GATE

Geology and Geophysics

Engineering

Previous Year Paper

2015

Graduate Aptitude Test in Engineering

tations :

Options shown in green color and with ✔ icon are correct.

Options shown in red color and with ✖ icon are incorrect.

uestion Paper Name: GG: GEOLOGY AND GEOPHYSICS 1st Feb shift2

umber of Questions: 95

tal 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

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

uestion Number : 1 Question Type : MCQ

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

pparent lifelessness _____ dormant life.

A) harbours (B) leads to (C) supports (D) affects

ptions :

✔ A

✖ B

✖ C

✖ D

uestion Number : 2 Question Type : MCQ

ill in the blank with the correct idiom/phrase.

hat 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

ptions :

✖ A

✖ B

✔ C

✖ D

uestion Number : 3 Question Type : MCQ

Choose the statement where 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

Select the appropriate option in place of underlined part of the sentence.

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.

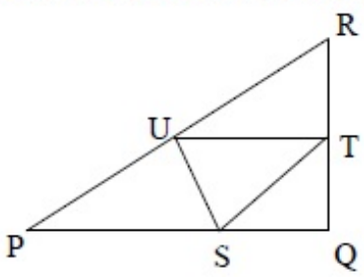
(A) Only conclusion I follows.
(B) Only conclusion II follows.
(C) Neither conclusion I nor II follows.
(D) Both conclusions I and II follow.

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

Question Number : 9 Question Type : MCQ

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

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 amongst the following is the CORRECT attitude of a bed?

(A) 221°, 95° (B) N45°W, 40°SE (C) 090°/ 20°W (D) 089°, 75°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 ≠90°
(C) unequal lengths with angle between a and c ≠90°
(D) unequal lengths with angle between *b* and *c* as 90°

Options :

1. ✖ A
2. ✖ B
3. ✔ C

4. ✖ D

Question Number : 16 Question Type : MCQ

A landform that results from free fall of rocks is called

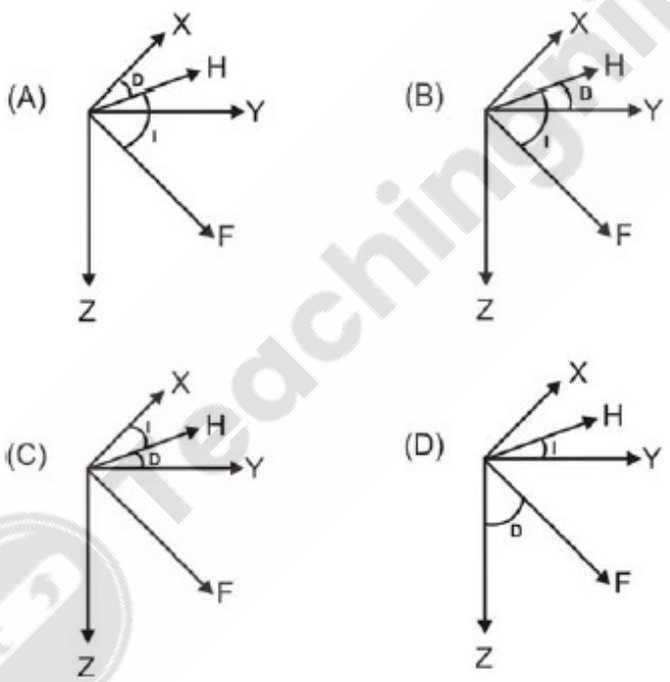
(A) talus slope (B) eskers (C) alluvial fan (D) debris flow

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

3. ✖ C
4. ✖ D

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 ms^{-1}; ρ = 1.5 gcm^{-3}) underlain by shale (V_p = 2500 ms^{-1}; ρ = 2.0 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 names listed in Group I with its attributes listed in Group II.

