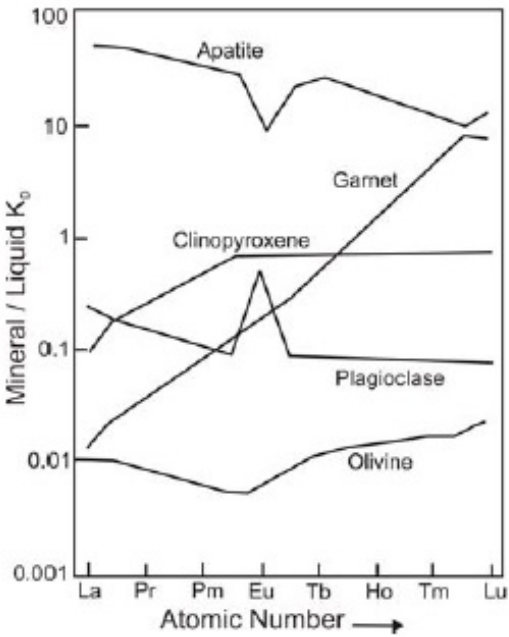
- (A) Delthyrium is a triangular cavity in cephalopod
- (B) Madreporite is a skeletal part of Brachiopoda
- (C) Pleuron is a part of thorax in Trilobite
- (D) Endocone is the jaw of an Ammonoid

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✔ C
- 4. ✖ D

Question Number : 38 Question Type : MCQ

Based on the figure that shows typical distribution / partition coefficients (K_D = mineral/liquid) for REEs between various minerals and basaltic melt, which one of the following statements is NOT true?



- (A) REEs are compatible only in apatite.
- (B) Heavy REEs are compatible whereas Light REEs are incompatible in garnet.
- (C) REEs are incompatible only in apatite.
- (D) REEs are incompatible in olivine.

Options :

- 1. ✗ A
- 2. ✗ B
- 3. ✓ C
- 4. ✗ D

Question Number : 39 Question Type : MCQ

Which one of the following is NOT a set of polymorphous minerals?

- (A) calcite, aragonite, vaterite
- (B) quartz, coesite, tridymite
- (C) graphite, anthracite, diamond
- (D) kyanite, sillimanite, andalusite

Options :

- 1. ✗ A
- 2. ✗ B
- 3. ✓ C
- 4. ✗ D

Question Number : 40 Question Type : MCQ

Granular minerals in basalts contain much more aluminum ($\text{Al}_2\text{O}_3 \sim 15\%$) in comparison to peridotites ($\text{Al}_2\text{O}_3 \sim 4\%$). This is because they contain

- (A) very little olivine
- (B) higher proportion of pyroxene
- (C) feldspars as dominant mineral
- (D) no quartz

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✔ C
- 4. ✖ D

Question Number : 41 Question Type : NAT

A sandstone bed whose attitude is $090^\circ, 30^\circ$ is exposed on a flat surface. The true thickness of the bed is 100 m. The width of the outcrop of the sandstone bed along a N-S traverse on the ground is _____ m.

Correct Answer :

200

Question Number : 42 Question Type : MCQ

Assertion (a): The $^{18}\text{O}/^{16}\text{O}$ ratio in natural systems can be used as a thermometer.

Reason (r): The fractionation of $^{18}\text{O}/^{16}\text{O}$ depends on temperature.

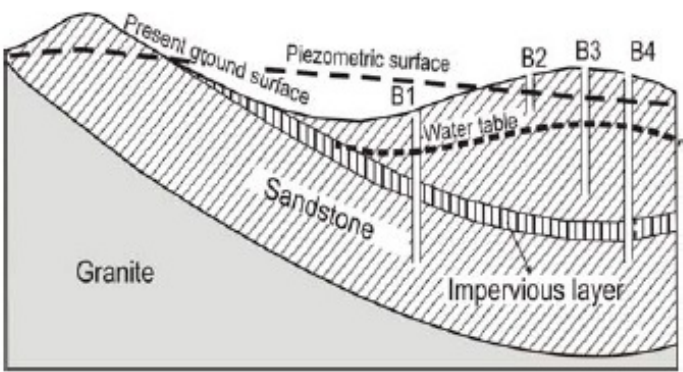
- (A) Both (a) and (r) are True and (r) is the correct reason for (a).
- (B) Both (a) and (r) are not True.
- (C) (a) is True but (r) is not True
- (D) Both (a) and (r) are True but (r) is not the correct reason for (a).

