Q. 1 – Q. 5 carry one mark each.

Q.1 The volume of a sphere of diameter 1 unit is _____ than the volume of a cube of side 1 unit.

(A) least (B) less (C) lesser (D) low

Q.2 The unruly crowd demanded that the accused be _____ without trial.

(A) hanged (B) hanging (C) hankering (D) hung

Q.3 Choose the statement(s) where the underlined word is used correctly:

(i) A prone is a dried plum.
(ii) He was lying prone on the floor.
(iii) People who eat a lot of fat are prone to heart disease.

(A) (i) and (iii) only (B) (iii) only (C) (i) and (ii) only (D) (ii) and (iii) only

Q.4 **Fact:** If it rains, then the field is wet.

Read the following statements:
(i) It rains
(ii) The field is not wet
(iii) The field is wet
(iv) It did not rain

Which one of the options given below is **NOT** logically possible, based on the given fact?

(A) If (iii), then (iv). (B) If (i), then (iii).

(C) If (i), then (ii). (D) If (ii), then (iv).

Q.5 A window is made up of a square portion and an equilateral triangle portion above it. The base of the triangular portion coincides with the upper side of the square. If the perimeter of the window is 6 m, the area of the window in m^2 is _____.

(A) 1.43 (B) 2.06 (C) 2.68 (D) 2.88

Q. 6 – Q. 10 carry two marks each.

Q.6 Students taking an exam are divided into two groups, **P** and **Q** such that each group has the same number of students. The performance of each of the students in a test was evaluated out of 200 marks. It was observed that the mean of group **P** was 105, while that of group **Q** was 85. The standard deviation of group **P** was 25, while that of group **Q** was 5. Assuming that the marks were distributed on a normal distribution, which of the following statements will have the highest probability of being **TRUE**?

(A) No student in group **Q** scored less marks than any student in group **P**.

(B) No student in group **P** scored less marks than any student in group **Q**.

(C) Most students of group **Q** scored marks in a narrower range than students in group **P**.

(D) The median of the marks of group **P** is 100.

Q.7 A smart city integrates all modes of transport, uses clean energy and promotes sustainable use of resources. It also uses technology to ensure safety and security of the city, something which critics argue, will lead to a surveillance state.

Which of the following can be logically inferred from the above paragraph?

(i) All smart cities encourage the formation of surveillance states.
(ii) Surveillance is an integral part of a smart city.
(iii) Sustainability and surveillance go hand in hand in a smart city.
(iv) There is a perception that smart cities promote surveillance.

(A) (i) and (iv) only (B) (ii) and (iii) only

(C) (iv) only (D) (i) only

Q.8 Find the missing sequence in the letter series.

B, FH, LNP, _ _ _ _.

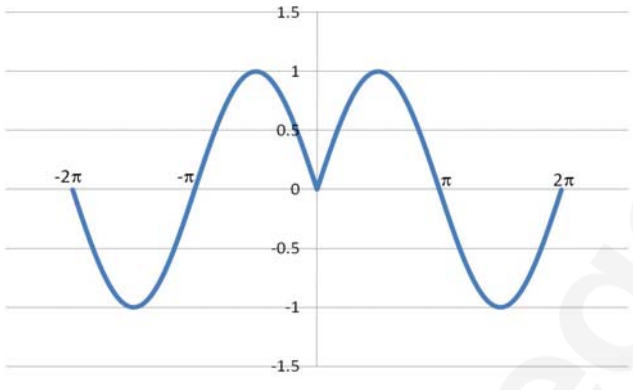
(A) SUWY (B) TUVW (C) TVXZ (D) TWXZ

Q.9 The binary operation □ is defined as $a \square b = ab+(a+b)$, where a and b are any two real numbers. The value of the identity element of this operation, defined as the number x such that $a \square x = a$, for any a, is _____.

