

This Test has 10 attempts. For information on editing questions, click **More Help** below.

Test Canvas: 2021\_11\_GCISCB1\_EXAM\_SUPP

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Question Settings

You can edit, delete or change the point values of test questions on this page. If necessary, test attempts will be remarked after you submit your changes.

Description

Instructions

Total Questions86

Total Points185

Number of Attempts10

Select: 

AllNone

Select by Type: 

- Question Type -

Delete and Remark

Points

Update and Remark

Hide Question Details

☐

1. True / False: Seismic studies were used to determin...

Points: 1

Question

Seismic studies were used to determine the layering of the solid earth.

Answer

✓ True

False

☐

2. True / False: Rocks closer to a mid-oceanic ridge a...

Points: 1

Question

Rocks closer to a mid-oceanic ridge are older than those farther out from the ridge.

Answer

True

✓ False

☐

3. True / False: The inner and outer core of the earth...

Points: 1

Question

The inner and outer core of the earth have the same chemical composition.

Answer

✓ True

False

☐

4. True / False: The margins of the African Plate coin...

Points: 1

Question

The margins of the African Plate coincide with those of the African continent.

Answer

True

✓ False

☐

5. True / False: Potassium is a mineral that is used i...

Points: 1

Question

Potassium is a mineral that is used in the dating of rocks.

Answer

✓ True

False

☐

6. True / False: Fossils help determine the absolute a...

Points: 1

Question

Fossils help determine the absolute ages of rocks.

Answer	True
	<input checked="" type="checkbox"/> False

☐ 7. True / False: Sedimentary rocks are formed by chang...

Points: 1

Question	Sedimentary rocks are formed by changes in temperature, pressure or introduction of reactive fluids.
Answer	True
	<input checked="" type="checkbox"/> False

☐ 8. True / False: Monomineralic rocks are composed of o...

Points: 1

Question	Monomineralic rocks are composed of one mineral only.
Answer	<input checked="" type="checkbox"/> True
	False

☐ 9. True / False: Discordant, lens-shaped intrusions ar...

Points: 1

Question	Discordant, lens-shaped intrusions are known as lopoliths, laccoliths or phacoliths depending on their overall concave or convex shape.
Answer	<input checked="" type="checkbox"/> True
	False

☐ 10. True / False: Igneous rocks formed at great depth i...

Points: 1

Question	Igneous rocks formed at great depth in the crust, are fine grained.
Answer	True
	<input checked="" type="checkbox"/> False

☐ 11. True / False: Dolerite is an igneous rock composed ...

Points: 1

Question	Dolerite is an igneous rock composed essentially of quartz.
Answer	True
	<input checked="" type="checkbox"/> False

☐ 12. True / False: A sill is an igneous rock in the form...

Points: 1

Question	A sill is an igneous rock in the form of a sheet that cross-cuts the structural planes of the surrounding rocks.
Answer	True
	<input checked="" type="checkbox"/> False

☐ 13. True / False: Hornfelsic rocks form at relatively h...

Points: 1

Question	Hornfelsic rocks form at relatively high temperature and low pressure conditions.
Answer	<input checked="" type="checkbox"/> True
	False

☐ 14. True / False: During lithification, the grain size ...

Points: 1

Question	During lithification, the grain size of a sediment increases.
Answer	True
	<input checked="" type="checkbox"/> False

☐ 15. True / False: Spaces between clasts in conglomerate...

Points: 1

Question	Spaces between clasts in conglomerate and breccia are void of material.
Answer	<div>True</div> <div><input checked="" type="checkbox"/> False</div>

☐ 16. True / False: Mechanically derived sedimentary rock...

Points: 1

Question	Mechanically derived sedimentary rocks are classified primarily on the basis of their grain size.
Answer	<div><input checked="" type="checkbox"/> True</div> <div>False</div>

☐ 17. True / False: Sandstone contains rounded or angular...

Points: 1

Question	Sandstone contains rounded or angular particles mainly of quartz in a cementing material such as silica, iron oxide, calcium carbonate or clay.
Answer	<div><input checked="" type="checkbox"/> True</div> <div>False</div>

☐ 18. True / False: Gravel composed of angular pebbles, w...

Points: 1

Question	Gravel composed of angular pebbles, will, upon being lithified, forms conglomerate.
Answer	<div>True</div> <div><input checked="" type="checkbox"/> False</div>

☐ 19. True / False: Iron-ore may occur as a chemically-de...

Points: 1

Question	Iron-ore may occur as a chemically-derived sedimentary rock.
Answer	<div><input checked="" type="checkbox"/> True</div> <div>False</div>

☐ 20. True / False: Argillaceous rocks are fine, and incl...

Points: 1

Question	Argillaceous rocks are fine, and include mudstone and shale.
Answer	<div><input checked="" type="checkbox"/> True</div> <div>False</div>

☐ 21. True / False: The different ranges of temperature a...

Points: 1

Question	The different ranges of temperature and pressure in which metamorphic rocks can form are referred to as metamorphic levels.
Answer	<div>True</div> <div><input checked="" type="checkbox"/> False</div>

☐ 22. True / False: Slate may form due to metamorphism of...

Points: 1

Question	Slate may form due to metamorphism of a mudstone.
Answer	<div><input checked="" type="checkbox"/> True</div> <div>False</div>

☐ 23. True / False: Schists are the products of a higher ...

Points: 1

Question	Schists are the products of a higher grade of metamorphism than slates but may form from the same rock type.
Answer	<div><input checked="" type="checkbox"/> True</div> <div>False</div>

☐ 24. True / False: A gneiss assumes a striped appearance...

Points: 1

Question	A gneiss assumes a striped appearance, due to the segregation of light and dark minerals, into separate bands.
Answer	<input checked="" type="checkbox"/> True <input type="checkbox"/> False

☐ 25. True / False: Clayey minerals in a sedimentary rock...

Points: 1

Question	Clayey minerals in a sedimentary rock recrystallize to form new minerals such as sillimanite in a zone known as a metamorphic aureole.
Answer	<input checked="" type="checkbox"/> True <input type="checkbox"/> False

☐ 26. True / False: In monoclines, the limbs need to dip ...

Points: 1

Question	In monoclines, the limbs need to dip in the same direction.
Answer	<input checked="" type="checkbox"/> True <input type="checkbox"/> False

☐ 27. True / False: The angle a fault plane makes with th...

Points: 1

Question	The angle a fault plane makes with the horizontal plane is known as its hade.
Answer	<input type="checkbox"/> True <input checked="" type="checkbox"/> False

☐ 28. True / False: When a rock has very few and widely s...

Points: 1

Question	When a rock has very few and widely spaced discontinuities, it is said to be massively jointed.
Answer	<input checked="" type="checkbox"/> True <input type="checkbox"/> False

☐ 29. True / False: After crossing a dextral strike-slip ...

Points: 1

Question	After crossing a dextral strike-slip fault from a point, the observer has to move to the right on the other side of the fault in order to find the corresponding point.
Answer	<input checked="" type="checkbox"/> True <input type="checkbox"/> False

☐ 30. True / False: Discontinuities vary in size from sma...

Points: 1

Question	Discontinuities vary in size from small fissures to huge faults, and the most common are joints and bedding planes.
Answer	<input checked="" type="checkbox"/> True <input type="checkbox"/> False

☐ 31. True / False: The Rustenburg Layered Suite forms pa...

Points: 1

Question	The Rustenburg Layered Suite forms part of the Bushveld Complex.
Answer	<input checked="" type="checkbox"/> True <input type="checkbox"/> False

☐ 32. True / False: The lowest unit of the Karoo Supergro...

Points: 1

Question	The lowest unit of the Karoo Supergroup is tillite.
Answer	<input checked="" type="checkbox"/> True <input type="checkbox"/> False

☐ 33. True / False: The oldest rocks in South Africa belo...