Options :

- 1. ✔ A
- 2. ✖ B
- 3. ✖ C
- 4. ✖ D

Question Number : 43 Question Type : MCQ

Based on the schematic figure below, match the boreholes B1, B2, B3 and B4 listed in Group I with their features listed in Group II.



Group I

- P. Borehole B1
- Q. Borehole B2
- R. Borehole B3
- S. Borehole B4

- (A) P-1; Q-3; R-2; S-4
- (C) P-3; Q-4; R-1; S-2

Group II

- 1. well in unconfined aquifer
- 2. artesian well with water not flowing to surface
- 3. artesian well with water flowing to surface
- 4. dry well

- (B) P-2; Q-4; R-1; S-3
- (D) P-3; Q-1; R-4; S-2

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✔ C
- 4. ✖ D

Question Number : 44 Question Type : NAT

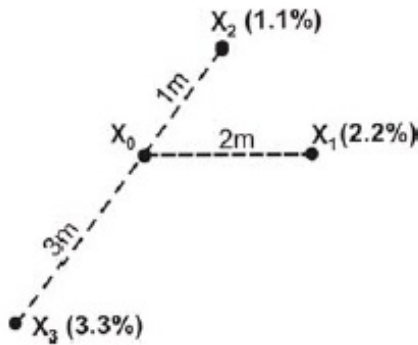
If the total volume of water in the Earth's atmosphere, estimated to be about $1.29 \times 10^4 \text{ km}^3$, were to completely precipitate and uniformly cover the Earth's surface, estimated to be $5.1 \times 10^8 \text{ km}^2$, the height of the resulting water column would be _____ cm.

Correct Answer :

2.52 to 2.53

Question Number : 45 Question Type : NAT

Samples of copper ores are drawn from locations X_1 , X_2 and X_3 as shown in figure below. The values of (% Cu) at sampling locations are given in brackets. The estimated grade at point X_0 using inverse distances weighting is _____%.



Correct Answer :

1.8

Question Number : 46 Question Type : MCQ

Match the point group (HM symbol) in Group I with its corresponding general form in Group II

Group I

- P. $\bar{6}2m$
- Q. $3/m$
- R. 422
- S. $\bar{4}2m$

Group II

- 1. Ditrigonal Dipyramid
- 2. Tetragonal Scalenohedron
- 3. Trigonal Dipyramid
- 4. Tetragonal Trapezohedron
- 5. Hexagonal Dipyramid

- (A) P-5; Q-1; R-2; S-4
- (C) P-1; Q-3; R-2; S-5

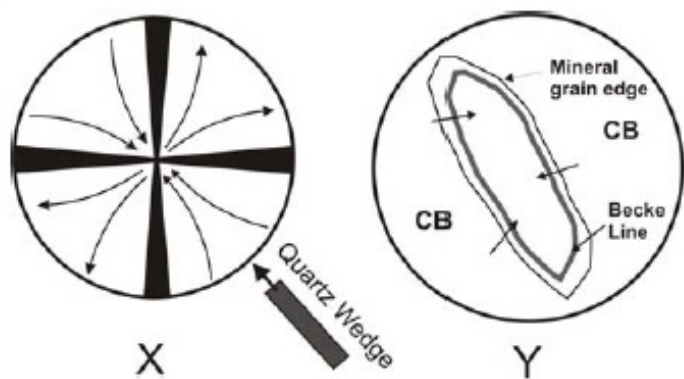
- (B) P-1; Q-3; R-4; S-2
- (D) P-3; Q-5; R-2; S-4

Options :