Group I	Group II
P. Carlsberg Ridge	1. Aseismic
Q. Ninetyeast Ridge	2. Subduction
R. Pranhita-Godavari basin	3. Spreading
S. Makran Coast	4. Transform
	5. Rift

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

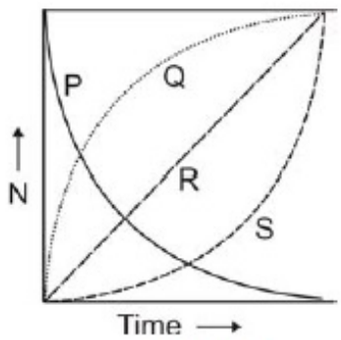
Options :

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
(B) P, R
(C) P, S
(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 2.0×10^6 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) CO_2, H_2O (B) N_2, O_2 (C) H_2O, CH_4 (D) H_2O, O_3

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.

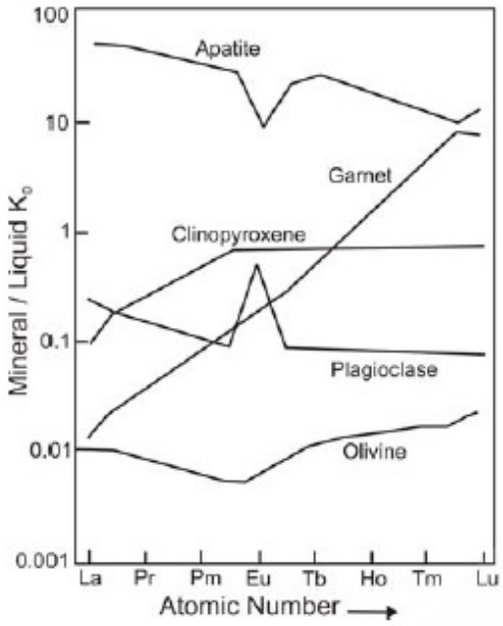
(A) Delthyrium is a triangular cavity in cephalopod
(B) Madreporite is a skeletal part of Brachiopoda
(C) Pleuron is a part of thorax in Trilobite
(D) Endocone is the jaw of an Ammonoid

Options :

1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

Question Number : 38 Question Type : MCQ

Based on the figure below 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

Chemical analysis reveals that basalts contain much more aluminum (Al_2O_3 ~ 15%) in comparison to peridotites (Al_2O_3 ~ 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°, 30° 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 $^{18}O/^{16}O$ ratio in natural systems can be used as a thermometer.
Reason (r): The fractionation of $^{18}O/^{16}O$ depends on temperature.

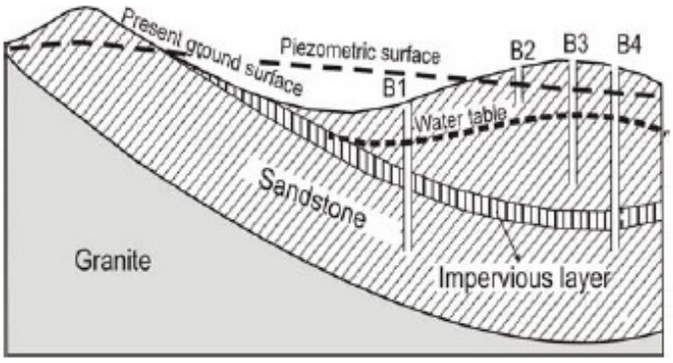
(A) Both (a) and (r) are True and (r) is the correct reason for (a).
(B) Both (a) and (r) are not True.
(C) (a) is True but (r) is not True
(D) Both (a) and (r) are True but (r) is not the correct reason for (a).

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

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

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

Options :

1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

Question Number : 44 Question Type : NAT

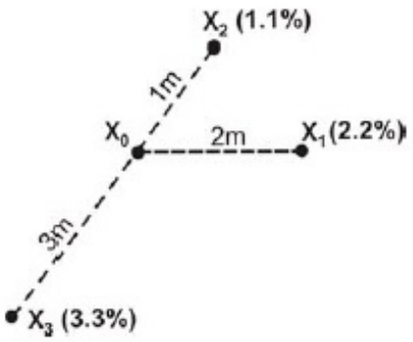
If the total volume of water in the Earth's atmosphere, estimated to be about $1.29 \times 10^4 km^3$, were to completely precipitate and uniformly cover the Earth's surface, estimated to be $5.1 \times 10^8 km^2$, the height of the resulting water column would be _____ cm.

