GATE Geology and Geophysics – Geology

Sample Paper – 1

Duration: 128 Minutes **Maximum Marks: 72**

Instructions

- This paper contains **46 questions** covering the core **Geology** stream of the GATE Geology and Geophysics paper conducted by the IITs and IISc (General Aptitude and the common section are provided as separate papers).
- **Q1–Q20 carry 1 mark each** and **Q21–Q46 carry 2 marks each**, for a total of **72 marks**.
- Each question carries **negative marking of one-third of its allotted marks**: a wrong 1-mark question costs **0.33** and a wrong 2-mark question costs **0.67**. Unattempted questions carry no penalty.
- Every question here is a single-correct **MCQ**. The real GATE paper also has Multiple Select (MSQ) and Numerical Answer Type (NAT) questions, and **those carry no negative marking**.
- Attempt this paper in one timed sitting of about **128 minutes**, the share this core subject earns at GATE's overall pace of 180 minutes for 65 questions. Unless stated otherwise, take the acceleration due to gravity as $g = 9.81$ m/s^2 and the unit weight of water as 9.81 kN/m^3.

Mineralogy and Crystallography

Q1. On the Mohs scale of relative hardness, the mineral that defines the maximum value of 10 (the hardest) is: **[1 mark]**

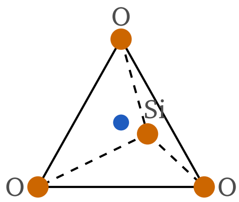
(A) Corundum

(B) Diamond

(C) Topaz

(D) Quartz

Q2. The fundamental building block of every silicate mineral is a tetrahedron consisting of one central silicon atom bonded to a number of surrounding oxygen atoms, as sketched. That number of oxygen atoms is: **[1 mark]**



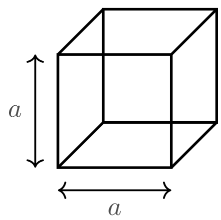
(A) 4

(B) 6

(C) 2

(D) 8

Q3. A crystal referred to three mutually perpendicular crystallographic axes that are all of equal length ($a = b = c$, $\alpha = \beta = \gamma = 90°$), as shown, belongs to which crystal system? **[1 mark]**



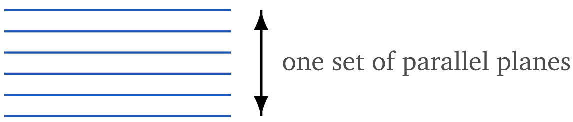
(A) Tetragonal

(B) Isometric (cubic)

(C) Orthorhombic

(D) Hexagonal

Q4. Muscovite mica splits into thin, flexible, elastic sheets, as indicated by the parallel planes below. The number of directions of perfect cleavage that produces these sheets is: **[1 mark]**



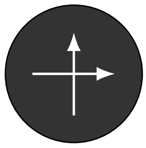
(A) Three at $90°$

(B) Two

(C) Four

(D) One

Q5. Under crossed polarisers (crossed nicols) on a petrological microscope, a mineral grain stays completely dark (extinct) in every position as the microscope stage is rotated through $360°$. Optically, this mineral is: **[1 mark]**



dark in all positions

(A) Uniaxial

(B) Biaxial

(C) Isotropic

(D) Anisotropic

Q6. Among the following common minerals, which one has the highest specific gravity? **[1 mark]**

(A) Quartz

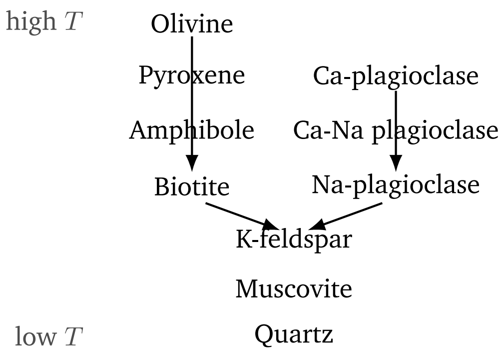
(B) Calcite

(C) Orthoclase feldspar

(D) Galena

Igneous and Metamorphic Petrology

Q7. In Bowen's reaction series, shown below, the first mineral to crystallise at the highest temperature along the discontinuous (ferromagnesian) branch is: **[1 mark]**



(A) Biotite

(B) Quartz

(C) Pyroxene

(D) Olivine

Q8. An igneous rock in which the individual mineral crystals are too small to be distinguished with the unaided eye, a texture produced by rapid cooling of lava at or near the surface, is described as: **[1 mark]**

(A) Aphanitic

(B) Phaneritic

(C) Porphyritic

(D) Pegmatitic

Q9. An igneous rock that contains more than about 66% silica (SiO_2) by weight, such as granite, is classified compositionally as: **[1 mark]**

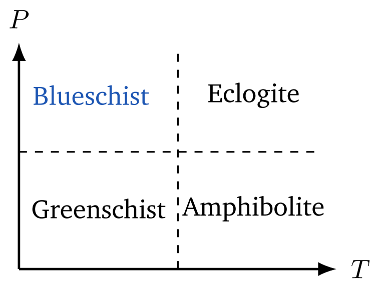
(A) Ultramafic

(B) Basic

(C) Acidic

(D) Intermediate

Q10. On the pressure–temperature grid of metamorphic facies shown, the field occupying high pressure but relatively low temperature, characteristic of subduction-zone metamorphism, corresponds to the: **[1 mark]**



(A) Blueschist facies

(B) Granulite facies

(C) Greenschist facies

(D) Amphibolite facies

Q11. Regional metamorphism of a shale (mudrock) at low grade produces a very fine-grained, well-foliated rock that splits readily into thin, flat sheets along a slaty cleavage. This rock is: **[1 mark]**

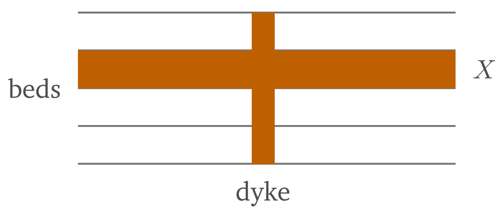
(A) Slate

(B) Gneiss

(C) Marble

(D) Quartzite

Q12. The concordant tabular igneous body labelled X in the cross-section, which was injected parallel to the bedding planes of the layered host rock, is a: **[1 mark]**



(A) Dyke

(B) Batholith

(C) Laccolith

(D) Sill

Sedimentology and Stratigraphy

Q13. A clastic sedimentary rock built of rounded gravel-sized clasts (diameter greater than 2 mm) set in a finer matrix and cemented together is called: **[1 mark]**