- 1. ✖ A
- 2. ✔ B
- 3. ✖ C
- 4. ✖ D

Question Number : 47 Question Type : MCQ

Identify the CORRECT pair of minerals both of which show optical properties as shown in figures X (optic axis figure) and Y (with increasing free working distance between objective and stage).
CB – Canada Balsam



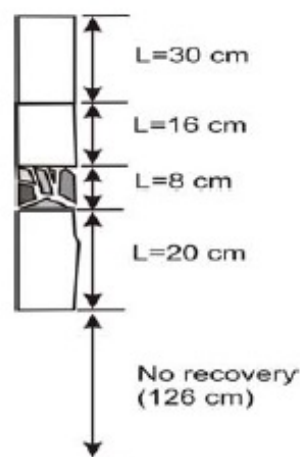
- (A) Quartz, Stishovite
- (B) Cordierite, Chlorite
- (C) Apatite, Tourmaline
- (D) Nosean, Halite

Options :

1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

Question Number : 48 Question Type : NAT

From the figure given below depicting a recovered core of a total length of 200 cm, the RQD (Rock Quality Designation) is _____ %.



Correct Answer :

33

Question Number : 49 Question Type : MCQ

Interdip angle and shape of a fold is best studied in a

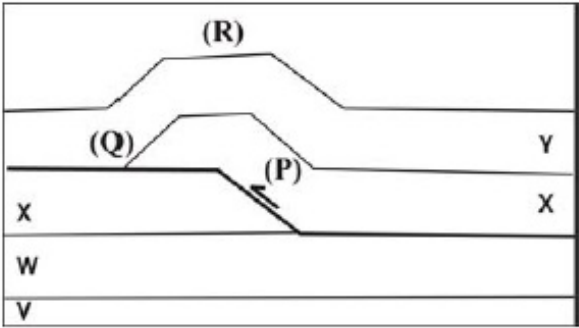
- (A) section parallel to the plunge of the fold axis
- (B) section parallel to the axial plane of the fold
- (C) section parallel to dip of bedding in the fold
- (D) section whose pole is the fold axis

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✖ C
- 4. ✔ D

Question Number : 50 Question Type : MCQ

The cross-section below shows a thrust fault with an associated fault-related fold. For the hanging wall, which one of the combinations of (P), (Q) and (R) is correct?



- (A) Ramp (P), Flat (Q), Fault Bend Fold (R)
- (B) Ramp (P), Flat (Q), Fault Propagation Fold (R)
- (C) Flat (P), Ramp (Q), Fault Bend Fold (R)
- (D) Flat (P), Ramp (Q), Fault Propagation Fold(R)

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✔ C
- 4. ✖ D

Question Number : 51 Question Type : MCQ

Euler Poles defined for plate motions on a spherical earth are

- (A) parallel to associated transform faults
- (B) perpendicular to associated transform faults
- (C) not related to associated transform faults
- (D) oblique to associated transform faults

Options :

- 1. ✖ A
- 2. ✔ B
- 3. ✖ C
- 4. ✖ D

Question Number : 52 Question Type : MCQ

Which one of the following sedimentary structures CANNOT be identified in vertical sections?

- (A) Convolute lamination
- (B) Gutter cast
- (C) Dish structures
- (D) Skip marks

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✖ C
- 4. ✔ D

Question Number : 53 Question Type : MCQ

A predominantly siliciclastic Mesozoic stratigraphic unit in mainland Kutch containing *Trigonia* and abundant plant fossils including *Ptillophyllum* is

- (A) Baisakhi Formation
- (B) Chari Formation
- (C) Pachcham Formation
- (D) Umia Formation

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✖ C
- 4. ✔ D

Question Number : 54 Question Type : MCQ

Match the texture in Group I with its corresponding description in Group II.