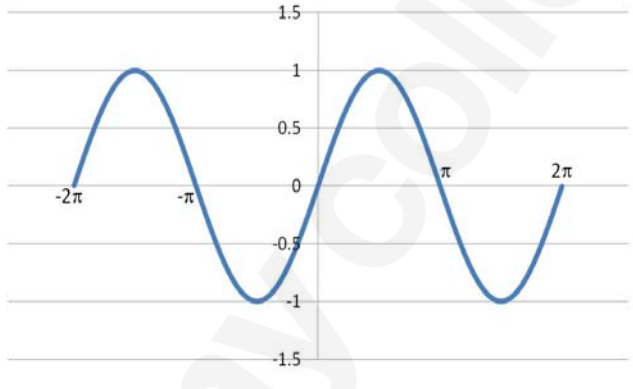
(A) 0 (B) 1 (C) 2 (D) 10

Q.10 Which of the following curves represents the function $y = \ln(|e^{[|\sin(|x|)|]}|)$ for $|x| < 2\pi$? Here, x represents the abscissa and y represents the ordinate.

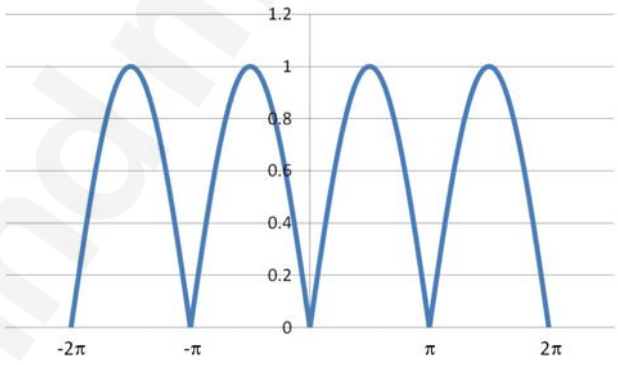
(A)



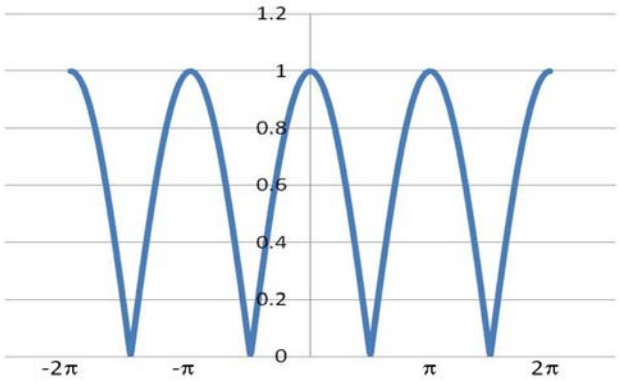
(B)



(C)



(D)



END OF THE QUESTION PAPER

Geology: Common Section

Q. 1 – Q. 25 carry one mark each.

Q.1 The first continental red beds appeared in the _____ Eon.

(A) Proterozoic (B) Archaean (C) Hadean (D) Phanerozoic

Q.2 Which one of the following is a chronostratigraphic unit?

(A) Eon (B) Period (C) Era (D) System

Q.3 _____ is a well-sorted sandstone containing up to 75% quartz, with rock fragments in excess of feldspar.

(A) Arkose (B) Lithic arenite (C) Quartz arenite (D) Feldspathic arenite

Q.4 International Geomagnetic Reference Field (IGRF) is used in processing regional magnetic data

(A) to remove the secular variation of the geomagnetic field.
(B) to remove the diurnal variation of the geomagnetic field.
(C) to remove the latitudinal variation of the geomagnetic field.
(D) to remove the terrain effect.

Q.5 Which one of the following layers of the Earth has the largest volume?

(A) Upper Mantle (B) Lower Mantle
(C) Outer core (D) Inner Core

Q.6 The S-wave shadow zone of the Earth ranges from _____.

(A) 103° to 180° (B) 103° to 160° (C) 103° to 153° (D) 103° to 143°

Q.7 According to Airy's model, gravity anomalies for fully isostatically compensated topography are characterized by

(A) negative Bouguer anomaly and positive free-air anomaly.
(B) positive Bouguer anomaly and negative free-air anomaly.
(C) zero Bouguer anomaly and negative free-air anomaly.
(D) positive Bouguer anomaly and zero free-air anomaly.