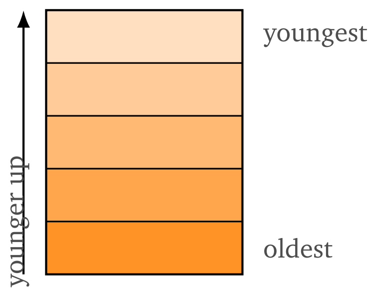
(A) Sandstone

(B) Shale

(C) Conglomerate

(D) Siltstone

Q14. The stratigraphic column shows an undisturbed, right-way-up sequence of sedimentary beds. The law of superposition tells us that: **[1 mark]**



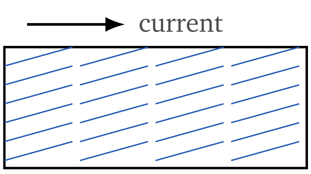
(A) All the beds are exactly the same age

(B) The youngest bed is at the bottom

(C) The oldest bed is at the bottom and the youngest at the top

(D) The relative age of the beds cannot be established

Q15. The inclined internal laminae within the sandstone bed shown (cross-bedding) are a primary sedimentary structure that is most useful for interpreting: **[1 mark]**



(A) That deposition was only marine

(B) That the rock was metamorphosed

(C) That the rock has an igneous origin

(D) The direction of the ancient current flow

Q16. A sandstone in which nearly all of the grains fall within a narrow, uniform range of sizes is described texturally as: **[1 mark]**

(A) Poorly sorted

(B) Well sorted

(C) Unsorted

(D) Graded

Q17. On the Wentworth grain-size scale, detrital particles with diameters between $\frac{1}{16}$ mm and 2 mm are classified as: **[1 mark]**

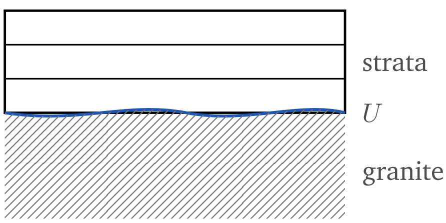
(A) Silt

(B) Sand

(C) Gravel

(D) Clay

Q18. The surface labelled U separates flat-lying sedimentary strata above from eroded, non-stratified granite below, as shown. This type of unconformity is a: **[1 mark]**



(A) Nonconformity

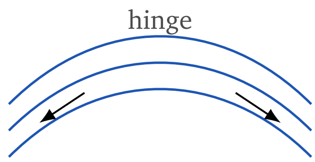
(B) Angular unconformity

(C) Disconformity

(D) Paraconformity

Structural Geology and Geotectonics

Q19. In the fold profile shown, the strata are arched upward, the two limbs dip away from the hinge, and the oldest beds occupy the core. This structure is an: **[1 mark]**



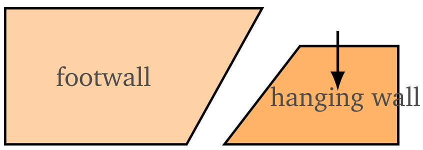
(A) Syncline

(B) Monocline

(C) Recumbent fold

(D) Anticline

Q20. In the fault block shown, the hanging wall has moved down relative to the footwall along a fault plane that dips steeply, in response to extensional (tensional) stress. This fault is a: **[1 mark]**



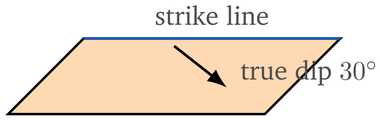
(A) Normal fault

(B) Reverse fault

(C) Thrust fault

(D) Strike-slip fault

Q21. An inclined planar bed has a true dip of $30°$. If the apparent dip is measured in a vertical cliff section whose trend is oblique to (not perpendicular to) the strike, the apparent dip angle will be: **[2 marks]**



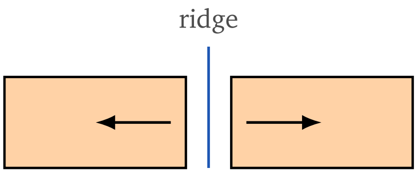
(A) Greater than 30°

(B) Less than 30°

(C) Exactly equal to 30°

(D) Exactly 90°

Q22. At the plate boundary shown, two plates move apart and fresh basaltic crust is created along a mid-ocean ridge between them. This is a: **[2 marks]**



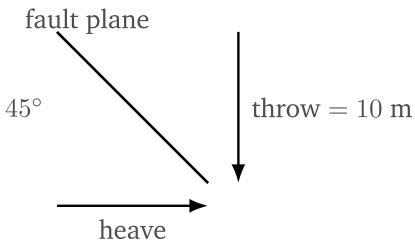
(A) Convergent boundary

(B) Transform boundary

(C) Divergent boundary

(D) Subduction zone

Q23. A normal fault dips at $45°$ and has a vertical throw of 10 m, as shown. The heave (the horizontal component of the net slip) is given by heave $=$ throw$/\tan$(dip). Its value is: **[2 marks]**



(A) 10 m

(B) 14.1 m

(C) 5 m

(D) 20 m

Q24. The Indian Plate is moving northward at an average rate of about 5 cm per year. Assuming this rate is constant, the northward distance it travels in 2 million years is: **[2 marks]**

(A) 10 km

(B) 1000 km

(C) 50 km

(D) 100 km

Palaeontology and Historical Geology

Q25. For a fossil species to serve as an ideal index (guide) fossil for stratigraphic correlation over large areas, it should have: **[2 marks]**

(A) A narrow geographic distribution and a long time range

(B) A long geologic time range irrespective of distribution

(C) A wide geographic distribution and a short time range

(D) Restriction to a single deep-sea benthic habitat

Q26. On the standard geological time scale, the period of the Cenozoic Era in which we are living at present is the: **[2 marks]**

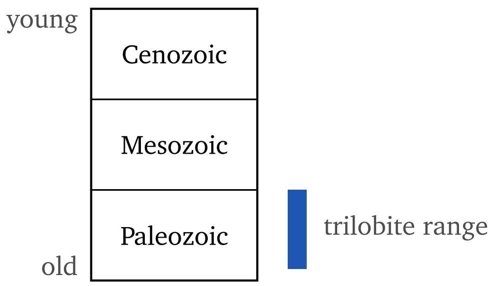
(A) Neogene

(B) Cretaceous

(C) Jurassic

(D) Quaternary

Q27. The stratigraphic range chart below shows the total time span of trilobites, a classic index-fossil group of marine arthropods. Trilobites finally became extinct at the close of which era? **[2 marks]**



(A) Cenozoic

(B) Mesozoic

(C) Paleozoic

(D) Precambrian

Q28. The mass extinction that eliminated the non-avian dinosaurs and many marine groups, and is marked by a worldwide iridium anomaly, occurred at the boundary between the: [2 marks]

(A) Permian and Triassic periods

(B) Triassic and Jurassic periods

(C) Cretaceous and Paleogene periods

(D) Jurassic and Cretaceous periods

Q29. The branch of stratigraphy that uses the vertical distribution of fossil assemblages in rock strata to subdivide and correlate the succession is called: [2 marks]

