ACT 0556A - SCIENCE TEST SECTION 4 Answers

Passage I

Question #1 –

From graph Fig 1 on Study 3, it is clear that the as the total annual precipitation increases (x-axis), the average discharge increases (y-axis).

ANSWER – A

(Also you can see that answers B, C, and D are incorrect and can be eliminated easily)

In general it is easy to see from the slope of the line shown in figures below as examples:

- If the slope is positive (fig A), then as x-axis value increases, the y-axis value increases.
- If the slope is negative, then as x-axis value increases, the y-axis value decreases (fig B)
- If the slope is zero (fig C – the line is along the x-axis or parallel to the x-axis), then as x-axis value increases, the y-axis value remains unchanged
- If the slope is infinity, then the x-axis value remains unchanged as the y-axis value increases (fig D – the line is along the y-axis or parallel to the y-axis)

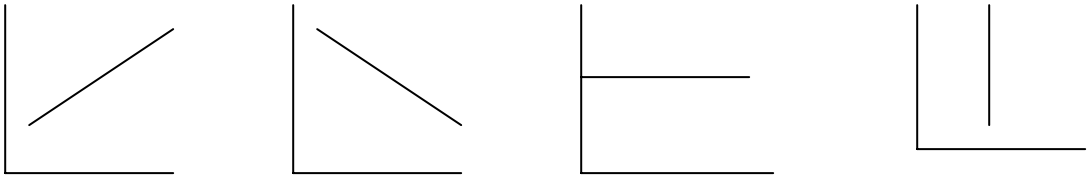

Fig A **Fig B** **Fig C** **Fig D**

Question #2 –

From Table 1, for limestone bedrock (Column 2), Catchments A,B, C (column 1) and looking at Figure 1, the average annual precipitation is increasing linearly from A to B to C, and the erosion rates (column 5) is also increasing linearly from 0.9 for A, to 1.9 for B, and 2.7 for C. Therefore the Answer A makes the right sense and is the answer.

ANSWER – F

(Answer G tells that the erosion rate decreases and then remains constant, Answer H tells that the erosion rate increases and then remains constant, Answer J tells that the erosion rate decreases as the annual precipitation increases – All these answers are incorrect)

Question #3 –

If Catchment C received 300 cm precipitation, then from study 3, what will the average discharge for catchment is expected to be?

Look at the graph in Figure 1, for the point C if you extrapolate (the x-axis goes up to 250 cm and the average discharge (y-axis) is 12) to 300, it is obvious that the average discharge is going to greater than 12 or Answer D.

ANSWER – D

Question #4 –

For Study 2, look at Table 2 for the relationship between air temperature (column 2) and total precipitation (column 3), there is no correlation between the 2. For example for precipitation of 67.5, the first data on column 3, the air temperature is 20 deg C, for precipitation of 142.5 the air temperature is 31 (looks like increasing in the same direction), but the next data precipitation of 202 the air temperature is 26 (decreasing). So there is no clear correlation between annual air temperature and total annual precipitation.

ANSWER – J

Question #5 –

The question is on Table 1, Study 1, about mechanical weathering (based on solid load, column 4) and chemical weathering (based on dissolved load, column 3) and how they compare for Limestone and Quatrzile.

For Limestone data A, B, C and comparing columns 3 and 4, it is clear that the Limestone is more susceptible to chemical weathering than to mechanical weathering or column 3 values are larger than column 4 values.

For Quartzile, the mechanical weathering is more than the chemical weathering or column 4 values are larger than column 3 values for data D and E for Quartzile.

Answer B is the correct one as none of the other answers meet the requirements described above from the data.

ANSWER – B

Question #6 –

From Table 1 for Limestone, the erosion rate for point A (erosion rate is in column 5) is 0.9 and from the graph in Figure 1, for point A the annual precipitation is about 70 cm. So, for a total annual precipitation of less than 25 cm, the erosion rate will be less than 0.9 (because you can see from the data points A,B, and C in Figure 1, shows that as annual precipitation decreases, the erosion rate decreases (a direct correlation between the 2 factors) and for a total annual precipitation of less than 25 cm, the erosion rate will be less than 1 cm/1000 yr) or Answer F.

You can also rule out answers G, H, and J as they are not true from the data evaluation.