Points: 1

Question	The oldest rocks in South Africa belong to the Witwatersrand Supergroup.
Answer	<div>True</div> <div> False</div>

☐ 34. True / False: The Barberton Supergroup predates the...

Points: 1

Question	The Barberton Supergroup predates the Witwatersrand Supergroup.
Answer	<div> True</div> <div>False</div>

☐ 35. True / False: The Central Rand Group forms part of ...

Points: 1

Question	The Central Rand Group forms part of the Transvaal Supergroup.
Answer	<div>True</div> <div> False</div>


☐ 36. True / False: When water is trapped in a synclinal ...

Points: 1

Question	When water is trapped in a synclinal aquifer it may produce water at an artesian spring.
Answer	<div> True</div> <div>False</div>


☐ 37. True / False: The main force driving groundwater is...

Points: 1

Question	The main force driving groundwater is gravity.
Answer	<div> True</div> <div>False</div>


☐ 38. True / False: When the water table intersects the g...

Points: 1

Question	When the water table intersects the ground surface, a spring is produced.
Answer	<div> True</div> <div>False</div>


☐ 39. True / False: During physical weathering, water, ca...

Points: 1

Question	During physical weathering, water, carbon-dioxide and oxygen react with rocks and minerals.
Answer	<div>True</div> <div> False</div>


☐ 40. True / False: Weathering may be caused by the chemi...

Points: 1

Question	Weathering may be caused by the chemical breakdown and alteration of the minerals of the rock.
Answer	<div> True</div> <div>False</div>

☐ 41. True / False: The smaller the soil grains, the grea...

Points: 1

Question	The smaller the soil grains, the greater the soil strength.
Answer	<div>True</div> <div> False</div>

☐ 42. True / False: An increase in the proportion of mont...

Points: 1

Question	An increase in the proportion of montmorillonite decreases the strength of a clayey soil.
Answer	<input checked="" type="checkbox"/> True <input type="checkbox"/> False

☐ 43. True / False: Higher confining pressure reduces the...

Points: 1

Question	Higher confining pressure reduces the shear strength of rock material.
Answer	<input type="checkbox"/> True <input checked="" type="checkbox"/> False

☐ 44. True / False: A rock with a comprehensive strength ...

Points: 1

Question	A rock with a comprehensive strength between 50Mpa and 120Mpa is classified as weak.
Answer	<input type="checkbox"/> True <input checked="" type="checkbox"/> False

☐ 45. True / False: Calculation of the "Stress Reducton F...

Points: 1

Question	Calculation of the "Stress Reducton Factor" is an essential part of Bienauwsky's method of classifying a rock mass.
Answer	<input type="checkbox"/> True <input checked="" type="checkbox"/> False

☐ 46. True / False: Bieniawski's Rock Mass Rating classif...

Points: 1

Question	Bieniawski's Rock Mass Rating classification scheme uses five classification parameters, and a correction for the geometric relationship between discontinuities and the excavation axis.
Answer	<input checked="" type="checkbox"/> True <input type="checkbox"/> False

☐ 47. True / False: Sinkholes and dolines are natural geo...

Points: 1

Question	Sinkholes and dolines are natural geological features that may be affect the stability of a foundation.
Answer	<input checked="" type="checkbox"/> True <input type="checkbox"/> False

☐ 48. True / False: The presence of water in soil decreas...

Points: 1

Question	The presence of water in soil decreases the likelihood of collapse of the wall of an excavation.
Answer	<input type="checkbox"/> True <input checked="" type="checkbox"/> False

☐ 49. True / False: Additional stress caused by the weigh...

Points: 1

Question	Additional stress caused by the weight of water in a dam may cause failure in the rocks forming the base or walls of the dam.
Answer	<input checked="" type="checkbox"/> True <input type="checkbox"/> False

☐ 50. True / False: Aggregate provides the strength to co...

Points: 1

Question	Aggregate provides the strength to concrete.
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Answer ☒ True  
☐ False

☐ 51. Multiple Choice: Parts of the Earth's lithosphere are ...

Points: 2

Question	Parts of the Earth's lithosphere are known as tectonic
Answer	<p>A. segments.</p> <p>B. sectors.</p> <p><input checked="" type="checkbox"/> C. plates.</p> <p>D. portions.</p> <p>E. none of the above.</p>

☐ 52. Multiple Choice: The mantle of the earth is rich in

Points: 2

Question	The mantle of the earth is rich in
Answer	<p>A. silicon and oxygen.</p> <p><input checked="" type="checkbox"/> B. magnesium and iron.</p> <p>C. iron and nickel.</p> <p>D. aluminium and silicon.</p> <p>E. none of the above.</p>

☐ 53. Multiple Choice: The margins of a tectonic plate may be

Points: 2

Question	The margins of a tectonic plate may be
Answer	<p>A. zones of extension.</p> <p>B. zones of shear.</p> <p>C. zones of collision.</p> <p><input checked="" type="checkbox"/> D. all of the above.</p> <p>E. none of the above.</p>

☐ 54. Multiple Choice: The order of the earth's layers, with...

Points: 2

Question	The order of the earth's layers, with increasing depth, is
Answer	<p>A. mantle, core, crust.</p> <p>B. core, mantle, crust.</p> <p><input checked="" type="checkbox"/> C. crust, mantle, core.</p> <p>D. none of the above.</p>

☐ 55. Multiple Choice: Radiometric dating of a rock primaril...

Points: 2

Question	Radiometric dating of a rock primarily reveals:
Answer	<div><input checked="" type="checkbox"/> A. its absolute age.</div> <div><input type="checkbox"/> B. its relative age.</div> <div><input type="checkbox"/> C. both of the above.</div> <div><input type="checkbox"/> D. none of the above.</div>

☐ 56. Multiple Choice: In Bowen's Reaction Series,

Points: 2

Question	In Bowen's Reaction Series,
Answer	<div><input checked="" type="checkbox"/> A. olivine crystalizes out of a cooling magma before pyroxene.</div> <div><input type="checkbox"/> B. pyroxene crystalizes out of a cooling magma before olivine.</div> <div><input type="checkbox"/> C. pyroxene and olivine crystallise over the same temperature range.</div> <div><input type="checkbox"/> D. none of the above</div>

☐ 57. Multiple Choice: According to Bowen's Reaction Series ...

Points: 2

Question	According to Bowen's Reaction Series depicting crystallization of a basic magma, as temperature decreases, olivine forms at the same time as
Answer	<div><input type="checkbox"/> A. feldspars rich in potassim.</div> <div><input type="checkbox"/> B. feldspars rich in sodium.</div> <div><input checked="" type="checkbox"/> C. feldspars rich in calcium.</div> <div><input type="checkbox"/> D. all the feldspars</div> <div><input type="checkbox"/> E. none of the above.</div>

☐ 58. Multiple Choice: If a tabular igneous rock is concordant...