(A) Biostratigraphy

(B) Lithostratigraphy

(C) Chronostratigraphy

(D) Magnetostratigraphy

Q30. The earliest era of the Phanerozoic Eon, which opens with the Cambrian "explosion" of abundant shelly marine life, is the: [2 marks]

(A) Paleozoic

(B) Mesozoic

(C) Cenozoic

(D) Proterozoic

Economic Geology and Mineral Resources

Q31. The principal ore mineral of iron that is an oxide with the chemical formula Fe_2O_3 and a characteristic cherry-red streak is: **[2 marks]**

(A) Magnetite

(B) Hematite

(C) Galena

(D) Bauxite

Q32. The chief ore of aluminium, a residual deposit formed by intense chemical weathering of aluminium-rich rocks in humid tropical climates, is: **[2 marks]**

(A) Chalcopyrite

(B) Cassiterite

(C) Sphalerite

(D) Bauxite

Q33. Among the ranks of coal listed, the one with the highest fixed-carbon content and calorific value, formed under the greatest heat and pressure, is: **[2 marks]**

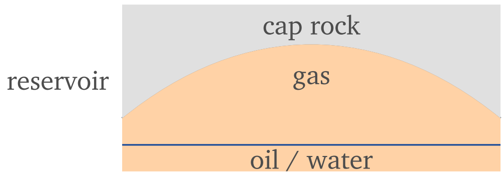
(A) Peat

(B) Lignite

(C) Bituminous coal

(D) Anthracite

Q34. In the anticlinal petroleum trap shown, the impermeable rock unit that seals the crest and prevents the upward escape of hydrocarbons from the reservoir is the: **[2 marks]**



(A) Reservoir rock

(B) Cap rock

(C) Source rock

(D) Basement rock

Q35. Economic concentrations of chromite and platinum-group elements in layered mafic-ultramafic intrusions are formed chiefly by the early crystallisation and gravitational settling of dense minerals in the cooling magma. This ore-forming process is called: **[2 marks]**

(A) Placer deposition

(B) Residual (weathering) concentration

(C) Magmatic segregation

(D) Evaporite precipitation

Q36. Deposits of gold, diamond and cassiterite that are concentrated by their high density in the gravels and sands of river channels are known as: **[2 marks]**

(A) Hydrothermal vein deposits

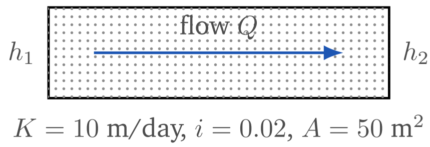
(B) Skarn deposits

(C) Porphyry deposits

(D) Placer deposits

Hydrogeology and Engineering Geology

Q37. Groundwater flows horizontally through the sand column shown. By Darcy's law $Q = K\,i\,A$, with hydraulic conductivity $K = 10$ m/day, hydraulic gradient $i = 0.02$ and cross-sectional area $A = 50$ m^2, the discharge Q is: **[2 marks]**



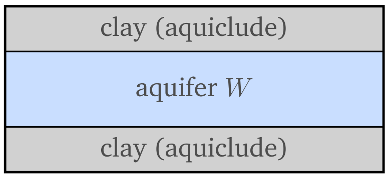
(A) 1 m^3/day

(B) 10 m^3/day

(C) 100 m^3/day

(D) 5 m^3/day

Q38. The aquifer labelled W in the section shown is bounded both above and below by impermeable clay layers (aquicludes), so that the water in it is held under pressure greater than atmospheric. Such an aquifer is: **[2 marks]**



(A) A confined aquifer

(B) An unconfined aquifer

(C) A perched aquifer

(D) An aquiclude

Q39. A clay layer can store a large volume of water in its pore spaces yet allows almost no water to pass through it. Such a material is best described as having: **[2 marks]**

(A) High permeability but low porosity

(B) High porosity but low permeability

(C) Both high porosity and high permeability

(D) Both low porosity and low permeability

Q40. When a rock mass is assessed as a foundation material for a heavy structure, the single property that best indicates its ability to resist crushing under load is its: **[2 marks]**

(A) Porosity

(B) Unconfined compressive strength

(C) Colour

(D) Streak

Q41. A cylindrical rock core has a total (bulk) volume of 100 cm^3 and a measured pore volume of 25 cm^3. Its porosity, expressed as a percentage, is: **[2 marks]**

(A) 4%

(B) 75%

(C) 25%

(D) 50%

Geochemistry, Geomorphology and Remote Sensing

Q42. By weight percentage, the single most abundant chemical element in the Earth's continental crust is: **[2 marks]**

(A) Silicon

(B) Oxygen

(C) Aluminium

(D) Iron

Q43. The chemical weathering reaction in which feldspar reacts with (slightly acidic) water and is converted into clay minerals such as kaolinite, with release of dissolved ions, is an example of: **[2 marks]**

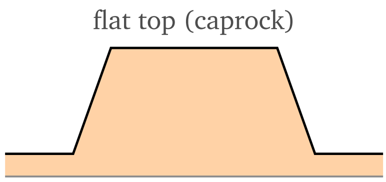
(A) Hydrolysis

(B) Oxidation

(C) Carbonation

(D) Exfoliation

Q44. The flat-topped, steep-sided erosional landform shown in profile, common in arid plateau regions and larger in top area than a butte, is a: **[2 marks]**



(A) Mesa

(B) Meander

(C) Delta

(D) Drumlin

Q45. In multispectral remote sensing, healthy green vegetation is most readily distinguished from soil and water because it reflects very strongly in which region of the electromagnetic spectrum? **[2 marks]**

(A) Blue

(B) Near-infrared

(C) Thermal infrared

(D) Microwave

Q46. In Goldschmidt's geochemical classification of the elements, those that have a strong affinity for sulphur and concentrate in sulphide phases (for example Cu, Zn, Pb) are grouped as: **[2 marks]**

(A) Lithophile

(B) Siderophile

(C) Chalcophile

(D) Atmophile

Detailed Solutions

Q1.

Solution

Concept – the Mohs scale of hardness: The Mohs scale ranks minerals from 1 (softest) to 10 (hardest) by their resistance to scratching.

Step 1 – recall the top of the scale: Talc $= 1$, gypsum $= 2$, and so on up to the hardest natural mineral.

Step 2 – identify hardness 10: The mineral defined as hardness 10 is diamond.

Step 3 – place the distractors: Corundum is 9, topaz is 8, quartz is 7.

Why the other options are wrong:

- A, corundum: is hardness 9, one step below diamond.
- C, topaz: is hardness 8.
- D, quartz: is hardness 7.

Final Answer: Diamond, hardness 10 $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q1

Q2.