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	Group II
P. $\bar{6}2m$	1. Ditrigonal Dipyramid
Q. $3/m$	2. Tetragonal Scalenohedron
R. 422	3. Trigonal Dipyramid
S. $\bar{4}2m$	4. Tetragonal Trapezohedron
	5. Hexagonal Dipyramid

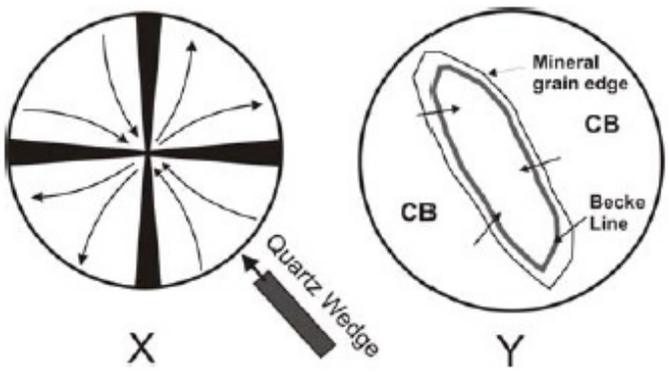
(A) P-5; Q-1; R-2; S-4
(B) P-1; Q-3; R-4; S-2
(C) P-1; Q-3; R-2; S-5
(D) P-3; Q-5; R-2; S-4

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



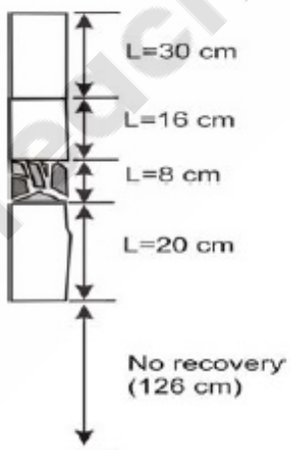
(A) Quartz, Stishovite
(B) Cordierite, Chlorite
(C) Apatite, Tourmaline
(D) Nosean, Halite

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

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

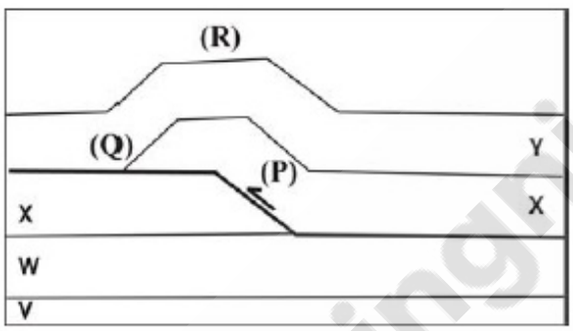
(A) section parallel to the plunge of the fold axis
(B) section parallel to the axial plane of the fold
(C) section parallel to dip of bedding in the fold
(D) section whose pole is the fold axis

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	Group II
P. Cumulus texture	1. triple point junction
Q. Exsolution texture	2. banding and crustification in open spaces
R. Caries texture	3. protuberances of replacing mineral with replaced host
S. Cockade texture	4. spindles or lamellae of one mineral in another
	5. aggregates of minerals with non-penetrative mineral boundaries

(A) P-5; Q-4; R-3; S-2
(B) P-4; Q-5; R-3; S-1
(C) P-5; Q-4; R-2; S-3
(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 (Ro %) 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 Raniganj 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	**Group II**
P. Bailadila Group	1. Mn
Q. Nallamalai Group	2. Phosphorite
R. Udaipur Group	3. BIF
S. Sausar Group	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	Group II
P. Untala Granite	1. Singbhum craton
Q. Dalma Volcanics	2. Aravalli craton
R. Chamundi Granite	3. Bastar craton
S. Bijli Rhyolite	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

Question Number : 58 Question Type : MCQ

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 - 1.3μm)
(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

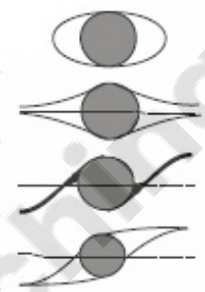
Q. σ type

R. θ type

S. ϕ type

Group II

1.
2.
3.
4.