Points: 2


Question	If a tabular igneous rock is concordant with structure in the country rocks the form is known as a
Answer	<div><input type="checkbox"/> A. dyke.</div> <div><input checked="" type="checkbox"/> B. sill.</div> <div><input type="checkbox"/> C. lopolith.</div> <div><input type="checkbox"/> D. phacolith.</div> <div><input type="checkbox"/> E. none of the above</div>

☐

Points: 2




**59. Multiple Choice: Major classes of sedimentary rocks ar...**

Question	Major classes of sedimentary rocks are based on
Answer	<div>  A. mode of formation. </div> <div> <hr/> </div> <div> <div>B. grain size.</div> <div> <hr/> </div> </div> <div> <div>C. mineralogical composition.</div> <div> <hr/> </div> </div> <div> <div>D. all of the above.</div> <div> <hr/> </div> </div> <div> <div>E. none of the above.</div> <div> <hr/> </div> </div>


☐ **60. Multiple Choice: Limestone is an example of**Points: **2**

Question	Limestone is an example of
Answer	<div>  A. a calcareous rock. </div> <div> <hr/> </div> <div> <div>B. a ferruginous rock.</div> <div> <hr/> </div> </div> <div> <div>C. a siliceous rock.</div> <div> <hr/> </div> </div> <div> <div>D. a carbonaceous rock.</div> <div> <hr/> </div> </div>

☐ **61. Multiple Choice: Metamorphic rocks are classified into...**Points: **2**

Question	Metamorphic rocks are classified into two major groups namely those with
Answer	<div>  A. foliated and non-foliated. </div> <div> <hr/> </div> <div> <div>B. silicious and calcareous.</div> <div> <hr/> </div> </div> <div> <div>C. coarse anf fine grained</div> <div> <hr/> </div> </div> <div> <div>D. high-temperature and low-temperature</div> <div> <hr/> </div> </div> <div> <div>E. none of the above.</div> <div> <hr/> </div> </div>

☐ **62. Multiple Choice: The three main agents responsible for...**Points: **2**

Question	The three main agents responsible for metamorphism are
Answer	<div> <div>A. heat.</div> <div> <hr/> </div> </div> <div> <div>B. pressure.</div> <div> <hr/> </div> </div> <div> <div>C. magma.</div> <div> <hr/> </div> </div> <div> <div>D. fluid activity.</div> <div> <hr/> </div> </div> <div> <div>E. A, B and C.</div> <div> <hr/> </div> </div> <div> <div>  F. A, B and D. </div> <div> <hr/> </div> </div>

☐ 63. Multiple Choice: The rocks below are metamorphic, except

Points: 2

Question	The rocks below are metamorphic, except
Answer	<p>A. slate.</p> <p>B. schist.</p> <p>C. gneiss.</p> <p>D. migmatite.</p> <p><input checked="" type="checkbox"/> E. none of the above.</p>

☐ 64. Multiple Choice: Amphibolite is produced when \_\_\_...

Points: 2

Question	Amphibolite is produced when _____ is metamorphosed.
Answer	<p>A. andesite.</p> <p><input checked="" type="checkbox"/> B. basalt.</p> <p>C. mudstone.</p> <p>D. all of the above.</p> <p>E. none of the above.</p>

☐ 65. Multiple Choice: A siliceous sandstone or conglomerate...

Points: 2

Question	A siliceous sandstone or conglomerate protolith changes to a hard rock known as ..... with the development of practically no new minerals.
Answer	<p>A. marble.</p> <p>B. gneiss.</p> <p>C. amphibolite</p> <p><input checked="" type="checkbox"/> D. quartzite.</p> <p>E. hornfels.</p>

☐ 66. Multiple Choice: When chert is metamorphosed, ..... ..

Points: 2

Question	When chert is metamorphosed, ..... is produced.
Answer	<p>A. amphibolite</p> <p>B. pyroxenite</p> <p><input checked="" type="checkbox"/> C. quartzite</p> <p>D. none of the above</p>

☐ 67. Multiple Choice: The axis of a fold

Points: 2

Question	The axis of a fold
Answer	<div><div><input checked="" type="checkbox"/> A. follows the hinge of the fold.</div><div><input type="checkbox"/> B. bisects the angle between the fold limbs.</div><div><input type="checkbox"/> C. is a horizontal line on one of the limbs.</div><div><input type="checkbox"/> D. all of the above.</div><div><input type="checkbox"/> E. none of the above.</div></div>

☐ 68. Multiple Choice: A fold is asymmetrical when

Points: 2

Question	A fold is asymmetrical when
Answer	<div><div><input type="checkbox"/> A. the limbs dip in opposite directions with equal dips.</div><div><input type="checkbox"/> B. when the limbs are almost parallel.</div><div><input type="checkbox"/> C. when the limbs are horizontal.</div><div><input type="checkbox"/> D. when the limbs are vertical.</div><div><input checked="" type="checkbox"/> E. none of the above.</div></div>

☐ 69. Multiple Choice: Cross-joints are

Points: 2

Question	Cross-joints are
Answer	<div><div><input type="checkbox"/> A. parallel to the strike of the axial plane of a fold.</div><div><input checked="" type="checkbox"/> B. at right angles to the strike of the axial plane of the fold.</div><div><input type="checkbox"/> C. oblique to the axial plane of a fold.</div><div><input type="checkbox"/> D. none of the above.</div></div>

☐ 70. Multiple Choice: These divisions of South African rock...

Points: 2


Question	These divisions of South African rocks are listed in order of decreasing age
Answer	<div><div><input type="checkbox"/> A. Limpopo Complex, Witwatersrand Supergroup, Ventersdorp Supergroup, Barberton Supergroup.</div><div><input type="checkbox"/> B. Witwatersrand Supergroup, Ventersdorp Supergroup, Barberton Supergroup, Limpopo Complex.</div><div><input type="checkbox"/> C. Ventersdorp Supergroup, Barbarton Supergroup, Limpopo Complex, Witwatersrand Supergroup.</div><div><input checked="" type="checkbox"/> D. Barbarton Supergroup, Limpopo Complex, Witwatersrand Supergroup, Ventersdorp Supergroup.</div></div>

☐ 71. Multiple Choice: The Onverwacht Group is found \_\_\_\_\_

Points: 2


Question	The Onverwacht Group is found _____ the Barberton Supergroup.
Answer	<div><div><input type="checkbox"/> A. south of</div></div>

Answer

-  A. at the base of
- B. in the middle of
- C. at the top of
- D. cross-cutting


☐ 72. Multiple Choice: Most of South Africa is covered by ro...

Points: 2

Question	Most of South Africa is covered by rocks of the
Answer	<p>A. Barberton Supergroup.</p> <p>B. Limpopo Complex.</p> <p>C. Witwatersrand Supergroup.</p> <p> D. Karoo Supergroup.</p> <p>E. none of the above.</p>


☐ 73. Multiple Choice: It is necessary for the water table t...

Points: 2

Question	It is necessary for the water table to intersect with the surface in order to have a spring except in the case of
Answer	<p>A. a fault spring.</p> <p>B. a valley spring.</p> <p>C. a artesian spring.</p> <p> D. none of the above.</p>

☐ 74. Multiple Choice: Formation of sinkholes

Points: 2

Question	Formation of sinkholes
Answer	<p>A. leads to the formation of carbonate.</p> <p>B. produces and leaves behind floaters.</p> <p> C. takes place in areas underlain by carbonate.</p> <p>D. produces and leaves behind caverns.</p> <p>E. all of the above.</p> <p>F. none of the above.</p>

☐ 75. Multiple Choice: The following represents a mechanical...

Points: 2

Question	The following represents a mechanical process of weathering
Answer	A. carbonatisation.

- B. hydration.
- C. hydrolysis.
- D. oxidation.
- ☒ E. none of the above

☐ 76. Multiple Choice: These earth materials are listed in t...

Points: 2

Question	These earth materials are listed in their order of decreasing mechanical strength:
Answer	<p>A. sandstone, siltstone, sand, quartzite.</p> <p>B. siltstone, sand, quartzite, sandstone.</p> <p>C. sand, quartzite, sandstone, siltstone.</p> <p><input checked="" type="checkbox"/> D. quartzite, sandstone, siltstone, sand.</p> <p>E. none of the above</p>

☐ 77. Multiple Choice: In a horizontal tunnel with a northwa...

Points: 2

Question	In a horizontal tunnel with a northward axis, this geometric arrangement results in thin and unstable roof wedges:
Answer	<p>A. strata with a gentle northward dip.</p> <p>B. strata with a steep northward dip.</p> <p>C. strata with a gentle southward dip.</p> <p>D. strata with a steep southward dip.</p> <p>E. A and C.</p> <p><input checked="" type="checkbox"/> F. B and D</p> <p>G. none of the above.</p>


☐ 78. Multiple Choice: An open excavation's wall will be mor...

Points: 2

Question	An open excavation's wall will be more stable if
Answer	<p><input checked="" type="checkbox"/> A. beds dip into the slope.</p> <p>B. beds dip into the opening.</p> <p>C. beds are horizontal.</p> <p>D. beds are folded</p>


☐ 79. Multiple Choice: Investigation of one of these feature...