Solution

Concept – the silica tetrahedron: Every silicate mineral is built from a basic unit in which a small silicon cation sits at the centre of a tetrahedron of oxygen anions.

Step 1 – recall the geometry: A tetrahedron has four corners (vertices).

Step 2 – place the oxygen atoms: One oxygen atom sits at each of the four corners.

Step 3 – write the unit: The unit is $(SiO_4)^{4-}$, so silicon is bonded to 4 oxygen atoms.

Step 4 – check the charge balance: Si contributes $+4$ and four O contribute $4 \times (-2) = -8$, giving a net charge of -4, consistent with the $(SiO_4)^{4-}$ ion.

Final Answer: 4 oxygen atoms $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q2

Q3.

Solution

Concept – crystal systems are defined by axial lengths and angles: The seven crystal systems are distinguished by the relative lengths of the crystallographic axes and the angles between them.

Step 1 – read the given conditions: Three axes, all mutually perpendicular ($\alpha = \beta = \gamma = 90°$).

Step 2 – read the length condition: All three axes are of equal length, $a = b = c$.

Step 3 – match to the system table: Equal axes at right angles define the isometric (cubic) system.

Why the other options are wrong:

- A, tetragonal: has two equal axes and one different ($a = b \neq c$).
- C, orthorhombic: has three unequal axes at $90°$ ($a \neq b \neq c$).
- D, hexagonal: has four axes and $120°$ inter-axial angles.

Final Answer: Isometric (cubic) system $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q3

Q4.

Solution

Concept – cleavage in the mica group: Cleavage is the tendency of a mineral to break along planes of weak bonding.

Step 1 – recall the mica structure: Micas are sheet (phyllo-) silicates with strongly bonded tetrahedral–octahedral sheets stacked on top of one another.

Step 2 – identify the weak planes: The bonds between the stacked sheets are weak, so breakage occurs along planes parallel to those sheets.

Step 3 – count the directions: All these weak planes are parallel to a single orientation, so there is only one direction of perfect (basal) cleavage.

Step 4 – confirm the result: This single perfect cleavage is why muscovite peels into thin, flexible sheets.

Final Answer: One direction of perfect cleavage $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q4

Q5.

Solution

Concept – behaviour under crossed polarisers: Between crossed polarisers, a mineral appears bright (shows interference colours) only if it can split light into two rays with different velocities (birefringence).

Step 1 – interpret "dark in all positions": A grain that never brightens on rotation is not splitting the light; it has no birefringence.

Step 2 – relate to optical class: Minerals with a single refractive index in every direction are optically isotropic (they belong to the cubic system or are amorphous).

Step 3 – conclude: Because the grain stays extinct throughout a full 360° rotation, it is isotropic.

Why the other options are wrong:

- A and B, uniaxial and biaxial: are subclasses of anisotropic minerals, which do brighten and go extinct four times per rotation.
- D, anisotropic: brightens between the extinction positions, so it is not dark throughout.

Final Answer: The mineral is isotropic $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q5

Q6.

Solution

Concept – specific gravity reflects atomic packing and heavy elements: Minerals rich in heavy metals such as lead have much higher specific gravities than common rock-forming silicates and carbonates.

Step 1 – list typical specific gravities: Quartz ≈ 2.65.

Calcite ≈ 2.71.

Orthoclase feldspar ≈ 2.56.

Galena (PbS) ≈ 7.5.

Step 2 – compare the values: 7.5 is far greater than 2.56, 2.65 and 2.71.

Step 3 – select the largest: Galena, a lead sulphide, has the highest specific gravity of the four.

Final Answer: Galena, S.G. $\approx 7.5 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q6

Q7.

Solution

Concept – Bowen's reaction series: Bowen's series lists the order in which minerals crystallise from a cooling mafic magma, with a discontinuous (ferromagnesian) branch and a continuous (plagioclase) branch.

Step 1 – identify the branch asked about: The discontinuous branch is the ferromagnesian (dark-mineral) branch.

Step 2 – read the top of that branch: The highest-temperature mineral on the discontinuous branch is olivine.

Step 3 – order the rest for context: Olivine is followed by pyroxene, then amphibole, then biotite as temperature falls.

Why the other options are wrong:

- A, biotite: crystallises near the bottom (low temperature) of the branch.
- B, quartz: is the very last mineral to form, at the lowest temperature.
- C, pyroxene: forms just after olivine, not first.

Final Answer: Olivine crystallises first $\Rightarrow$ $\boxed{D}$

Answer: (D) Go Back to Q7

Q8.

Solution

Concept – igneous textures record cooling rate: The grain size of an igneous rock depends mainly on how fast the magma cooled.

Step 1 – interpret "too small to see": Crystals invisible to the naked eye indicate very rapid cooling, which allows only tiny crystals to grow.

Step 2 – name the texture: A uniformly fine-grained, invisible-crystal texture is called aphanitic.

Step 3 – link to occurrence: Aphanitic textures are typical of volcanic (extrusive) rocks such as basalt.

Why the other options are wrong:

- B, phaneritic: has coarse, visible crystals from slow, deep cooling (e.g. granite).

- C, porphyritic: has large crystals set in a finer groundmass (two cooling stages).
- D, pegmatitic: has exceptionally large crystals.

Final Answer: Aphanitic texture $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q8

Q9.

Solution

Concept – silica-content classification of igneous rocks: Igneous rocks are grouped by weight percentage of silica: ultramafic ($< 45\%$), basic (45–52%), intermediate (52–66%) and acidic ($> 66\%$).

Step 1 – read the given silica content: The rock has more than 66% SiO_2.

Step 2 – match to the class boundary: $> 66\%$ silica falls in the acidic (felsic) class.

Step 3 – confirm with the example: Granite is the classic acidic (silica-rich) rock, consistent with the description.

Why the other options are wrong:

- A, ultramafic: less than 45% silica.
- B, basic: 45–52% silica.
- D, intermediate: 52–66% silica.

Final Answer: Acidic rock $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q9

Q10.

Solution

Concept – metamorphic facies on a P–T grid: Each metamorphic facies occupies a distinct field of pressure and temperature.

Step 1 – read the requested field: High pressure combined with relatively low temperature.

Step 2 – link to a tectonic setting: High-P, low-T conditions occur where cold crust is pushed down rapidly in a subduction zone.

Step 3 – name the facies: The facies of that field is the blueschist facies, named for the blue amphibole glaucophane.

Why the other options are wrong:

- B, granulite: is high temperature (and moderate–high pressure).
- C, greenschist: is low pressure and low temperature.
- D, amphibolite: is moderate to high temperature at intermediate pressure.

Final Answer: Blueschist facies $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q10

Q11.

Solution

Concept – prograde metamorphism of pelitic rocks: As a shale is metamorphosed to progressively higher grade it passes through slate, then phyllite, then schist, then gneiss.