Group I

- P. Cumulus texture
- Q. Exsolution texture
- R. Caries texture
- S. Cockade texture

- (A) P-5; Q-4; R-3; S-2
- (C) P-5; Q-4; R-2; S-3

Group II

- 1. triple point junction
- 2. banding and crustification in open spaces
- 3. protuberances of replacing mineral with replaced host
- 4. spindles or lamellae of one mineral in another
- 5. aggregates of minerals with non-penetrative mineral boundaries

- (B) P-4; Q-5; R-3; S-1
- (D) P-4; Q-3; R-2; S-5

Options :

- 1. ✔ A
- 2. ✖ B
- 3. ✖ C
- 4. ✖ D

Question Number : 55 Question Type : MCQ

Choose the CORRECT statement regarding coal.

- (A) Sapropelic coal is a potential source rock of oil
- (B) Vitrinite reflectance value (R_o %) should be >1 for a lignite sample
- (C) H/C content of the vitrinite maceral groups is more than that of liptinite maceral groups
- (D) In Ranigunj field coal seams alternate with limestone beds

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 56 Question Type : MCQ

Match the stratigraphic units in Group I with the economic deposits in Group II.

Group I

- P. Bailadila Group
- Q. Nallamalai Group
- R. Udaipur Group
- S. Sausar Group

Group II

- 1. Mn
- 2. Phosphorite
- 3. BIF
- 4. Pb-Zn
- 5. Pyrite

(A) P-3; Q-4; R-2; S-1

(B) P-4; Q-2; R-3; S-5

(C) P-2; Q-3; R-4; S-5

(D) P-3; Q-4; R-1; S-2

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 57 Question Type : MCQ

Match the igneous bodies in Group I with the cratons where they occur in Group II.

Group I

- P. Untala Granite
- Q. Dalma Volcanics
- R. Chamundi Granite
- S. Bijli Rhyolite

Group II

- 1. Singbhum craton
- 2. Aravalli craton
- 3. Bastar craton
- 4. Dharwar craton
- 5. Bundelkhand craton

(A) P-2; Q-1; R-5; S-3

(B) P-2; Q-1; R-4; S-3

(C) P-3; Q-4; R-1; S-5

(D) P-1; Q-3; R-1; S-5

Options :

- 1. ✗ A
- 2. ✓ B
- 3. ✗ C
- 4. ✗ D

The reflectance spectrum of solar energy by the hydrous molecules in plant leaves is best represented in an optical spectrometer in the wavelength range of

- (A) Near Infrared (0.7 - 1.3 μm)
- (B) Short Infrared (1.3 - 3.0 μm)
- (C) Mid Infrared (3 - 8 μm)
- (D) Long Infrared (8 - 15 μm)

Options :

- 1. ✗ A
- 2. ✓ B
- 3. ✗ C
- 4. ✗ D

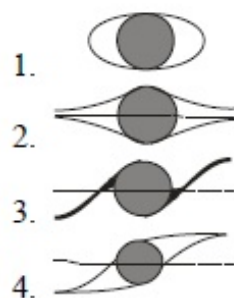
Question Number : 59 Question Type : MCQ

Match the type of mantled porphyroclasts in Group I with the corresponding figure in Group II.

Group I

- P. δ type
- Q. σ type
- R. θ type
- S. ϕ type

Group II



- (A) P-1; Q-3; R-2; S-4
- (C) P-3; Q-1; R-2; S-4

- (B) P-3; Q-4; R-1; S-2
- (D) P-2; Q-1; R-4; S-3

Options :

- 1. ✗ A
- 2. ✓ B
- 3. ✗ C
- 4. ✗ D

Question Number : 60 Question Type : MCQ

Choose the CORRECT symmetry operations that can create all possible two dimensional planar point groups.

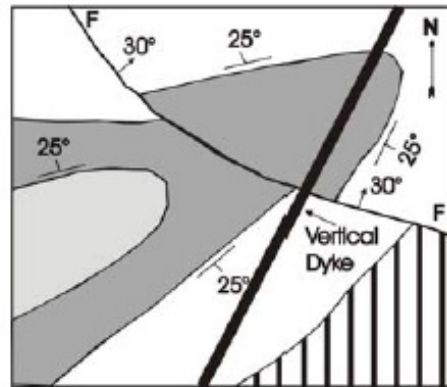
- (A) translation, rotation, screw, glide
- (B) translation, reflection, rotation, glide
- (C) screw, reflection, rotation, glide
- (D) translation, reflection, screw, glide

Options :

- 1. ✗ A
- 2. ✓ B

Question Number : 61 Question Type : MCQ

In the folded and faulted sequence of beds given in the map below, the fault F-F (dipping 30°NE) is which type of fault?