Points: 2

Question	Investigation of one of these features is unnecessary when foundation rocks and soils are investigated. Which one is it?
Answer	<div>A. the underlying rock types.</div> <div>B. the depth of the water table.</div> <div>C. the degree of weathering.</div> <div> D. none of the above.</div>

☐ 80. Multiple Choice: Rocks to be used as rip-rap need to be

Points: 2

Question	Rocks to be used as rip-rap need to be
Answer	<div> A. fresh.</div> <div>B. able to take a polish.</div> <div>C. uniform.</div> <div>D. be resistant to staining.</div> <div>E. none of the above.</div>

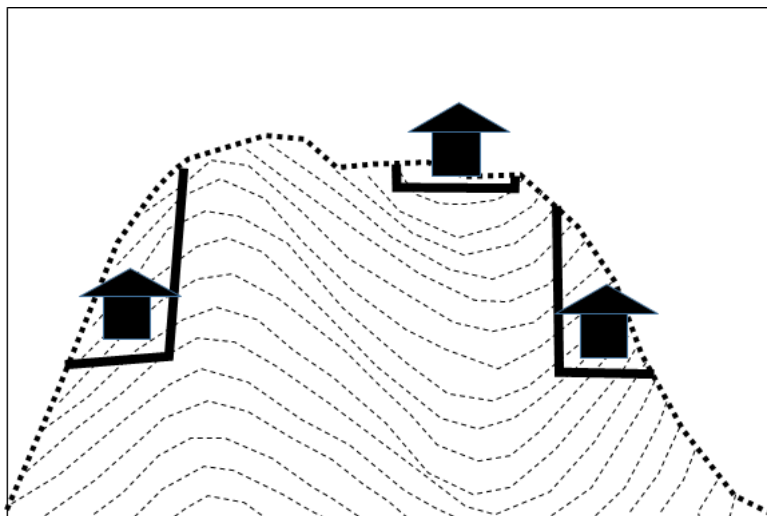
☐ 81. Fill in Multiple Blanks: You may find it useful to have a pen ...

Points: 12

Question
<div></div>

You may find it useful to have a pen and paper, write down a list of the responses, and fill them in the appropriate spaces on this page.

The sketch below shows a hill with three potential sites for buildings. The underlying rocks are steeply folded. The hill surface is marked by the thick dotted line. The excavations for the foundations for the building are shown by thick lines, with a picture of a hut, while the steep folding is shown by the thin dashed lines. Carefully study the drawing and answer the following questions.



1. Will the **foundation** of the house on the left side of the hill be stable? [1]
2. Give a reason for your answer in 1., using the dip of the rock units up or down the hill and the hill slope. [2]
3. Will the excavation **slope** on the left side of the hill be stable? [3]
4. Give a reason for your answer in 3., using the dip of the rock units up or down the hill and the hill slope. [4]
5. Will the **foundation** on the hill top be be stable? [5]
6. Give a reason for your answer in 3. [6]
7. Will the **foundations** on the right be stable? [7]
8. Give a reason for your answer in 7, using the dip of the rock units up or down the hill and the hill slope . [8]
9. There are two folds in the sketch - name the type of fold on the left.? [9]
10. Explain your answer in 9. [10]
11. In terms of the foundation stability and in relation the rock structue, which of the three foundations will be the most stable? N. B. USE ONLY THE TERMS 'left', 'top' or 'right' IN YOUR ANSWER [11].
12. Give a reason for your answer [12]

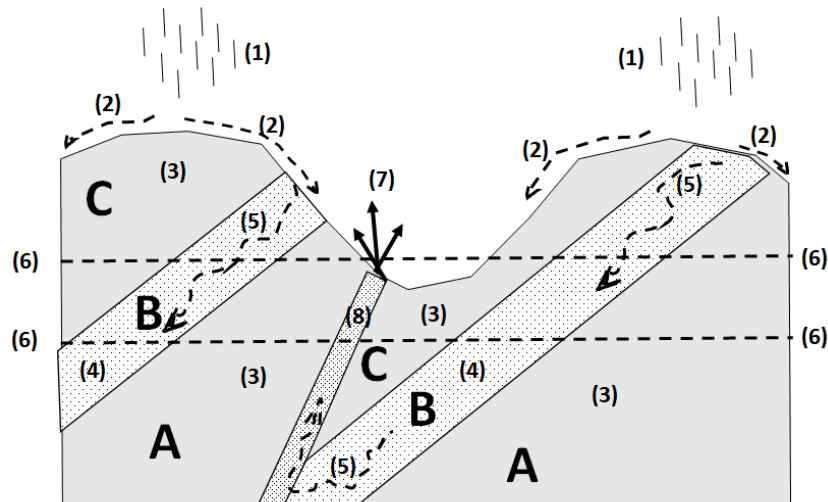
Evaluation Method	Answers for: 1	Case Sensitivity
Exact Match	no	
Evaluation Method	Answers for: 2	Case Sensitivity
Contains	dip into excavation	
Contains	dip down the slope	
Evaluation Method	Answers for: 3	Case Sensitivity
Exact Match	no	
Evaluation Method	Answers for: 4	Case Sensitivity
Contains	dip into the excacation	
Evaluation Method	Answers for: 5	Case Sensitivity
Exact Match	yes	
Evaluation Method	Answers for: 6	Case Sensitivity
Pattern Match	syncline	
Pattern Match	no dips into excavation	
Pattern Match	no dips down the hill slope	
Evaluation Method	Answers for: 7	Case Sensitivity
Contains	no	
Contains	symmetric anticline	
Contains	similar anticline	
Evaluation Method	Answers for: 8	Case Sensitivity
Pattern Match	dip down the hillside	
Evaluation Method	Answers for: 9	Case Sensitivity
Contains	symmetric	
Contains	similar	

<b>Evaluation Method</b>	<b>Answers for: 10</b>	<b>Case Sensitivity</b>
Pattern Match	equal and opposite dips	
Pattern Match	vertical axial plane	
<b>Evaluation Method</b>	<b>Answers for: 11</b>	<b>Case Sensitivity</b>
Exact Match	top	
<b>Evaluation Method</b>	<b>Answers for: 12</b>	<b>Case Sensitivity</b>
Contains	no dip	
Contains	syncline	
Contains	shallow	

82. Fill in Multiple Blanks: The diagram below represents tilted strata with a fracture along which some movement has occurred. A spring has been produced as a result. Study the sketch, and answer the following questions.

Points: 10

**Question** The diagram below represents tilted strata with a fracture along which some movement has occurred. A spring has been produced as a result. Study the sketch, and answer the following questions.