Step 1 – read the clues: Very fine grain size, low grade, and splitting into thin flat sheets along a slaty cleavage.

Step 2 – match to the sequence: The lowest-grade, fine-grained, slaty-cleavage rock is slate.

Step 3 – confirm: Slate is the first metamorphic product of shale and is used for roofing because of its perfect slaty cleavage.

Why the other options are wrong:

- B, gneiss: is high grade with coarse compositional banding.
- C, marble: forms from limestone, not shale.
- D, quartzite: forms from sandstone, not shale.

Final Answer: Slate $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q11

Q12.

Solution

Concept – shapes of shallow igneous intrusions: Intrusions are described as concordant (parallel to bedding) or discordant (cutting across bedding).

Step 1 – read the geometry: Body X is tabular and lies parallel to the bedding planes, so it is concordant.

Step 2 – match the concordant tabular body: A concordant, sheet-like intrusion parallel to bedding is a sill.

Step 3 – contrast with the dyke in the figure: The vertical body cutting across the beds is a dyke (discordant), which confirms X is the concordant one, the sill.

Why the other options are wrong:

- A, dyke: is discordant (cuts across bedding).
- B, batholith: is a very large, deep, discordant plutonic mass.
- C, laccolith: is concordant but lens-shaped and domes the overlying beds upward.

Final Answer: Sill $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q12

Q13.

Solution

Concept – clastic rocks are named by clast size: Clastic sedimentary rocks are classified by the diameter of their component grains.

Step 1 – read the clast size: Rounded clasts larger than 2 mm are gravel-sized.

Step 2 – name the rock made of gravel: A cemented rock of rounded gravel clasts is a conglomerate.

Step 3 – note the angular counterpart: If the gravel clasts were angular the rock would instead be a breccia.

Why the other options are wrong:

- A, sandstone: grains $\frac{1}{16}$–2 mm.
- B, shale: clay-sized particles, fissile.
- D, siltstone: silt-sized particles ($\frac{1}{256}$–$\frac{1}{16}$ mm).

Final Answer: Conglomerate $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q13

Q14.

Solution

Concept – law of superposition: In any undisturbed sequence of sedimentary strata, each bed is younger than the one beneath it and older than the one above it.

Step 1 – apply it to the base: The bottom bed was deposited first, so it is the oldest.

Step 2 – apply it to the top: Each successive bed is deposited on top, so the topmost bed is the youngest.

Step 3 – state the relationship: Therefore the oldest bed is at the bottom and the youngest at the top.

Why the other options are wrong:

- A: superposition orders the beds in time, so they are not all the same age.
- B: reverses the correct order.
- D: in an undisturbed sequence the order is precisely determinable.

Final Answer: Oldest at bottom, youngest at top $\Rightarrow \boxed{C}$

Answer: (C) Go Back to Q14

Q15.

Solution

Concept – cross-bedding as a palaeocurrent indicator: Cross-beds are inclined laminae deposited on the downstream (lee) face of migrating ripples or dunes.

Step 1 – read what the laminae record: The laminae dip in the direction the transporting current was moving.

Step 2 – interpret the structure: By measuring the dip direction of the foresets, geologists reconstruct the ancient current (palaeocurrent) direction.

Step 3 – conclude: So cross-bedding is most useful for determining the direction of the ancient current flow.

Why the other options are wrong:

- A: cross-bedding forms in rivers, deserts and coasts, not only in marine set-

tings.
- B and C: cross-bedding is a sedimentary (not metamorphic or igneous) feature.

Final Answer: Direction of the ancient current flow $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q15

Q16.

Solution

Concept – sorting describes the spread of grain sizes: Sorting measures how uniform the grain sizes in a sediment are.

Step 1 – read the description: Grains lie in a narrow, uniform size range.

Step 2 – assign the sorting term: A narrow size range means the sediment is well sorted.

Step 3 – link to process: Good sorting reflects prolonged or energetic transport (for example by wind or waves) that separates grains by size.

Why the other options are wrong:

- A and C, poorly sorted / unsorted: describe a wide mix of grain sizes.
- D, graded: describes a systematic vertical change in size within one bed, not uniformity.

Final Answer: Well sorted $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q16

Q17.

Solution

Concept – the Wentworth grain-size scale: The Wentworth scale sets standard diameter limits for clay, silt, sand and gravel.

Step 1 – recall the sand limits: Sand is defined from $\frac{1}{16}$ mm (0.0625 mm) up to 2 mm.

Step 2 – compare with the question: The given range $\frac{1}{16}$ mm to 2 mm exactly matches the sand class.

Step 3 – conclude: Therefore the particles are classified as sand.

Why the other options are wrong:

- A, silt: $\frac{1}{256}$–$\frac{1}{16}$ mm.
- C, gravel: greater than 2 mm.
- D, clay: finer than $\frac{1}{256}$ mm.

Final Answer: Sand $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q17

Q18.

Solution

Concept – types of unconformity: An unconformity is a buried erosion or non-deposition surface; its type depends on the rocks below it.

Step 1 – read what lies below the surface: Below U are eroded, non-stratified plutonic (granite) rocks.

Step 2 – read what lies above: Above U are flat-lying sedimentary strata.

Step 3 – match to the definition: Sedimentary beds resting on eroded igneous or metamorphic (non-stratified) rock define a nonconformity.

Why the other options are wrong:

- B, angular unconformity: the beds below are tilted and truncated, not the case here.
- C, disconformity: separates two parallel sedimentary sequences across an erosion surface.
- D, paraconformity: a subtle, near-parallel break with no visible erosion, both sides sedimentary.

Final Answer: Nonconformity $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q18

Q19.

Solution

Concept – anticlines versus synclines: Folds are classified by the way the limbs dip and by the age pattern of the beds in the core.

Step 1 – read the fold shape: The strata arch upward and the two limbs dip away from the central hinge.

Step 2 – read the age pattern: The oldest beds occupy the core of the fold.

Step 3 – match to the fold type: Limbs dipping away from the hinge with oldest beds in the core define an anticline.

Why the other options are wrong:

- A, syncline: limbs dip toward the hinge and the youngest beds are in the core.
- B, monocline: a single one-limbed step-like flexure.
- C, recumbent fold: an over-folded structure with a near-horizontal axial plane.

Final Answer: Anticline $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q19

Q20.

Solution

Concept – classifying dip-slip faults: Dip-slip faults are named by the sense of movement of the hanging wall relative to the footwall and by the driving stress.

Step 1 – read the movement sense: The hanging wall has moved down relative to the footwall.

Step 2 – read the stress regime: The movement is caused by extensional (tensional) stress that pulls the crust apart.

Step 3 – match to the fault type: Hanging wall down under extension defines a normal fault.