Q.8 Match the metals (listed in Group I) with the localities of their deposits (listed in Group II).

Group I	**Group II**
P. Iron	1. Boula
Q. Zinc	2. Gadag
R. Gold	3. Bellary
S. Chromium	4. Agucha

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

Q.9 In a region, given the palaeomagnetic inclination (I_R), the palaeolatitude (ς_R) can be calculated using the formula _____.

(A) $\cos I_R \mid \sin \varsigma_R$
(B) $\tan I_R \mid \tan \varsigma_R$
(C) $\tan I_R \mid 2 \tan \varsigma_R$
(D) $\sin I_R \mid 2 \cos \varsigma_R$

Q.10 Which one of the following parent-daughter systems has the longest half life?

(A) ^{147}Sm Ÿ ^{143}Nd
(B) ^{40}K Ÿ ^{40}Ar
(C) ^{87}Rb Ÿ ^{87}Sr
(D) ^{187}Os Ÿ ^{187}Re

Q.11 For a soil, Liquidity Index = (Natural Water Content – X) / Plasticity Index.
Here, X is _____ .

(A) Shrinkage Limit (B) Plastic Limit (C) Liquid Limit (D) Activity

Q.12 Match the following features (listed in Group I) with the different agents of erosion (listed in Group II).

Group I	**Group II**
P. Earth pillar	1. River
Q. Fjord	2. Wind
R. Pot hole	3. Glacier
S. Yardang	4. Rain

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

Q.13 Match the parameters listed in Group I with the units listed in Group II.

Group I	**Group II**
P. Hydraulic conductivity	1. Newton sec./m^2
Q. Permeability	2. m/sec.
R. Viscosity	3. m
S. Hydraulic head	4. m^2

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

Q.14 In digital remote sensing, land-water contrast is best identified in the _____wavelength band.

(A) ultraviolet (B) near IR (C) middle IR (D) thermal IR

Q.15 Which one of the following rocks has the highest magnetic susceptibility value?

(A) Quartzite (B) Limestone
(C) Gabbro (D) Shale

Q.16 In which one of the following electromagnetic methods is the rate of change of secondary field recorded?

(A) Very Low Frequency method
(B) Time-domain EM method
(C) Magnetotelluric method
(D) TURAM method

Q.17 A Wenner array with 60 m spacing between current electrodes is placed over an inhomogeneous ground. If the measured potential difference and current flow in subsurface are 10 mV and 5 mA, respectively, the apparent resistivity will be _____ Ým. (Use ´ = 3.14)

Q.18 Which one of the following geophysical methods is most suitable for the exploration of a horizontally stratified graphite deposit at a depth of 50 m?

(A) Gravity (B) Magnetic (C) Radiometric (D) Electromagnetic

Q.19 Which one of the following logging techniques is most suitable to detect a shale layer sandwiched between two sandstone layers?

(A) Neutron-Gamma (B) Gamma-Gamma (C) Natural Gamma (D) Sonic

Q.20 The following schematic diagram is a plan view of three oceanic plates forming a stable triple junction on a flat earth. Plate A subducts below Plate C normal to the plate boundary, while the contact between Plates A and B is a transform fault, as indicated. The boundary between Plates B and C is a _____.

(A) mid-oceanic ridge
(B) subduction zone
(C) sinistral transform fault
(D) dextral transform fault

Q.21 In Gondwanaland reconstructions, much of the present west coast of India is placed adjacent to _____.

(A) South America
(B) Madagascar
(C) Antarctica
(D) Australia

Q.22 Two vertically dipping limbs of a fold have perpendicular strikes. The fold can be classified as _____ .

(A) an antiformal fold
(B) a synformal fold
(C) a vertical fold
(D) a recumbent fold

Q.23 Match the crystal forms (listed in Group I) with their corresponding number of faces (listed in Group II).

Group I	**Group II**
P. Cube	1. Two
Q. Tetrahedron	2. Four
R. Pinacoid	3. Six
S. Dodecahedron	4. Twelve

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

Q.24 Match the rocks in Group I with their essential mineral assemblages in Group II.