- (i) Name all the parts of the spring set up labeled (1) to (8) (1) [1], (2) [2], (3) [3], (4) [4], (5) [5], (6) [6], (7) [7], (8) [8].
- (ii) What type of spring is it? [9]
- (iii) What is the consequence on the spring if the feature labeled (6) moves from the higher to the lower level? [10]

<b>Evaluation Method</b>	<b>Answers for: 1</b>	<b>Case Sensitivity</b>
Contains	precipitation	
Contains	rain	
Contains	dew	
Contains	snow	
<b>Evaluation Method</b>	<b>Answers for: 2</b>	<b>Case Sensitivity</b>
Contains	runoff	
Contains	run-off	
Contains	run off	
<b>Evaluation Method</b>	<b>Answers for: 3</b>	<b>Case Sensitivity</b>
Contains	aquiclude	
Contains	impermeable	
Contains	impervious	
<b>Evaluation Method</b>	<b>Answers for: 4</b>	<b>Case Sensitivity</b>
Contains	aquifer	
Contains	permeable	
<b>Evaluation Method</b>	<b>Answers for: 5</b>	<b>Case Sensitivity</b>
Contains	permeation	
Contains	percolation	
Contains	infiltration	
<b>Evaluation Method</b>	<b>Answers for: 6</b>	<b>Case Sensitivity</b>
Contains	water table	
Contains	water-table	
Contains	watertable	
<b>Evaluation Method</b>	<b>Answers for: 7</b>	<b>Case Sensitivity</b>



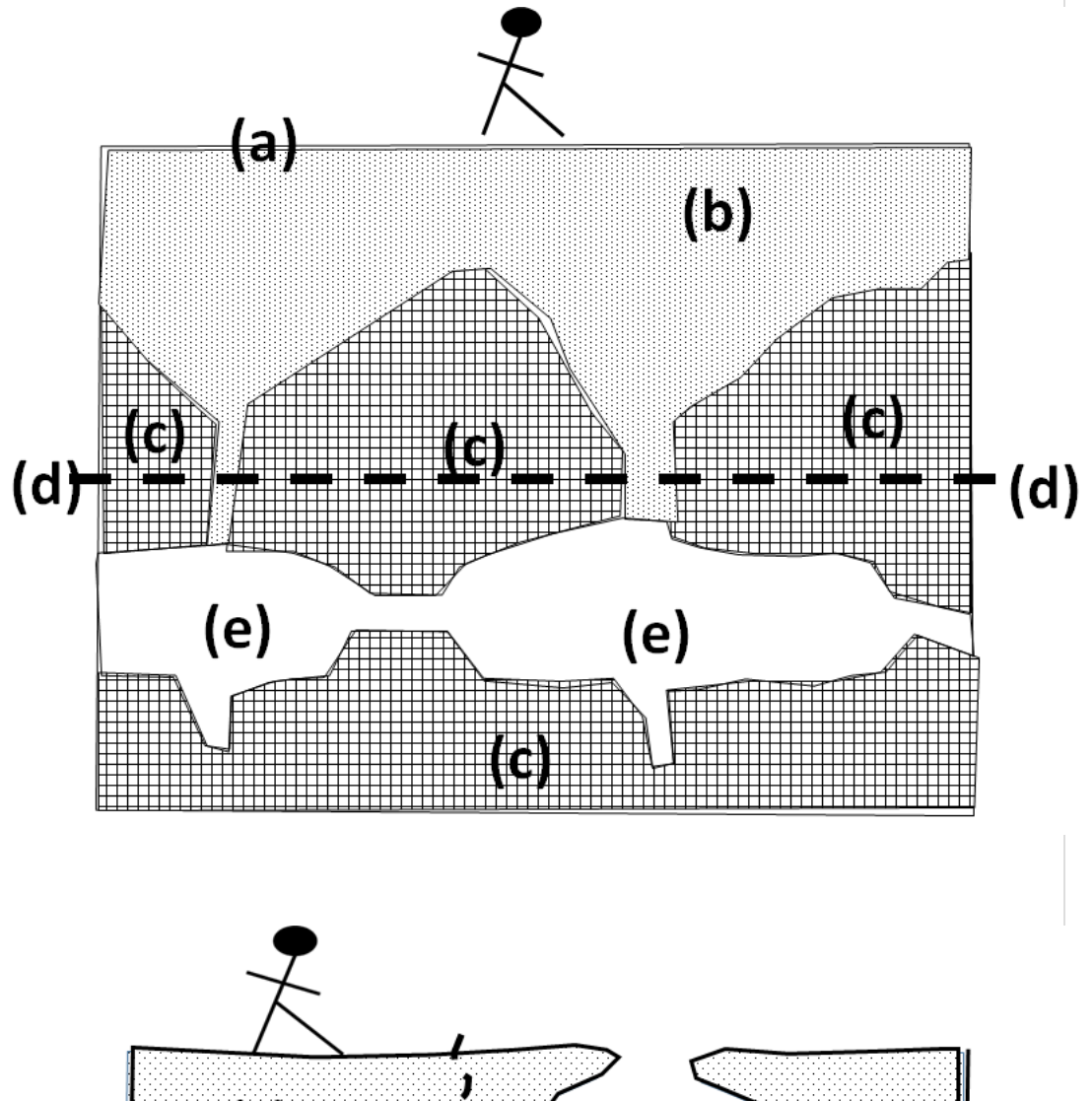
Contains	fault spring	
Contains	spring	
Contains	outflow	
Contains	fault-spring	
Contains	faultspring	
<b>Evaluation Method</b>	<b>Answers for: 8</b>	<b>Case Sensitivity</b>
Contains	fault	
Contains	fracture	
Contains	permeable	
Contains	breccia	
Contains	discontinuity	
<b>Evaluation Method</b>	<b>Answers for: 9</b>	<b>Case Sensitivity</b>
Contains	fault spring	
Contains	fault-spring	
Contains	faultspring	
<b>Evaluation Method</b>	<b>Answers for: 10</b>	<b>Case Sensitivity</b>
Contains	no spring	
Contains	disappear	
Contains	removed	
Contains	dry up	
Contains	dries up	
Contains	dry-up	
Contains	dries-up	

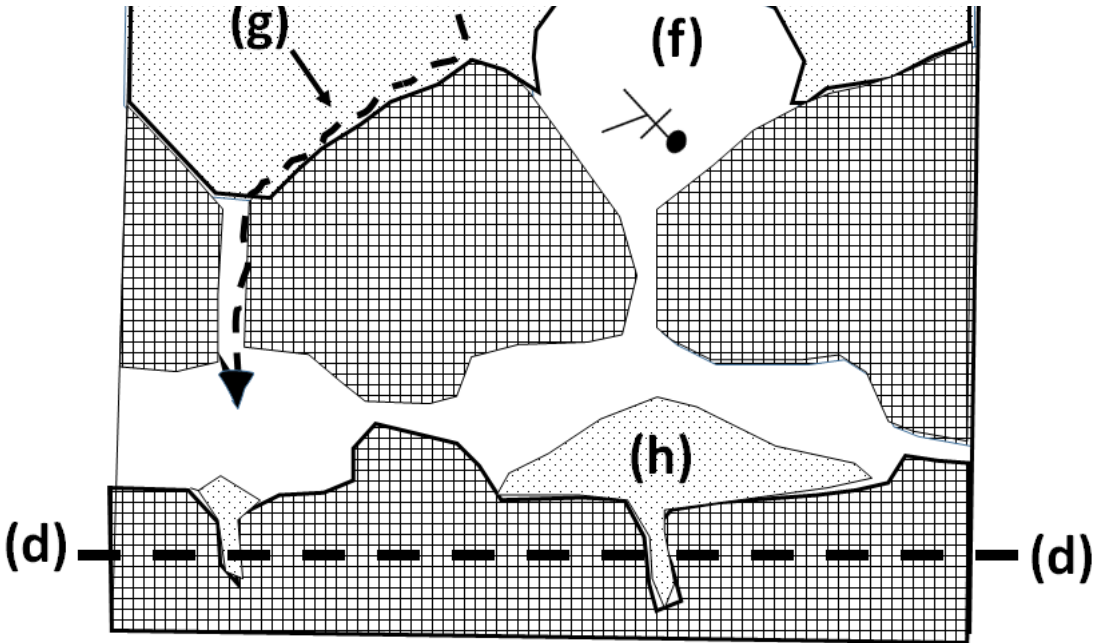
☐ 83. Fill in Multiple Blanks: You may find it useful to have a pen ...

Points: 11

**Question** You may find it useful to have a pen and paper, write down a list of the responses, and fill them in the appropriate spaces on this page.

Study the two sketches below. They represent a situation of ground failure which may occur due to a specific style of carbonate rock weathering. This is possible under certain certain groundwater conditions.