Why the other options are wrong:

- B, reverse fault: hanging wall moves up under compression.
- C, thrust fault: a low-angle reverse fault (dip $< 45°$).
- D, strike-slip fault: mainly horizontal movement along the strike.

Final Answer: Normal fault $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q20

Q21.

Solution

Concept – apparent dip versus true dip: The true dip is the maximum inclination of a bed, measured perpendicular to strike. An apparent dip is measured in any other vertical section.

Step 1 – write the relationship: $\tan(\text{apparent dip}) = \tan(\text{true dip}) \times \sin\theta$, where θ is the angle between the section and the strike.

Step 2 – note the range of $\sin\theta$: For any oblique section, $0 < \sin\theta < 1$.

Step 3 – apply it: Multiplying $\tan(30^\circ)$ by a factor less than 1 gives a smaller tangent.

Step 4 – conclude: A smaller tangent means a smaller angle, so the apparent dip is less than the true dip of 30°.

Step 5 – state the limiting cases: Only when the section is perpendicular to strike ($\sin\theta = 1$) does the apparent dip equal the true dip; parallel to strike it is 0°.

Final Answer: Apparent dip is less than $30^\circ \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q21

Q22.

Solution

Concept – the three types of plate boundary: Plate boundaries are divergent (plates move apart), convergent (plates move together) or transform (plates slide past).

Step 1 – read the motion: The two plates are moving apart from each other.

Step 2 – read what forms between them: New basaltic crust is created along a mid-ocean ridge in the gap.

Step 3 – match to the boundary type: Plates moving apart with new crust formed at a ridge define a divergent (constructive) boundary.

Why the other options are wrong:

- A, convergent: plates move toward each other and crust is consumed.
- B, transform: plates slide horizontally past each other with no crust created or destroyed.
- D, subduction zone: a specific convergent setting where one plate descends beneath another.

Final Answer: Divergent boundary $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q22

Q23.

Solution

Concept – throw and heave of a fault: For a fault of dip angle δ, the vertical component of the dip separation is the throw and the horizontal component is the heave, related by heave $= \dfrac{\text{throw}}{\tan\delta}$.

Step 1 – list the data: Dip $\delta = 45°$, throw $= 10$ m.

Step 2 – evaluate the tangent: $\tan 45° = 1$

Step 3 – substitute into the formula: heave $= \dfrac{10}{1}$

Step 4 – evaluate: heave $= 10$ m

Step 5 – sanity check: At a $45°$ dip the vertical and horizontal components are equal, so heave equalling the throw of 10 m is consistent.

Final Answer: Heave $= 10$ m $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q23

Q24.

Solution

Concept – distance from a constant plate velocity: Distance equals rate multiplied by time, $d = v \times t$.

Step 1 – list the data: $v = 5$ cm/year, $t = 2 \times 10^6$ years.

Step 2 – multiply rate by time: $d = 5 \times (2 \times 10^6)$

Step 3 – evaluate in centimetres: $d = 10 \times 10^6 = 1 \times 10^7$ cm

Step 4 – convert to metres (1 m $= 100$ cm): $d = \dfrac{1 \times 10^7}{100} = 1 \times 10^5$ m

Step 5 – convert to kilometres (1 km $= 1000$ m): $d = \dfrac{1 \times 10^5}{1000} = 100$ km

Final Answer: $d = 100$ km $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q24

Q25.

Solution

Concept – requirements of a good index fossil: An index (guide) fossil is used to date and correlate strata across wide areas.

Step 1 – geographic requirement: It must be widespread, so the same species can be found in many separate places.

Step 2 – temporal requirement: It must have a short time range, so its presence pins the rock to a narrow interval of geologic time.

Step 3 – combine the two: Therefore the ideal index fossil has a wide geographic distribution and a short time range (and is usually abundant and easily identified).

Why the other options are wrong:

- A: narrow distribution defeats correlation, and a long range gives poor time resolution.
- B: a long range makes the fossil useless for precise dating.
- D: restriction to one habitat limits where it can be found.

Final Answer: Wide distribution and short time range $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q25

Q26.

Solution

Concept – the geologic time scale: The Cenozoic Era is divided into the Paleogene, Neogene and Quaternary periods, from oldest to youngest.

Step 1 – identify the youngest period: The Quaternary is the most recent period, beginning about 2.6 million years ago.

Step 2 – locate the present: We live in the Holocene Epoch, which lies within the Quaternary Period.

Step 3 – conclude: Therefore the present period is the Quaternary.

Why the other options are wrong:

- A, Neogene: the period just before the Quaternary; it has ended.
- B, Cretaceous: the last period of the Mesozoic Era.
- C, Jurassic: a middle period of the Mesozoic Era.

Final Answer: Quaternary Period $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q26

Q27.

Solution

Concept – the range of trilobites: Trilobites are extinct marine arthropods whose fossils span most of the Paleozoic Era.

Step 1 – recall their first appearance: Trilobites appear in the Early Cambrian, at the base of the Paleozoic.

Step 2 – recall their extinction: They died out in the end-Permian mass extinction, which closes the Paleozoic Era.

Step 3 – read the range chart: The shaded bar ends at the top of the Paleozoic box, confirming extinction at the close of the Paleozoic.

Why the other options are wrong:

- A and B, Cenozoic and Mesozoic: trilobites were already extinct before these eras.
- D, Precambrian: precedes the first trilobites.

Final Answer: End of the Paleozoic Era $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q27

Q28.

Solution

Concept – the end-Mesozoic (K–Pg) extinction: The extinction that removed the non-avian dinosaurs is marked worldwide by a thin clay layer enriched in iridium, linked to a large asteroid impact.

Step 1 – identify the era boundary: The dinosaurs vanished at the end of the Cretaceous, the last period of the Mesozoic.

Step 2 – name the periods on either side: The boundary is between the Cretaceous (below) and the Paleogene (above).

Step 3 – conclude: This is the Cretaceous–Paleogene (K–Pg) boundary event.

Why the other options are wrong:

- A, Permian–Triassic: the largest extinction ever, but it predates the dinosaurs' dominance.

- B, Triassic–Jurassic: an earlier extinction that helped dinosaurs rise.
- D, Jurassic–Cretaceous: no major mass extinction of this kind.

Final Answer: Cretaceous–Paleogene boundary $\Rightarrow \boxed{C}$

Answer: (C) Go Back to Q28

Q29.

Solution

Concept – branches of stratigraphy: Stratigraphy is subdivided according to the property used to order and correlate strata.

Step 1 – read the property used: The question uses the vertical distribution of fossil assemblages.

Step 2 – match to the branch: Ordering and correlating strata by their fossil content is biostratigraphy.

Step 3 – confirm the unit: Its basic unit is the biozone, defined by fossil ranges.

