IEA - Data Enhancement Project

Questionnaire printing

Study: SC2

Population: 3

Instrument: STE_3

Student Achievement Test Earth Science (3E) Population 3

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1 A solar collector for a water heater is placed outside, on the sunny side of a house, tilted 34ø from the horizontal. At which position of the Sun would the heat collector receive the most intense solar radiation?

[Picture]

A Position A
B Position B
C Position C
D Position D
E Position E

P3E01

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2 Given only the distance of a planet from the Sun, which of the following can be computed?

A the planet's mass
B the planet's orbital period
C the planet's surface gravity
D the planet's period of rotation
E the planet's density

P3E02

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3 The diagram below represents a contour map of a hill.

[Picture]

On which side of the hill does the land have the steepest slope?

A north
B south
C east
D west
E south-east

P3E03

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4 Suppose the Earth's mass were twice as great as it is. Assuming that the Earth stayed in the same orbit, what would happen to its period of revolution?

A increase 4 times
B increase 2 times
C decrease by a factor of 2
D decrease by a factor of 4
E remain the same

P3E04

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5 The diagram below shows latitude and longitude lines on the surface of the Earth. Letters A to E represent sea level locations and the arrow shows the direction of the Earth's rotation. The latitude lines shown are spaced 10ø apart and the longitude lines are spaced 15ø apart.

Which location would receive the highest average yearly insolation per square meter of surface if the atmosphere were completely transparent a each location?

[Picture with the positions A to E on globe]

P3E05

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6 The diagram below shows an artificial satellite in an elliptical orbit about the Earth. At which position will its velocity be greatest?

[Picture with the positions A to E on orbit]

P3E06

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7 [Picture]

The diagram above represents the Earth.
What is the latitude at position A?

A 20 degrees North
B 40 degrees North
C 50 degrees North
D 60 degrees North
E 70 degrees North

P3E07

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8 Which of the following pairs of characteristics is most useful in determining a rock's origin?

A colour and shape
B size and mass
C density and hardness
D composition and texture
E colour and mass

P3E08

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9 The diagram below represents a hot-air solar collector consisting of a wooden box frame, an absorber plate, a glass cover, and insulation.

[Picture]

What is the main purpose of the insulation behind the absorber plate?

A It decreases the amount of energy lost through the back of the collector.
B It decreases the amount of energy received by the collector.
C It increases the amount of energy reflected by the absorber plate.
D It increases the rate of energy transfer through the absorber plate.
E It increases the amount of energy transmitted by the glass cover.

P3E09

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10 Which of the following locations on Earth will have the greatest number of daylight hours on July 1st?

A 23 degrees North latitude
B 70 degrees North latitude
C 23 degrees South latitude
D 60 degrees South latitude
E 70 degrees South latitude

P3E10

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11 The diagram below is a map showing the stream drainage pattern for an area of the Earth's crust.

[Picture]

Which geologic cross-section shows the most probable underlying rock structure and surface for this area along line X-Y?

[Pictures A to E]

P3E11

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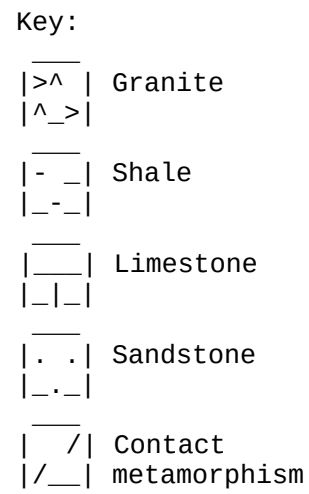
12 The diagram below represents a cross-sectional view of a portion of the Earth's crust with specific points A, B, C, D, and E within the cross-section.

In which region would rock be found which shows a gradual transition from sedimentary to metamorphic rock?

[Picture with the positions A to E]



P3E12

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13 Relative humidity is 50 per cent. What does this mean?

A The chance of rain is 50 per cent.
B The atmosphere contains 50 pounds of water per cubic mile.
C The atmosphere contains 50 grams of water per cubic meter.
D The atmosphere would be saturated with water if the air temperature were 50øC.
E The atmosphere contains 50 per cent as much water as it could contain at its present temperature.

P3E13

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14 The diagram below represents a geological cross-section. Letters E, F, G, H, J, M, N and P indicate rock formations. Roman numerals I and II identify boundary lines indicating geologic events. (Assume contact metamorphism has occurred around igneous intrusions H and J.)

[Picture]

In which two kinds of rocks are fossils *least* likely to be found?

A M and G
B H and J
C P and N
D M and P
E G and N

P3E14

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15 A mineral sample contains large crystals. Which one of the following is most probably true?

A The mineral was formed in a volcano.
B The mineral contains a valuable metal.
C The mineral cooled instantly under water.
D The mineral has cleavage in three directions.
E The mineral solidified slowly from hot liquid.

P3E15

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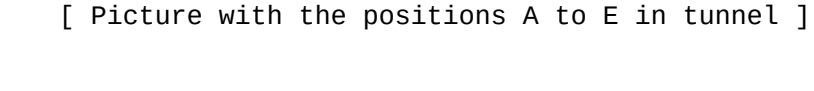
16 The diagram below represents a cross-sectional view of a tunnel cut through a mountain. The area where the mountain is located receives heavy rainfall. If the shale layers are impermeable, at which point would the most water probably seep through the roof of the tunnel?

Key:

Shale



Sandstone

P3E16

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17 Which statement best describes how the surface of the Earth changes over billions of years?