- (1). Give the names of the features labeled as (a) to (h).
- (a) [a], (b) [b], (c) [c], (d) [d], (e) [e], (f) [f], (g) [g], (h) [h]
- (2) What causes the changes in the levels of the feature (d) between the two diagrams? [2]
- (3) What is the main material that is filling the space labeled as (e) in the FIRST diagram? [3].
- (4) Why has most of the material mentioned in (3) above disappeared in the SECOND diagram? [4].
- (5) What is the main process leading to formation of the space labelled as (e) before it gets filled by the material mentioned in (3) above? [5]

**Evaluation Answers for: a**  
**Method**

- Contains ground
- Contains surface

**Evaluation Answers for: b**  
**Method**

- Contains soil
- Contains regolith
- Contains weathered rock
- Contains weathered-rock
- Contains weathered carbonate
- Contains weathered-carbonate
- Contains weathered limestone
- Contains weathered-limestone
- Exact Match weathered dolomite
- Exact Match weathered-dolomite

**Evaluation Answers for: c**  
**Method**

- Contains carbonate
- Contains limestone
- Contains dolomite
- Contains jointed carbonate
- Contains jointed-carbonate
- Contains jointed limestone
- Contains jointed-limestone
- Contains jointed dolomite
- Contains jointed-dolomite

**Evaluation Answers for: d**  
**Method**

- Contains water table
- Contains water-table
- Contains watertable

**Evaluation Answers for: e**  
**Method**

- Contains cavern

Contains	cave
Contains	void
Contains	space
Contains	cavity
Contains	hole
<b>Evaluation Answers for: f</b>	
<b>Method</b>	
Contains	sinkhole
Contains	sink-hole
Contains	sink hole
<b>Evaluation Answers for: g</b>	
<b>Method</b>	
Contains	soil drainage
Contains	drainage
Contains	drainage into cavern
Contains	drainage into cave
Contains	drainage into void
Contains	drainage into hole
Contains	drainage into space
Contains	drainage into cavity
<b>Evaluation Answers for: h</b>	
<b>Method</b>	
Exact Match	rubble
Exact Match	debris
Exact Match	soil
Exact Match	rock
<b>Evaluation Answers for: 2</b>	
<b>Method</b>	
Contains	climate change
Contains	change of climate
Contains	change-of-climate
Contains	climate-change
Contains	change in temperature and pressure
<b>Evaluation Answers for: 3</b>	
<b>Method</b>	
Contains	water
<b>Evaluation Answers for: 4</b>	
<b>Method</b>	
Contains	water table has been lowered
Contains	lower water table
Contains	water table change
Contains	lowered water table
<b>Evaluation Answers for: 5</b>	
<b>Method</b>	
Contains	carbonatisation

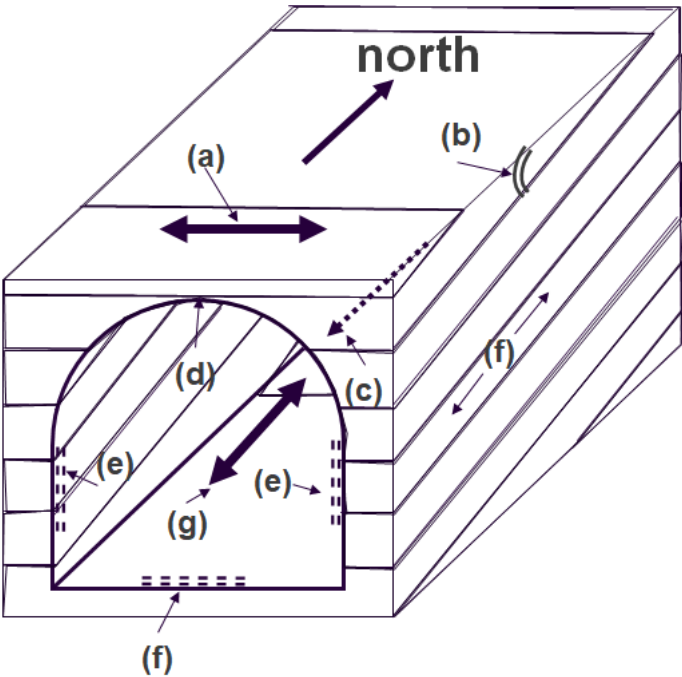
☐ 84. Fill in Multiple Blanks: You may find it useful to have a pen ...

Points: 14

Question

You may find it useful to have a pen and paper, write down a list of the responses, and fill them in the appropriate spaces on this page.

Study the diagram of an underground excavation (tunnel) made into rocks with very gently dipping discontinuities and slabs of rock and answer the following questions.



1. Name the parts labelled as (a) to (g)

- (a) [a]
- (b) [b]
- (c) [c]
- (d) [d]
- (e) [e]
- (f) [f]
- (g) [g]

2. Create correct statements in the following sentencesparagraph. Choose responses from ONLY AMONG THE CLUES GIVEN. This will prevent wrong spelings or omission in the responses. Such will report as errors. We will not fix this later if this instruction is not adhered to.

- 2.1 The western wall will be (h) [h] (CLUES: 1. stable, 2. unstable).
- 2.2 This is because (i) [i] (CLUES: (1) the rocks dip into the excavation (2) the rocks dip into the wall (3) the rocks dip neither into nor out of the wall into the excavation).
- 2.3 The eastern wall will be j [j] (CLUES: (1) prone to failure (2) not prone to failure).
- 2.4 This is because (k) [k] (CLUES: (1) the rocks dip from the wall into the excavation (2) the rocks dip from the excavation into the wall (3) the rocks dip neither into nor out of the wall).
- 2.5 The roof of the tunnel will (l) [l] (CLUES: (1) be likely to undergo failure (2) be unlikely to undergo failure).
- 2.6 This is mainly due to (m) [m] (CLUES: (1) the rocks dipping steeply into the excavation (2) the formation of prisms (3) the formation of thin wedges in the middle of the tunnel).

Evaluation Method	Answers for: a	Case Sensitivity
Exact Match	strike	
Exact Match	stike	
Evaluation Method	Answers for: b	Case Sensitivity
Contains	dip angle	
Contains	dip-angle	
Contains	angle of dip	
Contains	angle-of-dip	
Evaluation Method	Answers for: c	Case Sensitivity
Contains	dip direction	
Contains	dip-direction	
Evaluation Method	Answers for: d	Case Sensitivity
Exact Match	roof	
Evaluation Method	Answers for: e	Case Sensitivity
Contains	wall	
Exact Match	tunnel wall	

Exact Match	tunnel-wall	
Exact Match	tunnelwall	
<b>Evaluation Method</b>	<b>Answers for: f</b>	<b>Case Sensitivity</b>
Contains	bed	
Contains	stratum	
Contains	material	
Contains	horizon	
Contains	unit	
Contains	strata	
<b>Evaluation Method</b>	<b>Answers for: g</b>	<b>Case Sensitivity</b>
Contains	axis	
Contains	tunnel axis	
Contains	tunnel-axis	
Contains	tunnelaxis	
<b>Evaluation Method</b>	<b>Answers for: h</b>	<b>Case Sensitivity</b>
Contains	stable	
<b>Evaluation Method</b>	<b>Answers for: i</b>	<b>Case Sensitivity</b>
Contains	the rocks dip neither into nor out of the wall into the excavation	
Contains	the rock dip neither into nor	
Contains	the rocks dip neither	
<b>Evaluation Method</b>	<b>Answers for: j</b>	<b>Case Sensitivity</b>
Contains	not prone to failure	
Contains	not-prone to failure	
Contains	not-prone-to-failure	
<b>Evaluation Method</b>	<b>Answers for: k</b>	<b>Case Sensitivity</b>
Contains	the rocks dip neither into nor out of the wall	
Contains	the rock dip neither into nor	
<b>Evaluation Method</b>	<b>Answers for: l</b>	<b>Case Sensitivity</b>
Contains	be likely to undergo failure	
Contains	likely to undergo failure	
Contains	be-likely-to-undergo-failure	
<b>Evaluation Method</b>	<b>Answers for: m</b>	<b>Case Sensitivity</b>
Contains	the formation of thin wedges in the middle of the tunnel	
Contains	the formation of thin wedges	

☐ 85. Multiple Answer: An area is being examined for possibl...