Group I	**Group II**
P. Granodiorite	1. Hornblende-plagioclase
Q. Harzburgite	2. Plagioclase-quartz
R. Gabbro	3. Olivine-orthopyroxene
S. Diorite	4. Clinopyroxene-plagioclase

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

Q.25 Which one of the following mineral assemblages is stable under eclogite facies conditions?

(A) Garnet-orthopyroxene-clinopyroxene-plagioclase
(B) Garnet-clinopyroxene-plagioclase-kyanite
(C) Garnet-orthopyroxene-hornblende-plagioclase
(D) Garnet-clinopyroxene-kyanite-quartz

Geology (Section-1): Optional Section

Q. 26 – Q. 55 carry two marks each.

Q.26 Select the CORRECT statement from the following options.

(A) Hogback is an isolated tableland with sides that are usually steep.
(B) Crevasses are deposits of glacial origin.
(C) Loess comprises pebbles of rocks or minerals with some plane faces formed by wind abrasion.
(D) Loamy soil is a mixture of sand and clay.

Q.27 Match the following patterns (listed in Group I) with their appropriate Cephalopod sutures (listed in Group II). Arrow gives the direction of aperture.

Group I	**Group II**
P.	1. Ceratitic
Q.	2. Nautilitic
R.	3. Goniatitic
S.	4. Orthoceratitic

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

Q.28 Match the following test composition (listed in Group I) with the microfossil taxa (listed in Group II)

Group I	**Group II**
P. Organic-walled	1. Radiolaria
Q. Siliceous	2. Conodont
R. Phosphatic	3. Foraminifera
S. Calcareous	4. Acritarch

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

Q.29 Which one of the following statements is CORRECT?

(A) Movement of the shoreline seaward is transgression.
(B) No movement of the shoreline is transgression.
(C) Movement of the shoreline seaward as a result of sea-level fall is forced regression.
(D) Movement of the shoreline landward is regression.

Q.30 Mud-supported limestone containing greater than 10% allochems is called _____.

(A) Packstone
(B) Wackestone
(C) Grainstone
(D) Mudstone

Q.31 At a depth of 500 m, the determined in-situ stresses in a rock mass are as follows: maximum horizontal stress = 20 MPa, minimum horizontal stress = 8 MPa, vertical stress = 13.5 MPa. Assume principal stress directions are vertical and horizontal. If this compressive stress field leads to faulting, the plausible fault would be a

(A) normal fault (B) reverse fault (C) strike-slip fault (D) detachment fault

Q.32 The following figure is a litholog showing various fossils found in the rock-strata. Identify the biozone (Note: The lines denote partial ranges of the fossils given in the figure).

(A) Assemblage Zone
(B) Taxon Range Zone
(C) Consecutive Range Zone
(D) Acme Zone

Q.33 Which one of the following stratigraphic successions is in the correct chronological order (from older to younger)?

(A) Iron Ore Group, Older Metamorphic Group, Kolhan Group
(B) Chitradurga Group, Sargur Group, Bababudan Group
(C) Jharol Group, Alwar Group, Ajabgarh Group
(D) Chitravati Group, Papaghni Group, Kurnool Group

Q.34 Water content and total porosity of a soil are given as 10% and 25%, respectively. Specific gravity of soil particles is 2.5. The volume of water that should be added to 100 m^3 of this soil for full saturation is _____ m^3.

Q.35 In a zone of superposed folding, poles to bedding show a great circle distribution. For such a case, the fold axes related to the first generation of folding will

(A) also be distributed along the same great circle girdle.
(B) be distributed on a great circle girdle orthogonal to the bedding plane girdle.
(C) show a cluster around the pole to the bedding plane girdle.
(D) show a small circle distribution around the pole to the bedding plane girdle.

Q.36 For horizontal flow in a saturated aquifer, the product of hydraulic conductivity and thickness is equal to _____

(A) specific yield.
(B) transmissivity.
(C) coefficient of storage.
(D) seepage force.

Q.37 If a rectangle is deformed into a parallelogram of equal area by simple shear deformation (with shear strain ν) parallel to the abscissa, the displacement matrix is _____.