ANSWER – F

Passage II

Question #7 –
The 3rd sentence under Hydrothermal Vent Hypothesis provides the information needed to answer this question. It says that the temperatures ranged from 700 deg C (deepest part) to 10 deg C (at the top of the vent or the seafloor opening). This temperature gradient produced organic molecules from chemical reactions. Answer B is the correct one describing the temperature range of 10 deg C to 700 deg C. You can see also that the other answers are not correct.
ANSWER – B

Question #8 –

The last sentence under each hypothesis discuss about self-replicating cells. Answer G describes this. Review of the other answers show that they can be eliminated.
ANSWER – G

Question #9 –
Both hypotheses indicate that the oceans provided the ideal conditions for creating life on earth. Under Hydrothermal Vent Hypothesis section the ocean floor and hydrothermal vents are discussed throughout the section and under Outer Space Hypothesis the deep oceans providing the ideal conditions for formation of organic molecules is described in the last sentence of this section.
ANSWER – B

Question #10 –
Under Outer Space Hypothesis section, the first and second sentence discusses the earth being bombarded by bodies from outer space and that the solar system has been bombarded by asteroids, comets, and meteoroids. Answer H is the correct choice.
ANSWER – H

Question #11 –
If organic molecules existed on earth before oceans existed on Earth, then Outer Space Hypothesis will support this discovery. Hydrothermal Vent Hypothesis assumes that the oceans existed and the temperature gradient in the hydrothermal vents allowed the chemical reactions to take place to form organic molecules. Answer A is the correct one.
ANSWER – A

Question #12 –
Both hypotheses are based on organic molecules forming polymers and later living, self-replicating cells. Therefore Answer H is the correct one.
ANSWER – H

Question #13 –
Under Outer Space Hypothesis section, the middle of the section states that most organic molecules were brought to earth by interplanetary dust particles and Answer C supports the statement described in this question.
ANSWER – C

Passage III

Question #14 –

It is clear by looking at the 3 graphs (top 3 of distance, y-axis and time, x-axis), Motorbike 3 is the one that is not at the starting line (0 on the graph is the staring line). Point A for Motorbike 3 is the starting point and it is not at 0.

ANSWER – G

Question #15 –

This question requires careful reading, as it is not very obvious at first glance**.** It is easier to look at the graph for Set 2, the middle graph for velocity versus time and figure the answer. Point A is when the vehicle is at a stop, then increases in velocity until it reaches Point B, then decreases to Point C and comes to a stop. Using this you can see that the Answer D is the correct one.

ANSWER – D

Question #16 –

Another question where it is easier to look at the graph first and then choosing the correct answer. Given that the negative values for acceleration are seen below the x-axis, looking at the bottom 3 graphs of acceleration versus time, the only graph that has this negative acceleration is for set 2 (bottom graph for Set 2). Now at the graph just above it for velocity (because the question is about velocity) corresponding to the time when acceleration is negative in the bottom graph, you can see that the velocity decreases during this time period. Answer H is the one.

ANSWER – H

Question #17 –

This is an easy one at first glance you can get the answer as A. The baseball is traveling in opposite direction as it is thrown from one person to the other and back. Other answers can be easily ruled out as they are traveling in the same direction

ANSWER – A

Question #18 –

This is again should be easy to spot from looking at the graphs (middle and bottom graphs) for set 3. From the bottom graph A to B is acceleration is 0 and the velocity from middle graph corresponding to this is also 0 from point A to B. But from point C to D on the bottom graph (acceleration Vs time) the acceleration is 0 and the corresponding points C to D in the middle (velocity Vs time) the velocity is not 0. This is the contradiction and the answer is J

ANSWER – J

Passage IV

Question #19 –

The question about the melting point for iron (Fe) at or above which is the temperature at which the iron substance will melt and can be poured out of the reactor (reactor is the container in which the reaction or heating takes place). From Table 1, for Fe (in column 1) the melting point from column 3 is 1,535 deg C. So Answer D is the correct one.

ANSWER – D

Question #20 –

It is easy to look at the data in Table 1, column 2, and going down the column, the atomic number increases, Corresponding melting points are in Column 3. You can easily see that there is no clear correlation between the atomic number and the melting point values. The values are all over the place (example it increases with atomic numbers 21, 22, and 23; then decreases for atomic numbers 24 and 25; then increases for atomic number 26; then decreases for the atomic numbers 27 to 30.

ANSWER – J

Question #21 –

Which element will require the least amount of energy to form a +1 ion?

Another easy one – look at the column 4, First Ionization energy values and the smallest value is for Sc of 631 kJ/mole.

ANSWER – A

Question #22 –

In Table 1, you need to look at the last 2 columns, column 5 gives the atom radius and the column 6 gives the corresponding ionic radius. It is clear that for each element the atomic radius (column 5) is always larger than the ionic radius (column 6) for each element. The answer is F. All other answers van be ruled out.