Points: 10

<b>Question</b>	An area is being examined for possible location of a dam. Use the tick-boxes next to the statements to select which of these properties are suitable for rocks underlying the <u>catchment</u> area.
<b>Answer</b>	<p>The rocks need to be able to get weathered readily.</p> <hr/> <p><input checked="" type="checkbox"/> The rocks must resist weathering.</p> <hr/> <p>Rocks that are eroded and transported easliy are suitable.</p> <hr/> <p><input checked="" type="checkbox"/> Thick quartzite is a suitable rock.</p> <hr/> <p>Granite is unsuitable for the area.</p> <hr/> <p>Limestone would be suitable.</p> <hr/> <p><input checked="" type="checkbox"/> Porous sandstone will be unsuitable.</p> <hr/> <p><input checked="" type="checkbox"/> Heavily faulted rock masses are unsuitable.</p> <hr/> <p><input checked="" type="checkbox"/> Mudstone will be unsuitable.</p> <hr/> <p>Shale will be suitable.</p>

☐ 86. Fill in Multiple Blanks: You may need a pen and paper to write...

## Question

You may need a pen and paper to write down the correct responses, before capturing them in the allocated spaces on this page.

You are provided with geomechanical data for an area targeted for a minor railway tunnel, and reference tables relevant for rock mass characterisation. Answer the questions which follow.

Geomechanical property	Description
Rock quality designation	Length of drilled core = 1200 m Length of core <100 mm = 120 m
Number of joint sets	Two
Description of joint surface roughness	Rough and discontinuous
Condition of groundwater	Dry
Description of gouge	Non-softening, slightly clayey non-cohesive filling
Separation of joint surfaces	Less 0.75 mm
Stress reduction factor data	Uniaxial compressive strength = 260 Mpa Depth of tunnel = 60 m Average density of overlying rocks = 2100 kgm <sup>-3</sup> Acceleration due to gravity = 9.814 ms <sup>-2</sup>

## Joint set number reference table

Number of Joint Sets	Joint Set No. Jn
Intact, no or few joints	0.5 — 1.0
One joint set	2
One joint set plus random joints	3
Two joint sets	4
Two joint sets plus random joints	6
Three joint sets	9
Three joint sets plus random joints	12
Four or more joint sets, random, heavily jointed, sugar cube, etc.	15
Crushed rock, earth-like	20

## Joint roughness number reference table

Description of Joint Surface Roughness	Discontinuous	Undulating	Planar
Rough	4.0	3.0	1.5
Smooth	3.0*	2.0	1.0
Slickensided	2.0*	1.5	0.5
Planes containing gouge thick enough to prevent rock wall contact	1.5*	1.0	1.0

## Joint alteration number reference table

Description of Gouge	Joint Alteration Number Ja for Joint Separation (mm)		
	<1.01	1.0-5.02	>5.03
Tightly healed, hard, non-softening impermeable rock mineral filling	0.75		
Unaltered joint walls, surface staining only	1.0		
Slightly altered, non-softening, non-cohesive rock mineral filling	2.0	4.0	6.0

Slightly altered, non-softening, non-cohesive rock mineral or crushed rock filling	2.0	4.0	6.0
Non-softening, slightly clayey non-cohesive filling	3.0	6.0*	10.0*
Non-softening strongly over-consolidated clay mineral filling, with or without crushed rock	3.0*	6.04	10.0
Softening or low friction clay mineral coatings and small quantities of swelling clays	4.0	8.0*	13.0*
1. Softening moderately over-consolidated clay mineral filling, with or without crushed rock	4.0*	8.04	13.0
2. Shattered or micro-shattered (swelling) clay gouge, with or without crushed rock	5.0*	10.04	18.0

**Joint water reduction factor reference table**

Condition of Groundwater	Head of water (m)	Joint Water Reduction Factor Jw
Dry excavation or minor inflow 5 litre/minute locally	<10	1.0
Medium inflow, occasional outwash of joint/fissure fillings	10 – 25	0.66
Large inflow in competent ground with unfilled joints/fissures	25-100	0.5
Large inflow with considerable outwash of joint/fissure fillings	25-100	0.33
Exceptionally high inflow upon excavation, decreasing with time	>100	0.2-0.1
Exceptionally high inflow continuing without noticeable decay	>100	0.1-0.05

**Stress reduction factor reference table 1**

For Zones of weakness	SRF Value
Multiple occurrences of weakness zones containing clay or chemically disintegrated rock, very loose surrounding rock (any depth)	10
Single weakness zones containing clay or chemically disintegrated rock (depth of excavation < 50m)	5
Multiple shear zones in competent rock (clay-free), loose surrounding rock (any depth)	2.5
Single shear zones in competent rock (clay-free), loose surrounding rock (any depth)	7.5
Single shear zones in competent rock (clay-free) (depth of excavation < 50m)	5.0
Single shear zones in competent rock (clay-free) (depth of excavation > 50m)	2.5
Loose open joints, heavily jointed or "sugar-cube" etc (any depth)	5.0

**Stress reduction factor reference table 2**(Principal stress =  $pgh = s_1$ ) where  $g = 9.814$ 

Competent rock/Stress problems	UCS /s1	st / s1	SRF Value
Low stress, near-surface	>200	>13	2.5
Medium stress	200-10	13-0.66	1.0
High stress, very tight structure (usually favourable to stability, may be unfavourable for wall stability)	10-5	0.66-0.33	0.5-2
Mild rock burst (massive rock)	5-2.5	0.33-0.16	5-10

(A). Determine Barton's Q-Value for the rock mass.

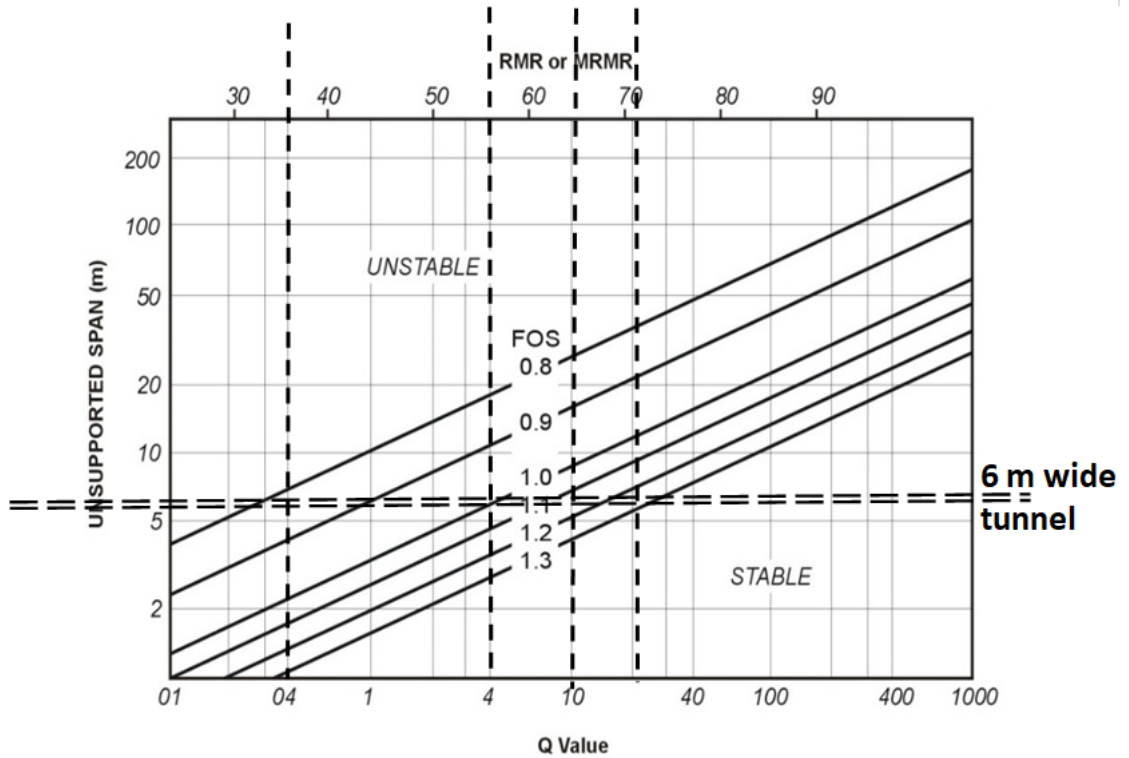
You are given that  $Q = RQD \times J_r \times J_w \times J_n / J_a / SRF$ , where