- (A) sinistral strike-slip
(B) reverse
(C) normal
(D) dextral strike-slip

Options :

1. ✖ A
2. ✔ B
3. ✖ C
4. ✖ D

Question Number : 62 Question Type : MCQ

Which one of the following sets of isotopic ratios contains ONLY those that change with time?

- (A) $^{87}\text{Sr}/^{86}\text{Sr}$, $^{143}\text{Nd}/^{144}\text{Nd}$, $^{207}\text{Pb}/^{206}\text{Pb}$, $^{147}\text{Sm}/^{144}\text{Nd}$
(B) $^{88}\text{Sr}/^{86}\text{Sr}$, $^{145}\text{Nd}/^{144}\text{Nd}$, $^{238}\text{U}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$
(C) $^{84}\text{Sr}/^{86}\text{Sr}$, $^{143}\text{Nd}/^{144}\text{Nd}$, $^{208}\text{Pb}/^{204}\text{Pb}$, $^{85}\text{Rb}/^{87}\text{Sr}$
(D) $^{145}\text{Nd}/^{144}\text{Nd}$, $^{86}\text{Sr}/^{84}\text{Sr}$, $^{147}\text{Sm}/^{144}\text{Nd}$, $^{208}\text{Pb}/^{86}\text{Sr}$

Options :

1. ✔ A
2. ✖ B
3. ✖ C
4. ✖ D

Question Number : 63 Question Type : MCQ

Sediments derived exclusively from the Deccan basalt are deposited on a high-energy beach and are lithified under shallow burial conditions. The sedimentary rock formed would be a/an

- (A) arkose
(B) greywacke
(C) lithic arenite
(D) quartz arenite

Options :

1. ✖ A
2. ✖ B

4. ✖ D

Question Number : 64 Question Type : MCQ

Choose the CORRECT mineral assemblages in mafic rocks that indicate eclogite facies metamorphism.

- (A) orthopyroxene + plagioclase + garnet
- (B) glaucophane + omphacite + lawsonite ± garnet
- (C) ugrandite garnet + omphacite + plagioclase
- (D) pyralspite garnet + omphacite ± kyanite

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✖ C
- 4. ✔ D

Question Number : 65 Question Type : MCQ

The maximum velocity of the Indian Plate is observed in

- (A) Maldives
- (B) Bangalore
- (C) Delhi
- (D) Srinagar

Options :

- 1. ✔ A
- 2. ✖ B
- 3. ✖ C
- 4. ✖ D

Geophysics

Number of Questions:

30

Section Marks:

60.0

Question Number : 66 Question Type : MCQ

Which type of VES curve is obtained for a three-layered earth model consisting of wet shale (top layer), poorly water saturated sandstone (middle layer) and impermeable granite (bottom layer)?

- (A) K
- (B) Q
- (C) H
- (D) A

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✖ C
- 4. ✔ D

Question Number : 67 Question Type : MCQ

In the presence of magnetotelluric transfer function, the time-independent conservation of current at conductivity discontinuities will result in

- (A) phase rotation (B) static-shift
(C) null tipper (D) equal bi-modal apparent resistivity values

Options :

1. ✗ A
2. ✓ B
3. ✗ C
4. ✗ D

Question Number : 68 Question Type : MCQ

In any given signal, removal of all periods shorter than Nyquist period is achieved by

- (A) high-pass filtering (B) band-pass filtering
(C) low-pass filtering (D) band-reject filtering

Options :

1. ✗ A
2. ✗ B
3. ✓ C
4. ✗ D

Question Number : 69 Question Type : MCQ

The magnetic flux density, \vec{B} and the magnetic vector potential, \vec{A} are related by