A A flat surface is gradually pushed up into steeper and steeper mountains until the world is covered with mountains.
B Very steep mountains gradually wear down until most of the world is worn down to sea level.
C Very steep mountains gradually wear down into flat surfaces that may be again pushed up into mountains, and so on over and over again.
D Very steep mountains and flat plains stay side by side for billions of years with little change.
E Very steep mountains are gradually pulled down by gravity into flat surfaces that may be again pushed up into mountains, and so on over and over again.

P3E17

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18 The diagram represents an exposed rock outcrop. Which geologic event probably occurred last?

A the intrusion of A
B the fault along line B
C the folding at C
D the deposition of sand at D
E the deposition of gravel at E

[Picture with A to E]

P3E18

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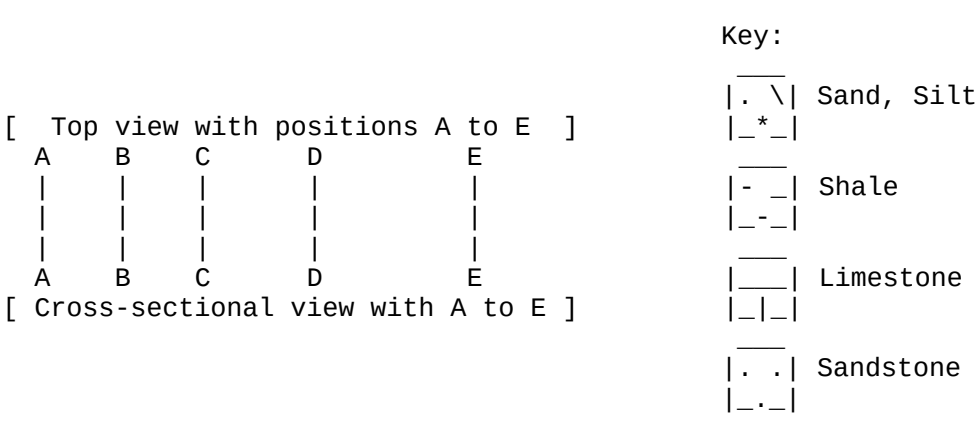
19 The next two questions refer to the following information,

Diagram 1 represents a map view of a stream with reference points A through E within the stream bed. Diagram 2 represents a geologic cross-section of the area over which the stream flows. (Assume that the volume of the stream is constant.)

At which point would the stream's velocity most likely be greatest?



P3E19

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20 Refer to the information in question 19.

An observer looks downstream from a location just above point D and draws a cross-section of the stream bed at point D. Which diagram would probably best represent this cross-section?

[5 pictures of diagrams A to E]

P3E20

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21 About what per cent of the Earth's surface area is covered by ocean?

A 10 per cent
B 30 per cent
C 50 per cent
D 70 per cent
E 90 per cent

P3E21

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22 If the Sun were directly overhead at noon on June 15, what would the latitude be?

A 23.5 degrees N
B 40 degrees N
C 23.5 degrees S
D 40 degrees S
E 0 degrees (the equator)

P3E22

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23 The ratio of the actual amount of water vapor in the air to the amount it could hold at that temperature is called

A dew point.
B vapor pressure.
C relative humidity.
D saturation vapor pressure.
E absolute humidity.

P3E23

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24 Why do temperatures generally decrease toward the poles?

A Air movement is generally toward the equator.
B Cold polar air masses prevent surface heating of the land.
C Cold surfaces do not absorb solar energy as readily as warm.
D Less solar energy per unit area falls on the Earth's surface toward the poles.
E The surfaces around the pole are oceanic rather than continental.

P3E24

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25 Why is the surface of the land irregular despite active gradation since the beginning of the Earth?

A Gradation is slow and inefficient.
B Parts of the crust have been uplifted.
C Gradation does not reduce elevation differences.
D The deposition of sediment re-elevates the continents.
E The surface of the land was originally created irregular.

P3E25

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26 How do the effects of physical weathering differ most fundamentally from those of chemical weathering?

A Chemical weathering changes the composition of particles whereas physical weathering does not.
B Chemical weathering changes the size of particles whereas physical weathering does not.
C Physical weathering changes the composition of particles whereas chemical weathering does not.
D Physical weathering changes the size of particles whereas chemical weathering does not.
E Physical weathering takes place at both the surface and beneath the surface while chemical weathering occurs only at the surface.

P3E26

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27 What fundamental assumption is made when the record found in the rocks is interpreted?

A The composition of the atmosphere and oceans has not changed significantly.
B The temperature of the Earth was much higher when the Earth was first formed.
C Some chemical and physical processes that occurred in the past do not take place today.
D Rock features were produced by the same processes that are producing those features today.
E Rock features were produced by processes quite different from those producing such features today.

P3E27

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28 The half-life of C^{14} is 5,700 years. What proportion of the original C^{14} would be left after 11,400 years?

A 1/4
B 1/2
C 3/4
D 7/8
E 15/16

P3E28

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29 The presence of wave-cut terraces 30 m above present sea level would most likely indicate that

A the land mass has risen.
B tides were higher in the past.
C storm waves were higher in the past.
D either land or sea level has undergone change.
E the terraces were cut by stream action.

P3E29

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30 What is the result of a decrease in the kinetic energy of a stream?

A Down-cutting will decrease.
B Turbulent flow will develop.
C Suspended material will increase.
D Dissolved material will increase.
E The potential energy of the stream will increase.

P3E30