- RQD is the rock quality designation
- $J_r$  is the joint roughness factor
- $J_w$  is the joint water stress reduction factor
- $J_n$  is the joint set number
- $J_a$  is the joint surface alteration factor
- SRF is the stress reduction factor

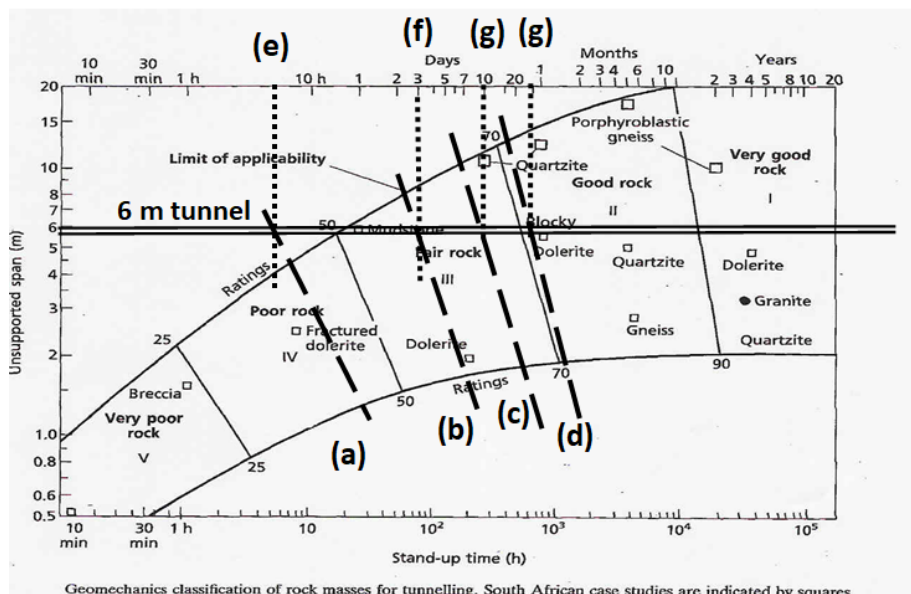
Round off your response to no decimal places [A]

(B) What is the Bieniawski's Rock Mass Characterisation (RMR) value for the body of rock? Round off your response to one decimal place. [B]

(C) What is the FOS value for a 6 metre-wide tunnel? Use the plot below to find the value. [C]



(D) Use your findings in (A) and (B) to select the correct stand-up-time for the 6 metre-wide tunnel. Use the labels (a), (b) or (c) to specify your select



(E) What will be the consequence of increasing the tunnel span to 10 metres on the FOS? [E]

(F) What will be the consequence of increasing the tunnel span to 10 metres on the stand-up-time? [F]

(G) Comment on the impact on stability of tunnels as the span is increased. [G]

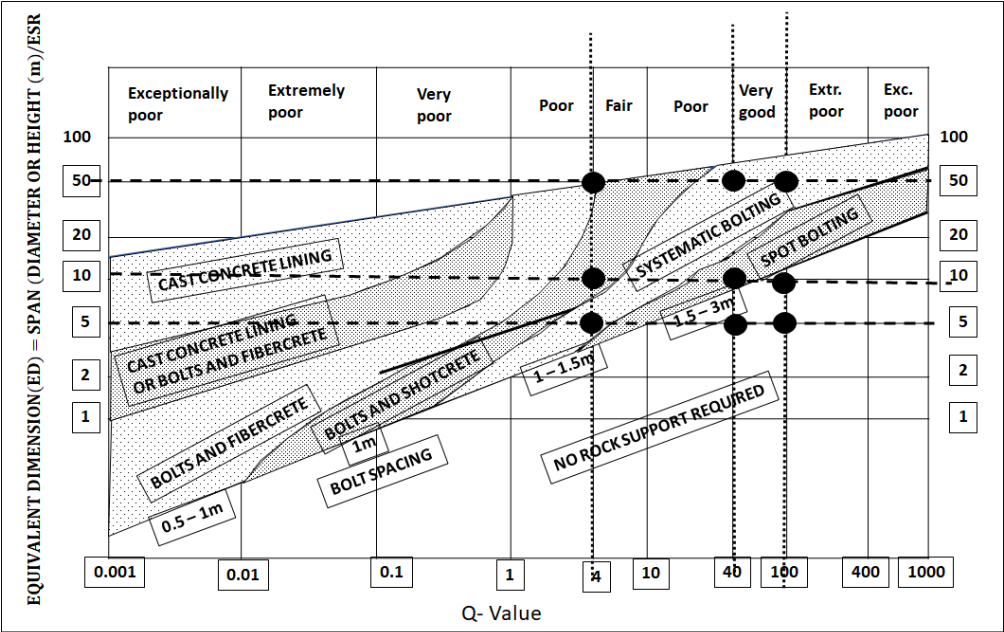
(H) A final decision is made to open the tunnel at a width of 14 meters: what will be the Equivalent Dimension? Hint: Use the Equivalent Support Ratio

**Equivalent support ratio (ESR) for different excavations**



Excavation Category		Equivalent Support Ratio (ESR)
1	Temporary mine openings	3 -5
2	Vertical shafts; circular section	2.5
	Vertical shafts; rectangular/square section	2.0
3	Permanent mine openings; water tunnels for hydropower (excluding high-pressure penstocks); pilot tunnels; drifts; headings for large excavations	1.6
4	Storage caverns, water treatment plants; minor highway and railway tunnels; surge chambers; access tunnels	1.4
5	Power stations; major highway or railroad tunnels; civil defence chambers; portals; intersections	1.0
6	Underground nuclear power stations; railroad stations; factories	0.8

(I) What will be the work necessary to ensure the stability of the excavation? Use the correct one of the plots below to find your answer. [I]



Evaluation Answers for: A  
Method

Exact Match 4  
Exact Match 4.0  
Exact Match 4,0

Evaluation Answers for: B  
Method

Exact Match 57  
Exact Match 56.5  
Exact Match 56,5  
Exact Match 56.48  
Exact Match 56,48

Evaluation Answers for: C  
Method

Exact Match 1  
Exact Match 1.0  
Exact Match 1,0

Evaluation Answers for: D

<b>Method</b>	
Contains	3 days
Contains	3days
Contains	3-days
<b>Evaluation Answers for: E</b>	
<b>Method</b>	
Exact Match	reduce
Exact Match	decrease
Exact Match	fall
Exact Match	go down
Exact Match	go-down
<b>Evaluation Answers for: F</b>	
<b>Method</b>	
Pattern Match	decrease
Pattern Match	reduce
Pattern Match	fall
Pattern Match	go down
Pattern Match	go-down
<b>Evaluation Answers for: G</b>	
<b>Method</b>	
Exact Match	reduce
Exact Match	decrease
Exact Match	go down
Exact Match	go-down
Exact Match	fall
<b>Evaluation Answers for: H</b>	
<b>Method</b>	
Exact Match	10
Exact Match	10,0
Exact Match	10.0
<b>Evaluation Answers for: I</b>	
<b>Method</b>	
Exact Match	bolts and shotcrete
Exact Match	bolts-and-shotcrete

Select: 

AllNone

 Select by Type: 

- Question Type -

Delete and Remark

Points

Update and Remark

Hide Question Details

← OK