(A) $\begin{bmatrix} \nu & 0 \\ 1 & 0 \end{bmatrix}$
(B) $\begin{bmatrix} 0 & 1 \\ \nu & 0 \end{bmatrix}$
(C) $\begin{bmatrix} 0 & \nu \\ 1 & 0 \end{bmatrix}$
(D) $\begin{bmatrix} 1 & \nu \\ 0 & 1 \end{bmatrix}$

Q.38 If tangent Young's modulus (at 50% of the uniaxial compressive strength) and modulus ratio of a rock are given as 60 GPa and 500, respectively, the uniaxial compressive strength of the rock is _____ MPa.

Q.39 In a rock sample, the values of $(^{87}Sr/^{86}Sr)_{present}$ and $(^{87}Rb/^{86}Sr)_{present}$ are 0.7125 and 0.2, respectively. The decay constant (ς) of ^{87}Rb is 1.42 Δ 10^{411} $year^{41}$, and time before present (t) is 1000 million years. The value of the initial ratio $(^{87}Sr/^{86}Sr)_0$ is _____.

Q.40 The $\div G^0$ of a reaction 2 Fe_3O_4 + 0.5 O_2 = 3 Fe_2O_3 at 300°C and 500 bars is 440.657 kilo calories. The value of the logarithm of oxygen (ÌÏÇ$\tilde{}$) at that temperature and pressure is _____.

Q.41 Match the types of mineralization in Group-I with their appropriate tectonic settings in Group-II. (VMS stands for volcanogenic massive sulfide)

Group I	**Group II**
P. Cyprus-type VMS	1. Island Arc
Q. Kuroko-type VMS	2. Continental Arc
R. Porphyry copper	3. Intraplate
S. Diamond in Kimberlite	4. Mid Oceanic Ridge

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

Q.42 Clay minerals and Fe-oxide minerals, products of hydrothermal alteration and supergene oxidation, are good indicators of mineralization. Choose the CORRECT Thematic Mapper (TM) band ratio images for detection of these minerals.

(A) band ratio 5/7 for clay and 3/1 for Fe-oxide minerals
(B) band ratio 3/1 for clay and 5/7 for Fe-oxide minerals
(C) band ratio 3/7 for clay and 5/1 for Fe-oxide minerals
(D) band ratio 5/1 for clay and 3/7 for Fe-oxide minerals

Q.43 The age range of reservoir rock in Cambay oil field is _____.

(A) 34 – 15 million years
(B) 56 – 34 million years
(C) 65 – 56 million years
(D) 100 – 65 million years

Q.44 Which one of the following statements is CORRECT in all respects for the amphibole glaucophane, $Na_2Mg_3Al_2Si_8O_{22}(OH)_2$?

(A) Na is in the M4-site, Al is in octahedral coordination and Si is in tetrahedral coordination.
(B) Na is in the A-site, both Al and Si are in tetrahedral coordination.
(C) Na is in the M4-site, Al is partly in octahedral and partly in tetrahedral coordination, Si is in tetrahedral coordination.
(D) Na is in the A-site, both Al and Si are in octahedral coordination.

Q.45 Choose the CORRECT modern analog of Besshi type VMS (volcanogenic massive sulfide) deposits (all these are ocean floor rift zones).

(A) 21°N East Pacific Rise (EPR)
(B) Guaymas Basin
(C) Lau Basin
(D) Trans Atlantic Geotraverse (TAG)

Q.46 Which one of the following options is arranged in the CORRECT increasing order of Vicker's micro-hardness?

(A) galena < chalcopyrite < sphalerite < magnetite
(B) sphalerite < galena < magnetite < chalcopyrite
(C) galena < magnetite < chalcopyrite < sphalerite
(D) sphalerite < magnetite < chalcopyrite < galena

Q.47 The (^{18}O / ^{16}O) of a quartz sample yields a value of 0.0019. The value of $\delta^{18}O$ of the quartz sample is _____. (Use the value of the ratio in VSMOW as 0.002005.)