- (A) $\vec{B} = \nabla \cdot \vec{A}$ (B) $\vec{B} = \nabla \times \vec{A}$
(C) $\vec{A} = \nabla \vec{B}$ (D) $\vec{A} = \nabla \times \vec{B}$

Options :

1. ✗ A
2. ✓ B
3. ✗ C
4. ✗ D

Question Number : 70 Question Type : MCQ

The frequency range (in Hz) that defines *dead-band* in magnetotelluric source signal is

- (A) 0.1 – 10 (B) 10 – 100
(C) 100 – 1000 (D) 1000 – 10000

Options :

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Question Number : 71 Question Type : NAT

The maximum time lag obtained from a 48-channel common-depth-point (CDP) reflection survey with the geophone and shot point spacing of 50 m and 100 m respectively, is _____.

Correct Answer:

12

Question Number : 72 Question Type : MCQ

The deviation in the geographical locations of the magnetic poles from the geomagnetic poles of the Earth's magnetic field is due to the

- (A) orientation of dipole axis
- (B) external magnetic field
- (C) non-dipole component
- (D) ionospheric currents

Options :

- 1. ✗ A
- 2. ✗ B
- 3. ✓ C
- 4. ✗ D

Question Number : 73 Question Type : MCQ

The analytic signal for the function $f(t) = \sin \omega t$ is

- (A) $-\cos \omega t$
- (B) $-\sin \omega t$
- (C) $e^{i\omega t}$
- (D) $-ie^{i\omega t}$

Options :

- 1. ✗ A
- 2. ✗ B
- 3. ✗ C
- 4. ✓ D

Question Number : 74 Question Type : NAT

The minimum frequency at which a signal comprising of 30 Hz, 50 Hz and 70 Hz frequencies should be sampled to avoid aliasing is _____ Hz.

Correct Answer:

140

Question Number : 75 Question Type : MCQ

Assertion (A): The Gutenberg-Richter frequency-magnitude relation of earthquakes globally suggests that subduction zones in general are characterized by lower b-values (b-value is slope of frequency-magnitude relation) when compared to the mid-oceanic ridges.

Reason (r): Earthquakes in the subduction zones occur at deeper focal depths also, whereas, earthquakes along mid-oceanic ridges occur at shallow focal depths.

- (A) (a) is false but (r) is true
- (B) Both (a) and (r) are true; and (r) is correct reason for (a)
- (C) Both (a) and (r) are true; and (r) is not a reason for (a)
- (D) Both (a) and (r) are false

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✔ C
- 4. ✖ D

Question Number : 76 Question Type : MCQ

The masses and radioactive heat generation values respectively for different parts of the Earth are tabulated as given below.

Region	Mass x 10^{21} kg	Radioactive heat generation x 10^8 (mWkg ⁻¹)
Upper continental crust	8	96.40
Lower continental crust	8	40.00
Oceanic crust	7	18.60
Mantle	4080	0.26
Core	1880	0

Deduce which one of the following statements is NOT correct from the given data

- (A) Core does not contain any radioactive isotope
- (B) Lower continental crust is depleted in heat producing elements related to upper continental crust
- (C) Mantle produces the highest radiogenic heat
- (D) Upper continental crust produces the highest radiogenic heat

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✖ C
- 4. ✔ D

Question Number : 77 Question Type : MCQ

Which ONE of the following statements is CORRECT with regard to the application of reduction-to-pole (RTP) technique on the total field magnetic anomaly map of any region?

- (A) RTP is an efficient tool in the areas close to the equator (below $\pm 20^\circ$ Lat.)
- (B) RTP assumes mainly induced magnetization for the source bodies
- (C) RTP cannot be applied at higher latitudes (above $\pm 60^\circ$ Lat.)
- (D) RTP completely eliminates the sources of remnant magnetization.