ANSWER – F

Question #23 –

This is a little tricky, but not hard to answer. For Zn, the second ionization energy is 1,733 kJ/mole (that is the energy required to remove the second electron from +1 ion (+ 1 ion is formed when one electron is removed or First ionization energy given in column 4 and for Zn, the first ionization energy is 906 kJ/mole) to form +2 (when an additional electron is removed from Zn in + 1 state). So to go from Zn neutral atom to +2 state, you have to add the 2 values of ionization energies or 906 + 1,733 or Answer D

ANSWER – D

Passage V

Question #24 –
From Figure 1 bar graph, it is clear looking at the answers, that between masses 0.6 to 1.0 has the largest percentage of seeds.
ANSWER – G

Question #25 –
From Figure 2, for seeds under 0.5 mg, the data for cleared sites and greenhouse disprove the hypothesis that below 0.5 mg seed mass cannot produce plants under any conditions. (the top 2 lines show that below 0,5 mg plants can be produced in cleared sites and in greenhouse). Answer is C
ANSWER – C

Question #26 –

From Figure 3, for greenhouse (top line), for 2 mg mass (x-axis), the average mass of seeds produced (y-axis corresponding to 2 mg on x-axis) is slightly less than 2.5. Answer H 2.4 is the correct one.
ANSWER – H

Question #27 –
Looking at Figure 2 corresponding to any parent seed mass, the mass of the plants were the greatest for greenhouse, cleared sites next and the least is for uncleared sites. Answer C is the correct one.
ANSWER – C

Question #28 –

From Figure 2, for parent mass of 0.9 (x-axis), the corresponding mass of plant (y-axis) is about 1.5. Using this 1.5 mg mass of parent in Figure 3 (x-axis), the corresponding average mass of seeds produced (y-axis) is zero or no seeds would be produced. So Answer F is the correct description.
ANSWER – F

Passage VI

Question #29 –

Looking at Figure 1 for Study 2, between 440 to 460 nm wavelength (x-axis), the corresponding rate of photosynthesis (y-axis) produces the greatest rate of photosynthesis. Answer A is the correct one. Reviewing the other answers, they can be ruled out.
ANSWER – A

Question #30 –

This is poorly worded question, but the answer is F. Bacteria require oxygen to survive and more oxygen is released in the red and orange light. The other answers can definitely be ruled out, as they are not true.
ANSWER – F

Question #31 –
None of the studies support the conclusion that as the light intensity increases photosynthetic activity increases. No data is provided on intensity of light.
ANSWER – D

Question #32 –
The color of a substance is from the wavelength of the light that it does not absorb. From Study 3, Figure 2, for carotenoids, the dotted line indicates that it absorbs blue, green and below 550 nm and therefore the color of carotenoids would most likely be yellow-orange or Answer G
ANSWER – G

Question #33 –
Another somewhat confused question makes you wonder why many stores sell blue or blue-purple grow lights. Study 1 indicates that most bacteria were found in the red & orange region and the answer is D

ANSWER – D

Question #34 –

Studies 1 and 2 are the most likely ones that will require maintaining the temperature to be the same. This is because temperature will have a direct effect on bacteria survival in Study 1 and the rate of photosynthesis in Study 2. Study 3 does not appear to have an impact of temperature changes to a large extent.

ANSWER – J

Passage VII

Question #35 –
Reviewing Experiment 2, it is clear that the sequence of steps is sample + acid to dissolve, then an oxidant is added, then diluted with water to get the test solution. So Answer D is the correct one. The other answers can be ruled out if needed.
ANSWER – D

Question #36 –
In experiment 2, the oxidant is added to convert Mn +2 to MnO_4 –, which is purple color and the intensity of the purple color is what is compared in the test solution versus known standard MnO_4 –. So, Answer G is the correct one. (Also note that in experiment 1, you start with permanganate (MnO_4 –) solution and therefore you don't need to add an oxidant)

ANSWER – G

Question #37 –
If not enough oxidant is added, then not all Mn+2 will be converted to purple MnO_4 – color and the value of the absorbance (absorbance is directly proportional to the color intensity and color intensity will be less if not enough oxidant is added) will be less than if all Mn+2 is converted to MnO_4 –

ANSWER – C

Question #38 –
For Experiment 2, reviewing Table 1, the absorbance value is highest for pipe A (0.850 from column 3) and therefore pipe A has the highest content of Mn

ANSWER – F

Question #39 –
From Table 1 you can see that for pipe D, the absorbance value (column 3) is 0.5. Use this value in Figure 1 (y-axis) to find the Mn concentration (from x-axis). For 0.5 absorbance, it appears that the Mn concentration is close to 1.1 or Answer C

ANSWER – C

Question #40 –
For Mn, the MnO_4 – absorbs light in the 530 nm range and the spectrometer for both the standard solutions (Figure 1) and the test solution (Table 1). So, for Copper, Cu, Cu2+ absorbs in the 675 nm range. Both standard solution and the test solution must be measured at the same wavelength (675 nm) to compare the results. Answer J is the one.

ANSWER – J