Q.48 The ionic strength of a solution having 0.5 molal NaCl and 0.25 molal $CaCl_2$ is _____ molal.

Q.49 During which stage of coalification is most of the methane gas generated?

(A) Lignite (B) Peat (C) Bituminous (D) Anthracite

Q.50 The figure shows the liquidus phase relations in the forsterite-anorthite-silica system at 1 bar pressure. From the options below, identify the CORRECT reaction that takes place at the isobaric invariant point P.

(A) Liquid (at P) = Forsterite + Anorthite + Enstatite
(B) Liquid (at P) + Forsterite = Anorthite + Enstatite
(C) Liquid (at P) + Forsterite + Anorthite = Enstatite
(D) Liquid (at P) = Forsterite + Anorthite + Silica polymorph

Q.51 A garnet peridotite contains 2400 ppm of nickel. After 20% partial melting, a basaltic melt is generated, leaving a residue comprising 60% olivine, 30% orthopyroxene and 10% clinopyroxene. Given the K_D^{Ni} (olivine) = 10, K_D^{Ni} (orthopyroxene) = 4 and K_D^{Ni} (clinopyroxene) = 2, the nickel concentration in the melt, assuming equilibrium batch melting, is _____ ppm.

Q.52 Which one of the following mineral assemblages is stable in a pelitic rock in the greenschist facies?

(A) Albite-epidote-actinolite-chlorite-quartz
(B) Muscovite-biotite-garnet-quartz
(C) Tremolite-talc-calcite-quartz
(D) Muscovite-biotite-garnet-sillimanite-quartz

Q.53 Match the co-existing mineral pairs in Group I with the diagnostic metamorphic conditions they are associated with in Group II.

Group I	Group II
P. Talc-phengite	1. Ultrahigh temperature
Q. Cordierite-andalusite	2. Very low temperature
R. Spinel-quartz	3. Ultrahigh pressure
S. Laumontite-wairakite	4. Low pressure, high temperature

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

Q.54 Out of the following symmetry elements, which one is present in all classes of the cubic system?

(A) Four axes of 3-fold symmetry
(B) Three axes of 4-fold symmetry
(C) Six axes of 2-fold symmetry
(D) Three mirror planes

Q.55 Match the minerals in Group-I with their optical properties in Group-II.

Group I	Group II
P. Calcite	1. Uniaxial negative, low birefringence, high relief
Q. Nepheline	2. Uniaxial negative, high birefringence, moderately high relief
R. Apatite	3. Uniaxial positive, low birefringence, low relief
S. Quartz	4. Uniaxial negative, low birefringence, low relief

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

Section-2 (Geophysics): Optional Section

Q. 26 – Q. 55 carry two marks each.

Q.26 Depth migration is applied to a stacked seismic section. Compared to the stacked section, dipping events in the migrated section

(A) have a steeper slope and move updip.
(B) remain unchanged.
(C) have a gentler slope and move downdip.
(D) have a steeper slope and move downdip.

Q.27 A monochromatic elastic wave of frequency 20 Hz propagates in a medium with average velocity 3 km/s. For zero offset reflection from horizontal reflectors, the thickness of the vertical first Fresnel zone is _____ m.

Q.28 The following figure shows a seismic reflection experiment above a reflector that dips 45°. The P-wave velocity in the medium is constant and equal to 2 km/s. The source is kept at location 'S' and the receiver is kept at location 'G'. The midpoint between S and G is denoted by 'M' and the depth to the reflector from 'M' is 1 km. The travel time of the primary reflected arrival recorded at the receiver is equal to____ seconds.

Q.29 Given a seismic wavelet w = { 6, 4, 2 } and reflectivity series s = { 0, 1, 0 }, the corresponding seismic trace is _____.

(A) { 0, 4, 0, 0, 0 } (B) { 0, 2, 4, 6, 0 } (C) { 0, 6, 0, 0, 0 } (D) { 0, 6, 4, 2, 0 }

Q.30 The time period of the signal $s(t) = \sin(\frac{\pi}{3}t) + \cos(\frac{\pi}{2}t)$ is _____ seconds.