Why the other options are wrong:

- B, lithostratigraphy: correlates by rock (lithological) character.
- C, chronostratigraphy: orders strata by their time of formation (age).
- D, magnetostratigraphy: uses the record of magnetic-polarity reversals.

Final Answer: Biostratigraphy $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q29

Q30.

Solution

Concept – the eras of the Phanerozoic Eon: The Phanerozoic is divided, from oldest to youngest, into the Paleozoic, Mesozoic and Cenozoic eras.

Step 1 – identify the earliest era: The Paleozoic is the first (oldest) era of the Phanerozoic.

Step 2 – link to the Cambrian explosion: Its opening period, the Cambrian, records the rapid diversification of shelly marine animals.

Step 3 – conclude: Therefore the earliest Phanerozoic era, beginning with the Cambrian explosion, is the Paleozoic.

Why the other options are wrong:

- B and C, Mesozoic and Cenozoic: later eras of the Phanerozoic.
- D, Proterozoic: an eon before the Phanerozoic, not a Phanerozoic era.

Final Answer: Paleozoic Era $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q30

Q31.

Solution

Concept – iron ore minerals: The two main iron oxides mined for iron are hematite and magnetite, distinguished by formula and streak.

Step 1 – read the formula given: Fe_2O_3.

Step 2 – match the formula: Fe_2O_3 is hematite (magnetite is Fe_3O_4).

Step 3 – confirm with the streak: Hematite has a characteristic cherry-red to reddish-brown streak, exactly as stated.

Why the other options are wrong:

- A, magnetite: Fe_3O_4, strongly magnetic, black streak.
- C, galena: PbS, an ore of lead, not iron.
- D, bauxite: the ore of aluminium, not iron.

Final Answer: Hematite (Fe_2O_3) $\Rightarrow \boxed{B}$

Answer: (B) Go Back to Q31

Q32.

Solution

Concept – the ore of aluminium: Aluminium is extracted mainly from a residual weathering product rich in aluminium hydroxides.

Step 1 – recall the formation: Intense chemical weathering (laterisation) in humid tropical climates leaches silica and leaves aluminium hydroxides behind.

Step 2 – name the residual product: This aluminium-rich residual deposit is bauxite.

Step 3 – conclude: Bauxite is the chief ore of aluminium.

Why the other options are wrong:

- A, chalcopyrite: $CuFeS_2$, the main ore of copper.

- B, cassiterite: SnO_2, the ore of tin.
- C, sphalerite: ZnS, the ore of zinc.

Final Answer: Bauxite $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q32

Q33.

Solution

Concept – the coalification (rank) series: With increasing heat and pressure, plant matter is converted through a series of ranks with rising carbon content: peat $\to$ lignite $\to$ bituminous $\to$ anthracite.

Step 1 – identify the highest rank: The final, highest-rank stage is anthracite.

Step 2 – link rank to properties: Anthracite has the greatest fixed-carbon content and the highest calorific value, and burns with little smoke.

Step 3 – conclude: Therefore the highest-rank coal listed is anthracite.

Why the other options are wrong:

- A, peat: the lowest rank, barely coalified.
- B, lignite: brown coal, low rank and low carbon.
- C, bituminous: intermediate rank, below anthracite.

Final Answer: Anthracite $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q33

Q34.

Solution

Concept – the elements of a petroleum trap: A working oil field needs a source rock, a porous reservoir rock and an impermeable seal (cap rock) in a trapping geometry.

Step 1 – identify the sealing unit: The rock that stops hydrocarbons escaping upward from the reservoir is the impermeable cap rock (seal).

Step 2 – read the figure: The impermeable unit arches over the crest of the anticline above the gas and oil.

Step 3 – conclude: Therefore the sealing unit is the cap rock.

Why the other options are wrong:

- A, reservoir rock: the porous rock that holds the hydrocarbons, not the seal.
- C, source rock: the organic-rich rock in which oil is generated.
- D, basement rock: the crystalline rock beneath the sedimentary basin.

Final Answer: Cap rock $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q34

Q35.

Solution

Concept – magmatic ore-forming processes: Some ore deposits form directly from a cooling magma as early-crystallising dense minerals settle out.

Step 1 – read the process described: Early crystallisation and gravitational settling of dense minerals in a mafic-ultramafic magma.

Step 2 – name the process: This concentration by crystal settling is magmatic segregation (magmatic differentiation).

Step 3 – link to the deposits: Chromite and platinum-group deposits of layered intrusions form in exactly this way.

Why the other options are wrong:

- A, placer: concentration by flowing water at the surface, not within a magma.
- B, residual: concentration by surface weathering.
- D, evaporite: precipitation from evaporating water, a sedimentary process.

Final Answer: Magmatic segregation $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q35

Q36.

Solution

Concept – placer deposits: Placers form where moving water sorts sediment and concentrates dense, durable, chemically resistant minerals.

Step 1 – read the setting: Heavy minerals settle out in the gravels and sands of river channels.

Step 2 – read the minerals: Gold, diamond and cassiterite are dense and resistant, so they lag behind lighter grains.

Step 3 – name the deposit: Such gravity-concentrated stream deposits are placer deposits.

Why the other options are wrong:

- A, hydrothermal vein: minerals precipitate from hot fluids in fractures at depth.
- B, skarn: forms by reaction of magmatic fluids with carbonate rocks.
- C, porphyry: disseminated ore associated with large shallow intrusions.

Final Answer: Placer deposits $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q36

Q37.

Solution

Concept – Darcy's law: For laminar groundwater flow, the discharge is $Q = K\,i\,A$, where K is hydraulic conductivity, i is the hydraulic gradient and A is the cross-sectional area.

Step 1 – list the data: $K = 10$ m/day, $i = 0.02$, $A = 50\ \text{m}^2$.

Step 2 – multiply K by i: $K\,i = 10 \times 0.02 = 0.2$ m/day

Step 3 – multiply by the area: $Q = 0.2 \times 50$

Step 4 – evaluate: $Q = 10\ \text{m}^3/\text{day}$

Step 5 – check the units: $(\text{m/day}) \times (\text{m}^2) = \text{m}^3/\text{day}$, a volume flow rate, as required.

Final Answer: $Q = 10\ \text{m}^3/\text{day} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q37

Q38.

Solution

Concept – confined versus unconfined aquifers: An aquifer is confined when it is enclosed between two impermeable layers, so its water is held under pressure.

Step 1 – read the boundaries: Aquifer W is bounded above and below by impermeable clay aquicludes.

Step 2 – read the pressure state: Being enclosed, its water is under pressure greater than atmospheric.

Step 3 – name the aquifer: An aquifer confined between two aquicludes with water under pressure is a confined (artesian) aquifer.

Why the other options are wrong:

- B, unconfined: has a free water table open to the atmosphere above.
- C, perched: a small local saturated zone above the main water table.
- D, aquiclude: an impermeable layer that does not yield water at all.