Options :

2. ✔ B

3. ✖ C

4. ✖ D

Question Number : 78 Question Type : MCQ

After migration, an anticline observed on an unmigrated seismic section becomes

- (A) broader (B) tighter (C) unaltered (D) flat

Options :

1. ✖ A

2. ✔ B

3. ✖ C

4. ✖ D

Question Number : 79 Question Type : MCQ

A clean, thick and hydrocarbon bearing sandstone bed can be identified through a combination of

- (A) low SP and high resistivity
(B) large SP and high resistivity
(C) low transit time and high resistivity
(D) large SP and low resistivity

Options :

1. ✔ A

2. ✖ B

3. ✖ C

4. ✖ D

Question Number : 80 Question Type : NAT

In a consolidated sandstone formation, the interval transit times of the formation, matrix and fluid are $70 \mu s$, $55 \mu s$ and $190 \mu s$ respectively. The porosity of the formation is _____.

Correct Answer:

0.11

Question Number : 81 Question Type : MCQ

Which one of the following statements is NOT CORRECT?

- (A) A well-conditioned matrix has a condition number close to 1.
(B) An ill-conditioned matrix has a large condition number
(C) The inverse of a well-conditioned matrix can be computed with good accuracy.
(D) A matrix that is not invertible has a condition number close to 1.

Options :

1. ✖ A

2. ✖ B
3. ✖ C
4. ✔ D

Question Number : 82 Question Type : MCQ

Match the type of inverse problem in Group I with its solution in Group II.

Group I

- P. Over determined
- Q. Under determined
- R. Mixed determined
- S. Even determined

Group II

1. $m = [G^T G + K^2 I]^{-1} G^T d$
2. $m = [G^T G]^{-1} G^T d$
3. $m = G [G^T G]^{-1} G^T d$
4. $m = G^T [G G^T]^{-1} d$
5. $m = G^{-1} d$ ($N = M$, rank of $G = N$)

- (A) P-2; Q-4; R-1; S-5
- (C) P-2; Q-1; R-3; S-4

- (B) P-2; Q-3; R-1; S-5
- (D) P-3; Q-5; R-2; S-1

Options :

1. ✔ A
2. ✖ B
3. ✖ C
4. ✖ D

Question Number : 83 Question Type : MCQ

In frequency domain IP, which one of the following frequency ranges (in Hz) is used to measure apparent resistivity at DC and AC limits?

- (A) 0.01 – 0.1
- (B) 0.1 – 1
- (C) 0.1 – 10
- (D) 10 – 100

Options :

1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

Question Number : 84 Question Type : MCQ

The expression for electrical potential, V , at a distance r from a subsurface point source of current in a homogeneous medium is given by

- (A) $V = \frac{2\pi r \rho}{I}$
- (B) $V = \frac{\rho I}{4\pi r}$
- (C) $V = \frac{2\pi r I}{\rho}$
- (D) $V = \frac{r \rho}{4\pi I}$

Options :

1. ✖ A
2. ✔ B
3. ✖ C
4. ✖ D

Question Number : 85 Question Type : MCQ

The Bouguer anomaly obtained after applying all necessary corrections is due to

- (A) topographic undulations above the datum
- (B) increase in densities of crustal rocks with depth
- (C) lateral density variations
- (D) vertical density contrast across Moho

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✔ C
- 4. ✖ D

Question Number : 86 Question Type : NAT

In a 3-D seismic survey, the bin size for the maximum frequency (f_{\max}) of 80 Hz at the target having a reflector dip of 15° and interval velocity of 3600 ms^{-1} is _____.

Correct Answer :

43.4 to 43.5

Question Number : 87 Question Type : NAT

A spherical body with its centre located at a depth of 1040 m gives a symmetric residual gravity anomaly high with $\Delta g_{\max} = 5.2 \text{ mGal}$. If the same anomaly were to be obtained over a 2-D horizontal cylinder, the depth to the centre of the horizontal cylinder (in m) is _____.