Q.31 Assertion (a): The inverse of a minimum phase wavelet is causal and stable.

Reason (r): The Z-transform of a minimum phase wavelet has all its zeros outside the unit circle.

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

Q.32 The value of free-air correction (assuming sea level as datum plane) at an elevation of 150 m is _____ mGal.

Q.33 A spherical cavity of radius 8 m has its centre 15 m below the surface. If the cavity is full of sediments of density 1.5×10^3 kg/m^3 and is in a rock body of density 2.4×10^3 kg/m^3, the maximum value of its gravity anomaly is _____ mGal.

Q.34 Match the items (listed in Group I) with the corresponding corrections applied for reduction of marine gravity data (listed in Group II).

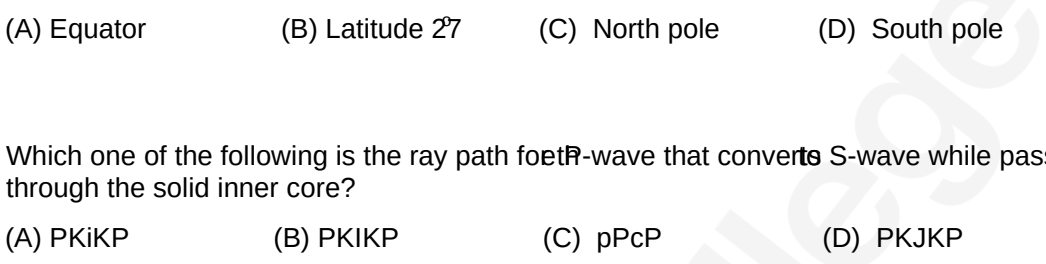
Group I	Group II
P. Effect of rotating homogeneous ellipsoidal Earth	1. Drift correction
Q. Effect of deficit mass from mean sea level to average depth to ocean floor	2. Latitude correction
R. Effect of relative motion of ship with respect to revolving Earth	3. Bouguer correction
S. Effect of elastic creep of gravimeter spring system and Earth tides	4. Eotvos correction

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

Q.35 Which one of the following Natural Remanent Magnetization (NRM) gives a primary, stable magnetization for igneous rocks?

(A) Depositional Remanent Magnetization (DRM)
(B) Thermo Remanent Magnetization (TRM)
(C) Chemical Remanent Magnetization (CRM)
(D) Isothermal Remanent Magnetization (IRM)

Q.36 The following figure shows the total magnetic field intensity anomaly above a spherical body polarized by the present day geomagnetic field. From among the options below, identify the region in which such an anomaly could be observed.



(A) Equator (B) Latitude 27° (C) North pole (D) South pole

Q.37 Which one of the following is the ray path for a P-wave that converts to S-wave while passing through the solid inner core?

(A) PKiKP (B) PKIKP (C) pPcP (D) PKJKP

Q.38 Which one of the following statements is CORRECT for the stress drop of an earthquake?

(A) Large slip on a small fault will cause more stress drop.
(B) Small slip on a large fault will cause more stress drop.
(C) Stress drop is inversely proportional to the slip of the fault.
(D) Stress is directly proportional to the rupture dimension.

Q.39 The energy released by an earthquake of magnitude 7 is _____ times the energy released by an earthquake of magnitude 4 (use Kanamori's formula).

Q.40 In resistivity logging using a 'Normal device', the distance between electrodes A and M is 0.40 m. If 20 mA current generates 10 mV potential, the apparent resistivity of the layer between the electrodes is _____ Ωm. (Use π = 3.14)

Q.41 A cylindrical sandstone core sample of diameter 0.20 m and length 0.04 m is fully saturated with brine solution of resistivity 0.5 Ωm. The resistance of the saturated sample measured in the laboratory is 500 Ω. The formation factor of the sample is _____. (Use π = 3.14)

Q.42 A Schlumberger array with current electrode separation 50 m and potential electrode separation 5 m is placed over an inhomogeneous medium. If the measured potential difference is 50 mV and the computed apparent resistivity is 100 Ωm, then the magnitude of current passing through the subsurface is _____ mA. (Use π = 3.14)