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

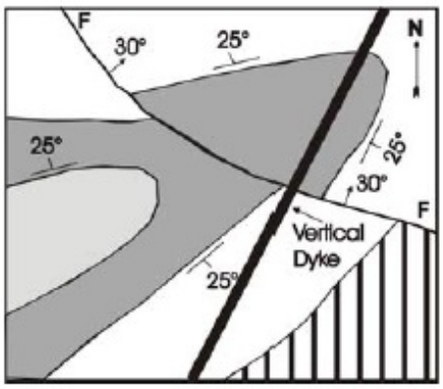
Options :

1. ✖ A
2. ✔ B

3. ✖ C
4. ✖ D

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

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

3. ✔ C
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 estimation 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 foldage 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 $\pm 20^0$ Lat.)
(B) RTP assumes mainly induced magnetization for the source bodies
(C) RTP cannot be applied at higher latitudes (above $\pm 60^0$ Lat.)
(D) RTP completely eliminates the sources of remnant magnetization.

Options :

1. ✖ A
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 μs, 55 μs and 190 μs 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	**Group II**
P. Over determined	1. $m = \left[G^T G + K^2 I\right]^{-1} G^T d$
Q. Under determined	2. $m = \left[G^T G\right]^{-1} G^T d$
R. Mixed determined	3. $m = G\left[G^T G\right]^{-1} G^T d$
S. Even determined	4. $m = G^T \left[GG^T\right]^{-1} d$
	5. $m = G^{-1} d$ (N = M, rank of G = N)

(A) P-2; Q-4; R-1; S-5 (B) P-2; Q-3; R-1; S-5
(C) P-2; Q-1; R-3; S-4 (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) $V = \frac{2\pi rI}{\rho}$ (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 15^0 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 Δg_{max} = 5.2 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 km/s and V_s = 3.87 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

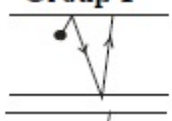
Options :

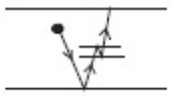
1. ✖ A
2. ✖ B
3. ✔ C
4. ✖ D

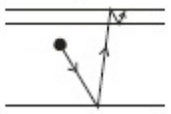
Question Number : 89 Question Type : MCQ

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

Group 1

P. 

Q. 

R. 

S. 

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
(B) P-4; Q-1; R-3; S-2
(C) 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 : 90 Question Type : MCQ

The Königsberger ratio, Q_n, related to magnetization of rocks is very low ($Q_n << 1$) 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) $\oint \vec{H}.\, dl = \varepsilon \int_S (\partial \vec{E}/\partial t)\, ds$

(B) $\oint \vec{E}.\, dl = -\int_S (\partial \vec{B}/\partial t)\, ds$

(C) $\oint \vec{E}\,.\, ds = 0$

(D) $\oint \vec{B}.\, ds = 0$

Options :

1. ✖ A
2. ✔ B
3. ✖ C

4. ✖ D

Question Number : 92 Question Type : NAT

Four point charges, $Q_1 = 40$ nC, $Q_2 = 50$ nC, $Q_3 = 20$ nC, $Q_4 = -60$ nC, are enclosed by a Gaussian surface, S. The next 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 Ω-m is
(Consider permeability of the medium, $\mu = 1$).

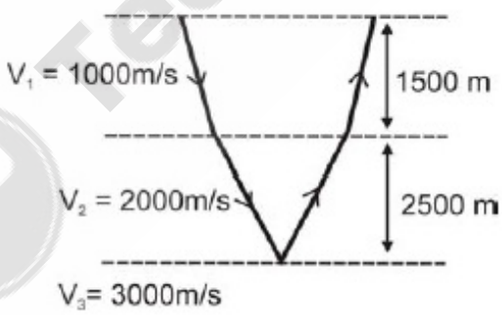
(A) 1-10 (B) 15-25 (C) 70-100 (D) 800-1000

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
2. ✔ B
3. ✖ C
4. ✖ D