Final Answer: A confined aquifer $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q38

Q39.

Solution

Concept – porosity versus permeability: Porosity is the fraction of pore space; permeability is the ability to transmit fluid through connected pores.

Step 1 – read what the clay does with water: It stores a large volume of water, so it has abundant pore space, meaning high porosity.

Step 2 – read what it does not do: It scarcely lets water pass, because its tiny pores are poorly connected, meaning low permeability.

Step 3 – combine: Therefore the clay has high porosity but low permeability.

Why the other options are wrong:

- A: reverses both properties.
- C: high permeability contradicts the fact that water hardly flows through.
- D: low porosity contradicts the large stored water volume.

Final Answer: High porosity but low permeability $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q39

Q40.

Solution

Concept – rock as an engineering foundation material: A foundation rock must carry structural loads without crushing, which is measured by its strength in compression.

Step 1 – identify the relevant load: A heavy structure applies a compressive (crushing) load to the rock beneath it.

Step 2 – select the matching property: Resistance to crushing is quantified by the unconfined compressive strength.

Step 3 – conclude: Therefore compressive strength is the key property for a foundation rock.

Why the other options are wrong:

- A, porosity: influences strength but is not the direct measure of load resistance.
- C and D, colour and streak: are identification properties, not mechanical strength.

Final Answer: Unconfined compressive strength $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q40

Q41.

Solution

Concept – definition of porosity: Porosity is the ratio of pore (void) volume to total (bulk) volume, expressed as a percentage: $n = \frac{V_v}{V_t} \times 100\%$.

Step 1 – list the data: Pore volume $V_v = 25$ cm^3, total volume $V_t = 100$ cm^3.

Step 2 – form the ratio: $\frac{V_v}{V_t} = \frac{25}{100}$

Step 3 – simplify: $\frac{25}{100} = 0.25$

Step 4 – convert to a percentage: $n = 0.25 \times 100\% = 25\%$

Final Answer: Porosity $= 25\% \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q41

Q42.

Solution

Concept – elemental abundance in the crust: The Earth's crust is dominated by silicate minerals, which are built from oxygen and silicon.

Step 1 – recall the abundance order by weight: Oxygen $\approx 46\%$, silicon $\approx 28\%$, aluminium $\approx 8\%$, iron $\approx 5\%$.

Step 2 – identify the largest: Oxygen, at about 46% by weight, is the most abundant.

Step 3 – reason why: Oxygen is the large anion in the silica tetrahedron that forms the framework of nearly all rock-forming minerals.

Why the other options are wrong:

- A, silicon: second most abundant at about 28%.
- C, aluminium: about 8%.
- D, iron: about 5%.

Final Answer: Oxygen $\Rightarrow \boxed{B}$

Answer: (B) Go Back to Q42

Q43.

Solution

Concept – chemical weathering reactions: Chemical weathering alters minerals through reactions such as hydrolysis, oxidation and carbonation.

Step 1 – read the reaction: Feldspar reacts with (slightly acidic) water and is transformed into clay minerals such as kaolinite, releasing dissolved cations and silica.

Step 2 – identify the reaction type: A reaction of a silicate with water that breaks it down into clay is hydrolysis.

Step 3 – conclude: Therefore the process is hydrolysis.

Why the other options are wrong:

- B, oxidation: reaction with oxygen (e.g. iron minerals rusting to limonite).
- C, carbonation: dissolution of carbonates by carbonic acid.
- D, exfoliation: a physical (mechanical) weathering process, not chemical.

Final Answer: Hydrolysis $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q43

Q44.

Solution

Concept – erosional landforms of arid plateaus: Where a resistant caprock protects softer rock beneath, differential erosion leaves flat-topped, steep-sided hills.

Step 1 – read the shape: Flat-topped and steep-sided, with a protective caprock.

Step 2 – read the size clue: Its top area is larger than that of a butte.

Step 3 – name the landform: A broad, flat-topped, steep-sided remnant larger than a butte is a mesa.

Why the other options are wrong:

- B, meander: a bend in a river channel.
- C, delta: a depositional landform at a river mouth.
- D, drumlin: a streamlined glacial deposit.

Final Answer: Mesa $\Rightarrow \boxed{\text{A}}$

$\boxed{\textbf{Answer: (A)}}$ **Go Back to Q44**

Q45.

Solution

Concept – the spectral signature of vegetation: Different surfaces reflect sunlight differently across the electromagnetic spectrum, giving each a characteristic spectral signature.

Step 1 – recall vegetation behaviour: Chlorophyll absorbs strongly in the visible red and blue, but the internal leaf (mesophyll) structure reflects strongly in the near-infrared.

Step 2 – identify the distinguishing band: The very high near-infrared reflectance is what sets healthy vegetation apart from soil and water.

Step 3 – conclude: Therefore vegetation is best distinguished in the near-infrared, which is the basis of vegetation indices such as NDVI.

Why the other options are wrong:

- A, blue: strongly absorbed by chlorophyll, so reflectance is low.
- C, thermal infrared: senses emitted heat, not the vegetation reflectance peak.
- D, microwave: used for roughness and moisture, not the greenness signature.

Final Answer: Near-infrared $\Rightarrow \boxed{B}$

Answer: (B) Go Back to Q45

Q46.

Solution

Concept – Goldschmidt's geochemical classification: Goldschmidt grouped the elements by the phases they prefer: lithophile (silicate/oxide), siderophile (metallic iron), chalcophile (sulphide) and atmophile (gaseous).

Step 1 – read the affinity described: Strong affinity for sulphur, concentrating in sulphide phases.

Step 2 – match to the group: Sulphur-loving, sulphide-forming elements are the chalcophile elements.

Step 3 – confirm with the examples: Cu, Zn and Pb occur mainly as sulphides (chalcopyrite, sphalerite, galena), consistent with chalcophile behaviour.

Why the other options are wrong:

- A, lithophile: bond with oxygen and concentrate in silicates (e.g. Si, Al, Ca).
- B, siderophile: prefer metallic iron and concentrate in the core (e.g. Ni, Au).
- D, atmophile: occur as gases in the atmosphere (e.g. N, noble gases).

Final Answer: Chalcophile elements $\Rightarrow \boxed{C}$

Answer: (C) Go Back to Q46

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	A	3	B	4	D	5	C
6	D	7	D	8	A	9	C	10	A
11	A	12	D	13	C	14	C	15	D
16	B	17	B	18	A	19	D	20	A
21	B	22	C	23	A	24	D	25	C
26	D	27	C	28	C	29	A	30	A
31	B	32	D	33	D	34	B	35	C
36	D	37	B	38	A	39	B	40	B
41	C	42	B	43	A	44	A	45	B
46	C								