Correct Answer:

800

Question Number : 88 Question Type : MCQ

Analysis of data from a 3-component broadband seismological station yields seismic velocities, $V_p = 7.0 \text{ km/s}$ and $V_s = 3.87 \text{ km/s}$ for the lower crust. The resulting Poisson's ratio of the lower crustal rocks (rounded to two decimal places) is

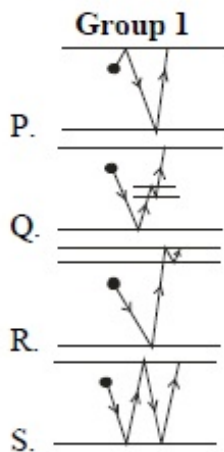
- (A) 0.24
- (B) 0.26
- (C) 0.28
- (D) 0.30

Options :

- 1. ✖ A
- 2. ✖ B
- 3. ✔ C
- 4. ✖ D

Question Number : 89 Question Type : MCQ

Match the parts of multiple reflections shown in Group I with their corresponding names in Group II.



- Group II**
1. peg-leg multiple
 2. simple multiple
 3. near-surface multiple
 4. ghost multiple

- (A) P-1; Q-4; R-2; S-3
(C) P-2; Q-4; R-1; S-3

- (B) P-4; Q-1; R-3; S-2
(D) P-3; Q-1; R-4; S-2

Options :

1. ✗ A
2. ✓ B
3. ✗ C
4. ✗ D

Question Number : 90 Question Type : MCQ

The Königsberger ratio, Q_n , related to magnetization of rocks is very low ($Q_n \ll 1$) for

- (A) sandstone (B) continental shield rocks
(C) oceanic basalt (D) continental volcanic rocks

Options :

1. ✗ A
2. ✓ B
3. ✗ C
4. ✗ D

Question Number : 91 Question Type : MCQ

In free-space, the integral form of Faraday's law is expressed as

- (A) $\oint \vec{H} \cdot d\vec{l} = \epsilon \int (\partial \vec{E} / \partial t) \cdot d\vec{s}$
(B) $\oint \vec{E} \cdot d\vec{l} = - \int (\partial \vec{B} / \partial t) \cdot d\vec{s}$
(C) $\oint \vec{E} \cdot d\vec{s} = 0$
(D) $\oint \vec{B} \cdot d\vec{s} = 0$

Options :

1. ✗ A
2. ✓ B
3. ✗ C

Question Number : 92 Question Type : NAT

Four point charges, $Q_1 = 40 \text{ nC}$, $Q_2 = 50 \text{ nC}$, $Q_3 = 20 \text{ nC}$, $Q_4 = -60 \text{ nC}$, are enclosed by a Gaussian surface, S . The net flux crossing S is _____ nC.

Correct Answer :

50

Question Number : 93 Question Type : MCQ

The highest frequency range (in Hz) of an inducing electromagnetic wave that can penetrate up to a depth of 178 m in a medium having a resistivity of $10 \Omega\text{-m}$ is (Consider permeability of the medium, $\mu = 1$).

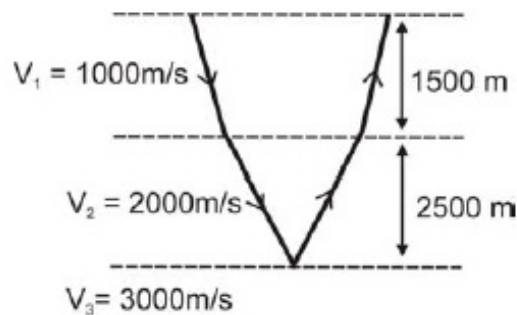
- (A) 1-10 (B) 15-25 (C) 70-100 (D) 800-1000

Options :

1. ✗ A
2. ✗ B
3. ✓ C
4. ✗ D

Question Number : 94 Question Type : NAT

For the given near offset reflection geometry, the RMS velocity (in km/s) to the bottom of the second layer is _____.



Correct Answer :

1.50 to 1.55

Question Number : 95 Question Type : MCQ

In seismic exploration the dynamite source is generally considered to be a wavelet of

- (A) zero phase (B) minimum phase
(C) mixed phase (D) maximum phase

Options :

1. ✖ A
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2. ✔ B

3. ✖ C

4. ✖ D